Geojournal of Tourism and Geosites

Year XVIII

2025 / no. 3

vol. 61

Editura Universităţii din Oradea

GTG

Geojournal of Tourism and Geosites

Oradea University Press

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ISSN 2065-0817, E-ISSN 2065-1198

The Journal is issued under aegis and with financial support of:

University of Oradea, Romania
Department of Geography, Tourism and Territorial Planning
Territorial Studies and Analysis Centre
1 University St., 410087, Oradea, Romania

Gdansk University of Physical Education and Sport, Poland
Faculty of Tourism and Recreation
ul. Kazimierza Górskiego 1, 80-336 Gdańsk, Poland

GTG
Geojournal of Tourism and Geosites

Year XVIII, no. 3, vol. 61

Oradea - Gdańsk
2025

PUBLICATION REQUIREMENTS OF ARTICLES IN THE GEOJOURNAL OF TOURISM AND GEOSITES

The Editorial Board goes trough each article, which in then submitted to two referees' judgment. Names of referees are confidential to the Editorial Board. Authors may be asked to make revisions to their manuscript. If substantial revision is required manuscripts may be re-reviewed before a decision to accept/publish is made. Final acceptance of manuscripts for publication is at the discretion of the Editors.

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The Geojournal of Tourism and Geosites
is indexed in:

SCOPUS: http://www.scopus.com/

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INDEX COPERNICUS: http://journals.indexcopernicus.com/karta.php?action=masterlist&id=3947
IC Value: **134.41** - 2022; **134.64** - 2021; **132.41** - 2020; **121.20** - 2019; **121.25** - 2018; **109.97** - 2017; **88.82** - 2016; **84.53** - 2015; **68.79** - 2014; **6.59** - 2013; 2012; **4.84** - 2011; **4.83** - 2010; **4.15** - 2009; **3.91** - 2008

Review accredited by **C.N.C.S.I.S.,** "**C**" Categoryhttp://vechi.cncsis.ro/cenaposs/2008/Arhiva/reviste_cat_C_08.pdf

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DOAJ - DIRECTORY OF OPEN ACCES JOURNALS: https://doaj.org/search

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Price of journal:

Individual	10 €
Institutional	15 €
Annual subscription	20 €

Address of the Editorial Office:
University of Oradea Department of Geography,
Tourism and Territorial PlanningTerritorial Studies and Analysis Centre 1 Universităţii St.,
410087, Oradea, Romania, Phone/fax: +40 259 408 475 e-mail: gtg.uoradea@yahoo.com

On line version:
http://gtg.webhost.uoradea.ro

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

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DOI 10.30892/gtg.61356-1566 1990

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Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1408-1419
DOI 10.30892/gtg.61301-1511

DESIGNING EFFECTIVE SIGNAGE SYSTEMS FOR TIBET'S POTALA PALACE: A MIXED-METHOD APPROACH TO ENHANCING TOURIST EXPERIENCE

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Citation: Wu, M., Tahir, H.B.M., & Padil, M.N. (2025). Designing effective signage systems for Tibet's Potala palace: A mixed-method approach to enhancing tourist experience. *Geojournal of Tourism and Geosites*, 61(3), 1408–1419. https://doi.org/10.30892/gtg.61301-1511

Abstract: Every year, the Potala Palace in Tibet is visited by millions of tourists due to its status as a landmark that is recognized all over the world. Nevertheless, the current signage system is not sufficient in guiding tourists, which results in confusion and a decrease in the level of satisfaction experienced by visitors. When it comes to directing visitors to culturally and historically significant areas, having a signage system that is both effective and adequate is absolutely necessary. This study's primary purpose is to evaluate the efficiency of the present signage system, as well as the preferences of tourists and cultural researchers on the improvement of signage, and to determine the level of satisfaction that these individuals have with the signage that is currently in place at Potala Palace. The purpose of this study is to examine the preferences of tourists and their levels of satisfaction regarding the effectiveness of signs by using a mixed-method approach that is based on both qualitative and quantitative data gathering. The findings of the study suggest that the current signage program is severely lacking in terms of meeting the requirements of tourists, particularly with regard to considerations such as clarity, visibility, and cultural sensitivity. This is the conclusion that can be drawn from the findings of the study. At Potala Palace, there were several guests who expressed their desire for more understandable and more contextualized signs. The outcomes of the study indicate that the multimodal signals should receive the utmost attention, particularly when translating into several languages and making use of pictograms that are sensitive to cultural norms. The study suggests that the directions should be designed appropriately, that signs should be used that are easily understood by everyone, and that information should be combined in a number of different languages in order to increase the customers' ability to comprehend what they are seeing at the Potala Palace.

Keywords: effective signage systems, Tibet's Potala Palace, mixed-method analysis, cultural researchers, perceptions, tourist experience

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INTRODUCTION

The Lhasa Potala Palace, an emblem of Tibetan culture, populace, and history, is renowned globally. The Fifth Dalai Lama constructed this site in 1635 as his abode. The winter palace served as the residence for successive Dalai Lamas and the administrative center until 1959. Potala Palace is a cultural and historical landmark due to its architecture, which integrates traditional Tibetan construction techniques with exquisite murals and antiques (Britannica, 2024).

The Potala Palace, a Tibetan Buddhist landmark, was designated a UNESCO World Heritage site in 1994. The palace, featuring more than 1,000 chambers, chapels, and halls, showcases centuries-old traditions alongside Tibetan art and culture (National Geographic, 2023). By 2024, the World History Journal indicates that it continues to serve as a potent emblem of Tibetan spirituality and a revered site that every Tibetan Buddhist aspires to visit.

Potala Palace is a prominent tourist destination that attracts thousands of visitors. The splendid architecture, panoramic views of Lhasa, and regional terrain attract visitors (Tibet Travel, 2024). Preserving building integrity and fulfilling daily tourist quotas exemplify challenges in cultural heritage management within tourism (National Geographic, 2023).

The palace embodies Tibetan culture beyond mere ornamentation and design. This underscores its significance as a Tibetan and global cultural and spiritual heritage that must be conserved as a historical monument (Britannica, 2024; World History Journal, 2024). Signage systems enhance travelers' experiences and safeguard both tangible and intangible cultural heritage. Effective indoor signage aids visitors in understanding the cultural context of heritage sites while offering direction.

Recent studies indicate that tourism signage necessitates meticulous design. Deri et al., 2023 contend that methodologies and practices regarding the cultural importance of the visited site are essential for enduring educational experiences derived from excursions. They emphasized the necessity of investigating and implementing innovative signage solutions that enhance community-based tourism, as well as social, economic, and environmental sustainability, including the use of QR codes for tourist engagement. Liu (2020) asserts that digital technologies in cultural heritage management transform heritage presentation from singular and one-dimensional to pluralistic, participatory, and immersive. This modification facilitates greater interaction between historical interpreters and visitors, enhancing the whole experience.

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Universal design in tourism signage is increasingly prevalent. Wan (2022a) examines visitor signage and experiences at heritage sites, promoting designs that cater to a broader audience, including individuals with disabilities. These signage systems enable all visitors to engage with cultural heritage, enhancing the inclusivity and diversity of the tourist experience.

Contemporary literature epitomizes modernity and becomes an essential component of tourism. With the progression of navigation, cultural knowledge, and technology, effective signage is crucial for the theater experience and cultural tourism.

Tourists often experience disorientation, language barriers, and unfamiliarity with local customs, which can negatively affect their vacation experience. When traveling to distant locations, they encounter numerous challenges. Although Japan's transit system is well-organized and efficient, the extensive range of transportation options can be overwhelming for non-Japanese speakers, leading to navigational difficulties (Visit Inside Japan, 2024b).

A significant challenge in tourism is overcoming linguistic barriers. While many Japanese businesses offer bilingual services, most restaurants, particularly in rural areas, lack English communication options (Visit Inside Japan, 2024b). Furthermore, reliance on translation apps often results in misinterpretations, potentially leading to safety concerns. Cultural unfamiliarity also impacts tourists' experiences, sometimes causing social faux pas and reducing their overall attraction to the destination. Moreover, decision-making processes and communication styles in Japan present additional complexities. These cultural differences can hinder tourists from effectively following local norms and behaviors, making it difficult for them to navigate social and organizational settings (Visit Inside Japan, 2024a).

To address these challenges, strategic measures must be implemented, including improving signage, expanding multilingual support, and providing comprehensive cultural orientation to international visitors.

Research Objectives

The main research objective of the study is to enhance the experiences of Potala Palace tourists while preserving its cultural integrity through the installation of signage. The specific objectives of the study are:

1. To assess the effectiveness of the current signage system at Potala Palace.
2. To identify the signage improvement preferences of the tourists to influence signage effectiveness at Potala Palace.
3. To evaluate the satisfaction levels of tourists regarding the existing signage at Potala Palace.

Significance of the Study

This study examines signage at the UNESCO World Heritage Site Potala Palace, which influences tourism, culture, and visitor satisfaction. The subsequent three points illustrate the significance of the study.

Initially, effective signpost systems enhance travelers' mobility and accessibility. With appropriate signage, tourists can effortlessly traverse Potala Palace, a site of cultural significance with diverse cultural and linguistic origins. The research enhances the experiences of both domestic and foreign tourists by mitigating navigation and language barriers in the host nation. Enhanced external and interior signage can elevate visitors' impressions and stimulate the local economy by encouraging repeat visits. Secondly, Potala Palace both engages and informs tourists on Tibetan culture and religion. This project employs Tibetan arts, symbolic narratives, and several languages to denote locations as historical pilgrimage sites. This study advocates for Tibetan culture and presents its findings in an academic manner. The research recognizes that signage informs tourists about the palace's history prior to their departure. Third, each temporary World Heritage site prioritizes visitors. This study examines signage problems such as ambiguous directions, improper placement, and signs that fail to align with visitors' cultural norms, and provides a solution that enhances visitor experience. Improving signals and indications for clarity, precision, and engagement enhances utility, productivity, and enjoyment. Repeat clients provide favorable evaluations and advocate for the site, enhancing its credibility and sustainability.

This study's findings enhance the literature on factors that enhance tourist experiences, preserve cultural heritage, and elevate visitor satisfaction, which is crucial for the management of historic sites and sustainable tourism.

LITERATURE REVIEW

Appropriate signage facilitates movement to and from locations in tourist zones. This may be observed in Jeju Olle Trail in South Korea uses different colors and markers to guarantee hikers are well directed on the best routes to travel (Jeju Olle Foundation, 2023). The design of signage is a critical element of accessibility within the design profession. Universal design criteria were employed by Wan (2022b) tourism signs at heritage sites where features ought to respond to the needs of the seriously physically disabled tourists. This method ensures equitable possibilities for visitors and improves their overall experience. The public's use of tourist sites enriches their informative value through diverse narratives. In House of Signs (2024) the author claims that good signs offer important information about historical and tourist places and convert trips into enlightening experiences. Consequently, such signage signifies an enhanced comprehension of the cultural significance and traditions of a specific region or city. Therefore, the current research the particular value of signs in boosting the directions, the access, and the teachiness at the tourist attractions. These results imply that the effective design and placement of signage systems can improve the visitor experience and cultural appreciation.

Key issues in cultural heritage design include the necessity for culturally sensitive designs. Numerous authors have commenced investigating potential methods for integrating cultural awareness into the establishment and continuous management of these locations. One way is to offer relatively tiny features that are assembled and operate as borders to existing monuments, thereby bringing a new lease on life to the location without aggravating the contextual problem. This technique assures that existing new interventions built strengthen the notion of the site without overpowering it to deny and disturb the assigned cultural narrative (Re-Thinking The Future, 2020). Designers can utilize local cultural architectural

elements and sustainability to convey a community's heritage. For instance, the building of Jean-Marie Tjibaou Cultural Centre in New Caledonia shows the traditional Kanak architecture to symbolize their culture (Scarano Architect, 2024).

Local communities engage in the process, so ensuring the preservation of the cultural values associated with these monuments. Engagement in design leads to an increased incorporation of perspectives and insights from indigenous cultures, thereby producing outcomes that are suitable for indigenous communities (Neoarchitects, 2024).

Decolonizing design methods reevaluate the role of 'third world' voices, ideas, and perspectives, particularly in the context of colonial histories. The Mixed Reality cultural Performances are characterized as techniques that facilitate a deeper comprehension of the historical context of cultural sites (Dima et al., 2024).

Therefore, culturally sustainable modifications to historic structures include non-obtrusive interventions, use of localized elements, public participation, use of ICT, and postcolonial approaches. They are all crucial in mitigating the loss of cultural objects and facilitating an accurate representation of the culture.

Effective signage in heritage and natural places presents several established challenges that must be addressed to enhance visitor experiences and site conservation. Current academic literature addresses the following issues: environmental constraints, aesthetics, cultural factors, and maintenance challenges.

The attributes of natural sites render them susceptible to issues that jeopardize their integrity, including exposure to environmental variables. Severe accidents may occur, and heightened winds, intense rainfall, or fluctuations in temperature contribute to the degradation of the surface and the amalgamation of the content. Naegele (2024) emphasizes the importance of material and design in maintaining the efficacy of signs against environmental challenges.

Heritage Park has a specific objective to preserve the appearance of historical centers. All signage and displays must be visually inconspicuous and should honor the site's architectural and cultural setting, thereby preserving the historic ambiance of the region. Building Conservation (2024) speaks about the issue of offering proper information and at the same time minimizing intrusiveness to the overall context of the site, and the writing points also to the notion that the signs have to be as small as possible to ensure that they fit into the environment.

Heritage investments necessitate that any signage provided must preserve the recognized cultural significance of the particular region. The absence of culturally appropriate signage may lead to misunderstandings, and the content of such signs can offend local sensibilities. American Society of Overseas Research (2024) emphasized the significance of cultural sensitivity in signage, which is intended to accurately communicate the historical context of the location.

Signage requires periodic upkeep to ensure it remains informative and legible. Many heritage and natural assets are hindered by insufficient resources, complicating the ongoing maintenance of their quality. According to American Whitewater, numerous river locations nationwide currently display fading and, thus, nearly illegible signs, while recent study confirms this as a prevalent issue regarding signpost maintenance, particularly in natural regions.

Addressing these challenges necessitates environmental solutions that encompass both internal and external integration, as well as the durability of aesthetics, cultural appropriateness, and sustainable maintenance, which enhance the tourist experience without compromising history and natural assets. Theoretical underpinnings of the study are from numerous studies, which includes framework for qualitative inquiry produced by Denzin & Lincoln (2011) offering participant-centred insights gathered in culturally sensitive areas such as heritage sites. Similarly, prior studies on heritage site management successfully integrated interviews to gather comprehensive feedback from participants. Jamal & Kim (2005) observed in their community-based heritage tourism study that surveys revealed culturally specific response needs that could not be deduced from the interview data. Authors Timothy and Boyd shown through interviews that this method can effectively uncover visitors' expectations and their appreciation for local culture at UNESCO sites.

The method of observation can be attributed to the ethnographic tradition articulated by Geertz (1973), which emphasizes the observer's active participation in cultural and spatial processes. Black et al. (2001) conducted observations of visitors in heritage places to assess the utility of interpretative signs. Likert scales were created based on psychometric principles established by Likert (1932) to assess objective perceptions of attitudes. The research on tourists' satisfaction particularly purchased interpretative signs (Moscardo, 1996; Tilden, 1957) employed online Likert scaled questionnaires to assess the variable such as clarity conformance and satisfaction. Choi & Sirakaya (2006) have proven that the Likert scales are beneficial in measuring the degrees of visitor satisfaction for numerous variables in the tourism experience. Segmentation analysis necessitates the discovery of client characteristics, particularly with visitor demographics, as proposed in Plog (1974) psychographic theory of tourism. Swarbrooke & Horner (2007) indicated that demographic variables, such as age and nationality, significantly influence visitors' expectations and satisfaction judgments. These publications include Kuo et al. (2005) on the linguistic accessibility in tourist environments that promotes the use of multilingual signages to assist movement and cross-cultural interaction. The interview and survey data reinforce this idea by emphasizing the utilization of motifs and narratives from Potala Palace of Tibet.

Tourist signage boosts navigation and accessibility and educational value for natural and heritage sites. The literature emphasizes using universal design principles together with cultural sensitivity and public engagement methods to create informative signage which meets universal needs. Non-intrusive interventions along with locally-designed elements and public participation approaches serve as critical factors for benefiting cultural representation and conservation initiatives according to scholarly literature. According to research investigative findings show sign materials must be made durable by both innovation and maintaining them sustainably because this ensures their continued legibility and effectiveness. Qualitative inquiry together with ethnographic observation and psychometric assessments and segmentation analysis provide an extensive knowledge about visitor experiences regarding signage. Research evidence shows multilingual

signs which are culturally attuned and easy to perceive enhance the satisfaction of tourists and increase their level of engagement and access. Different factors unite to prove that carefully crafted signage must maintain cultural heritage rights and environmental integrity, so it can develop positive tourism experiences.

DATA AND METHODOLOGY

This study employs both quantitative and qualitative research methodologies to effectively analyze the sign systems of Potala Palace. The current study aimed to enhance typical survey data by incorporating diverse opinions from tourists, design experts, and cultural analysts. The subsequent section delineates the methodologies employed in the study and the data collection process.

1. Research Methodology

A cross-sectional exploratory comparative study employed qualitative and quantitative data collection methods to examine the signage systems at Potala Palace. The qualitative component involved the collection of detailed comments and opinions, whilst the quantitative component aimed to identify overall trends and preferences. This architecture facilitated comprehensive analysis while also enhancing generalizability. An overview of the whole research design is evident from the Figure 1.

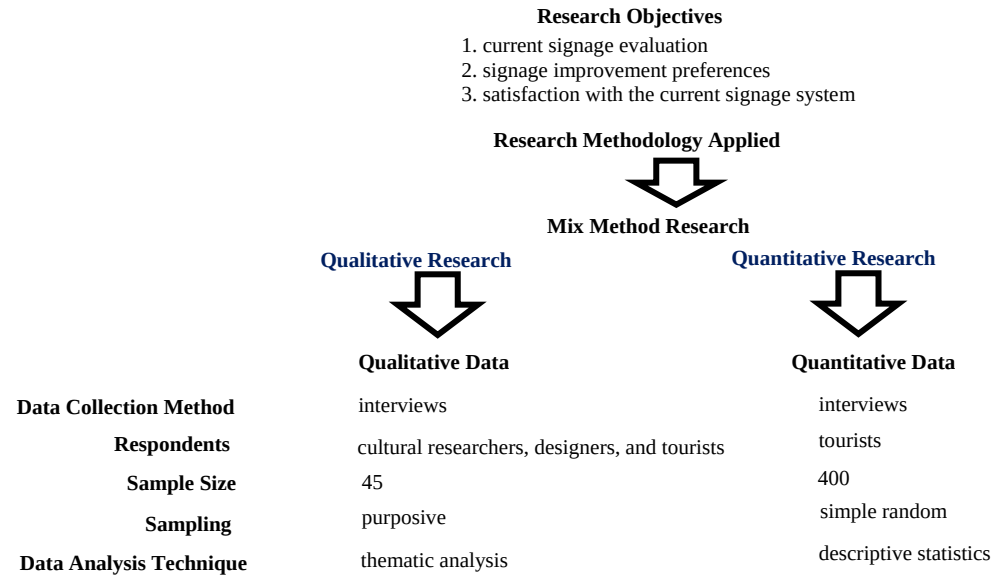

Figure 1. Research Design

2. Data Collection

For qualitative data, a purposive sample of 45 people was selected, comprising: Fifteen tourist participants from diverse ethnic and linguistic origins, fifteen designer participants with experience in signage or heritage site projects, and fifteen cultural participants knowledgeable about Tibetan culture and heritage. Semi-structured interviews and observational notes were utilized to gather qualitative data. Interpatch interviews inquired about participants' prior experiences with existing signage, while proposing concerns and solutions. Participants were selected by convenience sampling to fulfill the study's objectives concerning signage design and utilization. The participants were selected based on their expertise, cultural awareness, or personal experience with the Potala Palace. Also, on-site observations at Potala Palace were conducted to assess the placement, content, and visual appeal of current signage.

For the collection of quantitative data, a total of 400 respondents participated in a structured survey. This sample size was determined to achieve a 95% confidence level with a ±5% margin of error, considering an estimated population of 10,000 tourists visiting annually. A questionnaire was designed with Likert-scale items (1–5) to evaluate: clarity of current signage, cultural representation in signage, multilingual availability, ease of navigation, overall satisfaction with signage systems. The survey captured demographic details, including age, gender, and country of origin, to explore variations in perceptions across diverse groups. Random sampling was used to ensure diversity among survey respondents, with efforts made to include both domestic and international tourists.

3. Data Analysis

For qualitative data analysis, interviews were transcribed and subjected to thematic analysis. Emerging themes focused on navigation challenges, cultural representation, and aesthetic preferences. Field observation notes were analyzed to identify gaps in the current signage system and contextualize participant feedback. While for quantitative data analysis, survey responses were analyzed using descriptive statistics to determine trends and preferences.

4. Ethical Considerations

Ethical approval was obtained prior to data collection. All participants were briefed about the study’s purpose and provided informed consent. Anonymity and confidentiality were maintained throughout the research process. For surveys and interviews, sensitive questions were avoided, and participants could withdraw at any point without explanation.

5. Limitations

While the mixed-method approach provides comprehensive insights, yet certain limitations exist. Firstly, the qualitative sample may not fully represent all tourist perspectives due to its smaller size. Secondly, seasonal variations in tourist demographics could influence the quantitative findings. Thirdly, budgetary and logistical constraints limited the scope of on-site observations.

RESULTS

1. Findings of Qualitative Analysis

1.1. Participants by their Role and Age

The Figure 2 provides descriptive statistics for participants' ages across three roles: cultural researcher, designer, and tourist. Each role comprises 15 participants. Cultural researchers range in age from 21 to 56 years, with a mean age of 38.27 years and a standard deviation of 10.787, indicating a moderately diverse age group with the central tendency slightly above the late 30s. Designers have an age range from 20 to 52 years, with a mean age of 37.00 years and a slightly higher standard deviation of 11.161, reflecting a similar central tendency but slightly greater variability compared to cultural researchers. Tourists exhibit the widest age range, from 21 to 60 years, with a mean age of 37.73 years and the highest standard deviation of 13.008, suggesting the greatest age diversity among this group. These statistics indicate that the participant groups are comparable in mean age, hovering around the late 30s, but differ in variability. Tourists represent the most age-diverse group, while designers and cultural researchers show relatively similar age distributions with slightly less variation. This diversity, particularly among tourists, may provide a broader perspective on signage preferences and usability across age groups.

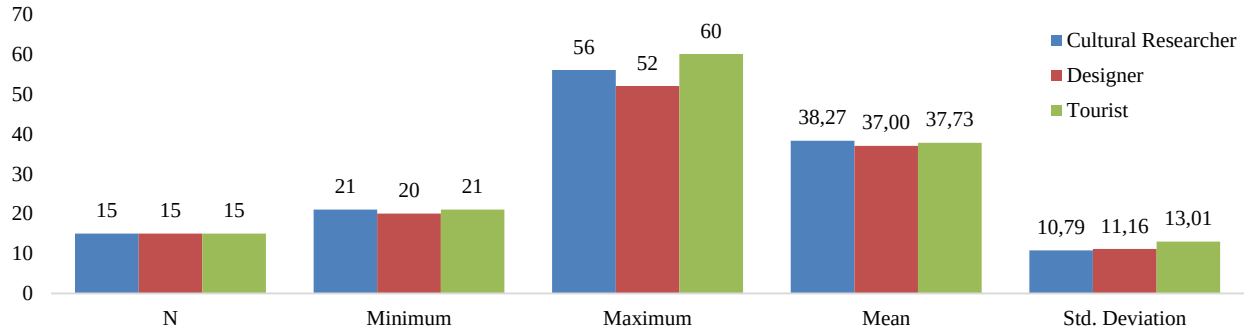

Figure 2. Participants by their Role and Age

1.2. Participants by their Role and Gender

The bivariate analysis (Figure 3) highlights the distribution of participants by role (cultural researcher, designer, tourist) and gender (female, male, other), with each role equally represented by 15 participants. Among the 45 participants, males slightly outnumber females (22 males versus 21 females), while individuals identifying as "other" are minimally represented, appearing only in the cultural researcher role (2 participants). Female representation is highest among tourists (8 participants) and lowest among cultural researchers (6 participants), while males are most represented among designers (8 participants) and least among tourists (7 participants). The cultural researcher role exhibits the highest gender diversity, encompassing all three gender categories, whereas designers and tourists lack representation from the "other" gender category. This distribution reflects near parity between male and female participants across roles but a significant underrepresentation of non-binary or other gender identities, which could influence the diversity of perspectives captured in the study. Future research should consider more inclusive sampling to better represent underrepresented gender identities, particularly in roles like designers and tourists.

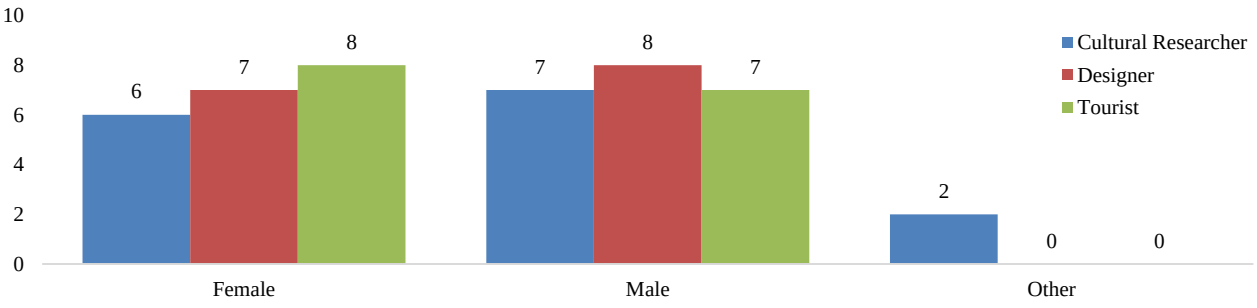

Figure 3. Participants by their Role and Gender

1.3. Participants by their Role and Feedback on Current Signage

The Figure 4 provides insights into participants' feedback on the current signage at Potala palace, categorized by their role (cultural researcher, designer, tourist) and grouped into three response categories: "average," "good," and "not clear." Overall, feedback skews positively, with 21 participants rating the signage as "good," compared to 9 rating it as "average" and 15 as "not clear." Among cultural researchers, opinions are evenly divided between negative (6 "not clear"), positive (6

"good"), and neutral (3 "average"), reflecting a mixed assessment of the signage. Designers provide the most favorable feedback, with 7 rating the signage as "good," though 6 also found it "not clear," and only 2 rated it as "average." Tourists exhibit the most positive view overall, with more than half (8 participants) rating the signage as "good," while 3 rated it as "not clear" and 4 as "average." The breakdown reveals that while the majority perceive the signage positively, a significant portion finds it unclear, particularly among cultural researchers and designers. Tourists appear more satisfied overall, indicating that the signage might cater better to visitors than to experts assessing cultural or technical aspects. These findings suggest that while the signage is functional for many users, there is room for improvement in clarity and cultural communication to address concerns raised by professionals and less favorable feedback.

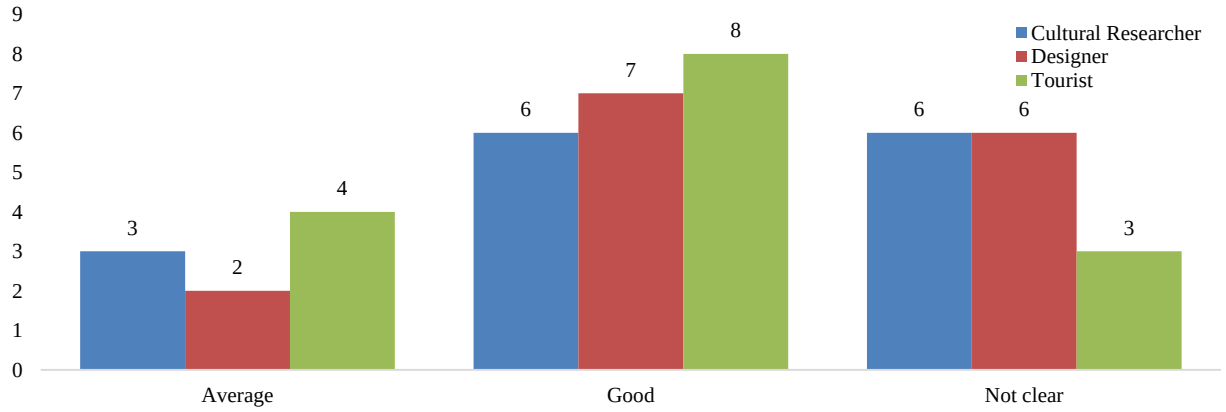

Figure 4. Participants by their Role and Feedback on Current Signage

1.4. Participants by their Role and Suggestions for Improvement

The Figure 5 shows participants' suggestions for improving the signage at Potala Palace, categorized by role and preferred focus area: add multilingual content, improve visuals, or use cultural symbols. Across all roles, the most common suggestion is to improve visuals, with 17 participants highlighting this as a priority. This is particularly emphasized by designers, with seven participants, and tourists, with six participants. Using cultural symbols is also a significant recommendation, with 15 participants suggesting it, especially cultural researchers and tourists, both with six participants each. Adding multilingual content is suggested by 13 participants, primarily cultural researchers and designers, with five participants each, reflecting the importance of language inclusivity among these groups. The results indicate that while there is agreement on the need to enhance signage, priorities differ across roles. Cultural researchers focus more on incorporating cultural elements and multilingual accessibility. Designers emphasize visual improvements, while tourists are equally concerned with cultural relevance and visual appeal. These findings suggest a balanced improvement strategy that incorporates multilingual content, visual enhancements, and cultural elements to address the diverse needs of stakeholders.

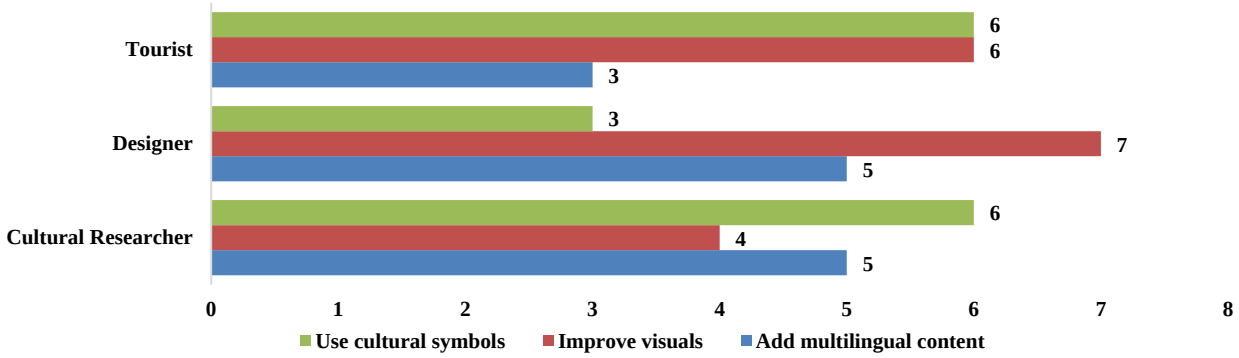

Figure 5. Participants by their Role and Suggestions for Improvement

1.5. Participants by their Role and Cultural Considerations

The Figure 6 illustrates participants' feedback on cultural considerations for improving signage at Potala Palace, categorized by role and preference for ensuring cultural sensitivity, focusing on traditional motifs, or including storytelling elements. Overall, the most common suggestion is to focus on traditional motifs, with 17 participants emphasizing this, especially cultural researchers, with 9 participants, reflecting their prioritization of preserving cultural authenticity. Ensuring cultural sensitivity is the second most emphasized consideration, suggested by 15 participants, with designers showing the strongest preference in this category, with 8 participants, highlighting their professional focus on avoiding cultural misrepresentation. Including storytelling elements is also significant, suggested by 13 participants, particularly tourists, with 6 participants, indicating an interest in engaging and informative signage. The qualitative investigation reveals various topics, notably the existing signage at Potala Palace, indicating disparities in priorities and preferences among different positions. Readers of cultural contexts value the symbolism inherent in traditional motifs and story elements of signage; nevertheless, they also note that numerous signs convey crude sentiments that may offend some

Tibetans owing to the designers' cultural insensitivity. Professionals are attentive to enhancements and culturally sensitive, since the design process emphasizes aesthetics and the accountability of designers.

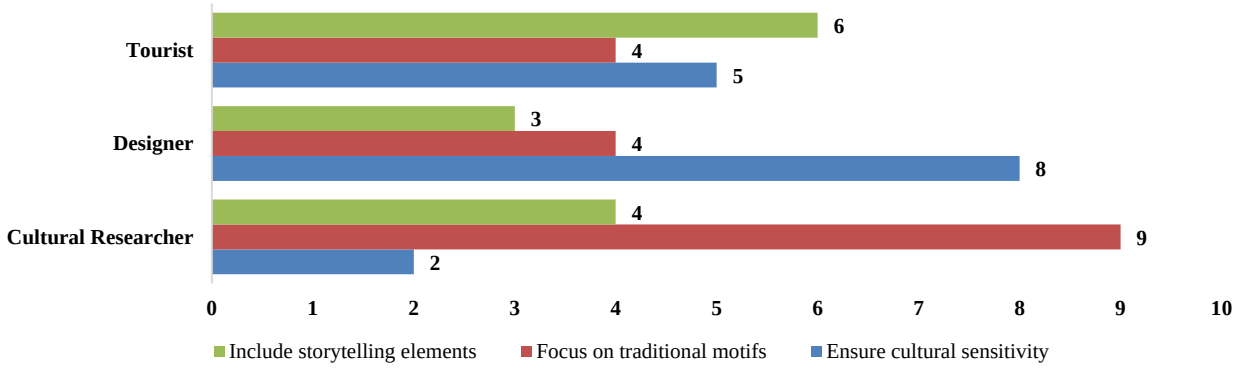

Figure 6. Participants by their Role and Cultural Considerations

Although the new signs offer information that tourists find appealing, respondents perceive the signs as generally inadequate and express a preference for more compelling narratives and enhanced graphics to elevate the sign experience. This analysis additionally incorporates the age of the participants, as the age distribution of visitors exceeds the median age of the participants, and varying age expectations may enhance the diversity of these findings. Collectively, these concepts suggest that signage from cultural, linguistic, aesthetic, and narrative viewpoints fulfills the many needs of stakeholders, hence enhancing the multicultural and significant nature of the visit.

2. Findings of Quantitative Analysis

2.1. Current Signage Evaluation

Figure 7 summarizes the participants' assessment of the intelligibility of signage at Potala Palace using a Likert scale ranging from 1 to 5. A considerable proportion of individuals expressed dissatisfaction, with 20 percent strongly opposing and 21.8 percent dissenting, indicating that 41.8 percent of the respondents encountered difficulties comprehending the displayed signals. Conversely, 37.8% held a favorable opinion of the clarity of the signs, while 16% expressed agreement and 21.8% strongly concurred, indicating that over one-third of the participants believe the institutions' signs are clear. The remaining 20.5% of participants provided a neutral response, neither agreeing nor disagreeing, which may indicate ambivalence or mixed experiences. These findings reveal a significant division in opinions about signage clarity, with dissatisfaction slightly outweighing satisfaction. The large proportion of neutral and negative responses underscores the need for improvements in clarity, ensuring that signage is more universally comprehensible and effective for diverse audiences. Addressing this issue could enhance navigation and user experience for a wider range of visitors.

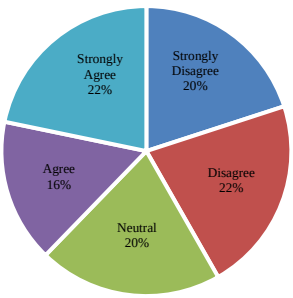

Figure 7. Participants' Perceptions of the Clarity of Signage at Potala Palace

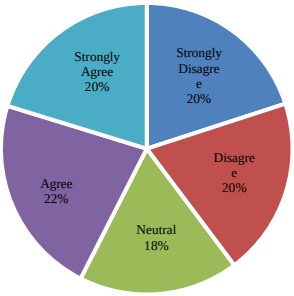

Figure 8. Participants' Perceptions of the Placement of Signage at Potala Palace

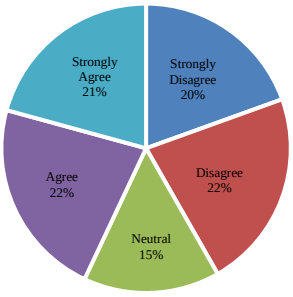

Figure 9. Participants' Perceptions of Signage at Potala Palace Reflecting Culture

The Figure 8 illustrates participants' perceptions of the placement of signage at Potala Palace, measured on a five-point Likert scale. Responses are relatively balanced, with 39.8% of participants expressing dissatisfaction (20% strongly disagree and 19.8% disagree) regarding signage placement. On the other hand, 42.6% of participants provided positive feedback (22.3% agree and 20.3% strongly agree), indicating that a slightly larger group finds the placement effective. Meanwhile, 17.8% of participants remained neutral, neither satisfied nor dissatisfied. These results reflect a divided opinion on the placement of signage. While a significant portion of participants sees room for improvement, a comparable group finds the current placement adequate. The neutrality observed suggests that some respondents may have mixed experiences or find the issue less critical. Improving signage placement could further enhance accessibility and usability for a broader audience, particularly addressing the concerns of those dissatisfied. The Figure 9 provides an overview of participants' perceptions of how well the signage at Potala Palace reflects Tibetan culture, rated on a five-point Likert scale. A substantial proportion of participants expressed dissatisfaction, with 19.5% strongly disagreeing and 22.3% disagreeing, meaning that 41.8% felt the signage does not adequately reflect Tibetan culture. Conversely, 43.1% provided positive feedback, with 22.3% agreeing and 20.8% strongly agreeing that the signage effectively reflects cultural aspects. A smaller group, 15.3%, remained neutral,

suggesting uncertainty or mixed opinions. These findings indicate a nearly even split in perceptions, with slightly more participants viewing the signage as culturally reflective. However, the significant proportion of dissatisfied respondents highlights the need to enhance cultural elements within the signage. Incorporating traditional motifs, storytelling, and other culturally significant features could address these concerns and create a more universally appreciated cultural reflection.

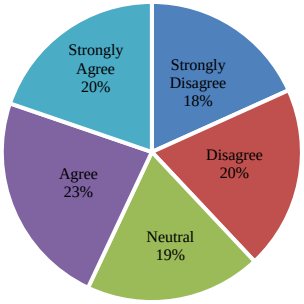

Figure 10. Participants' Perceptions of the Multilingual Accessibility of Signage at Potala Palace

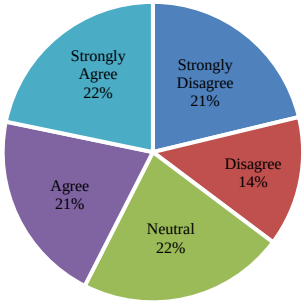

Figure 11. Participants' Perceptions of the Visual Appeal of Signage at Potala Palace

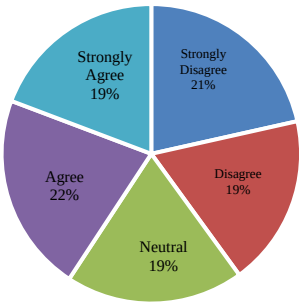

Figure 12. Participants' Perceptions of the Navigation Guidance Provided by the Signage at Potala Palace

The Table 9 outlines participants' perceptions of the multilingual accessibility of signage at Potala Palace, rated on a five-point Likert scale. A moderate level of dissatisfaction is observed, with 18.3% strongly disagreeing and 19.8% disagreeing, resulting in 38.1% of participants perceiving that the signage does not adequately cater to multilingual needs. On the positive side, 43.1% of participants expressed satisfaction, with 23.3% agreeing and 19.8% strongly agreeing that the signage effectively accommodates multiple languages. A notable 19% provided a neutral response, suggesting a level of indifference or uncertainty among some participants. These results reveal a slight majority perceiving the signage as multilingual-friendly, yet a significant proportion remains dissatisfied. The presence of neutral responses indicates variability in experiences, possibly due to the varying linguistic backgrounds of participants. Addressing the concerns of those dissatisfied by expanding language options or improving the clarity of multilingual signage could enhance inclusivity and accessibility for a wider audience. The Figure 11 presents participants' perceptions of the visual appeal of signage at Potala Palace, rated on a five-point Likert scale. Responses indicate a diverse range of opinions. A significant proportion expressed dissatisfaction, with 21.3% strongly disagreeing and 14.0% disagreeing, accounting for 35.3% of participants who found the signage visually unappealing. On the other hand, 42.6% expressed positive views, with 20.8% agreeing and 21.8% strongly agreeing that the signage is visually appealing. Meanwhile, 22.3% of participants remained neutral, suggesting a lack of strong opinion or mixed experiences with the visual design. These findings reveal a fairly even split between those satisfied and dissatisfied with the signage's visual appeal, with a notable portion remaining neutral.

The results suggest that while many participants appreciate the current visuals, a substantial group perceives room for improvement. Enhancing the aesthetics through culturally inspired designs or modern graphical elements could address the concerns of those dissatisfied and elevate the overall user experience. The Figure 12 outlines participants' perceptions of the navigation guidance provided by the signage at Potala Palace, rated on a five-point Likert scale. Responses are evenly divided, with 40% of participants expressing dissatisfaction (21.5% strongly disagreeing and 18.5% disagreeing) and an identical 40.8% expressing satisfaction (21.5% agreeing and 19.3% strongly agreeing). A further 19.3% of participants provided neutral responses, indicating uncertainty or mixed experiences with the navigation functionality of the signage. The results highlight a clear division in opinions, with equal proportions of participants finding the signage effective or ineffective in aiding navigation. This split suggests that while some users find the signage functional, a significant number experience difficulty. Enhancing navigation guidance through better placement, clearer directions, and interactive or digital tools could help address these challenges and improve the overall effectiveness of the signage system. The Figure 13 summarizes participants' perceptions of how well the signage at Potala Palace contributes to their cultural understanding, rated on a five-point Likert scale. A significant portion of participants expressed dissatisfaction, with 22.3% strongly disagreeing and 18.8% disagreeing, totaling 41.1% who feel the signage does not effectively enhance their cultural understanding.

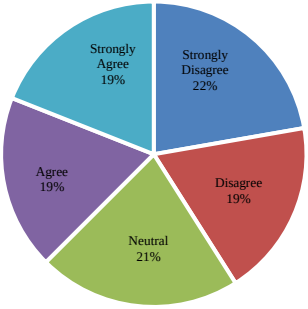

Figure 13. Participants' Perceptions of the Signage at Potala Palace Contributing to Cultural Understanding

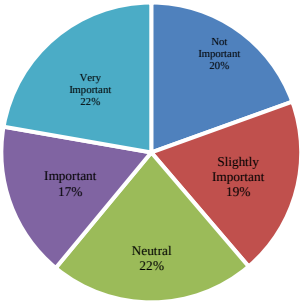

Figure 14. Participants' Perceptions of the Importance of Multilingual Content for the Signage at Potala Palace

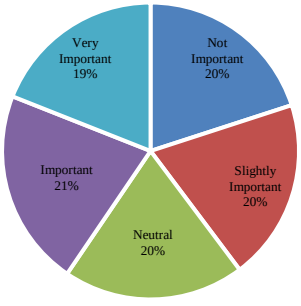

Figure 15. Participants' Perceptions of the Importance of Visual Enhancements for Signage at Potala Palace

In contrast, 37.5% of participants provided positive feedback, with 18.5% agreeing and 19.0% strongly agreeing that the signage aids their understanding of Tibetan culture. Meanwhile, 21.5% of participants remained neutral, indicating ambivalence or mixed experiences. These findings highlight a noteworthy gap in the signage's ability to effectively convey cultural information, as dissatisfaction outweighs satisfaction. The large proportion of neutral responses further suggests that many participants may find the cultural messaging insufficient or inconsistent.

Addressing this issue through the incorporation of storytelling elements, traditional motifs, and clearer explanations could improve the signage's ability to enhance cultural understanding for a broader audience.

2.2. Signage Improvement Preferences

The Figure 14 illustrates participants' perceptions of the importance of multilingual content for the signage at Potala Palace, rated on a five-point scale from not important to very important. Responses reveal a divided perspective. A combined 38.8% of participants rated multilingual content as "not important" (19.5%) or "slightly important" (19.3%), indicating that a significant portion of respondents does not prioritize multilingual signage. In contrast, an equal 39.1% of participants rated it as "important" (16.8%) or "very important" (22.3%), demonstrating a comparable emphasis on the need for language inclusivity. A substantial 22.3% of respondents selected a neutral stance, indicating ambivalence or a lack of strong opinion on this matter. These data demonstrate that there is no clear endorsement of multilingual signage as a crucial necessity, with the opinions marginally in favour and against this requirement. The remaining replies indicate that individuals may have exhibited preferences for survey questions that varied according to their language or previous experiences. To address these diverse attitudes, multilingual signs could be strategically implemented in key areas to ensure efficiency without causing overwhelm.

In the given below, Figure 15, there is information on participants' perceptions of the importance of visual enhancements for signage at Potala Palace. The responses indicate a relatively even distribution of opinions. A combined 39.8% of participants rated visual enhancements as either "not important" (20.0%) or "slightly important" (19.8%), reflecting a significant portion who do not see visual improvements as a priority. Conversely, 40.5% rated them as "important" (21.5%) or "very important" (19.0%), highlighting a similar proportion that emphasizes the need for improved visuals.

Additionally, 19.8% of participants remained neutral, indicating ambivalence or mixed feelings about the importance of visual enhancements. These results suggest a divided perspective on the role of visual appeal, with a slight tilt toward considering it important. The notable neutral responses may indicate that visual enhancements are not universally seen as a critical element of effective signage. To address the varied preferences, implementing balanced visual improvements, such as enhancing clarity and cultural motifs, could satisfy both advocates and those less concerned with aesthetics.

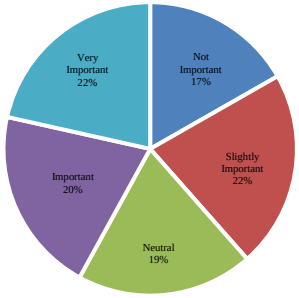

Figure 16. Perceptions of the Participants on the Importance of Incorporating Cultural Symbols into the Signage (at Potala Palace)

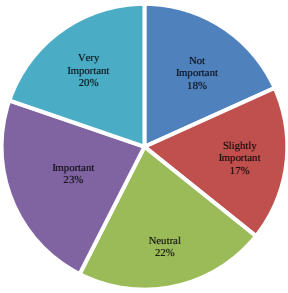

Figure 17. Participants' Perceptions of the Importance of Incorporating Storytelling Elements into the Signage at Potala Palace

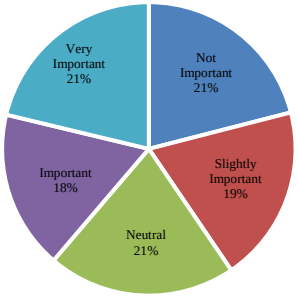

Figure 18. Participants' Perceptions of the Importance of Placement Visibility for Signage at Potala Palace

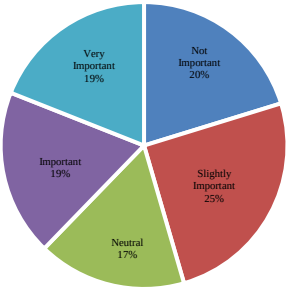

Figure 19. Participants' Perceptions of the Importance of Incorporating Interactive Signage at Potala Palace

The Figure 16 presents participants' perceptions of the importance of incorporating cultural symbols into the signage at Potala Palace, rated on a five-point scale. The responses are evenly distributed, with 38.6% of participants considering cultural symbols as either "not important" (16.8%) or "slightly important" (21.8%), indicating that a notable portion does not see cultural symbols as a high priority. On the other hand, 42.0% rated cultural symbols as "important" (20.5%) or "very important" (21.5%), suggesting a slightly larger group values their inclusion. Meanwhile, 19.5% of participants expressed a neutral stance, reflecting a level of ambivalence or lack of strong opinion on the matter.

These findings indicate a balance between participants who prioritize cultural symbols and those who view them as less critical, with a significant neutral group. The participants' assessment of the necessity for incorporating storytelling elements in the signage at Potala Palace is evaluated using a five-point scale, as illustrated in Figure 17.

Somewhat less, 42.6% of the aforementioned population, state that storytelling is vital; yet 22.8% consider it important just, and 19.8% very important. Conversely, 35.8% believe that storytelling is of lesser significance, with 18.3% categorizing it as 'not important' and 17.5% regarding it as 'somewhat important'.

Additionally, 21.8% of participants expressed neutrality concerning the utilization of narrative on signs, indicating uncertainty or ambivalence regarding its potential significance in signing. The results reveal a compelling distribution, indicating that while a considerable number of participants value narrative, a major portion does not regard it as crucial, and many participants perceive the concept as merely ordinary. This suggests that storytelling elements, while appreciated by some, may not be universally seen as essential. To address this, incorporating storytelling in a balanced and culturally relevant way could appeal to those who value engagement while not overwhelming those who see it as less important. The Figure 18 illustrates participants' perceptions of the importance of placement visibility for signage at

Potala Palace, rated on a five-point scale. Responses are evenly distributed across the spectrum, reflecting a division in opinions. While 38.5% of participants consider placement visibility less critical, with 21.0% rating it as "not important" and 19.5% as "slightly important," an almost equal 38.8% see it as significant, with 17.5% rating it as "important" and 21.3% as "very important." Additionally, 20.8% of participants expressed a neutral stance, indicating ambivalence or a lack of strong preference on the matter. These findings highlight a near-even split in perceptions, with no overwhelming consensus on the importance of placement visibility. While a substantial group values visible placement, another significant portion does not see it as a priority. This suggests that while improving placement visibility could enhance the experience for some, it might not be universally impactful. A strategic focus on critical areas where placement visibility is essential could cater to its proponents without overemphasizing it for those less concerned.

The figure 19 reflects participants' perceptions of the importance of incorporating interactive signage at Potala Palace, rated on a five-point scale. The responses indicate that a significant portion, 45.6%, views interactive signage as less critical, with 20.3% rating it as "not important" and 25.3% as "slightly important." On the other hand, 37.8% of participants consider interactive signage important, with 18.8% rating it as "important" and 19.0% as "very important." Additionally, 16.8% of participants expressed a neutral stance, indicating uncertainty or a lack of strong opinion on the matter. These findings suggest a notable division in preferences, with a slight majority viewing interactive signage as less essential. However, the substantial group advocating for its importance highlights its potential value for engaging a specific subset of visitors. A balanced approach, introducing interactive signage in key areas while maintaining traditional elements, could cater to diverse preferences and enhance the overall visitor experience without alienating those who prefer simpler formats.

2.3. Satisfaction with the Current Signage System

The figure 20 summarizes participants' overall satisfaction with the signage at Potala Palace, rated on a five-point scale from very dissatisfied to very satisfied. Responses reveal a relatively balanced distribution, with 41.8% of participants expressing dissatisfaction (19.3% very dissatisfied and 22.5% dissatisfied). In contrast, 43.1% reported satisfaction, with 21.3% satisfied and 21.8% very satisfied, indicating that a slightly larger proportion of participants view the signage positively. Additionally, 15.3% of respondents remained neutral, suggesting ambivalence or mixed experiences. These findings highlight a division in perceptions, with a near-even split between those satisfied and dissatisfied. While many participants appreciate the current signage, a significant portion finds it unsatisfactory, pointing to areas that need improvement. Enhancements in clarity, cultural representation, and functionality could address the concerns of those dissatisfied, further increasing overall satisfaction among visitors.

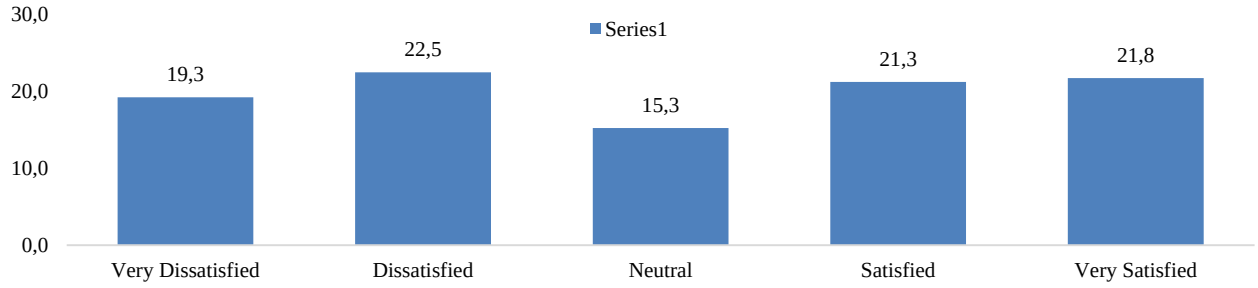

Figure 20. Participants' Overall Satisfaction with the Signage at Potala Palace

The figure 21 provides insights into participants' perceptions of how the signage at Potala Palace contributes to their overall experience, rated on a five-point scale from very dissatisfied to very satisfied. The results show that 39.8% of participants expressed dissatisfaction, with 17.5% being very dissatisfied and 22.3% dissatisfied. On the other hand, 39.5% of participants reported satisfaction, with 18.5% satisfied and 21.0% very satisfied, reflecting a nearly equal proportion to those dissatisfied. Additionally, 20.8% of participants selected a neutral stance, indicating mixed opinions or ambivalence regarding the signage's contribution to their experience. These findings indicate a balanced split between satisfaction and dissatisfaction, suggesting that while the signage contributes positively for some, there is considerable room for improvement. Addressing areas such as clarity, cultural relevance, and accessibility could enhance the signage's effectiveness and overall contribution to visitor experience, potentially reducing dissatisfaction and neutral responses.

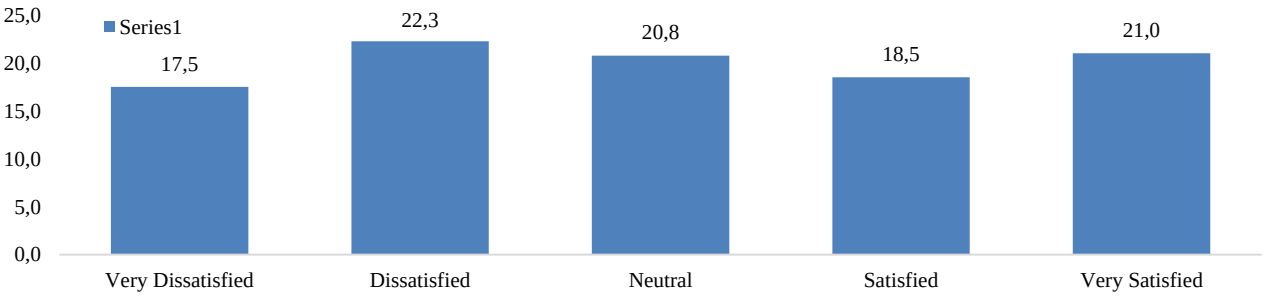

Figure 21. Perceptions of the Participants on the Signage as Contributing to their Overall Experience

DISCUSSION

The results of the present study are consistent with earlier research in demonstrating that well-integrated signage systems increase the experience, wayfinding, and appreciation of culture in tourists. The tourists faced several challenges, including ambiguous directions, inadequate sign placement, and restricted access to materials in languages other than Chinese. This aligns with the observations of Black et al. (2001) regarding interpretive signage placement, who emphasized the necessity of multilingual interpretive signage. The multilingual interpretive signage is gauged through the research objective 1 and objective 2 of this study. Cultural scholars and designers indicated the necessity for sensitive and aesthetically pleasing designs (objective 2 of this study; suggestions for improvement), along with findings from Timothy & Boyd (2003); Moscardo (1996) regarding the significance of aesthetics and cultural relevance in attracting attention. The inclusion of storytelling (objective 2 of this study; suggestions for improvement) in the present signage aligns with Tilden (1957) assertion that tales in signage improve the comprehension of cultural significance. The survey reiterated the significance of visual enhancements, multilingual information, and improved positioning (objective 2 of this study; suggestions for improvement) as suggested by Wan (2022b), emphasizing inclusive design, and by Liu (2020), concerning interactive and instructional signage. Therefore, future efforts should aim to achieve proportional improvements in both communicative function and cultural relevance within sign systems, thereby enhancing signage to offer enjoyable and instructive contributions to visitors' experiences at heritage sites.

CONCLUSION

This research utilizes significant information regarding the signage systems at Potala Palace currently and their influence on tourists' opinions. Positive aspects of the current signage system include its navigational assistance; yet, significant concerns persist, such as ambiguous sign directions, insufficient signpost placement, and limited language support, along with poor representation of cultural features. These factors impede the comprehension of the cultural connections between the landscape and the tourists, while also undermining their meaningful engagement with the cultural information inherent in the smaller location. Two significant concerns have arisen from stakeholder comments indicating that mass transportation signage systems must be aesthetically pleasing, culturally sensitive, and functional. The signage of Potala Palace can enhance visitor satisfaction, foster an inclusive attitude at the site, and safeguard its cultural and historical legacy.

Suggestions

The study concludes that signage can remain legible and current by enhancing its distinctiveness and positioning, optimizing multilingual features, incorporating pertinent cultural elements, prioritizing visual appeal, integrating interactive and digital components, and ensuring continuous maintenance and evaluation. Consequently, continuous assessments and visitor input must be incorporated to evaluate the effectiveness of the new signage system and implement any modifications. The subsequent recommendations aim to address the aforementioned deficiencies and enhance the visual requirements of all Potala Palace visitors: an aesthetically pleasing signage system that conveys messages contextually, thoughtfully, and creatively, serving as a means of cultural education and engagement.

Appendix: Questionnaire for Quantitative Data Collection

Section 1: Demographics	Age:	Gender: Male / Female / Other
	Country of Origin:	Have you visited Potala Palace before? Yes / No
Section 2: Current Signage Evaluation	**Statement**	**Scale**
Instructions: Please rate the following statements based on your experience with the signage at Potala Palace.		1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.
The current signage is clear and easy to understand. (Clarity)		
The signage is well-placed and easy to locate. (Placement)		
The signage effectively reflects Tibetan culture and traditions. (Cultural Reflection)		
The signage is multilingual and accommodates diverse linguistic needs. (Multilingual Accessibility)		
The visuals and design of the signage are aesthetically pleasing. (Visual Appeal)		
The signage provides adequate guidance for navigating the palace. (Navigation Guidance)		
The signage enhances my understanding of the site's cultural significance. (Cultural Understanding)		
Section 3: Improvement Preferences		
Instructions: Please rate the following improvement suggestions based on how important you think they are. Use the scale:		**Scale:** 1 = Not Important, 2 = Slightly Important, 3 = Neutral, 4 = Important, 5 = Very Important.
Adding multilingual content to accommodate different languages. (Multilingual Content)		
Improving the visuals and design of the signage. (Visual Enhancements)		
Incorporating Tibetan cultural symbols and motifs. (Cultural Symbols)		
Including storytelling elements to provide engaging cultural narratives. (Storytelling)		
Enhancing the placement and visibility of the signage. (Placement Visibility)		
Using interactive or digital signage for tech-savvy users. (Interactive Signage)		
Section 4: Overall Satisfaction		
Instructions: Please rate the following based on your overall experience with the signage at Potala Palace. Use the scale:		**Scale:** 1 = Very Dissatisfied, 2 = Dissatisfied, 3 = Neutral, 4 = Satisfied, 5 = Very Satisfied.
My overall satisfaction with the current signage system.		
The signage's contribution to my overall experience at Potala Palace.		

Author Contributions: Conceptualization, M.W., H,B.M.T. and M.N.B.P.; methodology, M.W.; software, M.W., H,B.M.T.; validation, H,B.M.T. and M.N.B.P.; formal analysis, M.W. and M.N.B.P.; investigation, H,B.M.T.; data curation, M.W.; writing - original draft preparation, M.W..; writing - review and editing, M.W., H,B.M.T. and M.N.B.P.; visualization, H,B.M.T.; supervision, H,B.M.T.; project administration, M.N.B.P.. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgments: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 12.01.2025 Revised: 06.06.2025 Accepted: 27.06.2025 Available online: 01.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1420-1429
DOI 10.30892/gtg.61302-1512

DIGGING UP RURAL COMMUNITY-BASED TOURISM (CBT) IN DEVELOPING COUNTRY, INDONESIA'S FRAMEWORK FINDING

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Citation: Priatmoko, S., Rahmat, A.F., Isnugroho, E., Bujdosó, Z., & Dávid, L.D. (2025). Digging up rural community-based tourism (CBT) in developing country, Indonesia's framework finding. *Geojournal of Tourism and Geosites*, 61(3), 1420–1429. https://doi.org/10.30892/gtg.61302-1512

Abstract: To effectively support new rural CBTs and create development plans, it is necessary to have a broad understanding of rural CBT in developing countries. This study uses Indonesia as a case study to map and analyze patterns in earlier research in order to establish a conceptual framework. The study used a qualitative content analysis methodology to find important themes and trends in Indonesia's rural CBT development by examining journal papers indexed by Scopus that were referenced by other researchers. By charting these academic works, the researchers were able to get a wider view and identify potential problems in the sector. The analysis identified five interconnected dimensions - spatial aspects, local attractions, rural capacity, economic viability, and socio-cultural components - that form the foundation of rural CBT. These dimensions are critical in building a comprehensive framework that guides development planning, stakeholder collaboration, and long-term sustainability. Findings emphasize the importance of aligning rural CBT development with the principles of the circular economy, which promote environmental stewardship, community empowerment, and sustainable resource management. The study also highlights how preserving social capital, fostering inclusiveness, and enhancing local welfare are long-term goals achievable through strategic mapping, capacity building, and equitable profit distribution. The study also emphasizes how important social media and digital platforms are in influencing public perceptions and interest in rural tourism, which has aided in the quick ascent of rural CBT organizations throughout Indonesia. It becomes clear that community involvement and government assistance are essential to turning rural regions into sustainable travel destinations. Nonetheless, it is necessary to address enduring issues including environmental degradation, human resource problems, and infrastructure constraints. Ultimately, the study offers a rural CBT framework that can assist policymakers, tourism planners, and local stakeholders in making context-sensitive decisions. By integrating socio-spatial understanding, participatory planning, and capacity-focused strategies, stakeholders can create more resilient, inclusive, and sustainable tourism systems. This framework not only supports local livelihoods but also aligns with global Sustainable Development Goals (SDGs), offering a replicable model for other developing countries seeking to implement rural CBT initiatives effectively.

Keywords: rural tourism, regional planning, sustainable development, content analysis, circular tourism, developing country

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INTRODUCTION

Since tourism has become part of the community-run businesses, there have been many changes in its activities (Murphy, 1988). In the sense of social ties in an environment, the community forms a joint agreement to take part in tourism business activities. In Indonesia, the developing economy in East Asia & Pacific (excluding high-income countries) (World Bank Group, 2024), people in villages and urban communities created these groups, a contract for tourism purposes: a community-based tourism (CBT) business organization. The popularity of rural tourism among both domestic and foreign travellers is on the rise (Dashper, 2014). Rural CBT in Indonesia has a specific form based on its location. The terminology of "rural tourism" (Indonesian language: *desa wisata*) is more often used than CBT for the community and academics. The popularity of "rural tourism" terminology is because people in rural areas more widely adopt the CBT. Additionally, the activity elements which are offered to tourists frequently highlight the customs and lifestyle of rural areas.

The growth of the tourist villages centres on their emphasis and branding of content is driven by competition and determination amongst communities to obtain a marketing context. For this reason, sub-themes emerged as activities carried out specifically by tourism villages and are used as new terminology by tourism village business actors. Terms such as agricultural tourism villages, geopark tourism village, and eco-tourism village began to appear. Even the effect

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of temporal landmarks on tourist destinations also determines the direction and image of an area in its development, whether as a cultural or natural destination (Dávid et al., 2003; Meng et al., 2024). More differentiation is needed to draw in visitors who belong to a certain target market. The phenomenon of a particular activity that emerged was also recorded from articles published by researchers. Mapping is necessary for the tourism village's specific activities, as the main content is distributed in the community's region. Using mapping as a note-taking technique, we can emphasize key thoughts and lines by visualizing various notions. It facilitates the illustration of the connections between the various concepts (University of Toronto Scarborough, n.d.). By knowing the regional distribution and particular activities at a macro scale, planning and working that are conducted in rural tourism destinations will be more comprehensively applicable (Dávid et al., 2008). The concept proposed will be useful for the informal sectors in developing countries, which covers almost 75% of the world's total area of land and represents 85% of the entire population (Aguilar & Campuzano, 2009; *Developing Countries - an Overview | ScienceDirect Topics*, n.d.). According to the previous explanation, this research paper will explore the concepts of tourism activities and villages in developing countries that emerged from previous studies, using Indonesia as a case study. With an emphasis on identifying important resources, players, obstacles, and chances for sustainable development in particular rural locations, this study aims to investigate and methodically map the growth, characteristics and activities of rural community-based tourism. This article starts with the introduction in part one, which presents the background of the tourism village and the phenomena related to the specific content.

A comprehensive literature review introduces part two to draw emphasis to the substantial research gap: the importance of understanding particular rural tourism activities to the development's framework concept. The link to the circular economy and tourism is also a top priority (Kabil et al., 2024). Furthermore, part three provides an explanation of the data collecting and analyzing methodology. Finally, after presenting the findings and debate, the conclusion is given.

LITERATURE REVIEW

Rural Tourism

One approach to address the issues facing rural areas is through rural tourism, which is a type of sustainable development and landscape conservation (Reina-Usuga et al., 2024). As part of CBT, rural tourism is a significant part of developing countries and is part of the rural development strategy (Tolkach & King, 2015). In terms of terminology, the term rural tourism continued until a mapping exercise was conducted, in which the terminology and definitions of rural tourism from a number of experts were investigated (Rosalina et al., 2021). The identity and pride held by local residents also positively influence involvement and growth in rural tourism activities (Han et al., 2024). The community manages rural CBT destinations and depends on nature and culture, unlike a destination run by a large company or the government (Rindrasih, 2018a). It can be challenging at times to educate people in rural CBT about the long-term benefits of tourism on their wellbeing (Junaid et al., 2020). For instance, agrotourism, which is also starting to be found in rural areas, shows an increasingly diverse rural tourism phenomenon (Safarov et al., 2024). However, active countryside tourism has increased over the past 25 years as more urban residents look to rural areas for leisure and relaxation (Dashper, 2014).

Specific forms of CBT are sometimes presented as a win-win strategy for developing nations to address their needs for both conservation and economic growth (Ocampo-Peñuela & Winton, 2017). Other study demonstrated that CBT has the capacity to facilitate the transformation of tourism destinations that have suffered or disaster significant disruptions. It can thus be inferred that the level of human involvement within a community provides a measure of resilience for the destination (Rindrasih, 2018b). Therefore, the local community contributes significantly to the development of sustainable tourism, especially as members of the community frequently live close to popular tourist sites and benefit from the money made by tourism (Putri & Adinia, 2018). If there is a balance between local management and the government, the increased transparency in decision-making also encourages the community to participate in tourism actively (Woosnam et al., 2024). Furthermore, tourism improves the well-being of rural communities through the creation of economic linkages generated by community-based tourism (CBT) (Trejos & Chiang, 2009).

The importance of these financial benefits seems to be one of the primary motivations behind the community to join in rural CBT activities. Although tourism does not always bring economic and social livelihood impacts to all village residents, some parties still get direct or indirect economic benefits from these activities (Biddulph, 2015). The possible solution for some of the issues related to missing revenue potential and population loss that come along with agriculture's decline is rural tourism (Dashper, 2014). Other significant sources of income are related to the exploitation of natural resources locally (Biddulph, 2015) in rural areas. Poor infrastructure, policy concerns, and inadequate financial resources are some of the primary causes of undeveloped rural areas.

Therefore, it is crucial to prioritize the local community at the core of rural tourism while fostering effective stakeholder collaboration and multisector linkage (Haulle et al., 2024). However, while these efforts clearly emphasize diversity and differences in practices and experiences related to rural tourism, they also display numerous similarities that seem to characterize rural tourism regardless of local context and specificity (Dashper, 2014).

CBT in Indonesia

There are 82,190 villages in Indonesia (BPS-Statistics, 2017). As the rural tourism idiom is a term that is very popular among Indonesian academics and citizens, it was recorded that in 2024 there were 4,812 rural CBT entities spread across Indonesia with different geographic locations (Indonesia Ministry of Tourism, n.d.). In Indonesia, the characteristics of a tourism village with other forming elements will form a different tourism system.

It becomes essential as a reference and direction for developing tourism elements (Purbasari & Manaf, 2017). For villagers, the philosophy of rural tourism is an "alternative tourism" in which tourism should diversify the traditional economy by contributing to its maintenance (Chevalier, 2018).

In Indonesia, the relationship between community attachment and support for the growth of tourism attractions in the village was successfully mediated by the economic impact of tourism (Tela et al., 2024). Those involved in rural tourism organization activities also have a part in the success of community collaboration and the collaboration of stakeholders has been demonstrated to facilitate the improvement of human capital and enhance the competitive advantage of businesses, thereby promoting more effective and sustainable tourism destination management (Hidayah et al., 2022).

The organization's stakeholders' involvement in a consequence and its perceived dependency with other stakeholders in dealing with the domain's dilemma are essential factors in collaboration (Manaf et al., 2018). These parties have a part in the success of a destination village in achieving its goals. The goals are to distribute local economic benefits and third-party businesses in rural tourism to gain a fairer distribution of sustainable economic and business benefits (Rosalina et al., 2023a). Along with the citizens' way of life, the concepts of sustainability and conservation have become a concern when residents begin to involve themselves in tourism business activities in their villages (Chevalier, 2018).

Activities centered around agriculture, village life, rural scenery, and local cultural tourism in the countryside are also considered as the operators' attraction aspects in the tourism industry in Indonesia (Priatmoko et al., 2021). From various research and case studies conducted on tourist villages in Indonesia, different spatial types and types of activities are correlated with the content offered. Undoubtedly, one of the key topics in tourism development today is the efficient use and management of tourism resources to accomplish the sustainable and coordinated growth of the environment, economy, and society (Luo & Peng, 2024). However, there is no systematic data collection for all content and spatial types, and related matters. It is essential to understand the spatial aspects related to the content so that a more macro and comprehensive road map and planning can be found on the development of rural CBT based on a spatial perspective.

Obviously, given that there are numerous villages throughout Indonesia, it is difficult to learn about all the spatial types and activities selected by tourism village actors. The most effective and possible approach is to utilize the research results of researchers who specialize in CBT tourism villages in Indonesia. Tourism policymakers, planners, managers, and other relevant stakeholders can better recognize cultural landscapes, elements, spatial organization, and representations in the changing values of other cultures by having a better understanding of the socio-spatial linkages of destinations (Centeno, 2024). These research' findings allow us to combine the content of published articles to identify different themes regarding tourist destinations, activities, and the attributes associated with them. Synthesizing ideas and visions carried out at different organization levels and processes can provide more good recommendations (Hoang & Romm, 2020).

Finally, we can say that there are many tourist villages with various attributes and characteristics attached. It turns out that systematic data collection and grouping have not been carried out. Knowing the macro characteristic map of the types of tourist villages will help make development strategies that are more comprehensive and interrelated.

Moreover, identifying the types of tourism villages will provide an accurate regional picture of the socio-economic meaning of rural CBT activities in developing countries.

MATERIALS AND METHODS

We construct a novel data set consisting of articles. The use of articles derived from previous studies, and a significant number of citations tends to lead to a sharp and focused analysis (Kabil et al., 2021). The reasoning behind this was that it would make it easier to analyze and synthesize the patterns, similarities, and differences across various literary works, having the same characteristic of being an excellent illustration of research. Content analysis is used to support the understanding of existing objects or processes and their relationship with other information. We do the content analysis: coding, categorizing, synthesizing, theorizing (Saldaña, 2013).

We use the article to provide a more comprehensive perspective from many studies. As “rural tourism” is a component of Community-based tourism (CBT), we use it as a keyword to find correlated articles. We use one of the databases that specifically consider the use of broader international researchers, the Scopus database.

We selected Scopus as a scientific database to gain access to a comprehensive collection of peer-reviewed articles and one of the largest databases in the academic field. It is widely used by scholars as a highly trustworthy information source (Baas et al., 2020). Since we believe the last five years are sufficient to see the present trend scenario and sometime in the future, we only search for publications from this time frame. The use of a 5-year time period is also used by some researchers to make future forecasts (Ofer et al., 2024).

We also use cited articles because they assess that the reports that have been cited are relatively trusted and influenced by at least one other researcher, thereby increasing the degree of trustworthiness of the source. We also eliminate articles that are not related to tourism research. Using articles from the suggested Scopus database with the particular keywords, we summarized the articles related using the NVIVO version 12 application. NVivo was selected for its auto-coding functionality, which enables the classification of textual data and offers the potential for scholars to reproduce the outcomes of previous studies. Its capacity to generate key term outputs in a structured framework, represented in a matrix, is also a feature that enhances its utility (Allsop et al., 2022; Hilal & Al Abri, 2013). We then reconstruct the theme to determine the concept. The study procedure is depicted in Figure 1 below.

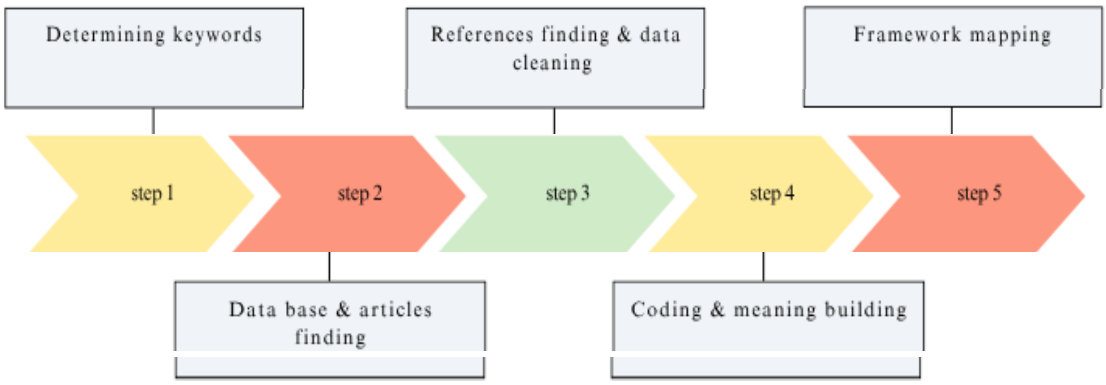

Figure 1. Research flow (Source: author, 2024)

RESULTS AND DISCUSSION

Our Literature Review's focus is on "Indonesia rural tourism", these keywords are what we utilize to look up relevant material. We collected 69 cited literature from the Scopus Database from 2019 to 2023. This database contains 33 samples, which are adequate for the qualitative analysis procedure. (Sim et al., 2018). After removing articles unrelated to tourism studies from the Scopus database, we used 66 of 69 papers, as shown in Table 1.

Table 1. Scopus Cited Articles (Source: generated by author, 2024)

No.	Author(s), year of publication	Citation	No.	Author(s), year of publication	Citation	No.	Author(s), year of publication	Citation
1	Jeyacheya & Hampton, 2020	54	25	Hutagalung et al., 2022	10	49	Mujiatun et al., 2023	4
2	Priatmoko et al., 2021	48	26	Utomo et al., 2020	10	50	Djuwendah et al., 2023	4
3	Nugraha et al., 2021	39	27	Sevisari & Reichenberger, 2020	9	51	Mulyani et al., 2022	3
4	Arintoko et al., 2020	36	28	Tiku et al., 2022	9	52	Rahmanto, 2021	3
5	Priatmoko et al., 2021	32	29	Sari et al., 2022	9	53	Wijanarko et al., 2023	2
6	Purnomo et al., 2020	24	30	Nugroho et al., 2021	9	54	Damayani et al., 2021	2
7	Utami et al., 2023	17	31	Setyawan, 2022	9	55	Dewi et al., 2022	1
8	Firdaus et al., 2021	16	32	Priatmoko & David, 2021	8	56	Astuti et al., 2021	1
9	Rosalina et al., 2023	16	33	Hermawan et al., 2023	8	57	Baihaqki & Islami, 2022	1
10	Chin & Hampton, 2020	15	34	Syafrudin et al., 2023	7	58	Maski et al., 2020	1
11	Wikantiyoso et al., 2021	15	35	Pranita et al., 2022	6	59	Wolor et al., 2023	1
12	Murti, 2020	15	36	Untari & Suharto, 2021	6	60	Rahman & Anwar, 2022	1
13	Singgalen, 2020	14	37	Chen et al., 2020	6	61	Yudanegara et al., 2021	1
14	Ariyani & Fauzi, 2023	13	38	Prayitno et al., 2022	6	62	Wibowo et al., 2023	1
15	Saputro et al., 2023	13	39	Rizal et aI., 2022	5	63	Pudianti et al., 2020	1
16	Andréfouët et al., 2021	13	40	Indarto & Hakim, 2021	5	64	Setiadi et al., 2022	1
17	PUTRI et al., 2020	13	41	Juliana et al., 2023	5	65	Meutia et al., 2022	1
18	Murti, 2020	11	42	Juliana et al., 2022	5	66	Tarlani et al., 2022	1
19	Yasir et al., 2021	11	43	Mastika et al., 2023	5	67	Priliani et al., 2020	6 (Not Avail.)
20	Dahles et al., 2020	11	44	Jayanthi et al., 2022	5	68	Mayuzumi, 2023	4 (Not Avail.)
21	Susilorini et al., 2022	11	45	Sari et al., 2021	4	69	Latif et al., 2022	2 (Not Avail.)
22	Agustin et al., 2022	10	46	Murti et al., 2023	4	-	-	-
23	Maharja et al., 2023	10	47	Alim et al., 2023	4	-	-	-
24	Prayitno et al., 2023	10	48	Choe & Mahyuni, 2023	4	-	-	-

We are considering the findings from the important articles above and found several highlights. Based on Jeyacheya & Hampton's fieldwork in Malaysia, Vietnam, Indonesia, and Myanmar, it poses the key issue of whether tourism-led growth can be inclusive in the short to medium term. However, it has been discovered that giving preference to foreign companies, crony conglomerates, and enormous capital is a regional tendency and a significant barrier to inclusive economic policies driven by tourism (Jeyacheya & Hampton, 2020). This implies that solving the issue requires a case-by-case approach. Social capital, which is made up of networks, trust, and norms, affects how young locals engage in agritourism (Nugraha et al., 2021). The younger generation was influenced by higher education levels to stay in the community, support sustainable agriculture, and maintain land use as an agricultural system. This implies that developing the economy of rural areas may be affected by unequal access to education.

As suggested by Arintoko et al. (2020), the primary strategy to accomplish destination objectives is a cooperation between the private sector, regional and state governments, and the community. State-owned enterprises continue to play a significant role in ensuring the sustainability of rural tourism destinations (Arintoko et al., 2020). For some remote locations where the role of State-Owned Enterprises is diminished or nonexistent, this creates a challenging position. Rosalina et al. (2023) argue the necessity of community and customary involvement in maintaining local control over resources, which allow for the efficient utilization of labor and infrastructure. These enable narrative and co-creative

experience-making to support resource conservation (Rosalina et al., 2023b). The challenge is to construct the understanding for residents with farming families with a lack of understanding of the concept of tourism and creativity. Some of the findings mentioned above indicate that the grand concept of developing rural CBT industry is still fragmented. Furthermore, from the 66 articles in Table 1, we did the coding process to determine the theme with the help of the NVivo 12 application. All papers were fully coded, and Nvivo software was used for analysis in order to discover important themes. From the interpretation of the words and nodes, analysis, and grouping phases, five large groups were obtained from the "tourism industries" node, including the activities, destination, economic aspect, social aspect, and capacity (Figure 2). We interpreted previous research articles on tourism villages from the themes and content in them, as shown in Figure 3.

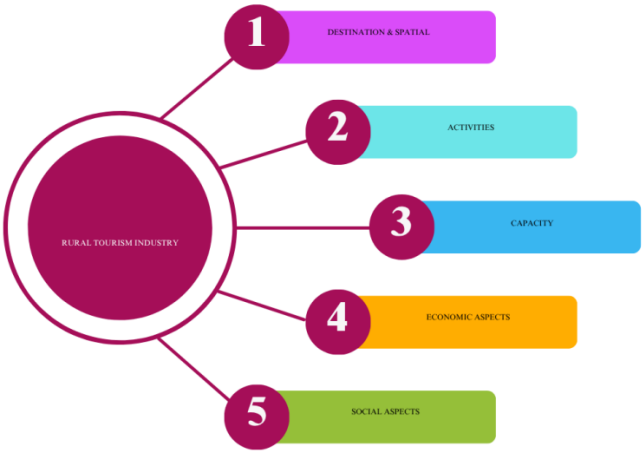

Figure 2. Indonesia Rural Tourism Theme Map Structure (Source: authors, generated from NVivo)

CORE CATEGORY	RELATED THEME & WORDS	INTERPRETATION
Destination&Spatial	Agro-tourism City & Suburban Coastal Protected & Conservation Geopark Heritage Remote Rural	regional understanding
Activities	Farming Fishing traditional art recreational & entertainment Education culture-based	attractions inventoring
Capacity	product & promotion cultural development infrastructure sustainable development village & urban development facilities human capital	capacity building
Economic Aspect	tourism business rural development social and community benefit environmental & pandemic issue natural resources capital government project local income	profit-neighborhood balance
Social Aspect	social capital inclusive community ties community welfare	long term-goal

Figure 3. Building Interpretation (Source: author, generated from NVivo)

1. Regional Understanding

From the regional potential in Indonesia, spatial with specific characteristics can be mapped to be developed into a rural CBT business. Macro understanding of this zoning is crucial because it will then determine the views of various stakeholders in making strategic choices. Each spatial area will have specific characteristics that will determine the level of the obstacle. Some regional initiatives should be highlighted as undermining the government's efforts to accurately quantify the size of tourism (Webster & Ivanov, 2012). Cooperation between academics, practitioners, and government assistance is required to

promote tourism activities, particularly those that depend on socio-cultural capital (Prasetyo et al., 2024). Determination of the development centre or "core-periphery" can be done after understanding the regional concept. Selecting the right "core-periphery" will quickly spread profits or benefits to the surrounding areas (Xi et al., 2015). Conversely, if spatial understanding is not fully understood, it will lead locals to disengage from tourism-related activities (Wang et al., 2020).

2. Attractions Inventoring

If it is possible to determine which spatial are considered potential, various attraction activities can be collected. The research results show that farming, fishing, traditional arts, recreation & entertainment, education, and culture-based significantly become the main themes of tourism villages in Indonesia. The continual convergence between activities of humans and the dynamics of nature maintained by the natural world's beauty can create a strong attraction and even develop sustainable agriculture (Giordano, 2019). However, taking advantage of various daily activities as attention needs to be maintained so long-term tourism growth is possible if the ecosystem remains stable and locals continue to support it. (Yang et al., 2020). The next thought is to determine the form of a more specific attraction according to the location that will be made "core-periphery."

3. Rural Capacity Building

The things that need to be done and prepared together in rural capacity building are infrastructure and human resources. Tourism is not the main occupation of the villagers or urban community. If this is the case, then education on the understanding of the tourism business and its relation to their way of life will have to be done. In emerging nations, a lack of capacity building is a significant obstacle to tourism development, and the primary barriers are located at the organizational and community levels (Aref, 2011). So far, the most frequent challenge for capacity building is that citizens think it is only for the benefit of certain parties (Mandić, 2019). The finding that scope capacity building is: product & promotion, cultural development, infrastructure, sustainable development, village & urban development, facilities, and human capital, makes it possible to increase the participation rate for the capacity building program. Moreover, CBT capacity building will be linked to the quality of design and service and will directly influenced tourists' intention to visit CBT destinations (Phengkona, 2021). Consequently, through rural capacity-building strategies, it is possible to enhance the ability of local human resources, improve the quality of village infrastructure, and, in turn, promote the well-being of local communities (Fatimah & Ayu, 2020).

4. Profit-neighborhood Balance

For villagers, cash gain is not the primary objective in rural CBT businesses. The balance between social and community benefits, environmental issues, and natural resources become a more careful consideration for every action in business. The concept of balance in protecting and enhance resources while still meeting the needs of all stakeholders (present and future) is part of destination management (UNWTO, 2007). Low awareness of protecting and enhance resources could be driven by the fact that tourism is not their primary and first job. Villager participation in the tourism industry and controlling the standard of travel-related activities and their impacts are prominent. In other words, the critical success component is the equilibrium in social exchange that favours the village. (Tirasattayapitak et al., 2015). This understanding of Profit-neighborhood Balance illustrates that the humanist approach is prioritized in the concept of rural CBT in Indonesia.

5. Long-term Goal

Social capital is valuable capital to build a rural CBT business where money is often a limitation. Although a good organization must support it, the growth of social capital can significantly increase the value of starting an enterprise (Moyes et al., 2015). Inclusiveness by involving all parties in the community in the village will create a strong bond. With the result of community ties, it will be easier to discuss and plan goals for the prosperity of a tourist village. Leadership, social capital, and contextual adaptability to social and ecological factors can create long-term, sustainable organizational goals (Dressel et al., 2021). Inclusiveness also means that the village must be prepared to welcome tourists from various racial and cultural backgrounds. The idea also aligns that planning for tourists should pay more attention to local cultures and should be capable of ensuring a better level of historic closeness; further, the community believed that it should aim for a more Indigenous/endogenous-oriented development (Del Chiappa et al., 2018).

Figure 4. Rural CBT Continuity Framework Concept (Source: author, 2024)

By understanding the regional attractions mapping, rural capacity building, profit-neighbourhood balance, and long-term goals in the rural tourism phenomena in Indonesia, we propose the model concept of the rural CBT framework, as seen in Figure 4. From the diagram, the long-term goal of rural CBT is preserving social capital, inclusiveness, and increasing community ties and welfare if regional understanding, attractions mapping, capacity building, and profit-neighbourhood balance meet. This concept means that it is in line with the circular economy in the tourism sector by becoming a model for circular tourism. The idea of circularity serves as a tool to encourage travellers to adopt more environmentally friendly consumption habits that protect and enhance the productivity of tourism resources at the local level (Alonso-Almeida et al., 2024). The innovative capacity of these destinations is included in a mixture of variously shaped and co-located sub-networks, whose characteristics are strongly influenced by the state of social capital (Schuhbert, 2023). Long-term goals also should be put into every planning, development, and target mission before understanding a broader perspective to support Sustainability Development Goals (SDGs) (Team Europe, 2020). Maintaining sustainability also means adapting rural tourism sites to their distinctive circumstances (Zhang et al., 2021).

Through understanding the diagram mapping approach, stakeholders can ascertain the tactics, undertakings, and even funding required to establish and grow a rural CBT enterprise. Tourism policymakers, planners, managers, and other relevant stakeholders can better recognize cultural landscapes, elements, spatial organization, and representations in the changing values of other cultures by having a better understanding of the socio-spatial linkages of destinations (Saleem Wani et al., 2024). Furthemore, to effectively create equitable income-earning opportunities in societies, it is essential to comprehend how tourism development fits into the local livelihood framework and how CBT efforts distribute tourism job opportunities (Legatzke et al., 2024). Participation in raising awareness of tourism resources is positively impacted by household characteristics, livelihood advantages, tourism resources, local CBT development planning, and community organization (Chi et al., 2024). In the framework of capacity building or other associated sustainable improvements, countries that are interested in tourism as an economic booster will be able to choose initiatives in a more targeted and strategic way. Finally, it can be said that using adaptable, context-aware CBT techniques based on a practical awareness of local sociocultural life is crucial (Chi et al., 2024).

Indonesia's Rural Tourism Industry as It Stands

There are currently 4,812 rural CBT entities dispersed throughout Indonesia in various geographic regions (Indonesia Ministry of Tourism, n.d.). Rural tourism villages in Indonesia have experienced rapid development along with the increasing public interest in nature-based tourism and local culture (Utomo et al., 2020). Information through social media also encourages village communities to start being interested in developing their natural and cultural potential into tourism villages (Senyao & Ha, 2022). The Indonesian government, through the Ministry of Tourism and Creative Economy, has been actively encouraging the growth of tourist villages. Driven by government funding, related ministries and institutions have become agents of change for villages that want to become tourist villages. Due to social media and digital marketing that emphasizes the distinctiveness and depth of regional culture, villages that were previously less well-known, are beginning to draw interest from both domestic and foreign tourists. This means that the demand for increased capacity building for villages is inevitable (Ezeuduji, 2015; Moscardo, 2008). One of the substantial factors in the development of rural tourism in Indonesia is community empowerment. This indicates the existence of a communal identity concern that motivates the group to engage in joint activities (Abrahams, 2015; Ilieș & Ilieș, 2015). Typically, they operate homestays, provide regional cuisine, and act as tour guides, introducing visitors to the traditions and way of life of the area. By doing this, the village's culture and surroundings are preserved, and the local economy is strengthened. Furthemore, it is essential to understand destinations at multiple levels, from the individual to the state level. The goal of establishing sustainable tourism is to seamlessly integrate travel into the current social-ecological system, not to centralize tourism (Hanita et al., 2024).

Spatial identities used as capital towards social welfare can also be found in several villages that are considered successful. Tourist villages such as Penglipuran Village in Bali, Nglanggeran Village and Pentingsari Village in Yogyakarta are successful examples of sustainable tourist village development by The World Tourism Organization/ UNWTO (unwto.org, n.d.). They combine natural beauty, tradition, and the friendliness of the local people, thus providing an authentic experience to tourists, which ultimately brings prosperity to the local people.

Still, there are obstacles to overcome, particularly in the areas of infrastructure, facilities, accessibility, human resources, and environmental sustainability. Since many rural tourism destinations are situated in remote locations, basic amenities like road connectivity still need to be developed (Purwani et al., 2023). Additionally, one of the particularly essential tasks for managers of tourist villages is to find a balance between growing visitor numbers and environmental sustainability. In addition, maintaining a balance between increasing the number of tourists and environmental sustainability is an important task for village managers (Utami et al., 2023). The intention is for long-term goals to be developed into long-term objectives. Inclusive and sustainable tourism-based village economic development can be attained if a balance between business interests, income, and benefits is met.

CONCLUSION

Content analysis can be used to understand an issue more comprehensively by using good research article sources. Using research results from the cited Scopus database is very helpful in seeing the broader context of various research gaps and generalizing existing findings. The selection of publications cited by other researchers makes the degree of connectivity of the reference sources better. The emergence of CBT tourism villages that seek to follow the pattern of tourism business forms can be observed from the results of previous studies. The ultimate goal is still to maintain social

links and aspirations to raise everyone's standard of living, regardless of the attraction's type, location, economic objectives, or capacity-building strategy used. However, to construct resilient and sustainable rural tourism in the face of essential dependencies, policy protections, capacity building, and cooperative partnerships are required (Sutomo et al., 2024). This study emphasizes the significance of customary involvement, conservationist resource interpretations, harmony between people and nature, and spirituality in rural tourist resource management (Rosalina et al., 2023a).

Various tourism development approaches will have varying effects and advantages in the local context, favoring some actors while marginalizing others (Giampiccoli, 2020). Therefore, the failure of a rural CBT activity always stems from the assumption that an action does not reflect the ultimate goal that contains shared values.

By knowing the pattern of Indonesia's rural CBT framework, the need for development planning and anticipating problems can be mapped thus the actions for the development program could be more focused and targeted.

Limitations and Implementation

The source of this research is one source, which, in this instance, is the database of Scopus. It will be exciting to build on this work by utilizing additional resources in the same way in the future. Even though Indonesia has thousands of rural tourism destinations, using articles from Indonesian cases will still provide a local perspective. By comparing the results of the other developing countries, we may find some new insights.

The framework of mapping components in the findings of this study can be used as indicators of measuring the performance and achievement of national and international bodies or stakeholders like the Ministry of Tourism or UNWTO to understand and develop the conditions of rural CBT businesses in other developing countries.

Author Contributions: Conceptualization, S.P. and A.F.R.; methodology, S.P and A.F.R.; software, S.P. and A.F.R.; validation, LDD. and Z.B..; formal analysis, S.P. and A.F.R.; investigation, A.F.R., and Z.B.; resources, E.I. and A.F.R..; data curation, S.P. and A.F.R. and L.D.D; writing - original draft preparation, S.P. and A.F.R and L.D.D..; writing - review and editing, S.P. and E.I.; visualization, Z.B. and L.D.D.; supervision, A.F.R., Z.B., and L.D.D; project ad-ministration, A.F.R., Y.I., A.B., and L.D.D.; funding acquisition, L.D.D. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: This work was supported by the Flagship Research Groups Programme of the Hungarian University of Agriculture and Life Sciences and the Hungarian University of Agriculture and Life Sciences, Doctoral School of Economic and Regional Sciences, Hungary.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 14.01.2025 Revised: 09.06.2025 Accepted: 30.06.2025 Available online: 15.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1430-1442
DOI 10.30892/gtg.61303-1513

ECOSYSTEM RESTORATION AS A NATURE-BASED SOLUTION: A CASE STUDY OF WADI RUM

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Citation: Jawabreh, O., Fahmawee, E.A.D.A., Jahmani, A., Qaddhat, R., Alqader, S.A. & Saleh, M. (2025). Ecosystem restoration as a nature-based solution: A case study of Wadi Rum. *Geojournal of Tourism and Geosites*, 61(3), 1430–1442. https://doi.org/10.30892/gtg.61303-1513

Abstract: This research examines the significance of ecosystems and their restoration in local or landscape-level management, using a case study of the Wadi Rum eco-region in southern Jordan. It emphasizes the need for nature-based solutions in light of considerable worldwide ecological deterioration. Aims: As global environmental degradation accelerates, ecosystem restoration has emerged as a critical strategy to combat land degradation, biodiversity loss, and climate change. This research investigates the role of ecosystem restoration as a nature-based solution (NbS) through a case study of the Wadi Rum Protected Area (WRPA) in southern Jordan. The aim is to assess restoration efforts in Wadi Rum, evaluate their effectiveness, and derive lessons to inform sustainable restoration practices globally. Method: The study employs a case study methodology, combining multiple site visits over five years with extensive literature review and stakeholder interviews. Both qualitative and quantitative approaches were integrated, including ecological and socio-economic data collection, GIS-based geographical analysis, and participatory methods involving local communities. Key ecological indicators and restoration practices were monitored and evaluated to determine the effectiveness and sustainability of interventions. Results: Findings reveal that Wadi Rum's ecosystems face critical threats from tourism, aquifer depletion, overgrazing, and climate change. Despite these challenges, several passive and active restoration techniques, such as habitat protection and community engagement initiatives, have shown promising results. Ecological indicators such as biodiversity distribution, soil stability, and community participation rates have improved in areas under active restoration. Geographical mapping highlighted zones of significant environmental change and areas where restoration efforts yielded the greatest impact. Interpretation: The research demonstrates that integrating ecological restoration within a broader NbS framework can significantly enhance ecosystem resilience and community well-being. Success in Wadi Rum underscores the importance of community participation, adaptive management, and the integration of socio-economic benefits into restoration projects. These insights offer scalable models for ecological restoration in other arid and semi-arid regions globally, emphasizing that sustainable outcomes depend on interdisciplinary approaches and localized, inclusive practices.

Keywords: Ecosystem Restoration, Nature-based solutions (NbS), Wadi Rum Protected Area (WRPA)

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INTRODUCTION

Ecosystem restoration - from the regeneration of degraded soils through rainwater harvesting to the rehabilitation of mountains that trap and channel precipitation - has been of great significance in many ancient cultures. A number of spiritual traditions center on stories that transfer lessons of ecological balance and harmony into social and spiritual thought or practice. Thus, for centuries, millions of individuals have worked to combat desertification, eroded slopes, and land abandonment through the implementation of various environmental technologies. As we face climate catastrophe and global industrial expansion, ecosystem and land restoration are growing as key strategies and methods for nature-based solutions, capable of supporting the scalability and sustainability of global environmental management efforts (Quintero-Angel et al., 2023). This paper explores the importance of ecosystems and their restoration in local or landscape-level management through a case study of the Wadi Rum ecoregion in southern Jordan. It outlines the necessity of nature-based solutions based on a background of significant global ecological degradation. The Wadi Rum case study is described here as a living laboratory within which nature-centered methods of environment and ecosystem repair have proven effective

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and resilient in restoring soil and ecosystems on degraded lands. The message promoted in this paper is that ecosystem restoration, capable of amplifying natural design patterns or processes, holds solutions to fields such as eroded land capping and restoration, indigenous land management, environmental engineering, landscape management and restoration, rainfall harvesting, soil moisture collection, landform engineering, sediment retention, as well as strategies supporting carbon sequestration and regional resilience building (Zhensikbayeva et al., 2024; Kurar & Kavacik, 2023). The central aim of the research presented is to better understand how to restore ecosystems that are showing signs of degradation. For that purpose, we have identified mitigation and adaptation to climate change as segments of vital importance to the overall health and welfare of residents and visitors to the protected area. In pursuing these objectives, the guiding questions of this research are: What restoration efforts are currently taking place, or have been implemented, in Wadi Rum? Are there any measurable changes that can be made to evaluate the success or failure of the restoration efforts in Wadi Rum? To develop an answer to these questions, we have decided to use Wadi Rum as a case study. Our choice was made after several personal visits to the area during the last five years and through a brief review of the existing literature on Wadi Rum. The importance of this research is threefold. Firstly, it provides an opportunity to record some original primary data from Wadi Rum. Secondly, the processes of degradation and the other pressures enumerated in this chapter replicate a global pattern of increased stress and degradation of protected areas in response to the increasing impacts of human activity. Thus, the research not only makes a valuable contribution to the existing body of literature on Wadi Rum but also to the practice of protected area management and ecosystem restoration more broadly. Thirdly, while ecological restoration efforts in Wadi Rum have been carried out in the past, systematic data on such efforts, their outcomes, and their efficiency have never been collated or evaluated in an academic article. Such an undertaking can help to improve future ecological restoration practices in Wadi Rum and globally.

2. BACKGROUND OF WADI RUM PROTECTED AREA

Ecosystem restoration is undergoing renewed interest, particularly in the form of forest restoration and associated work as a key nature-based solution in the context of changing Nature's Contributions to People. While degraded lands, deforested and eroded, have been a focus across continents and decades, including the Thar Desert, the Newe Hishu Desert in Israel, and the Bajio in Mexico – emulated by advocates for soil and conservation districts engaged in controlling erosion in the US Dust Bowl of the 1930s – no comprehensive efforts in restoration have addressed the lifestyle and culture of the people living there. Societies and cultures of all regions have watched degradation unfold over long periods. Three trends have been particularly alarming in recent decades, less so due to revelation and more due to synthesized and circulated data (Al Dein, 2022; Sen et al., 2024; Al Fahmawee & Jawabreh, 2022a).

Degradation and erosion continue perpetuating desiccation and accelerated soil loss while aquifers – and therefore, the hydrologic link to fertility and bodies of water – continue to be overdrawn. These historical and current patterns highlight the necessity for restoration. Additionally, efforts that restore ecological functioning can be as much as 25 times lower than appropriations for high-tech interventions to secure water elsewhere, such as desalination or dam construction. An integrated land, water, and soil husbandry approach encompassing stewardship is applicable for all ecosystems with pre-industrial human populations or impacted analogs worthy of emulating for contemporary socioeconomic reasons. Ecosystem health and associated ecosystem functioning are the significant criteria for sustaining quality of life.

Ecosystem restoration has become the talk of the town in conservation science. The interrelationships between various forms of environmental degradation and human security need an interdisciplinary and multiform approach to ecological restoration. As a result, ecosystem restoration has evolved as a transversal ecosystem management approach intersecting with many other related fields such as rewilding, ecological gardening, ecological social work, reconciliation ecology, and many others (Le et al., 2024; Lin et al., 2022; Al Fahmawee & Jawabreh, 2023 ; Al-Shawabkeh, 2023). Diverse as these approaches are in their goals and philosophical foundations, they all assume the possibility of humans as ecosystem healers, no matter the reasons for or the scale of ecosystem degradation. The theories and practices of ecosystem restoration have deeply grounded theoretical and ideological roots dating back to at least the early 1940s for restoration ecology, the 1920s for nature conservation philosophy, and the 1910s for forestry science. The intellectual and ideological roots of ecosystem restoration shape the practice of restoration ecology and help explain the emergence and multifaceted identity of the different approaches to ecosystem restoration and management today.

The field of ecosystem restoration has not consensually defined limits yet, but there seems to be a consensus about certain concepts and basic principles of using human interventions to improve and restore ecological functions and ecosystem services. For some, ecosystem restoration is a social-ecological process of renewing and re-renewing the environmental and cultural bases of human relations with the environment, seeking possible futures based on better understandings of their past (Sutiksno et al., 2024 ; Al Dein, 2021 ; Al Fahmawee & Jawabreh, 2022b). Others define it as a process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed, resulting in a forest ecosystem. Consider ecosystem restoration as a multi-faceted social and ecological intervention whose ambition is to create the conditions for a self-sustaining dynamic recovery of the ecosystem, specific species, and the ecosystem services they supply. Reconstruction is yet another area within ecosystem restoration, defined as the re-creation of a pre-existing community where management aspirations are to widely be part of influencing the recovery of the ecosystem. A common theme for the abovementioned definitions is that while broad in scope, they are also strongly and exclusively oriented towards deliberate and targeted human interventions, paying little attention to what happens in cases in which human intervention is minimized. The theoretical framework developed can be applied in broader and shallower terms to support such a view. Building on the early theoretical work, this approach considers that the more fundamental concept of restoration ecology begins from the premise of recovery or repair, most often in terms of human values (Jawabreh & Al

Fahmawee, 2023a). This theoretical approach is, therefore reflective of the restoration practice and strategy applied in various contexts. Similar to the many definitions provided for ecosystem restoration, its importance has diverse meanings: from the willingness of scientists, practitioners, and land managers to restore ecosystem functions and sustain or encourage particular ecosystem services and the biodiversity levels based on the restoration management historical or cultural values at multiple spatial and temporal scales; to conservational considerations that push to the optimum conditions for insufficiently explored ecologies to reveal the discovery of new species and facilitate the global exchange of genes. But the challenges have also been vividly laid out: ecosystem resilience is determined by the social-ecological state of the system, and because financial and human resources are spread very thin across the planet, priorities are necessary.

Although the latest trends in literature demonstrate a growing divergence of views on the aspects of restoration, the most widely accepted definition of ecosystem restoration is still that of the Society for Ecological Restoration. According to this understanding, 'ecosystem restoration' means "the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed." The definition provided by SER is instrumental in highlighting the multi-dimensional aspects of ecological restoration, from physical rehabilitation works to the structural processes defining the compositions of restorative interventions, holistic projects, restoration of new ecologies, and participative decision-making as innovative management practices, to name a few. Professional restorationists share the view that similarities and differences occur among and within all ecosystem types. Four different levels of restoration success are suggested for possible objectives as ultimate targets, which fall within three categories: repairing the components; achieving ecological criteria that are not directly linked to any specific species and might therefore be considered "structural" or "functional"; rehabilitation or full restoration of the ecological functioning or integrity; and re-creation of the original ecosystem according to reference conditions (Jawabreh & Al Fahmawee, 2023b; Jawabreh, 2020).

There are countless different classifications of the types of restoration. Some are based on species, sites, modality, handicap, and social factors. The scope of ecological restoration practices encompasses a wide range of restoration actions and measures. Many typologies of desired results concerning ecological restoration actions are adopted, including the complete amelioration or reduction of negative impacts caused by human activities, the recovery of a previous situation, or the restoration of the "ecological functionality" of an area in the context of a new land resource. Subtitling all these intended goals as "ecological restoration" likely accommodates some propaganda to provoke support and funding (Jawarneh, 2021; Morino et al., 2022). These insights are crucial for addressing the situation in Wadi Rum, where supported actions aim to redefine the North-Western range of the protected area system.

Importance of Ecosystem Restoration

Ecosystem restoration is a critical means of maintaining the integrity of ecosystems and ensuring their continuous ability to provide services to human beings and diverse life. One of the major environmental benefits of restoration is the mitigation of climate change by enhancing carbon storage and sequestration in vegetation and soils. The restoration of degraded areas is also a means for conserving biodiversity by creating more habitats and corridors for species. It can also reduce loss and damage to lives, livelihoods, and properties (Jawabreh et al., 2021; Shatnawi & Obaidat, 2022; Seidualin et al., 2024). There are many forms of nature-based solutions that rely on ecosystem restoration to help in disaster risk reduction, such as restoring mangroves to buffer tidal waves or protecting watersheds to reduce the risk of flash floods. Restoration work can also enhance ecosystem services like water purification and the provision of products such as clean water, timber, and non-timber forest products, staples, indigenous knowledge, and cultural values. It can thus improve human well-being and provide an asset base for adaptation to climate change and other stresses. Restoration can potentially deliver greater efficiency, convenience, and cost-effectiveness of ecosystem services compared to build-engineered solutions.

Restoration provides worth to other restoration projects through its means of securing the legal right to land, creating more ownership ties, promoting investments, and building social capital. It also brings indirect benefits in restoring social and cultural values of an area, empowering local people, reducing their vulnerability, and promoting social accountability, social learning, and security. Moreover, at the macroeconomic level, restoration contributes to poverty reduction, rural-urban economic growth, engendering development, and improving employment opportunities while preventing increasing migration. In this way, an economic approach could serve as a strong tool in launching a business-as-unusual style restoration (Voronkova et al., 2021; Wang et al., 2023). Any nature-based solution must present an outstanding and compelling case in each country for why it is important, linking it to national biodiversity conservation, climate change, land degradation, and national environmental policies and goals. Such a case can be made powerfully by demonstrating restoration.

Nature-Based Solutions

Nature-based solutions (NbS) are approaches to societal challenges based on ecosystem-based responses (Clement, 2021). They aim to address global challenges such as climate change, food and water security, and loss of biodiversity, all of which are unlikely to be achieved through technological, infrastructure-based, or other anthropocentric pathways alone (Konijnendijk, 2021). Ecosystem restoration makes use of nature-based solutions and is often ascribed as one of the most effective actions to increase our resilience against climate change while also mitigating some of its impacts. NbS must be based on the protection, management, or restoration of natural and/or modified ecosystems. They should concurrently provide environmental, social, cultural, and/or economic benefits for human well-being. NbS should also be proven to balance the distribution of their benefits and costs to all stakeholder groups. Finally, their methods of application are generally sustainable and do no harm to the natural or built environment. These characteristics place NbS as inherently interdisciplinary, focusing on the benefits that natural systems provide through their services.

NbS is guided by the aspiration to create societies in which people enjoy a better quality of life, within the carrying capacity of ecosystems, care for and conserve nature, and thus will leave a rich legacy to future generations (La Notte & Zulian, 2021). The implementation of NbS is based on several principles. Given that they are focused on connectivity between diverse systems, they should remain sustainable and adaptive for the long term. NbS tend to be most effective when they are integrated into local contexts and are best when they make use of broad interdisciplinary frameworks. Human health and social welfare frameworks can also form intersections with these strategies. As such, ecosystem restoration for exactly that focus can be seen in this broader context. Restoration can be undertaken as a response to long-term systems collapse or as an intersection of natural and human systems. When focused on human systems, in this broader context, ecosystem restoration can most conveniently be integrated, understood, and acted on as a form of nature-based solutions. Such a designation inherently places restoration within the purview of interdisciplinary interest and enables stakeholder interaction across various fields, ensuring innovation—and hopefully solutions—in the face of complex and urgent challenges. Using our case study thus provides a comprehensive example of the benefits of utilizing such holistic approaches (Bonham-Corcoran et al., 2022; Andreucci, 2021; Alshamali, 2020).

Nature-based solutions (NbS) are interventions that harness biological and ecological processes to address societal challenges, including water scarcity, climate change impacts, and land degradation, within a framework of socially inclusive, sustainable development. NbS are currently enjoying attention from practitioners, policymakers, and scholars alike, attracting investment from international conservation, development, and financial institutions. NbS tempts an array of stakeholders because these strategies leverage the straightforward concept of assisting nature to "do the work." Importantly, the definition and guiding principles of NbS stress the importance of listening, valuing, and incorporating traditional ecological knowledge of natural resources. Solutions must be co-designed, using input and influence from local communities, other government actors, and community-based organizations active in the landscapes.

They must support locally defined pathways to include increased spatial connectivity for socio-ecological well-being. When "done well," NbS can support opportunities to restore local economies, empower women and younger generations, and generally incentivize pro-environmental behaviors and choices. To this end, principles that characterize NbS include: (i) Localization and customization: Solutions must integrate experience from the natural and social sciences with traditional ecological knowledge to be effective in their unique biophysical, social, and cultural context. In restoration projects in particular, the principle of localization can emphasize enhanced adaptability to site and programmatic sustainability. (ii) Adaptability and responsiveness: Flexibility is a key asset of locally appropriate NbS across operation, structure, and scope, and supports sustainable long-term interventions that co-evolve with the target system. (iii) Multi-functionality and co-benefits: NbS should create multiple benefits for landscapes, ecosystems, and societies, including an increase in the production of food and the assurance of water and energy, biodiversity conservation, climate change mitigation and adaptation, disaster risk reduction, and cultural services. (iv) Restorative approach: NbS typically emphasize the ecological benefits of restoration or rehabilitation and their potential to function in socially valued ways. Science and traditional knowledge can inform and infuse this principle to ensure that socio-ecological dynamics and trade-offs are managed to support ecological health and foster thriving local traditions and livelihoods (Chen et al., 2021).

The histogram below shows the number of articles on "Ecosystem Restoration as a Nature-Based Solution" from 2014 to 2024. The fundamental understanding is as follows: Initial Period (2014–2020): During this era, there were a limited number of publications, totaling less than 25 per year. The subject was likely gaining momentum and generating initial interest. A significant escalation started in 2021, culminating in 61 publications and thereafter expanding to 86 in 2022. There is an increasing recognition of the importance of ecosystem restoration in addressing environmental problems. Research production reaches its zenith in 2024 with 137 articles, after 110 in 2023. There is a growing global focus on restoring ecosystems to meet sustainability goals and combat climate change as it clear in Figure 1. The trend highlights the increasing significance of ecosystem restoration as a nature-based solution, accompanied by heightened interest and study in recent years.

Figure 1. The quantity of articles on "Ecosystem Restoration as a Nature-Based Solution" from 2014 to 2024

Methodology

This research employs a case study methodology, concentrating on the Wadi Rum Protected Area (WRPA) in southern Jordan. The researchers conducted multiple site visits over five years to gather firsthand observations and document ecological restoration efforts. This fieldwork was complemented by a thorough review of existing literature on Wadi Rum, ecosystem restoration practices, and nature-based solutions. The study combined qualitative and quantitative methods, including interviews with local stakeholders, community members, and environmental experts, to capture diverse perspectives. Additionally, geographical and ecological data were collected and analyzed to assess land degradation,

biodiversity distribution, and restoration progress. The researchers also incorporated participatory approaches, engaging local communities in restoration discussions and decision-making processes. This method gave a complete picture of restoration practices and their effects by combining ecological, socio-economic, and cultural factors. It focused on long-lasting and community-driven solutions. A vast, arid valley called Wadi Rum is located on the southern border of Jordan. About half the size of Amman, Wadi Rum is situated 100 kilometers south of the ancient Nabatean ruins at Petra and 60 kilometers east of the Jordanian seaside city of Aqaba. The valley is surrounded by peaks of granite and sandstone that have been eroded over thousands of years by an unforgiving desert wind. These mountains' highest point is 1,754 meters above sea level. Along a north-south axis, the old valley floor is dotted with large sand dunes and a number of granite and basalt hills as shown in Figure 2. Approximately 720 square kilometers of nothingness, a level and featureless desert plain that extends all the way to the Saudi Arabian border, replace Wadi Rum in the east (Jawabreh et al., 2025).

Figure 2. Wadi Rum Protected Area Map: Prepared by the researchers, using Global Mapper software, April 2024

Case Study: Wadi Rum

Wadi Rum is a remote desert wilderness in southern Jordan, one of the driest areas in the country. The face of Wadi Rum is dramatically sculpted by sandstone and granite outcrops that rise up from the southern desert plains (Jawabreh, 2017; Giersch, 1993). With limited military activities in the past, Wadi Rum has remained relatively untouched over the years, and it is here that the Wadi Rum Protected Area (WRPA) was established. WRPA is home to a surprising amount of biological diversity, mainly due to its varied landscapes. Few places in the world contain such a complete range of landscapes within a small an area. The erosion of granite has created long, narrow ravines and valleys. In contrast, the massive, chiseled sandstone ridges dominate the northern half of the WRPA, some of them rising from low desert valley floors to nearly 1800 m above sea level. Other high cliffs form an impenetrable barrier against the east-west oriented sandstone valleys. On entering the protected area, the visitor is struck by the deep silence and immense beauty.

The Wadi has attracted humans for thousands of years, with tribes settling in caves to escape persecution (Kottangal & Purohit, 2024; Eid & Mallon, 2021). Over time, these tribes became the Nabateans. Wadi Rum is world-renowned for its rock art, consisting of petroglyphs, inscriptions, and archaeological remains. It is a vast collection of sites, covering an area of about 400 sq km and containing tens of thousands of individual inscriptions and representations in various locations. Wadi Rum is, however, increasingly under pressure, mainly due to tourism, although climatic changes and public perceptions of nature are rapidly altering the landscapes of the wider area. Both of these issues contribute significantly to the physical land degradation problem. Among these pressures, the most significant one is the mining of the delicate aquifer waters.

Location and Description Situated in the heart of the Arabian Desert, Wadi Rum is a unique and spectacular desert landscape in Jordan, known colloquially as the Valley of the Moon. Wadi Rum is characterized by a series of parallel sandy wadis that run in a north-northwest-south-southeast orientation and form the drainage system of the western Rum sandstone massif. The area can be divided into five main habitats: sand valleys, sandstone and granite jebels, sabkhas, semi-fixed and fixed dunes, and irrigated or cultivated areas (Strachan, 2012; Jawabreh et al., 2025). Wadi Rum is situated in a hyper-arid zone with a desert climate, characterized by a mean annual temperature of 20–24°C and summer temperatures often exceeding 40°C. Annual average rainfall is currently approximately 35.5 mm, occurring in two periods—winter from November to March and late spring to early summer in April to May (Shawash et al., 2023). Wadi Rum is a window into the past and reflects a landscape formed during a more humid, cooler, and different climatic era several thousand years ago. The area is especially famous for some of its features which are of universal significance. Wadi Rum is often used as a model for desert-type landscapes and is renowned for its rock formations, flora and fauna, and bird species, with high rates of endemism and threatened species. The area is an outstanding example of the interaction between human communities, an

original indigenous community with a cultural and Stone Age lifestyle, and the desert landscape, and has maintained a rich oral history, etched into the landscape as petroglyphs, built structures, cairns, and other traces since prehistoric times to date.

Ecosystem Degradation and Pressures

Wadi Rum suffers from several pressures that affect its ecosystem and lead to its degradation. Over the decades, several human activities have put pressure on the Wadi Rum environment and its natural systems. The increasing interest in the natural and cultural heritage of the place and the emerging tourism has been considered a double-edged phenomenon. Although tourism has always been a primary source of income for the local community, if not well managed, it has also been known to cause irreversible damage to the designated area. In Wadi Rum, the increase in tourist visits has led to the exploitation of resources, such as stone theft, over-pastoralization by livestock, and desert drivers enlarging tourist sites and routes, negatively influencing valuable habitats and turning them into degraded lands (Bedarkar et al., 2024).

The loss of biodiversity in Wadi Rum stems from habitat destruction. Pressures on the land are removing its capacity to support and maintain this variety of species. Any degradation of the protected area, due to overuse or any other unsustainable practices, may have spillover impacts on the local communities that are partially dependent on the ecological services that an intact environment provides. Climate change is expected to have a range of negative impacts on Wadi Rum's ecosystems, including more frequent and severe droughts, heat waves, and changes in species distribution. This degradation bars natural systems from being able to perform the services that they have provided for centuries, including maintaining freshwater sources and allowing species and plants to adapt their movements and dispersion strategies. Given such multiple and repeated threats pressing on local ecological resources, the pursuit of restoring these ecosystems comes as a priority. Wadi Rum's desert ecosystems are linked to the local population and are affected by social and economic factors, such as population growth and extensive grazing. Any initiative to restore Wadi Rum should, therefore, take these challenges into account.

Geographical and Ecological Analysis of Wadi Rum

Wadi Rum, also known as the "Valley of the Moon," is one of Jordan's most iconic desert landscapes, characterized by its towering sandstone mountains, vast sandy plains, and rich cultural heritage (McKee, 2009; Chatelard, 2003). This region, with its unique geological formations and ecological significance, faces various environmental challenges that require sustainable management and conservation efforts. The following sections provide an in-depth analysis of four key aspects related to Wadi Rum: topography, environmental changes, biodiversity distribution, and land use.

Topographic Features of Wadi Rum (Topographic Map of Wadi Rum)

Wadi Rum's topography is defined by a combination of towering sandstone mountains, deep canyons, and expansive desert plains. The region features several prominent rock formations that rise up to 1,800 meters above sea level, creating a dramatic landscape that has been shaped over millions of years by erosion and geological processes. The elevation gradients in Wadi Rum play a crucial role in shaping the local climate and ecosystems. Higher elevations, such as Jebel Rum and Jebel Umm ad Dami (the highest peak in Jordan), experience slightly cooler temperatures and occasional precipitation, which contribute to the development of microhabitats for various plant and animal species (Zhang et al., 2021).

Conversely, the lower desert plains are characterized by extreme aridity and high temperatures, making them more susceptible to desertification. The rock formations in Wadi Rum consist primarily of red sandstone and granite, which have been sculpted by wind and water erosion into unique shapes, including natural arches, bridges, and deep canyons. The region's rugged topography also influences human settlement and land use patterns, as certain areas provide natural protection and shade, historically attracting nomadic communities and wildlife. Understanding Wadi Rum's topography is essential for conservation and tourism management, as its unique geological features not only attract visitors but also serve as natural refuges for various species as shown in Figure 3. Proper mapping and analysis of elevation patterns help in designing sustainable trails, minimizing human impact on fragile ecosystems.

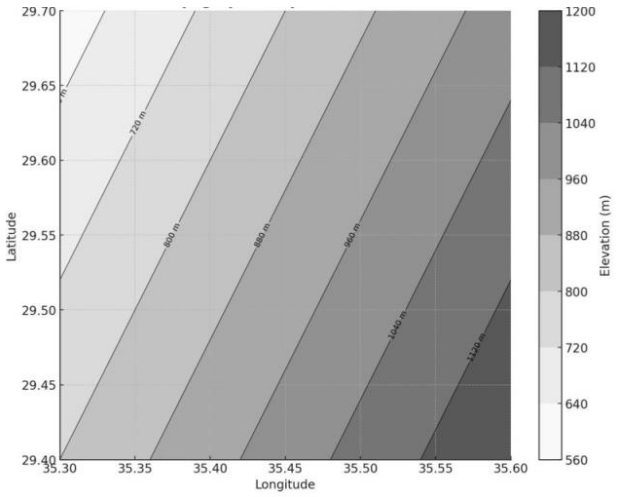

Figure 3. Topographic Map of Wadi Rum: Shows the terrain and geographical features of the region. Illustrates elevations and terrain using grayscale and contour lines to accurately define high and low areas. (Source: Author, prepared by the researchers using Global Mapper software, April 2024)

Environmental Changes in Wadi Rum (Environmental Change Map of Wadi Rum)

Wadi Rum is experiencing significant environmental changes due to a combination of natural and human-induced factors (Fernandes & Marshall, 2023). The region's ecosystem is under pressure from desertification, biodiversity loss, and water resource depletion, each of which poses serious threats to its ecological stability.

Desertification and Land Degradation

Desertification is one of the most pressing environmental issues in Wadi Rum. The increasing aridity, coupled with climate change, has led to soil degradation and loss of vegetation cover. Overgrazing by livestock, off-road vehicle tourism, and deforestation of native shrubs have accelerated the spread of barren land, reducing the ability of the soil to retain moisture and support plant growth.

Biodiversity Loss

The fragile balance of biodiversity in Wadi Rum is at risk due to habitat destruction and human activities. Several species, including the Arabian oryx (*Oryx leucoryx*) and the sand gazelle (*Gazella subgutturosa*), have experienced significant population declines as a result of overhunting and habitat fragmentation. Additionally, the loss of key plant species has disrupted the ecological food chain, leading to a decrease in herbivore populations and their natural predators, such as the desert fox (*Vulpes rueppellii*).

Water Resource Depletion

Water scarcity is a major challenge in Wadi Rum, as the region relies on limited groundwater sources (Brand, 2001). The extraction of water for agricultural and tourism purposes has placed stress on underground aquifers, leading to lower water tables. Additionally, climate change has disrupted rainfall patterns, further exacerbating water shortages. Conservation efforts are needed to implement sustainable water management practices, such as rainwater harvesting and the restoration of natural water catchment areas. Addressing these environmental challenges requires a comprehensive restoration strategy that includes reforestation of native plants, controlled grazing, and eco-friendly tourism regulations to minimize land degradation as shown in Figure 4.

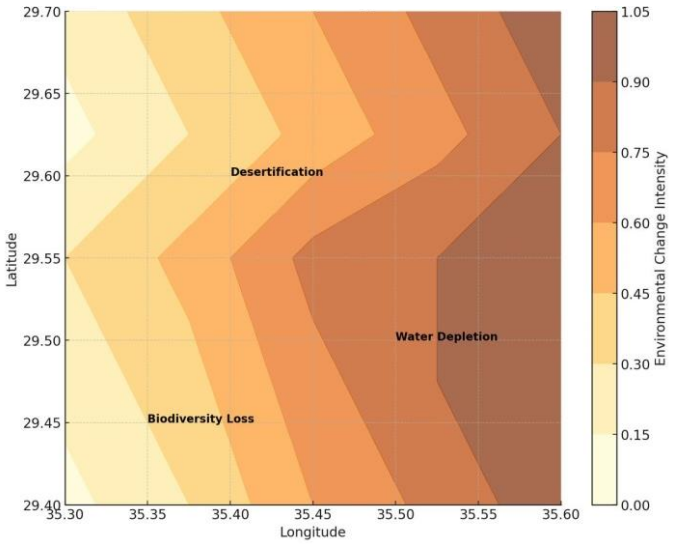

Figure 4. Environmental Change Map of Wadi Rum: Displays the effects of desertification, biodiversity loss, and water resource depletion. (Source: Author, prepared by the researchers using Global Mapper software, April 2024)

Biodiversity Distribution in Wadi Rum (Biodiversity Distribution Map of Wadi Rum)

Despite its harsh desert environment, Wadi Rum is home to a diverse range of flora and fauna, many of which have adapted to survive in extreme conditions. The biodiversity of Wadi Rum is distributed across various microhabitats, depending on factors such as elevation, soil type, and water availability.

Key Species and Their Distribution

- Arabian Oryx (*Oryx leucoryx*): once extinct in the wild, the Arabian oryx has been successfully reintroduced in select areas of Wadi Rum. These antelopes prefer open desert plains where they can detect predators from a distance and find sparse vegetation for grazing.
- Sand Gazelle (*Gazella subgutturosa*): This species is well adapted to arid environments and is found in semi-fixed dunes and rocky desert areas. Sand gazelles rely on their ability to obtain moisture from the plants they consume, making them highly resilient to water scarcity.
- Desert Fox (*Vulpes rueppellii*): The desert fox is a nocturnal predator found in rocky outcrops and sand valleys. Its keen sense of hearing and exceptional night vision help it hunt small mammals and insects while avoiding daytime heat.
- Native Plants: Wadi Rum hosts several drought-resistant plant species, including Acacia trees, Retama shrubs, and Artemisia plants. These plants play a crucial role in stabilizing the soil and providing food and shelter for herbivores and pollinators.

Threats to Biodiversity

The main threats to biodiversity in Wadi Rum include habitat destruction, poaching, and climate change. Conservation

efforts, such as the establishment of protected reserves and anti-poaching initiatives, are essential for safeguarding the region's unique wildlife as shown in Figure 5. By mapping biodiversity distribution, conservationists can better allocate resources to protect critical habitats and promote sustainable coexistence between humans and wildlife.

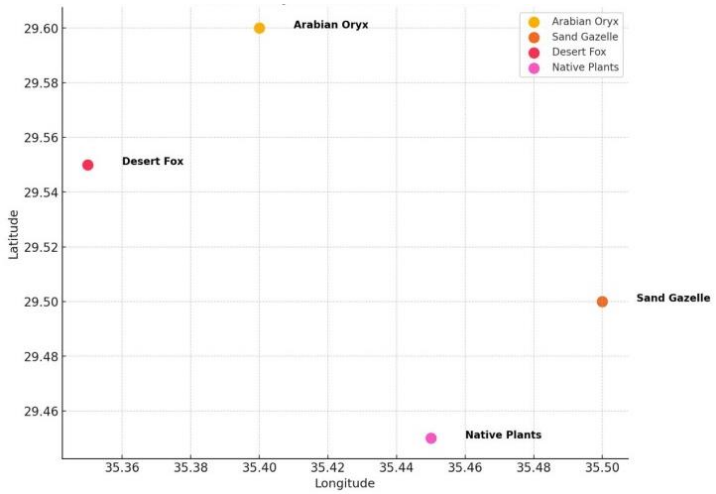

Figure 5. Biodiversity Distribution in Wadi Rum: Indicates the locations of Arabian oryx, sand gazelles, desert foxes, and native plants. (Source: Author, prepared by the researchers using Global Mapper software, April 2024)

Land Use Patterns in Wadi Rum (Land Use Map of Wadi Rum)

The land used in Wadi Rum is shaped by a combination of natural landscapes, cultural heritage, and economic activities. The main categories of land use in the region include protected areas, tourism zones, agricultural lands, residential areas, and human settlements.

Protected Areas: The Wadi Rum Protected Area (WRPA) covers a vast expanse of the desert and is designated as a UNESCO World Heritage Site. This area is managed to preserve its ecological and cultural significance, restricting activities such as hunting, excessive tourism, and unregulated development.

Tourism Zones: Tourism is a major economic driver in Wadi Rum, with designated zones for eco-tourism, hiking, and camel trekking. Several luxury desert camps and adventure tourism activities are concentrated in specific areas to minimize their impact on the environment.

Agricultural Lands: Although agriculture is limited due to water scarcity, some small-scale farming initiatives exist in Wadi Rum, mainly relying on greenhouse technology and drip irrigation to cultivate crops like tomatoes and date palms.

Residential Areas and Human Settlements: The local Bedouin communities have traditionally lived in Wadi Rum, maintaining a nomadic or semi-nomadic lifestyle. However, with the rise of tourism, many have settled in designated residential areas, where they operate eco-lodges, craft markets, and tour services.

Challenges in Land Management:

The growing tourism industry and increasing human activities pose challenges to sustainable land management in Wadi Rum. Without proper regulations, unplanned development could lead to overcrowding, environmental degradation, and depletion of natural resources (Bott, 2013). To balance conservation with economic growth, land use planning strategies should focus on sustainable tourism, controlled development, and the protection of fragile ecosystems.

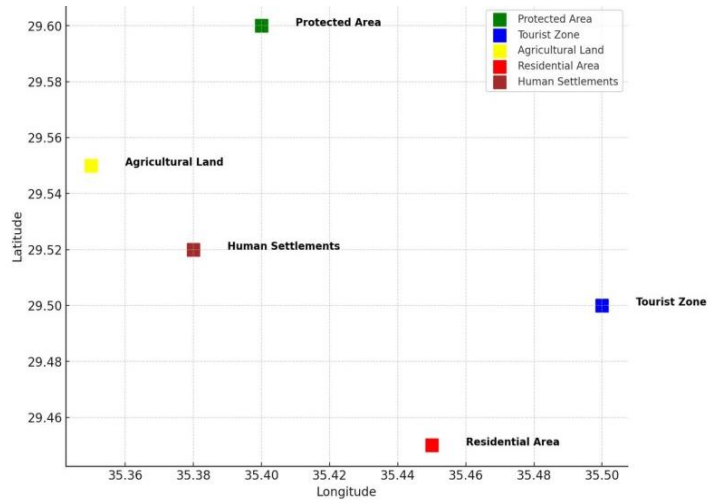

Figure 6. Land Use Map of Wadi Rum: Illustrates protected areas, tourist zones, agricultural lands, residential areas, and human settlements (Source: Author, prepared by the researchers using Global Mapper software, April 2024).

The study of Wadi Rum's topography, environmental changes, biodiversity, and land use reveals the need for a holistic conservation approach that integrates scientific research, policymaking, and community engagement as shown in Figure 6. Mapping these key aspects provides valuable insights into sustainable management strategies that can preserve Wadi Rum's natural beauty and ecological integrity for future generations (Pongratz et al., 2017).

Ecosystem Restoration Techniques

Restoration techniques are generally categorized into passive and active approaches. Passive restoration refers to no or minimal intervention by humans, with the underlying idea of ecosystems recovering themselves. Restoration in such ecosystems can be characterized by allowing the natural ecological processes to have their way and focusing on the removal of barriers rather than the promotion of recovery (Pan et al., 2016). This approach is generally applied in areas where ecosystems show resilience and are able to naturally shift back to their original state over time (Kimball et al., 2015: Berger, 1993). Wadi Rum would also be sampled eventually to revert to its predominantly vegetated state if not for the constraining harsh climatic and geological factors. Conversely, active restoration can signal a range of treatments which involve significant manipulation to act towards the restoration aims. This can include human interventions within the site by planting or habitat manipulation, or the ecosystem is managed and assisted in improving its condition. A plethora of tools may be suggested for active restoration depending on the goals, including mainly physical restoration, ecosystem reconstruction, chemical repair, biological reparation, and simplification approaches.

Passive Restoration

Ecosystems have an intrinsic ability to regenerate and self-organize, and nature-based solutions - and by extension ecological rehabilitation - have been demonstrated to be effective in promoting ecosystem recovery. Furthermore, given the breadth and scope of benefits derived from such an approach, the resultant ecosystem can become self-sustaining and naturally evolve towards a self-organized climax state, with species composition and community dynamics reflecting those of the unimpacted or minimally impacted state. There is a veritable dearth of research examining the potential of passive restoration in arid ecosystems (Da Silva et al., 2017). This is especially relevant considering the working framework of AGE, the ecosystem type within which Wadi Rum occurs, and ecosystems within this broad ecological type in arid regions have been identified as being relatively intact - this ranges from varying degrees of slight degradation to being deemed intact. Age is semiarid rather than the fully arid contexts described in these studies. Ecosystems with intact seed banks and a relatively resilient viable ecological framework have the potential to respond readily to appropriate interventions in the effort to manage and rehabilitate land. It is promising that many of these past studies have demonstrated positive outcomes in terms of intensified seed deposition, seed germination, and seedling and plant establishment, pointing to the potential for passive approaches to ecosystem restoration in arid regions (Lin et al., 2017).

Active Restoration

The intervention stage is known as active restoration, which utilizes applied techniques in the process of ecosystem restoration. These practices become efficient in increasing the recovery rate by decreasing total time. Limitations in the performance of these techniques are noted due to missing treatment windows, but the global overview on active restoration is positive. Habitat improvement has become beneficial for many species such as scavengers, large herbivores, and ungulates, acting as species reintroduction-friendly methods. There are also reintroductions of species that involve extinct or extirpated species that occurred due to overhunting, coral bombing, and others. The active restoration section will critically overview all other interventions presented and see its applicability in practice and the possibility to further develop the needed techniques. The appropriate techniques to be applied for each system highly depend on the local conditions and context. Creating and fostering the participation of relevant stakeholders and local inhabitants are crucial to designing a proper active restoration plan. Yet, active restoration has also encountered various challenges, among which are resource allocation and limiting factors, such as source population and breeding facility special considerations, as well as the ecological impact. Thus, active restoration activities should be viewed within the framework of adaptive sustainable management. This grants the development of restoration attempts to current and genuine situations while still considering the future arguments for which the strategy is also oriented. Many examples show the successful results of active restoration.

Monitoring and Evaluation

Monitoring and evaluation are crucial to the success of an ecosystem restoration project. The role of monitoring is to verify whether the objectives set out in the planned activities are achieved over time and to make corrections where progress is not as fast or successful as expected. Management actions have to take into account existing information and gradually build a robust system based on logical and achievable indicators and metrics. The process of evaluating the success of restoration based on ecological criteria is a specific research field, and methodologies exist to assess whether restored ecosystems are functioning appropriately in terms of diversity, structure, and ecological processes (Zhang et al., 2025). To define the criteria for success, a general reference to ecological theory is needed, as restoration's ultimate goal is to reconstruct processes and functions that were disrupted by the degradation of an ecosystem.

In addition, two methodologies exist: Habitat Quality Assessment for characterizing the existing state of the target habitat and learning from the Past to define the trajectory and aims of a restoration plan. A key tool for a restoration initiative is adaptive management to progressively learn from the results of monitoring, accurately assess the success of a chosen strategy, and then evolve the strategy according to the results of the continuous monitoring. The combination of

both scientific data and local knowledge is critical to assessing and effectively managing a restoration project. Long-term success in an arid mountain environment is only possible if adequate planning, feasibility studies, local knowledge, participative approaches, and monitoring systems are integrated into the restoration process.

Key Indicators and Metrics

Continued success of the general vision outlined above depends on the continuous unit-specific monitoring of the main restoration targets and activities. To guide the monitoring of ecosystem restoration projects, we propose the following metrics and indicators to be considered: - Ecological indicators for restoration such as species richness, functional composition, ecosystem functions, and processes. - Socioeconomic indicators encompassing indicators of capability, livelihood, and vulnerability, and indicators of the distribution of benefits and costs, such as specific indicators for monitoring marginalized and vulnerable groups. - Indicators reflecting changes in ecosystem services, including the enhancement of the cultural and well-being services and the regulation and support services necessary for long-term, sustainable ecosystem functioning (Pouso & Gómez-Baggethun, 2021).

Monitoring of project implementation and of ecological and sociocultural goals and objectives should be based on monitoring of selected key indicators. Qualitative metrics, such as focus group discussions and key informant interviews in ecological and sociocultural networks, should also be used to complement quantitative monitoring and to allow stakeholders whose priorities differ to be included. Monitoring of key indicators will be important to determine whether the project has met the project's goals and purposes. However, it is important to remember that this is a linear trade and that each level of monitoring provides progressively more detailed information and understanding.

Any one level of trade is not considered an appropriate substitute for another.

Community Engagement and Participation

Community involvement is considered to improve the effectiveness and sustainability of restoration projects by enabling more effective planning that is based on a wider knowledge base and is more likely to succeed, supporting and strengthening local social networks and relationships, creating a sense of local ownership and helping maintain the results of the project, and contributing to wider learning and transfer of technology (Elliot et al., 2019).

There are many ways that local communities, by virtue of being local, can be involved in a restoration project. In particular, they can participate in the planning of restoration activities, review proposed activities (and scale down or reject them as necessary), help implement proposed activities, monitor their impact and effectiveness, and help maintain and manage the resources that are restored. Approaches that are concerned with fostering greater participation include participatory planning, consultative meetings, and review at each stage of the proposal process, information dissemination, sharing of technical knowledge, and so on. In particular, the use of indigenous or local knowledge and the practice of reintegrating indigenous or local regenerative practices, including agroforestry, alley cropping, or fallow land regeneration, must be fully considered and possibly integrated into any activities (Clement, 2021).

Partnerships and stakeholders: In considering the beneficiaries of restoration, it is important to work to develop collaborative arrangements and partnerships with other stakeholders that have some interest in the area being restored. One of the key tasks in setting up community-based processes for conservation and restoration is to establish multi-stakeholder partnerships and promote collaboration and linkages across a wide range of interests. Experience and case studies: Community involvement in restoration activities is not an extensively researched field, and as yet there are not many hard benefits of the process in terms of ecological or economic change. There are several areas that have been more rigorously studied, including the development of agroforestry as part of community resource management projects and socio-forestry projects and ecological management. Other areas where the role of community involvement has been researched include catchment management, small-scale fisheries management, and pest management.

This must be taken as preliminary evidence of the merit of community involvement in restoration activities because it is possible for short-term improvements as a result of short-term action or investment plans, and it is the longer-term objective of sustainability in all spheres that is of interest to us. Barriers to involvement: In community-based processes for problem-solving or nature conservation, a range of different people and social groups with different objectives for the area come together in what is generally called a multi-stakeholder workshop. This process can throw up a number of problems and barriers to communication, not all of which can be solved. A common problem is the unequal representation, power, and knowledge of the various stakeholders involved in the planning for restoration or for the process of restoration. Because of this, it is necessary to establish clear rules in the use of indigenous and local community knowledge in terms of intellectual property rights and political and regulatory frameworks.

Economic and Social Benefits of Ecosystem Restoration

Many restoration projects have shown that ecosystem restoration can increase the provision of essential goods such as soil fertility and clean water, and biodiversity conservation while enhancing other ecosystem services that are important to local communities. Economic arguments for restoration are powerful. Investing in nature can lead us to the triple win of increased human well-being, improved environmental conditions, and reduced air pollution while building resilience to the impacts of climate change. In addition, setting restoration targets based on the provision of benefits or ensuring that benefits trickle down to all stakeholders can reduce environmental injustice. This is important considering that degraded lands, when unrestored, not only have lower biodiversity but also emit significant amounts of CO_2 every year. Investing in restoration is therefore a key part of the toolkit for meeting sustainable development goals (Wang et al., 2024). Nature-

based solutions refer to sustainable management and use of nature for tackling socio-ecological challenges that combine the human, social, and ecological aspects of sustainability. Ecosystem restoration and afforestation in Jaisalmer, Rajasthan, India, have led to the increased availability of ingredients such as honey and significantly contributed to the household income of local communities while providing additional economic incentives for ecotourism in the area.

CONCLUSION AND FUTURE DIRECTIONS

The presented findings have reinforced the conviction that ecosystem restoration should be the heartbeat of nature-based solutions, both in practice and research. This has been illustrated through the Nexus of Wadi Rum, where restoring ecological health has multiple implications for the well-being of a community. We have highlighted the necessity of novels, effective practices that are attuned to local socio-ecological contexts and have drawn out key lessons for designing restoration initiatives from communities and practitioners in Wadi Rum. These include fostering collective ownership and community participation processes, broadening our understanding of success, and integrating ecological and socio-economic outcomes in restoration activities. Several success stories illustrate this approach. Included are cases examining integrated ecological and social results, building community inclusivity, designing adaptive restoration plans, and developing partnerships that play on a community's aligned objectives. These sections also provide details on the lessons these cases offer, with a view to informing future workshops and research.

Future research in the area of sustainable natural resources management is rich with opportunities to continue this work. For instance, in the establishment of peri-urban settlements, questions of tensions between livelihood strategies linked to towns and agricultural lands and conservation will only grow in importance and could be the focus of further research. Additionally, there is a need to continue to develop and document effective participatory means for natural resources management, and to compare these experiences with participatory resource management strategies in other countries, which may well hold important lessons of relevance for communities in Wadi Rum. A further area of interest for the research would be the barriers and approaches to developing viable industries linked to restoration activities generally.

Although there are promising examples related to the harvesting of restoration-related products in these case studies, their knitting together in a series of complementary activities to create a viable small business is rare. Such examples are rich in the further questions they might raise about necessary marketing strategies, appropriate local processing and associated training and skills transfer, and approaches to value adding. Furthermore, the ways in which various organizations have worked with such communities will continue to offer valuable lessons. One approach, in a region like Wadi Rum that may be increasingly affected by climate change impacts on changing rainfall and increased temperatures, could be methods and technologies that contribute to water harvesting, minimizing water losses in restoration, and increasing water retention in soil and vegetation in order to increase resilience.

Moreover, Wadi Rum rapidly growing tourist industry provides terrific opportunities for linking restoration with nature-based tourism, and indeed, any sector is growing in resource-constrained and water-stressed areas across the globe. Open spaces and outstanding nature are becoming scarcer, and available water reserves are more than ever a strong economic development asset. A related study could also investigate the establishment of planned parks and reserves in Wadi Rum with the various stakeholder groups currently involved.

Limitations

It is widely acknowledged that ecosystem restoration is not easy; indeed, it is fraught with many complex biological, social, and economic challenges. Specifying causes of degradation and well-defined communities or natural assemblages as targets makes the work on whole or semi-natural processes 'ecological hard restoration.' Such projects, therefore, typically require a profound understanding of ecosystem assembly rules, successful propagation, and reintroduction of all natural community components. For example, in many biogeographical regions, habitat patches have been lost not only from exploitation and degradation but also due to habitat fragmentation.

Redesign of such areas to create ecologically functional or refuge eco-restoration islands and corridors can facilitate re-expansion of all major compartments of natural assemblies. However, a great many exist in situ, with flow-on implications for the phenotypic value of propagules and anticipated dynamics.

Restoration is also complicated by our lack of knowledge and understanding of effective techniques, often under climate scenarios that favor new competitors over key native biota. Long-term restoration planning is constrained by unpredictable climate variability and change. There are also diverse social barriers, including lack of government, community, and philanthropic funding; landholders choosing not to participate; and conflict with community-based activities. Projects require adaptive management so that unanticipated difficulties and negative effects from interventions can be accommodated. It is also clear that interdisciplinary research is required to address issues of greatest complexity, e.g., tourism and ecological restoration. Interdisciplinary restoration research capable of such valuation also needs to be developed since the 'environmentally friendly restoration market' is currently significantly undervalued.

Author Contributions: Conceptualization, O.J and E. F; methodology, O.J. and H.A.; software, E.A. and O.J.; validation, R.Q. and E.A.; formal analysis, S.A. and A. J; investigation, A.J. and O.J.; data curation E.A. and O.J; writing - original draft preparation, O.J. and E.A.; writing - review and editing, S.A. and R.Q; visualization, S.M and R.Q.; supervision, O.J.; project administration, O.J. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgments: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 15.03.2025 Revised: 10.06.2025 Accepted: 30.06.2025 Available online: 15.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1443-1453
DOI 10.30892/gtg.61304-1514

CULTURAL HERITAGE AND ITS INFLUENCE IN KOSOVO

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Citation: Tahiri, A., Kovaçi, I., Cucović, A., Misini, D., Dimoska, T., Draga, N., Nikqi, K., Tahiri, E., & Mekuli, M. (2025). Cultural heritage and its influence in Kosovo. *Geojournal of Tourism and Geosites*, 61(3), 1443–1453. https://doi.org/10.30892/gtg.61304-1514

Abstract: This research study examines the Cultural heritage and its influences in Kosovo. Through an in-depth analysis of Kosovo's history, traditions and cultural developments, this study aims to provide a holistic view of how different cultures have influenced Kosovo. In this study, quantitative methods were used to investigate the influence of different cultures in Kosovo. Methods: Quantitative methodology uses numbers and numerical data to make measurements and analyses, ensuring a high level of objectivity and accuracy in the data collected. This method was applied because it was more appropriate to achieve the goals of the study. The study is based on a cross-sectional design, where data are collected and analyzed at a given time to assess changes and connections in indigenous culture in Kosovo. A sample of 150 respondents was used in the cities of Prizren, Pristina, and Ferizaj to ensure an adequate representation of the indigenous communities. The results of this study provide an in-depth perspective on the interaction between indigenous and foreign cultures, identifying key factors and including recommendations to strengthen the indigenous cultural dimension in Kosovo. Moreover, the study highlights the importance of policy interventions, community engagement, and educational reforms to promote and strengthen the indigenous cultural dimension. It recommends the development of cultural heritage programs, support for local artists and artisans, and increased public awareness initiatives. In terms of theoretical grounding, the study draws on concepts from indigenous culture theory and its evolution in Kosovo, elements that have an impact on the evolution of culture, postcolonial studies, and identity theory, which help to interpret the processes of cultural adaptation and resistance in Kosovo. These perspectives support the argument that cultural identity is not static but rather shaped by continuous interaction with social, political, and historical forces. They also provide a framework for understanding how marginalized or minority communities navigate their place within dominant cultural narratives.In conclusion, this study contributes to the understanding of cultural transformation processes, combining quantitative methodology with a self-formulated instrument and a cross-sectional design to determine appropriate recommendations for strengthening the indigenous cultural dimension in Kosovo.

Keywords: culture, cultural heritage, cultural identity, the influence of culture, indigenous communities

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INTRODUCTION

The evolution of indigenous culture in Kosovo has been the result of a combination of historical, political, economic, and social factors. Due to Kosovo's geographical position, it has been a country that has historically included several foreign cultures, ranging from the Romans and Byzantines to the Ottoman Empires and modern Western influences. These foreign influences have left deep traces in various areas of Kosovar culture, including language, vocabulary, customs, art, architecture, food, and lifestyle (Burkart & Medlik, 1981). Different cultures have left a marked legacy in architecture, cuisine, and religion. Ottoman mosques and hammams are still present in many cities. Culture in Kosovo is rich and diverse, reflecting the history and ethnic diversity of the region. It includes a mixture of Albanian, Ottoman, and European traditions, which have deeply influenced the development of the country's cultural identity.

This study is of particular importance for creating a broad and informed perspective on the development of culture in Kosovo, contributing to the academic and public policy debate on the preservation, promotion, and development of the country's cultural heritage (Bislimi, 2006). In this context, one of the main challenges is to preserve and promote the autochthonous cultural identity in order not to lose its special values and characteristics. The influence of foreign cultures, including the global influences of media, technology, foreign fashions, and trends, brings changes in the habits, way of life, and perceptions of individuals. To address this problem, it is important to identify the necessary strategies and policies for the preservation and development of indigenous culture in Kosovo. It is necessary to prepare measures for promoting cultural awareness, educating the population on indigenous values, and traditions, as well as supporting initiatives and projects that encourage creativity and the promotion of indigenous cultural identity.

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LITERATURE REVIEW

An important study in this area is "The Impact of Globalization on Indigenous Cultures" by Smith et al. (2010), which examines how indigenous cultures change through the contact and influence of foreign cultures. The study analyzes the cases of some indigenous cultures around the world and identifies the processes and challenges they face in the protection and development of cultural identity in different global conditions.

Another important study is “Social Adaptation of Students in a Multicultural Environment during Distance Learning.” by Soroka (2022). This study investigates how indigenous cultures adapt and develop in the context of a multicultural environment. Through the analysis of concrete cases, the study identifies the strategies and mechanisms used by indigenous cultures to maintain identity and coexist with foreign cultures. Also, another important study about Cultural Institutions in the Promotion and Protection of indigenous cultures" by Richards (2012). This study examines the responsibilities and role of cultural institutions in the preservation, promotion, and development of indigenous cultures. Through the analysis of different policies and practices, the study identifies challenges and opportunities for cultural institutions in supporting indigenous cultures and protecting cultural heritage. Heritage is universal and belongs to everyone.

It has to do with culture, history, natural and built sites. Heritage management is often complex and problematic for a country's identity and local culture. There is indeed a need to manage and interpret locations in a way that addresses the relationship between location-based values and the associated features around them. Value-based management is viewed among the most important approaches to heritage management, and public heritage sites are usually managed by professional managers, but not private ones (Howard, 2003:1). The closest connection of “heritage” is to the perception of inheritance, while in the French literature this word represents “legacy” (Meha et al., 2020). Each culture is a special case that could be discovered and explored in various ways, such as organized visits, manifestations, campaigns, etc.; therefore, tourism as an economic powerhouse could enable a strong revenue and valuable lifestyle within the country and the region contributing towards achievement and promotion of the UN SDGs (Tahiri et al., 2022). It has long been recognized that globalization affects our lives and our communities in both positive and not-so-positive (or perhaps even negative) ways. From a cultural heritage standpoint, we know that globalization has facilitated processes where communities learn more about each other’s cultural heritage through physical and virtual interaction. As a consequence of this is the debate that globalization insinuates hybridization and interferes with our unique identities and our diversity (Tahiri et al., 2024).

1. Cultural heritage and sustainable development

Speculative developments driven by short term interests cause a substantial threat to cultural heritage and historic environment. Cultural heritage and historic environment are not just of value to individuals who own or live in historic properties. Cultural heritage can also have the value to the wellbeing and quality of life of communities, can help prevent cultural globalization, sustain cultural diversity and positively affect economic development (Heritage Counts, 2003). According to D. Rypkema, thinking in a broader context, the role of heritage striving for sustainable development is absolutely clear: preserving cultural heritage provides environmental sustainability, cultural sustainability and economic sustainability (Rypkema, 2006).

1.1. Cultural heritage and its influence

The concept of cultural heritage is subjective and evolves over the years. It is subjective in the sense that cultural heritage consists of the good that the values that prevail in any society at a given time must be sensitive to be protected and preserved as a legacy of the past for future generations. The Council of Europe Framework Convention on the Value of Cultural Heritage for Society of 2005 states that “cultural heritage is a group of resources inherited from the past that people identify, regardless of ownership, as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions”. Cultural heritage has tremendous potential in terms of its contribution to improving the quality of life for people, understanding the past, helping territorial cohesion, promoting economic growth, opening up employment opportunities and supporting wider developments such as improvements in education and artistic careers. The preservation of cultural heritage is as important as the preservation of the natural environment. However, most tourism scholars have focused their discussions of sustainable tourism on the natural world. While some natural areas recover from the impacts of development and regenerate organically, this does not happen with damaged cultural heritage. Built heritage is a non-renewable resource that once destroyed is gone forever. This creates a unique challenge for conservationists and heritage managers, who have long had to deal with hordes of tourists clambering on or vandalizing historically significant sites (Tahiri et al., 2024). Heritage tourism is anticipated to continue its rapid growth trajectory, attracting a substantial influx of visitors to cultural and historical sites, thus playing a crucial role in fostering economic development and alleviating poverty worldwide. This influx of tourists is expected to bring significant foreign currency revenue to these destinations, further enhancing their economic viability and sustainability. Heritage tourism refers to tangible and intangible cultural, historical and natural elements of the past and present, and their use as tourism resources (Džogović, 2024).

1.2. Culture and the influence of foreign cultures in Kosovo

After the fall of communism in Albania and Kosovo, despite the fact that the Albanian people were not yet completely freed from the communist influence of culture, social and economic life has undergone visible and rapid changes. The emigration of a large part of the Albanian population in developed Western countries has influenced the transformation of culture. Immigrants have followed education, employment and got to know the culture of the countries where they lived, bringing their return with new knowledge and experience (Tahiri & Kovaci, 2017).

For the indisputable dimension, emigration and contacts with other cultures have influenced the advancement of new generations. The Albanian language and traditions still remain unique, but after the fall of communism, elements of foreign cultures have been incorporated into Albanian culture, whether progressive or regressive. One of the foreign elements that has infiltrated the Albanian culture is "tallava" music. Emigration and connections with other cultures have brought changes in the identity and cultural expression of the Albanian people (Tahiri, 2020).

Indigenous dress and clothing in general serve as a universal aspect that expresses the identifying power for individuals, ethnicities, countries and nations. Cultural and social anthropology assigns clothing a key role as a basic component in distinguishing between ethnicities, shaping cultural heritage and tradition (Petroni, 2015).

Nowadays, traditional Albanian clothing is often used in festive ceremonies, national holidays and private events to showcase tradition and cultural wealth. However, their use has become rarer in some Albanian countries, including Montenegro, except for festive occasions and ceremonies. Some women, such as the Hasian Women, still proudly wear traditional clothing. In the field of language, the English language is becoming more and more official, especially after the fall of communism. This has extended its use to various areas of life, including law, where laws drafted in the English language have priority. Other foreign languages spoken in Albanian territory include German and, to a lesser extent, Turkish. In relation to religious belief, the phenomenon of the implementation of religious rituals expresses a desired return after the forbidden period during communism (Ermela, 2011). Bars (restaurants and cafes) are now the favorite places for Albanians, and they are frequented by both sexes without apparent restrictions, while earlier, the Albanian female gender only frequented certain places. The emigration of the rural population to the cities is one of the main factors that have influenced these changes, since in the cities there are no waiting rooms as in rural areas, and families are smaller in number, so traditional reception is not possible in the same form as before (Gossling, 2006).

A significant difference is also observed in the practices of childbirth among Albanians. At the time of communism, a decrease in the birth rate was observed compared to the period before the Second World War, while now this decrease is much more pronounced. Today, in Albanian families it is more common to have one or two children. Also, in the names of young people, most are of the Muslim type, but there are also names of Albanian origin and from Western culture (Howard, 2003).

2. Definition of indigenous culture

Authors examining indigenous culture generally share a common perspective, regarding it as an inherited heritage. Cultural elements, such as language, traditions, customs, morals, beliefs, family and friendly relations, art, and the spiritual world, serve as components of a person's identity (Murphy, 2016). In general, the definitions of indigenous culture by local and international authors have some similarities. Academician Bislimi (2006) defines autochthonous culture as “a composite and complex system of values, activities and social relations, formed and developed historically in close connection with the life of the national ethnic community.” Academician Mark Krasniqi says that indigenous culture is the basis from which the culture of the whole people originates, develops, and nourishes from. A complimentary international definition comes from Oxford University authors Monaghan & Just, who see culture or civilization as a complex whole that includes knowledge, belief, art, morals, law, customs, and any other acquired skills and habits of man as a member of a society (Gellert, 2004). Traditions, customs, language, holidays, rituals, dances, music, songs, craftsmen (crafts or handicrafts) are usually presented as potentially inherent in spiritual heritage. Thus, these expressions are defined and specified in the Kosovo legal framework and international conventions. People knew and preserved the traditions of the ancients, and nurtured new behaviors intertwined with the old. These types of potentials must be smelled where they are proven, invented, valued and selected, declared protected at various levels and ultimately proposed as world heritage values if other member states of the world agree with that. The warm welcome of the foreign guest is one of the features that guests especially express in front of the citizens of Kosovo. This is a typical Albanian tradition. The traditions of the Albanian people are also presented through marriage ceremonies, which are interesting and are still preserved to some extent in some peripheral areas of the country. It is interesting that, as with other types of traditions, the 89 variability of docks, especially in marriage, has significant nuances between the small ethnographic areas in Kosovo (Tahiri & Kovaçi, 2020).

3. Albanian culture from a historical and geographical perspective

Albanian culture has deep roots and a long history, which coincides with the existence of Albanians themselves. This culture has established its identity in the autochthonous Balkan-Mediterranean civilization. The ancient Illyrian culture served as the ancestor of the arboreal-Albanian culture and was present in a territory in the western part of the Balkans. The old autochthonous Albanian culture, which originated in the Illyrian-Pelasgian period, includes the material and spiritual heritage of the culture of that time. From this period, there have been special autochthonous developments, such as clothing, construction techniques of castles, towers, and forts, as well as mastery in seamanship and swordsmanship.

This culture has an authentic bag of Illyrian architecture, especially in the period of the rule of Ballo, Genci, Bardhyl, and then in the time of Queen Teuta (Smith, 2006). For Albanians, who are one of the most ancient peoples of Europe, regardless of their faith (Muslim, Orthodox, or Catholic), they have always remained faithful to their cultural identity. This has included resistance to time changes and maintaining the Albanian language without being influenced by other areas of civilization. The Albanian language has evolved and formed its new features, improving and achieving a strong ethnological and cultural identity. History shows that Illyrian culture and gender equality were essential in ancient Albanian society (Alfer, 1994). The favorable geographical position of the Albanians, through the road "Via Egnatia", has brought enrichment of cultures and exchange of a diversity between peoples. However, this has also brought challenges and potential conflicts,

especially in the border areas with the Greek and Slavic peoples. In general, urbanism among Albanians has followed a more pronounced course in coastal areas throughout history. These factors have contributed to the formation and development of their culture, preserving an authentic identity through different historical periods (Burkart & Medlik, 1981).

4. Definition of indigenous culture

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5. The evolution of indigenous culture in Kosovo

Independent culture, an important phenomenon in the region, represents a movement that is often called alternative culture, subculture, non-institutional culture, or autonomous culture. These terms are not always used as synonyms and may have different interpretations of cultural actors and trends, but are usually associated with non-profit, artistic and cultural organizations, civil society initiatives, private organizations, and individual artists. This phenomenon has followed a particular development after the 2000s, although there are similarities and influences from the period of the 1980s and 1990s. After the war period in Kosovo and in the post-war region, an atmosphere of enthusiasm erupted, led by the ideas of democratic transition and the promise of economic growth and development. This period of optimism also affected the cultural scene of Kosovo, bringing about the creation of several pioneering organizations that formed the basis of the independent cultural scene of Kosovo today (UNESCO, 2010). In recent years, the independent culture has seen significant growth and development. Organizations, initiatives, and individuals in this field have prepared a wide range of activities, including artistic activities, performances, exhibitions, and various cultural events. However, challenges for independent culture include a lack of resources, limited funding, and the need to find platforms that will help them grow and develop sustainably. This phenomenon shows a marked change in the cultural scene and society of Kosovo and continues to play an important role in the formation of the country's cultural identity. Enter here:

- "Exit Gallery" which was opened in 2001 in Peja as a contemporary art organization;
- Documentary and Short Film Festival – DokuFest in Prizren (film festival and educational platform), Multimedia Center and Theater Oda established in 2002;
- STATION - Center for Contemporary Art Pristina (artistic production, exhibitions, annual programs, residencies) founded in 2006 (Reçiça & Millaku, 2013).

In the case of Kosovo, the financial support for the developing cultural scene was characterized by the dominant participation of foreign funds. State institutions often held the position that the responsibility for supporting the independent scene rested with international agencies and donors, claiming that they had a different agenda. (Hoper, 2016).

After this period, the cultural sector is mainly focused on public institutions, with spending focused on infrastructure and heritage protection. The Ministry of Culture, Youth and Sports (MCYS) has a key role in this regard.

In general, the cultural sector in Kosovo experiences great difficulties due to the lack of expertise and professional profiles, causing this field to remain unplanned and dependent on current policies. In the absence of a socio-political context that includes long-term and strategic thinking for investments in culture, it has often not been possible for actors, whether public, private, or civil society, to have the capacity and influence to bring about substantial changes. However, the independent cultural scene of Kosovo has been an important factor in this context (Liu, 2005).

6 . The role of cultural institutions in the evolution of culture in Kosovo

When one aims to understand culture through art, he or she must turn to cultural institutions such as museums, theaters, concert halls, and libraries. These institutions are the places where cultural forms are stabilized, regulated, and evaluated. Museums, theaters, libraries, galleries, and art schools are places where we can explore canonical works of art, which help shape society's symbolic language. Cultural institutions do not exist simply because of art; they are

symbols of social integrity and serve as distributors of values and norms. Also, institutions are a great tool to know the present time, telling us a tale about the current state of society (Richards, 2012). Cultural institutions are looking for ways to demonstrate their values by adapting the evaluation criteria of society, which are concluded by consumers, users, and citizens. This is seen as an attempt to rebuild trust in institutions, a process that has been underway since the early 2000s but is facing various challenges and crises. The crisis of institutions is a phenomenon that is seen as part of a wider trend, not only in Kosovo but also in many other countries (Gossling, 2006).

7. Elements that have an impact on the evolution of culture

Many analyses explain how culture has an impact on people's behavior. The content of culture includes religion, language, history and education, and these elements communicate indirect messages to consumers and customers about the choice of products and services. The impact of the evolution of culture depends on aspects such as language, technology, material culture, laws and policies, education, values, attitudes, and religion, which will be explained in detail below (Lagrange & Oter, 2018).

7.1 Language and culture

The sources of culture include several key elements, including nationality, education, occupation, ethnic group, religion, family, gender, social class, and corporate culture. Language is an important indicator of a country's culture (Lew, 2018).

Language, as a central aspect of the expression of human beings, creates a wide dimension in poetic discourses, surpassing the simple role of expression and taking on new stylistic and semiotic functions. Language affects different social levels, from local to universal. For this reason, through communication, language has a powerful influence on the author's style within the literary genre (Ismaili, 2002).

Meanwhile, discussions and dilemmas related to the history and development of the Albanian language have had a great impact, including political and historical aspects. This has led researchers to carefully research and analyze the broad cultural and historical context of the Albanian language about other languages of the Balkans. The establishment of the first chairs of the Albanian language dates from the beginning of the 20th century and took place mainly in well-known cultural and scientific centers such as Austria and Italy. At the University of Vienna, the chair of the Albanian language was created at the beginning of the last century and was headed by the Albanian Albanologist Gjergj Pekmezi. This chair has been active for more than a century and has contributed to Albanian studies in this European center (Richards, 2012).

7.2. Technology and culture

Material culture and technology are closely related. The study of material culture often involves knowledge of the technological foundations of culture. On the other hand, the analysis of technology involves the study of the material character of everyday life, emphasizing the connection between people and material objects. For an area, the way it conducts commercial activity is essential. Technology progression often moves toward traditional convergence. For example, black and white televisions show this trend, where the United States of America had a very high market share compared to Europe and Japan. This technological development enabled the US to reach a higher level of culture and civilization, thereby surpassing the stock market within a short decade (Xhemaj, 2019).

7.3. Education and culture

Education has a profound impact on the transmission and exchange of culture. Education is the foundation of success in many areas of business and includes the development of skills, attitudes, and thoughts, as well as training in specific disciplines. Before operating in a country, many firms analyze the quality of the education system and what makes that country special. For example, Japan and Korea are known for science, especially in the field of engineering, surpassing other Western countries. Education has a major role in shaping culture and contributing to economic development and consumer behavior. Through education, we transmit ideas, attitudes, and innovations that influence the change of culture and serve as a trigger for its reflection (Timothy, 2011).

METHODOLOGY

This study employs a quantitative research method to systematically to analyze the influence of foreign cultures on the development of indigenous culture in Kosovo. The primary objective is to analyze how external cultural influences shape local traditions, values, and customs, providing measurable insights into this evolving dynamic.

For data collection, a structured questionnaire was applied. The questionnaire included 20 well-defined questions, divided into different categories to investigate the impact of foreign cultures on the development of indigenous culture in Kosovo. Each question had a rating scale of 5, allowing respondents to answer gradually. The study includes a representative sample of 150 respondents. The sample was selected from three cities Kosovo, Prizren, Pristina, and Ferizaj. 50 respondents were surveyed from each of these cities. The reason for selecting these cities as a sample is that we think that the evolution of indigenous culture is more pronounced in these areas. These cities have unique histories, traditions, and characteristics, offering a rich perspective to understand the influence of foreign cultures on the development of indigenous culture. For data analysis, appropriate statistical methods were used to interpret and evaluate the results. Data were coded and analyzed through specialized statistical software. The use of the quantitative method has allowed us to evaluate trends, correlations, and statistically significant changes in the collected data.

RESULTS OF THE STUDY

Table 1 presents the distribution of subjects by gender. In total, there are 150 subjects in this study. Regarding gender, 63.3% of the subjects are female, including several 95 subjects, while 36.7% are male, with several 55 subjects.

Table 1. Subjects' gender

		N	%
Valid	Female	95	63.3
	Male	55	36.7
	Total	150	100.0

In Figure 1, it can be seen that a total of 150 respondents participated in our study, of which 63.3% were female and 36.7% were male. Thus, the results show a dominance of the sample of female participants compared to the male one.

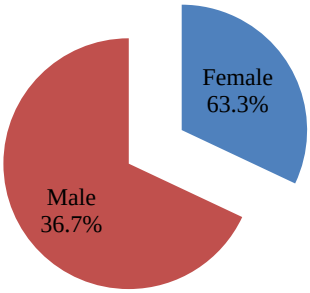

Figure 1. Gender of respondents

Table 2 provides information on the age of the subjects. This includes a total number of 150 subjects. The minimum age of the subjects is 17 years, while the maximum age is 59 years. The average age of the subjects is 35.1667 years, while the standard deviation is 12.24220. Table 3 provides an overview of the education level of the subjects included in the study. In total, there are 150 subjects. Regarding the level of education, it turns out that 24.0% of the subjects have completed high school, including 36 subjects. A larger part, i.e. 42.7%, completed Bachelor studies (64 subjects). In addition, 23.3% have Master's studies (35 subjects), while 10.0% have reached the level of Ph.D. studies (15 subjects).

Table 2. Age of subjects

	N	Minimum	Maximum	Average	Std. Deviation
Age	150	17.00	59.00	35.1667	12.24220
Valid N (listwise)	150				

Table 3. Education level of subjects

		N	%
Valid	High school	36	24.0
	Bachelor studies	64	42.7
	Master studies	35	23.3
	Ph.D. studies	15	10.0
	Total	150	100.0

The results show that 24% of the respondents have completed High School, 43% have completed Bachelor studies, 23% have completed Master studies and 10% have completed Ph.D. studies.

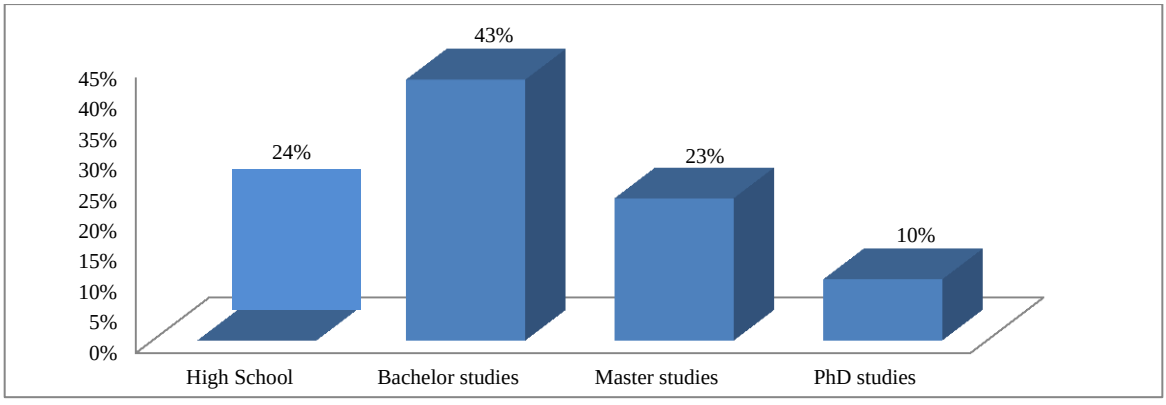

Figure 2. Level of education of respondents

Table 4 provides an assessment of the questionnaire's reliability through Cronbach's Alpha index. The level of reliability is 0.890, a value that indicates a high degree of consistency in the responses of the subjects regarding the questionnaires. This result can be interpreted as a good sign of the quality of the questionnaire. This reliability index determines how well a subject's responses correspond to their responses overall. In this case, the number of items for which Cronbach's Alpha was calculated is 20.

Table 4. Credibility of the questionnaire

Cronbach's Alpha	N of items
.890	20

Table 5. Average and Std Deviation related to subjects' responses

	N	Minimum	Maximum	Average	Std.Deviation
How much do you think elements of foreign cultures have been integrated into the indigenous culture of Kosovo?	150	3.00	5.00	4.6000	.55563
How would you evaluate the influence of foreign cultures on the traditional clothing of the indigenous population in Kosovo?	150	2.00	5.00	3.6000	.95538
How much do you think foreign cultures have changed indigenous customs and traditions in Kosovo?	150	2.00	5.00	4.0000	.81923
Do you think the indigenous language has been influenced by foreign cultures? To what extent?	150	1.00	5.00	2.8333	1.10166
How much change do you notice in traditional indigenous music due to the influence of foreign cultures?	150	2.00	5.00	4.2000	.79427
How would you evaluate the influence of foreign cultures on the indigenous art in Kosovo?	150	2.00	5.00	4.1000	.74860
How much do you think foreign cultures have changed the traditional values of indigenous communities in Kosovo?	150	2.00	5.00	4.1333	.72043
Do you think that the influence of foreign cultures has brought about changes in the traditional way of life of the indigenous population?	150	3.00	5.00	3.9000	.65282
Do you notice changes in individual identity due to the influence of foreign cultures?	150	1.00	5.00	2.8667	1.20773
How would you evaluate the impact of foreign cultures on the collective identity of the native population?	150	2.00	5.00	3.6000	.80268
Do you think that foreign cultures have stimulated indigenous economic sectors in Kosovo?	150	1.00	5.00	2.5667	1.05815
Do you think that foreign cultures have changed the cultural tourism sector in Kosovo?	150	3.00	5.00	4.4000	.55563
How would you evaluate the impact of foreign cultures on education in Kosovo?	150	3.00	5.00	4.8000	.47769
Do you think that the influence of foreign cultures has contributed to the social integration of the indigenous population in Kosovo?	150	3.00	5.00	4.8333	.45490
How often do you think foreign cultures have stimulated indigenous cultural industries?	150	2.00	5.00	4.1667	.68949
Do you think that the influence of foreign cultures has brought challenges for the preservation of indigenous culture in Kosovo?	150	5.00	5.00	5.0000	.00000
How effective do you think existing policies and strategies are in protecting indigenous cultural heritage?	150	3.00	5.00	4.7667	.49720
Do you think there is a need for new policies and strategies to preserve and advance indigenous culture?	150	1.00	3.00	1.3000	.58791
How often do you think that education initiatives are effective in promoting indigenous culture?	150	3.00	5.00	4.8000	.47769
Do you think there is a need for more legal protection and promotion of indigenous culture in Kosovo?	150	3.00	5.00	4.8667	.42831
Total	150	3.65	4.50	3.9667	.18057

Table 5 provides information on the mean and standard deviation of the subjects' responses in the conducted study. In total, there are 150 subjects included in the analysis.

- The minimum value of the answers is 3.65, while the maximum value is 4.50. This rank expresses the differences in the level of responses of the subjects and gives an idea of the distribution of the response values.
- The average of the answers is 3.9667, it shows the average value of the subjects' answers. This is an indicator of the position of the responses in the middle of the distribution.
- The standard deviation is .18057, a means of determining how far individuals' values are from the mean. A higher standard deviation indicates a wider distribution of responses from the mean. In this case, the standard deviation is relatively small, indicating that the responses have a narrower distribution around the mean.

Table 6 provides information on gender differences in subject responses, analyzing the mean, standard deviation, and mean standard error for each gender group. For females (95 subjects), the mean response is 4.0026, with a standard deviation of .18841. The mean standard error for this group is .01933. For men (55 subjects), the mean of responses is 3.9045, with a standard deviation of .14822. The mean and standard error for this group is .01999.

Table 6. Gender differences in subject responses

Gender	N	Average	Std Deviation	Mean of Error Std
Female	95	4.0026	.18841	.01933
Male	55	3.9045	.14822	.01999

Table 7. t-test analysis for gender differences in subject responses

	Levent's test for equality of variance		t-test for comparison of means						
	F	Sig.	t	df	Sig. (2-sides)	D. Averages	D. of Error Std	95% D. of the confidence interval	
								Low	High
Assumed equal variances	2.691	.103	3.311	148	.001	.09809	.02962	.03955	.15662
Equal variances not assumed			3.528	134.613	.001	.09809	.02780	.04310	.15308

Table 7 is used to analyze gender differences including Leventi's test for equality of variance and t-test for equality of means. For Levent's test, a high value of F and a small p-value (here .103) indicate that the variances in the gender groups may be different, but it is not a statistically significant difference. For the t-test for comparison of means, a t-value of 3.311 with a degree of freedom (df) of 148 and a p-value of .001 indicates that there is a statistically significant difference in mean responses between females and males. The difference between the means is .09809, with a standard deviation of .02962. The 95% confidence interval for the difference in means is .03955 to .15662. When the variances are equal, the difference in the means is also statistically significant (p = .001), while when the variances are not equal, the difference in the means remains significant (p = .001). For gender differences in subject responses, there is a statistically significant difference in mean responses between females and males, and this difference may be affected by differences in variances in the two groups.

Table 8. Age differences in subject responses

	N	Average	Std Deviation
17-20 years	20	3.9500	.00000
21-30 years	50	4.0000	.21082
31-40 years	45	4.1000	.00000
41-50 years	15	3.85000	.00000
51-60 years	20	3.9500	.00000
Total	150	3.9667	.18057

Table 8 presents the differences in the mean and standard deviation of the subjects' responses, divided by age groups. For the group of subjects in the age group 17-20 years (20 subjects), the mean of the responses is 3.9500, and the standard deviation is 0.00000. For the age group 21-30 years (50 subjects), the mean of the responses is 4.0000, and the standard deviation is 0.21082. For the age group 31-40 years (45 subjects), the mean of the responses is 4.1000, and the standard deviation is 0.00000. For the age group 41-50 years (15 subjects), the mean of the responses is 3.8500, and the standard deviation is 0.00000. For the age group 51-60 years (20 subjects), the mean of the responses is 3.9500, and the standard deviation is 0.00000. The total number of subjects in the analysis is 150, with an average of responses of 3.9667 and a standard deviation of 0.18057.

Table 9. ANOVA analysis for age differences in subject responses

	Sum of squares	df	Average squared	F	Sig.
Between-Groups	2.790	22	.127	7.784	.000
Within-Groups	2.069	127	.016		
Total	4.858	149			

Table 9 contains the analysis of age differences through the analysis of standard deviation variables (ANOVA).

Between-Groups has a sum of squares of 2.790 to 22 degrees of freedom, a quadratic mean of .127, and an F-value of 7.784 with a p-value of .000. This indicates that there are statistically significant differences in mean responses between age groups. Within-Groups has a sum of squares of 2.069 with 127 degrees of freedom and a quadratic mean of .016. The sum of the squares is 4.858 with 149 degrees of freedom.

Table 10 provides information on the differences in the mean and standard deviation of the subjects' responses, broken down by education level. For the group of subjects with high school (36 subjects), the mean of the responses is

3.9643, and the standard deviation is .19874. For the group of subjects with Bachelor studies (64 subjects), the mean of the responses is 4.0167, and the standard deviation is .17747. For the group of subjects with Master's studies (35 subjects), the average of the responses is 3.9643, and the standard deviation is .16205. For the group of subjects with PhD studies (15 subjects), the mean of the responses is 3.8000, and the standard deviation is .11180. The total number of subjects in the analysis is 150, with an average of responses of 3.9667 and a standard deviation of .18057.

Table 10. Differences in the level of education in the subjects' answers

	N	Average	Std Deviation
High school	36	3.9643	.19874
Bachelor studies	64	4.0167	.17747
Master studies	35	3.9643	.16205
PhD studies	15	3.8000	.11180
Total	150	3.9667	.18057

Table 11 contains the analysis of differences in the level of education through the analysis of standard deviation variables (ANOVA). Between-Groups has a sum of squares of .589 with 4 degrees of freedom, a quadratic mean of .147, and an F-value of 5.004 with a p-value of .001. This indicates that there are statistically significant differences in mean responses between different education level groups.

Table 11. ANOVA analysis for differences in the level of education in the subjects' responses

	Sum of squares	df	Average squared	F	Sig.
Between-Groups	.589	4	.147	5.004	.001
Within-Groups	4.269	145	.029		
Total	4.858	149			

Within-Groups has a sum of squares of 4.269 with 145 degrees of freedom and a quadratic mean of .029. The sum of the squares is 4.858 with 149 degrees of freedom. From the ANOVA analysis, it appears that there are statistically significant differences in the mean responses between the different education level groups. The significance level (p-value) is .001, indicating a statistically significant difference between at least two educational level groups analyzed.

DISCUSSION OF THE RESULTS

The discussion of the results of the tables gives a detailed insight into the characteristics of the subjects included in the study and their distribution in some main dimensions such as gender, age, and level of education.

During the gender analysis (Table 1), it can be seen that most of the subjects are female, comprising 63.3% of the total. Meanwhile, men make up 36.7% of subjects. This difference in distribution may have implications for the results and estimates in our study, particularly in cases where subjects may have different responses or behaviors based on gender.

Table 2 shows a wide age distribution of the subjects, from 17 to 59 years. The mean age is 35.1667 years, while the standard deviation is 12.24220. This shows a great variability of ages, suggesting a common group of participants in terms of life experience and perceptions. Table 3 shows that most subjects have a higher education level, with 42.7% having Bachelor's studies and 23.3% having Master's studies. The high level of education can affect differently the responses and perceptions in the study. Subjects in secondary school make up 24.0%, although they are not in the majority.

The results suggest that the questionnaire is reliable and suitable for use. The high level of reliability indicates that the responses of the subjects are consistent and can be taken into account in the interpretation of the results. The distribution of responses and their mean show that subjects tend to be in a narrow range of responses around an expected general mean, adding consistency to their responses. The discussion of the results from Tables 8 and 9 provides a more in-depth analysis of the gender differences in the subjects' responses and determines their impact on the interpretation of the study:

Females show a higher mean of responses (4.0026) compared to males (3.9045). This difference can be interpreted as a tendency for women to give higher answers compared to men, despite their standard deviation being higher. The standard deviation for female responses (0.18841) is higher than the standard deviation for male responses (0.14822). This indicates a wider distribution of responses than the mean for women. Levent's test shows that there are no statistically significant differences in variances between gender groups. This suggests that the variability in subject responses is not significantly altered between females and males. Gender differences in subjects' responses show that females tend to give higher ratings than males. The level of consistency between women's responses is higher, while for men it is lower. Statistically significant differences in mean responses indicate that this difference may be more than a fluke, but a true trend of difference between the two gender groups. These findings can be interpreted by considering social, cultural, or individual differences that may influence the responses of women and men in the context of the study.

Tables 10 and 11 provide a detailed overview of the differences in the mean and standard deviation of the subjects' responses by age group and analysis of variance (ANOVA). The results suggest that there are differences in the way subjects give their answers about age groups. Age groups with a high mean (21-30 years and 31-40 years) have a larger standard deviation, indicating a wider distribution of responses. On the other hand, age groups with a lower mean (41-50 years) show a standard deviation of zero, indicating a narrower distribution and higher consistency between responses.

Statistically significant differences between age groups in the ANOVA determine that the differences are more than chance and indicate that this age variable has a significant influence on the responses of the subjects in the study.

Tables 9 and 10 present information about the differences in the mean and standard deviation of the subjects' responses, by level of education and through the analysis of variance of the standard deviation (ANOVA). The discussion of the results provides an in-depth analysis of the impact of education levels on the way subjects give their answers. The results suggest that there are differences in how subjects respond based on their level of education. Higher levels of education (Bachelor, Master, PhD) have a higher response mean and a lower standard deviation, indicating a higher consistency between responses. Lower levels of education (secondary school) have a wider distribution of responses than the mean. Statistically significant differences from the ANOVA analysis confirm that this effect is more than a fluke and has a significant impact on how subjects respond based on their level of education.

CONCLUSIONS

This study has analyzed the perceptions and evaluations of the subjects regarding the evolution of the indigenous culture of Kosovo. The results of the statistical analysis have brought some important discoveries that can determine the meaning of this topic. Following are some key conclusions:

Most of the participants expressed that the elements of foreign cultures are well integrated into the indigenous culture of Kosovo. The mean of this response is high (4.60), while the standard deviation is relatively small (.55563), indicating broad agreement among participants. In addition to the general response, the study has identified changes in the subjects' perceptions regarding certain elements of indigenous culture. For example, the impact rating on traditional clothing is altered, where the final mean is 3.60 and the standard deviation is 0.95538.

The analyses performed have shown statistically significant differences in the subjects' responses based on gender and age. Females showed a higher average (4.00) compared to males (3.90), with a statistically significant difference ($p = .001$). Also, differences in mean responses have been identified between age groups.

The study showed that the level of education influenced the responses of the subjects. For example, subjects with PhD studies showed a lower mean (3.80) compared to those with Bachelor studies (4.02). ANOVA analysis has confirmed statistically significant differences between education level groups ($p = .001$).

In general, these conclusions show that the influence of foreign cultures in Kosovo has a profound impact on the perceptions and evaluations of the indigenous population. This study provides an important contribution to the further understanding of the impact of globalization and cultural diversity in Kosovar society. To better understand this phenomenon, it is important to continue research and examine different cultural dynamics across time and generations.

Recommendations

Based on the topic of Autochthonous culture in Kosovo, I can propose some recommendations to improve and preserve the autochthonous cultural identity in this context. These recommendations are built on the needs and challenges identified about this issue:

- Investment and support of local cultural projects that promote and preserve indigenous values. These projects may include cultural events, publications, and other initiatives aimed at strengthening local cultural identity.
- Provision of resources and financial support for local organizations and creators that contribute to the preservation and development of indigenous culture. This investment may include grants, foundations, and other support programs.
- Developing and promoting educational programs that focus on indigenous history, language, and traditions. This will help to strengthen the cultural identity of the new generation and create lasting cultural wealth.
- Improving infrastructure and promoting cultural tourism to present indigenous wealth to international visitors. This step can increase international awareness of the values of indigenous culture and contribute to the economic development of the region.
- Use of technology for documenting and preserving cultural heritage. Using apps, social networks, and other technologies to promote and share Indigenous cultural values with a wider audience.
- Creation of libraries and study centers to collect and study materials on history, traditions, and indigenous languages. These resources can be open to the public and scientists to deepen knowledge.

These recommendations are oriented towards creating a stable balance between preserving the indigenous culture and accepting the influences of foreign cultures to build a multicultural and rich environment.

Author Contributions: Conceptualization, A.T., A.C., N.D. and K.N.; methodology, E.T. and M.M.; software, I.K., D.M. and T.D.; validation, A.T. and A.C.; formal analysis, A.C., N.D. and E.T.; investigation, N.D. and I.K.; data curation, K.N. and I.K.; writing - original draft preparation, A.T., T.D. and M.M.; writing - review and editing, E.T. and D.M.; visualization, M.M., T.D. and K.N.; supervision, N.D.; project administration, A.T.. All authors have read and agreed to the published version of the manuscript.

Funding: This work received no external funding

Institutional Review Board Statement: The study involved an anonymous questionnaire with voluntary participation, and no sensitive personal data were collected, in accordance with institutional and ethical guidelines.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. "Written informed consent was obtained from the respondents to publish this paper after we had previously informed them that their data and responses would be anonymous and would be used only for the purpose of the study.

Data Availability Statement: The data that was used for this research is available and is part of the submission.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 15.01.2025 Revised: 11.06.2025 Accepted: 01.07.2025 Available online: 16.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1454-1461
DOI 10.30892/gtg.61305-1515

TECHNOGENESIS AS A DRIVER IN THE DEVELOPMENT OF RECREATIONAL AREAS FOR SUSTAINABLE DEVELOPMENT AND BIODIVERSITY CONSERVATION

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Citation: Berdenov, Zh., Mendybayeva, G., Beketova, A., Sadvakassova, S., Laiskhanov, S., Kara, T. & Kholov, Y. (2025). Technogenesis as a driver in the development of recreational areas for sustainable development and biodiversity conservation. *Geojournal of Tourism and Geosites*, 61(3), 1454–1461. https://doi.org/10.30892/gtg.61305-1515

Abstract: In the face of intensifying anthropogenic pressures, rapid urban expansion, and widespread environmental degradation, the preservation of biodiversity and the implementation of sustainable land-use strategies have emerged as pressing global imperatives. This review critically examines the complex ecological challenges that arise in industrialized regions, offering insights into contemporary mechanisms of ecosystem restoration, the strategic value of recreational spaces, and the multifaceted role of protected areas (PAs) in promoting biodiversity conservation and enhancing societal well-being. Particular emphasis is placed on the ecological significance of steppe ecosystems, which constitute one of the most fragile and underrepresented biomes in global conservation discourse. Despite their ecological richness and potential for supporting rare and endemic species, steppes continue to face habitat fragmentation, overexploitation, and limited legal protection. Through a comprehensive synthesis of interdisciplinary literature, this review demonstrates that the integration of recreational and green zones into industrial and urban environments yields substantial ecological and social benefits. These include the recovery of native flora and fauna, the mitigation of urban heat island effects, improved air and water quality, and the promotion of physical and psychological health among local populations. Moreover, such interventions serve as platforms for fostering environmental awareness, stimulating sustainable economic activity through ecotourism, and strengthening community engagement in conservation efforts. The analysis further highlights the indispensable role of Pas – particularly in steppe and post-industrial landscapes – in preserving ecosystem services such as carbon sequestration, soil fertility, and hydrological regulation. Cross-national case studies from Kazakhstan, Germany, China, and South Korea underscore the success of integrative management approaches that synergize scientific research, participatory governance, and environmental legislation. Given the accelerating pace of ecological disruption, the expansion, functional enhancement, and adaptive management of PAs in steppe and industrial zones must become a central focus of both national and international environmental strategies. These efforts are essential not only for halting biodiversity loss, but also for fostering climate resilience and ensuring long-term human-nature coexistence.

Keywords: technogenesis, sustainable development, biodiversity, recreational zones, protected areas, steppe zone, ecosystem restoration, environmental security

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INTRODUCTION

Technogenesis – defined as anthropogenic impact on the natural environment – has emerged as a major driver of biosphere transformation in the 21st century. Its manifestations vary depending on the level of industrialization, spatial planning frameworks, and the rigor of environmental policy (Antrop, 2005; Safarov & Berdenov, 2021).

Among the global challenges associated with technogenesis are pollution, soil degradation, resource depletion, biodiversity loss, and climate change. This review considers the specific features of technogenic issues in post-Soviet countries, industrialized Western nations, as well as in selected regions of Latin America and Asia (Kamann & Nijkamp, 1991; Osipov & Rumyantseva, 2019). In the Commonwealth of Independent States (CIS), technogenesis bears the distinct imprint of a "hard" industrial legacy. A key concern is the high concentration of industrial facilities operating without adequate filtration and treatment systems. In countries such as Russia, Kazakhstan, and Ukraine, many cities with monofunctional industrial economies– e.g., Norilsk, Temirtau, and Donetsk – continue to suffer from extreme levels of atmospheric and soil contamination. Additional issues in these regions include radioactive contamination (e.g., Chernobyl, the Semipalatinsk nuclear test site), chemical pollution resulting from outdated manufacturing processes and

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unmanaged waste, and severe degradation of water bodies. One notable example is the Aral Sea, which has experienced depletion and pollution due to aggressive irrigation schemes and unchecked industrial discharge.

Urban densification without enough integration of natural compensatory mechanisms has further disrupted ecological networks and landscape connectivity. The overarching problem remains the lack of coherent environmental policy and the slow adoption of sustainable development technologies. In the United States and Canada, technogenic impacts are subject to stricter regulatory oversight compared to many other regions. Nonetheless, the legacy of large-scale 20th-century industrialization continues to manifest in various environmental forms. Although environmental impact assessment (EIA) mechanisms are firmly institutionalized, a persistent tension remains between economic interests and ecological safety (Hall et al., 1998; Monz, 2010; Noje et al., 2025). In South American countries such as Brazil, Peru, Chile, and Argentina, technogenic issues are often entangled with agricultural expansion and extractive industries geared toward export. Major challenges include illegal mining – particularly mercury extraction in the Amazon Basin – deforestation for agribusiness (e.g., soybean monocultures or cattle grazing), hydrotechnical projects that disrupt hydrological regimes (e.g., dam construction along the Amazon), and a lack of regulatory transparency, which hampers effective environmental governance. In East and South Asia (notably China, India, and Japan), technogenesis is characterized by both extreme pressures and uneven environmental regulation, shaped by high population densities and rapid economic development (Zheng et al., 2019). China remains the world's largest emitter of CO_2. Despite major efforts toward a green transition, industrial concentration – particularly in provinces such as Guangdong and Shandong – continues to cause severe localized air and water pollution. India experiences the compounding effects of rapid urbanization, underdeveloped wastewater treatment infrastructure, and unsustainable agricultural practices, contributing to soil erosion, contamination of the Ganges River, and worsening sanitary conditions (Avishek, 2025).

Japan, by contrast, offers a case of partial recovery from historical technogenic disasters of the 1950s-60s (e.g., Minamata, Yokkaichi), having since implemented stringent environmental standards. However, technogenic risks persist in the form of technological hazards, as exemplified by the Fukushima nuclear accident (Leung, 2012).

The issue of technogenesis is not merely a byproduct of industrial progress; it also serves as a diagnostic marker of a nation's ecological maturity. While developed countries are increasingly moving toward managed technogenesis through comprehensive environmental reforms, in the CIS and other developing regions the problem remains defined by acute tensions between industrialization and sustainability. Addressing these challenges requires a systemic approach involving infrastructure transformation, legal enforcement, public engagement, and international cooperation. Nevertheless, industrial development is widely regarded as a central driver of modernization, economic growth, and improved living standards. However, the environmental consequences of industrial zones are profound, manifesting in ecosystem degradation, contamination of natural components, biodiversity loss, and a decline in the quality of life for local populations. These impacts extend across a wide array of processes – from disruptions in biogeochemical cycles to dysfunctions in social and economic systems. One of the most pressing issues associated with technogenesis is air pollution caused by industrial emissions and vehicular traffic. In cities with a strong industrial base – such as Temirtau (Kazakhstan), Donetsk (Ukraine), and Wuhan (China) – exceedances of permissible air pollutant concentrations are regularly recorded, particularly during the winter months (Ivanov, 2024; Seidualin, 2025). Studies by the World Health Organization (WHO) confirm a direct correlation between air pollution and increased mortality from respiratory and cardiovascular diseases (Dustin et al., 2018).

Of concern are industrial facilities that generate substantial volumes of solid and liquid waste, including slag, ash, acid effluents, and sewage sludge. In the absence of modern treatment and recycling technologies, such waste is stored in tailings ponds and sludge repositories, where it is prone to erosion and infiltration into groundwater. In Kazakhstan, thousands of hectares are occupied by sludge storage facilities (Beketova, 2019; Dzhanaleyeva et al., 2017; Berdenov et al., 2016), especially in the areas surrounding Lake Balkhash, as well as the cities of Khromtau, Rudny, and Zhezkazgan. In Eastern Europe, legacy storage sites for toxic chemicals and industrial waste from the Soviet era continue to pose ongoing threats to ecosystems. Comparable concerns exist in the United States, where abandoned metallurgical sites – brownfields – represent a persistent source of environmental risk. As a result, the ecological costs of industrialization are often overlooked in the short term, yet they exert significant long-term pressure on regional economies. These costs include declining agricultural productivity due to soil contamination, the loss of recreational and tourism potential, and the reduction of fish stocks in water bodies affected by eutrophication and toxic discharges.

Regions with high levels of environmental pollution are also becoming increasingly unattractive to foreign investors, particularly considering the global shift toward ESG compliance (Environmental, Social, and Governance criteria). Such areas face major obstacles in attracting sustainable business development, including in sectors such as ecotourism, agriculture, and renewable energy. The environmental challenges faced by industrialized territories represent a systemic threat encompassing all dimensions of human well-being – from biological and ecosystem-level processes to economic stability and social resilience. Industrial development pursued without adequate environmental oversight leads to environmental degradation, biodiversity loss, increased disease burden, and a decline in the investment attractiveness of affected regions. Contemporary solutions demand the integration of sustainable development principles into industrial policy, land use planning, and environmental governance.

METHODOLOGY

This review was conducted using a systematic qualitative methodology, with the aim of synthesizing interdisciplinary scientific knowledge on the interrelation between technogenesis, sustainable development, and the role

of recreational areas in biodiversity conservation. The methodology followed general principles of transparency and reproducibility, informed by the PRISMA guidelines (2009/2020), adapted for conceptual environmental and geographical reviews. The literature selection and analysis process was carried out in four stages: Identification, Screening, Eligibility, and Inclusion (Figure1).

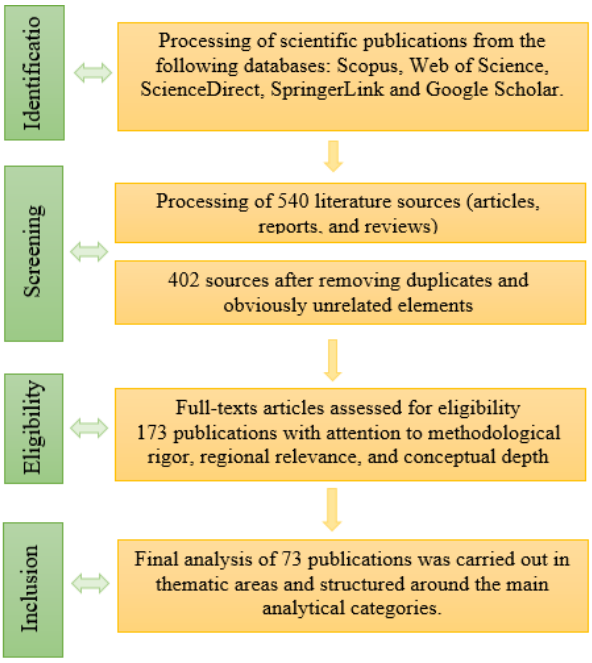

Figure 1. PRISMA 4-phase flow diagram of the literature selection process (Source: own construction)

Identification: A targeted search strategy was developed to identify peer-reviewed journal articles, conceptual papers, and systematic reviews published between 2000 and 2025. The review focused on works exploring technogenic transformations in industrial landscapes, ecosystem restoration, recreational land use, and the role of protected areas in environmental recovery. The databases consulted included Scopus, Web of Science, ScienceDirect, SpringerLink, and Google Scholar. Search terms combined keywords such as technogenesis, sustainable development, recreation, industrial zones, steppe ecosystems, biodiversity, and green infrastructure. The initial search yielded 540 articles, reports, and reviews, of which 402 were retained after removing duplicates and clearly unrelated items.

Screening: Records were screened based on titles and abstracts to assess relevance. The inclusion criteria were: (a) English-language publications; (b) published in peer-reviewed journals or academic volumes; (c) dealing substantively with the interaction of anthropogenic impact and natural ecosystems; (d) addressing recreational or protected areas in post-industrial or technogenic contexts; and (e) contributing to conceptual, theoretical, or applied ecological and spatial frameworks. Exclusion criteria involved publications focusing narrowly on technical engineering solutions, single-site case reports without broader theoretical framing, and non-peer-reviewed gray literature. This phase resulted in 173 records being selected for full-text evaluation.

Eligibility: The full texts of 173 publications were analyzed with attention to methodological rigor, regional relevance, and conceptual depth. Each article was assessed on the basis of whether it addressed: (1) the ecological consequences of technogenesis; (2) approaches to restoration or land transformation; and (3) the integration of recreational or conservation frameworks. Special attention was given to articles presenting comparative case studies from various countries, particularly Kazakhstan, Germany, China, South Korea, the USA, and others. A final selection of 73 works was made, comprising systematic reviews, theoretical papers, and case studies with implications for policy and planning.

Inclusion and Analysis: The final corpus of 73 articles was analyzed thematically, structured around the main analytical categories defined in the Literature Review section: technogenesis and environmental degradation; nature-based solutions and restoration strategies; role of recreational zones in post-industrial recovery; and steppe ecosystem conservation. Data were extracted on the geographic focus, methodological approach (where applicable), and conceptual contributions. The selection spans a range of disciplinary fields – geography, urban planning, ecology, environmental science, and regional development – ensuring a multidisciplinary synthesis.

A majority of the included works were published in high-impact journals such as GeoJournal of Tourism and Geosites, Sustainability, Ecologies, and Environment and Planning, indicating the academic quality and relevance of the sources. Several studies were government-funded or affiliated with environmental institutions, reflecting both academic and applied significance. Where applicable, visual data such as satellite imagery, geospatial modeling, and ecological indicators were noted, although the focus of this review remains primarily conceptual and policy-oriented.

The entire selection process was documented and conducted by a team of seven researchers with expertise in landscape planning, biodiversity conservation, urban geography, and environmental policy.

Inter-reviewer consistency was ensured by double-checking the inclusion criteria and synthesizing themes collaboratively. The result is a robust, comprehensive, and globally contextualized analysis of how technogenesis, recreational infrastructure, and biodiversity intersect in the context of sustainable territorial development.

LITERATURE REVIEW

Amid ongoing environmental degradation driven by technogenesis and industrial activity, ecosystem restoration has emerged as a critical strategy for achieving the Sustainable Development Goals (SDGs), particularly at the regional level. Restoration efforts not only improve ecological indicators but also generate employment opportunities, enhance quality of life, reduce social inequality, and mitigate the impacts of climate change.

Restored ecosystems contribute to improved water and air quality, climate regulation, and the reduction of risks associated with floods, droughts, and erosion. Biodiversity conservation plays a central role in enhancing ecosystem resilience to both natural and anthropogenic stressors.

Nature-based solutions offer cost-effective alternatives to traditional infrastructure: for instance, restored wetlands often outperform engineered treatment plants in water filtration efficiency.

Sectors such as ecotourism, sustainable agriculture, and renewable energy are increasingly becoming viable economic drivers based on the recovery and sustainable management of natural systems.

Today, China is implementing the world's largest ecosystem restoration initiative – the "Great Green Wall" project in the northern and northwestern regions of the country. Since 1978, forests have been planted across millions of hectares to combat desertification, particularly in the provinces of Gansu, Inner Mongolia, and Shaanxi. The outcomes of this policy include a reduction in the frequency of dust storms in Beijing and northern provinces, increased soil moisture, stabilization of agricultural production, and job creation in rural areas. China is also actively restoring wetlands and river systems, such as the Yangtze River, while promoting the concept of an "ecological civilization."

Costa Rica underwent a major transformation in the late 20th century, shifting from a deforestation-driven economy to an environmental development model. In the 1970s and 1980s, the country faced one of the highest deforestation rates in the world. However, beginning in the 1990s, it adopted a radically different policy centered on payments for ecosystem services (PES), ecotourism, and reforestation.

Today, approximately 60% of Costa Rica's territory is forested, while GDP continues to grow steadily – partly driven by sustainable tourism and the export of environmentally certified products.

Germany has long invested in the reclamation of industrial landscapes and the development of "green belts." Particularly in former coal-mining and metallurgical areas such as the Ruhr region, large-scale land restoration is underway. Abandoned mines and quarries have been transformed into parks, lakes, and recreational zones. "Green corridors" are being created to link urban centers. Techniques such as bioremediation and phytoremediation are widely used. A notable example is the Emscher Landschaftspark – a network of former industrial lands repurposed in the 21st century as a combined recreational and conservation area.

South Korea has prioritized urban greening and ecological planning. As part of the U-City program and "smart" sustainable development projects, the city of Seoul restored the Cheonggyecheon stream – previously covered by an elevated highway turning it into an ecological corridor in the heart of the metropolis. Former industrial zones are being converted into green belts, helping to mitigate the urban heat island effect and improve overall city ecology. This example illustrates how ecosystem restoration can be successfully integrated into urban planning strategies.

As a young state, Kazakhstan began its transition toward environmental reclamation and the establishment of protected areas (PAs) in the early 21st century (Saparov et al., 2024; Berdenov, 2024; Dmitriyev, 2023; Zakiryanov et al., 2022). Ecosystem restoration is being advanced through the national "Zhasyl Kazakhstan" initiative, along with afforestation programs such as the creation of forest belts around Astana. Notable progress has also been made in the rehabilitation of the Aral Sea region – particularly through saxaul planting on the desiccated seabed. Additionally, the expansion of protected areas contributes to the conservation of steppe biodiversity.

Globally, the ecosystem-based approach has gained traction Summers et al., 2012; Taff et al., 2019; Wolf et al., 2017, viewing nature as an interconnected system and restoration as a multidimensional process that integrates social and ecological contexts. A key trend is the shift toward inclusive planning, in which local communities are actively involved in monitoring, decision-making, and benefit-sharing from restored ecosystems. Scientific and technological tools are widely applied, including geospatial monitoring of degraded lands using drones and artificial intelligence (AI) (De Castro et al., 2021), remote sensing data for evaluating restoration success (Mangewa et al., 2022; Ntouros et al., 2025; Pettorelli, 2011; Qi et al., 2024; Cardoso, 2011), and biotechnological methods such as phytoremediation and microbiological treatment (Reed et al., 2011; Obaideen, 2022; Ilies et al., 2024).

Thus, ecosystem restoration is not merely about recovering natural landscapes – it is a strategic investment in the long-term resilience of regions. It is directly linked to climate stability, food security, biodiversity preservation, public health, and sustainable economic development. Case studies from countries that have successfully implemented restoration initiatives demonstrate that even severely degraded areas can recover their ecological functions and catalyze a transition toward more equitable and sustainable development models (Carpenter et al., 2009; Potschin et al., 2013; Willis, 2015; Roh et al., 2025; Nawrath, 2022). A genuine transition to sustainability is impossible without recognizing the intrinsic value of nature. The regeneration of ecosystems represents a cornerstone of a new regional development paradigm in the 21st century (Loreau et al., 2003; De Groot et al., 2010; Taff, 2019).

RESULTS

Thus, the development of recreational zones in industrial regions holds both global significance and profound social relevance. Industrial areas are traditionally associated with high levels of environmental pollution, urban congestion, monofunctional land use, and a declining quality of life for the population (Dzhanaleyeva et al., 2017; Berdenov et al., 2015). Under such conditions, the creation of recreational spaces – parks, green belts, riverwalks, forest parks, and ecotourism zones – becomes a crucial component of sustainable territorial development. These initiatives are not only a means of ecological compensation but also serve as strategic instruments for public health improvement, cultural integration, and regional attractiveness (Herman et al., 2019; Beketova et al., 2019; Grama et al., 2022). Recreational zones in industrial regions serve not only as public leisure spaces but also function as geochemical buffers (Berdenov, 2021). Their benefits include:

- Reduction of air pollution: trees absorb carbon dioxide, particulate matter, and toxic gases;
- Mitigation of the urban heat island effect: green spaces lower air temperatures in overheated industrial and urbanized areas;
- Water bioremediation: restored landscapes have the capacity to filter surface runoff and groundwater.

A large-scale example of regional recreational transformation is found in Germany's Ruhr Basin, one of the most industrialized regions in Europe. The Emscher Landschaftspark was established through the reclamation of former coal mines and metallurgical sites. This initiative included the development of extensive cycling networks, public parks, and water bodies, as well as the repurposing of old industrial structures into museums and cultural centers. This strategy improved environmental conditions, reduced unemployment, and transformed the Ruhr into a model of "green industrial transformation" (Dustin et al., 2018; Romagosa et al., 2015; Safarov et al., 2024).

Another notable case is the High Line Park in New York City, USA. Built on a disused elevated freight railway in Manhattan, the High Line has become a narrow yet elongated green recreational corridor featuring landscaping, benches, and public art installations (Monz et al., 2010; Ruzicka & Miklos, 1990).

A major project has also been implemented in Poland – the Nowa Huta initiative in Kraków. Once an industrial district associated with metallurgical pollution (Von Lindern, 2015). Nowa Huta has, in the 21st century, undergone a transformation into a recreational urban space. A network of public gardens, playgrounds, and bicycle routes has been established, contributing to social integration and the revitalization of a post-industrial neighborhood.

Research indicates that access to parks and green spaces significantly reduces the risk of cardiovascular and respiratory diseases, increases physical activity across all age groups, and improves psychological well-being – especially among children and the elderly (Berdenov, 2024). Many contemporary recreational projects incorporate environmental education elements such as informational signage (Herman, 2019), ecological trails, outdoor workshops, festivals, and community fairs. Parks become inclusive social spaces, fostering communication, dialogue, and equitable access. In contexts of social polarization (often characteristic of industrial cities) recreational zones function as "social glue", bridging divides and supporting cohesion (Zhansagimova et al., 2022; Wolf et al., 2019; Wang & Yu, 2018; Von Lindern, 2015). Many transformed industrial zones evolve into spaces of collective memory, housing museums of industrial heritage in Germany or post-industrial cultural clusters in the UK (Stojanović et al., 2024).

Thus, the development of recreational zones in industrial regions is not a luxury, but a necessity – essential for improving environmental quality, mitigating the damages of technogenesis, and promoting sustainable development. Such spaces become vital components of the green transition, enabling the integration of ecological, social, and economic functions within a single landscape (Ahmed et al., 2020). Successful international experiences confirm that even under deep industrial transformation, it is possible to create spaces where nature regenerates, community well-being is restored, and regional identity is strengthened (Inamura et al., 2022; Majeed et al., 2021; Neagu, 2021). For Kazakhstan and other post-Soviet countries, this direction holds strategic significance, particularly in areas burdened by high levels of technogenic stress and a lack of green infrastructure. In the context of accelerating urbanization, environmental pollution, and deteriorating public health, nature-based recreation and the development of green infrastructure have become critical factors for societal well-being Dustin, 2018; Nawrath et al., 2022; Romagosa et al., 2015; Venter, 2014. Recreational zones are not merely leisure spaces – they are multifunctional environments where ecological, medical, social, and cultural functions converge to provide physical restoration, mental balance, and social inclusion (Hermes et al., 2018; Kuklina, 2018; Marion et al., 2016; Monz et al., 2013). Developing such spaces near industrial or urban areas is particularly important, as they compensate for the negative effects of technogenic pressure, offering communities access to restorative natural environments. In the 21st century, nature-based recreation is increasingly viewed not as a privilege but as a fundamental social right (Sumanapala & Wolf, 2019).

Creating recreational zones is one of the most effective tools for both improving quality of life and protecting biodiversity. Well-designed and properly managed recreational landscapes function as buffer zones, ecological corridors, species habitats and migratory pathways, centers for environmental education, and platforms for sustainable practices Bourma et al., 2023; Inogwabini, 2014; Kitikidou et al., 2024; Opdam et al., 2003.

Moreover, recreation can be a functional component of ecological reclamation. Industrial waste heaps, abandoned quarries, and former military sites are increasingly being converted into green spaces and nature reserves. Restoration techniques such as phytoremediation and natural succession are employed to reestablish vegetation cover and soil function Hartig et al., 1997; Gholamhosseinian et al., 2021. Over time, colonizing species establish themselves on these restored lands, gradually forming new ecosystems. In Germany, for example, former mining fields are being transformed into urban forests (Grünzug), which support emergent flora and fauna. The Biotopvernetzung program integrates natural corridors across agricultural and urban landscapes. Similarly, the Netherlands has developed a national ecological network strategy, in which city parks and green zones serve as connective elements between protected natural

areas (McDonald, 2013). In conclusion, the development of recreational zones represents a critical instrument for biodiversity conservation in the face of mounting technogenic and urban pressures. These zones can serve as refuges for species, hubs for environmental education, and key nodes in regional green infrastructure networks. When planned and managed effectively, they form the nucleus of sustainable regional development, aligning ecological integrity with social and economic resilience. Biodiversity conservation through recreation must be recognized as a strategic imperative of the 21st century. Extensive agricultural development in the 20th century led to the conversion of over 70% of Eurasian steppe lands into arable fields. This process resulted in the loss of pastureland mosaics and the disruption of fire and hydrological regimes. Today, the steppe biome is one of the least protected ecosystems globally: according to WWF estimates, only around 5% of Eurasian steppe territories are under formal protection, in contrast to forests and mountain systems, which benefit from significantly broader conservation coverage (Ambarlı et al., 2016; Duman et al., 2024).

The steppe zone represents a unique ecological and cultural landscape, playing a critical role in maintaining biological diversity, climatic stability, and the economic vitality of many Eurasian nations. However, these areas remain among the most vulnerable and undervalued, particularly in the context of nature conservation and environmental governance (Maksanova, 2023; Schulte, 2014). Establishing and expanding protected areas in steppe regions is a strategic priority of the 21st century. Achieving this goal requires an integrated approach that combines scientific justification, international cooperation, community engagement, and sustainable funding mechanisms. Only through such a comprehensive framework can steppe ecosystems be safeguarded for both current and future generations.

Author Contributions: Conceptualization, Zh.B. and A.B.; methodology, Zh.B, A.B. and S.S..; software, G.M. and S. L.; validation, A.B., T.K. and G.M.; formal analysis, A.B. and G.M.; investigation, Zh.B.; data curation, A.B., E.A. and S.L.; writing - original draft preparation, A.B. and Zh.B.; writing - review and editing, A.B., T.K. and S.L..; visualization, S.L; supervision, Zh.B. and A.B.; project administration, Zh.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP19575017).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 15.03.2025 Revised: 12.06.2025 Accepted: 02.07.2025 Available online: 16.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1462-1472
DOI 10.30892/gtg.61306-1516

MAPPING GLOBAL ECOTOURISM RESEARCH: A BIBLIOMETRIC STUDY USING VOSVIEWER

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Citation: Pathmanandakumar, V. (2025). Mapping global ecotourism research: A bibliometric study using vosviewer. *Geojournal of Tourism and Geosites*, 61(3), 1462–1472. https://doi.org/10.30892/gtg.61306-1516

Abstract: Ecotourism has become a central theme in sustainable tourism discourse, emphasizing the balance between environmental conservation and socio-economic development. This study aims to offer a comprehensive bibliometric overview of global ecotourism research trends and identify emerging directions for future inquiry. By mapping the evolution of this multidisciplinary field, the study clarifies the role of ecotourism in sustainability, conservation, and community empowerment. A total of 2,228 publications from 1986 to 2024 were extracted from the Web of Science Core Collection. Bibliometric techniques such as performance analysis and science mapping were conducted using VOSviewer to analyze trends in authorship, keywords, co-citation, and institutional collaborations. The results demonstrate a steady growth in ecotourism scholarship, with significant contributions from China, the United States, and Australia. Key themes include sustainable tourism, conservation, GIS applications, and community-based ecotourism initiatives. Influential authors and journals were identified, revealing clustering patterns around sustainability management and policy frameworks. The findings also underscore the rising importance of interdisciplinary and international collaboration. While research remains concentrated in English-language sources, there is increasing engagement from developing regions. Temporal analysis shows an exponential rise in publications post-2010, reflecting growing academic and policy interest. The study also captures how digital tools and remote sensing technologies are shaping new research frontiers in ecotourism. Furthermore, collaboration networks indicate a shift toward South-South academic partnerships, especially in biodiversity-rich regions. This structured analysis provides valuable guidance for researchers, policymakers, and practitioners aiming to enhance the sustainability and inclusivity of ecotourism initiatives. The study contributes to the strategic development of ecotourism by highlighting conceptual gaps, research strengths, and the need for integrated, policy-relevant approaches. It also points out underexplored areas such as indigenous knowledge integration and long-term impact assessment. Ultimately, this research facilitates a better understanding of how ecotourism can support the global sustainability agenda.

Keywords: bibliometric analysis, ecotourism, sustainability, community based, conservation planning, eco-tourism research trends, sustainable tourism, VOSviewer

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INTRODUCTION

The global tourism industry shows ecotourism as its fastest developing segment to support sustainable development including environmental conservation and community engagement. Ecotourism defined as responsible travel to natural areas that conserves the environment and improves the well-being of local people (Lee & Jan, 2019).

It is increasingly recognized as a tool to balance the demands of tourism with the need to protect ecological and cultural heritage. Environmental sustainability awareness growth at a global level has boosted the acceptance of ecotourism as a practical approach to mitigate mass tourism effects while enhancing traveler connections with natural environments (Hasana et al., 2022). The rapid expansion of ecotourism research has been observed during recent years through rising scholarly works on its conceptual framework, implementation challenges, and socio-economic implications (Ocelli Pinheiro et al., 2021; Hasana et al., 2022). This growing body of literature reflects the multidisciplinary nature of ecotourism research spans diverse academic fields including environmental science, economics, sociology, and geography. Bibliometric analysis offers researchers a valuable synthesis capability for understanding this diverse body of research to identify key trends, influential publications, and emerging themes within the field (Donthu et al., 2021; İnci & Köse, 2023). The systematic analysis of ecotourism research within academic databases yields critical understanding about its evolution, current gaps, and future directions.

As a key element of sustainable tourism practices ecotourism conserves natural environments while promoting local cultural participation through tourism activities that minimize environmental degradation. Over the years, the academics and professionals have increasingly paid attention on studying ecotourism as it shows a promising tool for achieving sustainable development goals (Mondino & Beery, 2019). The research community has examined both the definitions and principles while establishing criteria that distinguish ecotourism from mass tourism (Selkani, 2020). Researchers started studying ecotourism academically during the late 1980s while sustainability movements gained momentum. Early academic exploration at first focused on defining ecotourism while distinguishing it from other modes of travel

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(Cobbinah, 2015). Subsequently, research into ecotourism progressed through studies of its economic, environmental, and socio-cultural impacts, leading to a more nuanced understanding of its benefits and challenges (Fennell, 2008). Recently, the scope of Ecotourism research has evolved witnessed the rise of interdisciplinary studies integrating ecological science, behavioral studies and management practices (Choi et al., 2021; Fu & Zhao, 2024).

Promoting environmental conservation is one of the fundamental principles of ecotourism (Krüger, 2005). A number of researches have been undertaken to study the effectiveness of ecotourism initiatives in protecting biodiversity and ecosystems. For instance, research conducted in national parks and wildlife sanctuaries, highlight the role of ecotourism in supporting conservation efforts and raising awareness about environmental issues (Wardle et al., 2018; Das & Chatterjee, 2022). Another focus of ecotourism studies is to investigate the engagement of local community in the ecotourism activities. Researchers have studied the economic advantages that ecotourism delivers to indigenous and rural communities through job creation, skill development, and cultural preservation (Kim et al., 2019; Anup et al., 2020). However, scholars have documented unequal benefit distribution and conflicts between stakeholders (Chen et al., 2021; Yeboah, 2024). Studies on ecotourists' motivations and preferences and satisfaction levels continues to evolve as an emerging area of research. Researches have explored the ecotourists' demographic and psychographic profiles, revealing their preference for maintaining authenticity, providing educational value, and preserving environmentally friendly experiences (Yang et al., 2023). Further, Sobhani et al., 2023 indicated that various visitors management strategies aim to reduce negative impacts while enhancing the overall experience.

It has been widely discussed in the ecotourism research that how policy frameworks and governance mechanisms foster the development of ecotourism activities. Researchers emphasize government must collaborate with private sectors, and non-governmental organizations (NGOs) to initiate and implement effective ecotourism policies (Pasape et al., 2015). The case studies in different countries demonstrate successful approaches with their respective best practices and lessons learned. Bibliometric analysis has become a popular method to review academic literature within the field of tourism. The quantitative analysis of publication trends citation networks, and co-authorship patterns reveals a comprehensive understanding of knowledge structure and emerging research directions (Donthu et al., 2021).

Recent bibliometric research has helped scholars map and synthesize this growing body of knowledge. For instance, Hasana et al. (2022) conducted a bibliometric review on ecotourism in protected areas, highlighting dominant research themes and challenges in policy implementation. Dinç et al. (2023) revealed fragmented global trends and underexplored regional networks. Similarly, Singh et al. (2021) examined thematic evolution and collaboration patterns in the Journal of Ecotourism. However, many of these studies are predominantly descriptive, with limited engagement in identifying conceptual gaps or critically evaluating the efficacy of ecotourism as a sustainable tool.

Several 2024–2025 studies have advanced this discussion. Lin et al. (2025) analyzed 3,982 eco-tourism publications and emphasized the need for integration between management and conservation goals, while Singh et al. (2025) examined sustainability trends and emerging themes in ecotourism using Scopus data. Their findings confirmed the rising importance of sustainable practices but noted a lack of longitudinal impact studies.

Riaz et al. (2024) explored ecotourism's contribution to economic growth through a systematic review, identifying a need for clearer metrics and regional differentiation. Amadu et al. (2025) highlighted the growing role of GIS in ecotourism, advocating for more spatially grounded planning. Additionally, Apriantoro et al. (2024) introduced the concept of halal ecotourism and traced its rapid development through bibliometric mapping. Aji et al. (2024) provided a detailed analysis of mangrove ecotourism, demonstrating the prominence of themes such as biodiversity, conservation, and carbon sequestration in coastal environments. Their findings highlighted the dominance of Asia in publication output and called attention to the importance of socio-ecological systems in ecotourism planning. Similarly, Sutiksno et al. (2024) explored the growth of geoheritage-based ecotourism, identifying international collaborations and emerging interests in financial inclusion and geoscience integration. However, both studies noted limitations such as geographic bias and methodological homogeneity, emphasizing the need for broader, more comparative approaches. Esparza-Huamanchumo et al. (2024) conducted a comparative bibliometric review of ecotourism, sustainable tourism, and nature-based tourism, revealing fragmentation in the literature due to separate treatment of overlapping concepts. Their study advocated for integrated research models that unify these streams to improve theoretical clarity and policy relevance.

Furthermore, they observed increasing international collaboration and a shift towards interdisciplinary research involving social, environmental, and technological fields. Despite the expanding literature, critical limitations remain. First, most bibliometric reviews, including those by Khanra et al. (2021) and Ocelli Pinheiro et al. (2021), rely heavily on quantitative metrics (e.g., citation count, co-authorship) without deep qualitative engagement. Second, language bias and English-dominated sources exclude valuable regional knowledge, especially from non-Western contexts. Third, interdisciplinary convergence remains limited, particularly in integrating behavioral science, technological innovation, and indigenous knowledge into ecotourism frameworks.

Empirical studies further complicate the picture. While ecotourism has shown promise in promoting biodiversity conservation (Wardle et al., 2018; Das & Chatterjee, 2022), scholars like Chen et al. (2021) and Yeboah (2024) note conflicts between stakeholders and unequal benefit distribution. Studies such as Anup et al. (2020) and Kim et al. (2019) underscore ecotourism's economic potential for rural communities but also point to the lack of proper institutional support. Meanwhile, research into ecotourist behavior (Yang et al., 2023) continues to highlight demand for authenticity and environmental responsibility, emphasizing the need for better visitor management (Sobhani et al., 2023). Liu & Chamaratana (2025) examined ecotourism in border areas of the Greater Mekong Subregion, finding stark contrasts between top-down ecotourism developments (e.g., Xishuangbanna, China) and community-based models (Luang Namtha,

Laos). The study exposed challenges such as external investor dominance, marginalization of local communities, and weak cross-border cooperation. They called for stronger governance frameworks and regional planning mechanisms

As a result, recent literature has begun advocating more holistic and cross-cutting frameworks. Choi et al. (2021) applied resilience theory to propose sustainable development models for estuarine ecotourism, and Fu & Zhao (2024) used the Theory of Planned Behavior to explore pro-environmental tourist behavior. These approaches move beyond traditional impact studies to consider decision-making, value systems, and governance.

This study aims to provide a comprehensive overview of global ecotourism research trends and identify future research directions through bibliometric analysis. By clearly mapping the evolution of this multidisciplinary field, the study seeks to clarify the role of ecotourism in sustainable development, conservation, and community engagement. , The review examines major scholarly work including authors and themes to present the view of how ecotourism research has evolved over time. This study reveals critical gaps in addition to opportunities for advancing theoretical and practical knowledge in this field. The findings of this study will provide guidance to researchers and policy makers and tourism practitioners to develop new approaches for sustainable tourism management and ecological conservation.

MATERIALS AND METHODS

Bibliometric analysis

Bibliometric analysis is a quantitative analysis method used to describe, evaluates, and monitors published academic literature to trace the structure and trend of knowledge expansion (Lima & Bonetti, 2020; Greener, 2022; Sutiksno et al., 2024). Bibliometric data analysis can be utilized primarily for two purposes such as performance analysis and science mapping (Tyagi, 2024). Recently, a different type of research has applied bibliometric analysis to present novel views on research trends. Scholars are able to identify emerging research areas within their discipline and establish links between different academic institutions and organizations through this technique (Donthu et al., 2021). People interested in a subject area can use this technique to get an overview of literature basics and how it has changed over time (Greener, 2022).

This Bibliometric method made it easier to identify emerging research areas in the discipline and develop collaboration between academic institutions and organizations (Sutiksno et al., 2024). Researchers can utilize bibliometric analysis to quickly show the basics of the literature and how it has evolved through time (Liu et al., 2019). Bibliometric indicators can also be utilized to evaluate the quantity and quality of publications (Singh et al., 2020; Donthu et al., 2021).

Performance analysis and science mapping, two bibliometric techniques, were combined and employed as the analysis methods of this study. The performance analysis is related to evaluating the impacts of individual publications, countries, and affiliated institutions. Science mapping is a visual representation of a field to visualize its structure, subjects, and linkages with other disciplines (Chen et al., 2023). Several bibliometric indicators were applied in this study including authors, institution, country, and journals, co-citation, keyword co-occurrences, and bibliographic coupling.

Data source and processing

Scopus and Web of Science are considered as two of the world's most prestigious and influential databases for academic literature. The two databases have become vital tools for bibliometric analysis due to their combination of published documents with citation databases from all areas of science. However, a comparative analysis revealed that Scopus suffers from duplicate publications as major data quality issue (Singh et al., 2020). On the other hand, Web of Science Core Collection (WoS) has been recognized as an important database which significantly influence the bibliometric studies of various subject matters within science (Yan & Wang, 2023). WoS provides access to index journals, books, proceedings in social sciences, natural sciences, arts and humanities and so on (Zhu & Liu, 2020).

Thus, this study relied heavily on the primary data from Web of science database. The keywords "ecotourism" or "eco-tourism" were chosen as search parameters in the "search field". In the "All field" drop-down menu, "Title" was selected (Title refers to the title of a journal article, proceedings paper, book, or book chapter). While making research over the WoS database, we filtered "article and conference paper" as a document type from "document types" and "English" as a language from "language." Thus, the search equation was defined as (TITLE- (ecotourism) OR TITLE-(eco-tourism*) AND (EXCLUDE (PUBYEAR, 2025)) AND (REFINE-(DOC-TYPE, "article", DOC-TYPE, "proceeding paper" and DOC-TYPE, "review article")) AND (REFINE (LANGUAGE, "English")).

However, the search criteria were not refined by time span. Consequently, data was collected from 1986 to 2024 in this study. By the end of December 2024, 2228 articles were used in bibliometric analysis. Information obtained from WoS database has been exported to tab-delimited (text) file and comma separated value (CSV) file for future investigations including detailed descriptions and cited references. The results of the study were crosschecked using an online tool on WoS website. VOSviewer (1.6.20) software was employed to visualize co-citation analysis, keyword analysis, co-occurrences analysis and bibliographic coupling. This study employed WoS as its only source of data. Therefore, there is little chance that mistakes could be made or some data be found duplicated (Rana, 2020).

RESULTS AND DISCUSSION

Results: Performance analysis

Annual performance of publications

The annual number of publications in a particular field of study is a strong indicator for assessing the progress of the field (Rana, 2020). The first publication on Ecotourism was recorded in the Web of Science core collection in 1986 which can be considered a pioneer work in the field of ecotourism. The articles related to ecotourism were not published

in the Web of Science Core Database between 1987 and 1989. Figure 1 shows a gradual increase in publications from 1986 until about 2005, after which a notable upward trend is observed. The number of publications increased sharply between 2010 and 2020 and reached the highest in 2022. The citation patterns also showed a similar trend, which also began rising significantly from 2005 onwards, reaching its highest point around 2022, since then indicating a decline.

The above trend indicates a growing research interest in the ecotourism-related subject over the past two decades, with a peak in 2022. The decline in both publications and citations observed from 2022 could indicate either a shift in research interest or a delay in citation accumulation for recent publications.

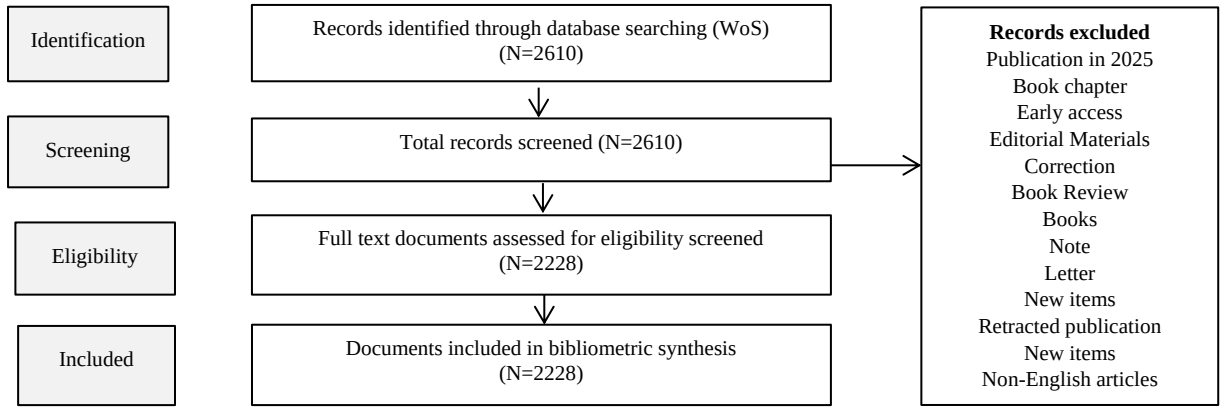

Figure 1. Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) flow diagram (Moher et al., 2009) for the systematic review of tourism research in Ecotourism

Leading countries and institutions

The number of publications and citations each country holds in the Web of Science core collection reflects which country is the most productive country in the particular research field (Dzikowski, 2018). 129 countries and 2334 institutions involved in ecotourism-related studies between 1986 and 2024. Figure 2 shows the figureglobal distribution of ecotourism-related paper publications from 1986 to 2023. Out of 129 countries, 13 have published more than 50 papers between 1986 and 2024. Based on the number of the documents published, China (440 articles and 1935 citations) is the most productive country and ranked first in the field of ecotourism research (Figure 3).

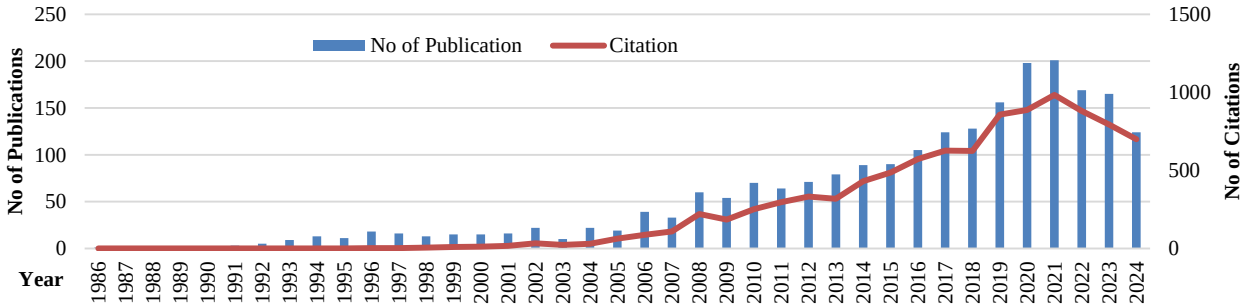

Figure 1. Distribution of publications and citations by years (1986-2024) (Source: Author, 2025)

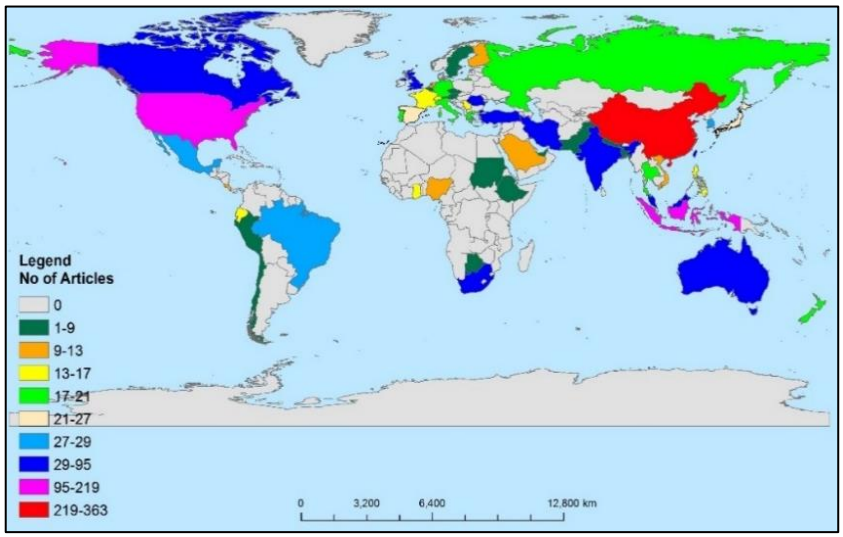

Figure 2. Worldwide distribution of ecotourism-related articles (Source: Author, 2025)

However, the United States is ranked first regarding the highest number of citations (6499 citations) (Table 1Table 1). A major portion of ecotourism research publications originates from China, Indonesia and Malaysia and India that demonstrates region's growing interest in ecotourism as a sustainable development approach.

The research publications from the USA and Canada showed higher levels of influence in ecotourism studies despite having fewer publications compared to China. Research from Iran and Taiwan and England produces substantial contributions to ecotourism knowledge, yet each entity exhibits varying levels of impact.

Griffith University is the most productive institute based on the number of publications (with 32 publications), followed by the Chinese Academy of Sciences (26 publications), the Islamic Azad University (24 publications), the University of Johannesburg (22 publications) and Bogor Agricultural University (20 publications). However, the rank differs remarkably in terms of influential institutions depending on the number of citations. For example, Griffith University is ranked first as the most influential institute having obtained the highest publication citations (773 citations), followed by the University of British Columbia (667 citations) and the Chinese Academy of Sciences (492 citations) (Table 2).

Table 1.Top ten leading countries in ecotourism-related research (Source: Author, 2025)

Country	Documents	Citations	Citation per Article
CHINA	440	1935	4.40
USA	286	6499	22.72
INDONESIA	185	174	0.94
AUSTRALIA	167	2311	13.84
MALAYSIA	102	475	4.66
INDIA	91	1149	12.63
CANADA	81	2017	24.90
ENGLAND	79	574	7.27
TAIWAN	75	226	3.01
IRAN	73	893	12.23

Table 2. Leading institutions based on the number of publications and citations (Source: Author, 2025)

Organization	Articles	Citations
GRIFFITH UNIVERSITY	32	773
CHINESE ACADEMY OF SCIENCES	26	492
ISLAMIC AZAD UNIVERSITY	24	214
UNIVERSITY OF JOHANNESBURG	22	334
BOGOR AGRICULTURAL UNIVERSITY	20	16
STATE UNIVERSITY SYSTEM OF FLORIDA	20	448
UNIVERSITY OF BRITISH COLUMBIA	19	667
BUCHAREST UNIVERSITY OF ECONOMIC STUDIES	18	80
GRIFFITH UNIVERSITY GOLD COAST CAMPUS	18	157

Most cited articles and leading authors

The number of citations obtained by a published article can be used to measure the relevance of the article in the respective field and considered as landmarks due to their pioneering contributions (Lima & Bonetti, 2020). Some of the articles that most frequently cited in studies are considered strong relevance reference material. However, it must be noted that, in general, older articles have higher chances of being referenced when compared to newer ones.

It should be remembered, however, that the most cited articles are not necessarily the most important ones (Mulet-Forteza et al., 2018). The indicates the top ten most cited articles in the field of ecotourism. "Ecotourism and the empowerment of local communities" is the most cited article (549 citations), published in Tourism Management Journal in 1999 (Scheyvens, 1999). This paper presents an empowerment framework to analyze how ecotourism influences the social, economic, psychological and political impacts of the local communities (Table 3).

Table 3. Top ten most cited articles between 1986 and 2023 (Source: Author, 2025)

Authors	Title	Publication Year	Total Citations
Scheyvens (1999)	Ecotourism and the empowerment of local communities	1999	628
Honey (2008)	Setting Standards: Certification Programmes for Ecotourism and Sustainable Tourism	2008	392
Weaver et al. (2007)	Twenty years on: The state of contemporary ecotourism research	2007	386
Chiu et al. (2014)	Environmentally responsible behavior in ecotourism: Antecedents and implications	2014	339
Powell & Ham (2008)	Can ecotourism interpretation really lead to pro-conservation knowledge, attitudes and behaviour? Evidence from the Galapagos islands	2008	307
Kruger (2005)	The role of ecotourism in conservation: panacea or Pandora's box?	2005	303
Stronza & Javier (2008)	Community views of ecotourism	2008	257
Jones (2005)	Community-based ecotourism - The significance of social capital	2005	254
Tsaur et al. (2006)	Evaluating ecotourism sustainability from the integrated perspective of resource, community, and tourism	2006	251
Mullner et al. (2004)	Exposure to ecotourism reduces survival and affects stress response in hoatzin chicks (Opisthocomus hoazin)	2004	236

Table 4 lists the top ten most productive authors in the field of ecotourism between 1986 and 2024. Carvache-Franco mauricio is the most productive author in ecotourism research, with 15 publications and 146 citations.

Table 4. The top ten most productive authors (Source: Author, 2025)

Author	Articles	Citations
Carvache-Franco, Mauricio	15	146
Carvache-Franco, Wilmer	13	93
Xu, Anxin	9	30
Zeppel, Heather	9	2
Butcher, Jim	8	57
Carvache-franco, Orly	8	45
Cater, Carl	8	140
Walter, Pierre	8	320
Avenzora, Ricky	7	5
Fennell, David	7	111

However, in terms of total citations, “Hunt Carter” is the most influential author in ecotourism research with five publications and 354 citations (Table 5).

Table 5. The top ten most influential authors (Source: Author, 2025)

Author	Articles	Citations
Hunt, Carter	5	354
Walter, Pierre	8	320
Buckley, Ralf	5	245
Chatterjee, Bani	6	236
Das, Madhumita	6	236
Carvache-Franco, Mauricio	15	146
Cater, Carl	8	140
Wolf, Isabelle	6	127
Fennell, David	7	111
Carvache-Franco, Wilmer	13	93

Leading journals

The top ten most popular journals are shown in Table 6. Between 1986 and 2023, 985 journals published articles on ecotourism in which "Sustainability" (95) was the most popular journal, followed by "Journal of Eco tourism" (54), "Journal of Sustainable Tourism" (47), and Journal of environmental protection and ecology (41) and "Tourism management" (34). Although "Sustainability" produced the most papers, "Tourism management" was the most cited journal with 3890 citations.

Table 6. The ten leading Journals with publications and citations on ecotourism (Source: Author, 2025)

Source	Articles	Citations
Sustainability	95	879
Journal of ecotourism	59	604
Journal of sustainable tourism	47	2299
Journal of environmental protection and ecology	41	102
Tourism management	34	3890
Environment development and sustainability	31	273
International handbook on ecotourism	30	120
Annals of tourism research	28	1933
Fresenius environmental bulletin	24	50
Ekoloji	22	63

Analysis of the intellectual structure

Author keyword co-occurrence analysis

An analysis of keyword co-occurrences enables tracing new study domains and research themes in a specific subject as keywords indicate the article's actual content (Singh et al., 2020). The co-occurrence analysis of author keywords examines the frequency of co-occurring keywords. Co-occurrence author keywords quantifying the frequency of articles in which two keywords appear together. The Table 7 below shows top ten author's keywords used in eco-tourism research from 1986 through 2024. The results show that "ecotourism” is the dominant research theme, followed by "sustainable development", "sustainability", and "eco-tourism". "Ecotourism" dominates the research landscape, suggesting a strong academic focus on environmental and sustainable tourism. The emergence of "GIS" indicates the increasing use of geospatial technologies in tourism studies.

Table 6. Top ten keywords, co-occurrence frequency, and total link strength (Source: Author, 2025)

Keyword	Occurrences	Total link strength
Ecotourism	937	1323
Sustainable development	154	276
Sustainability	105	215
Eco-tourism	99	85
Tourism	92	161
Conservation	91	193
Sustainable tourism	72	146
Protected areas	69	146
Community-based ecotourism	44	77
GIS	43	93

The Figure 4 below shows clusters of co-author keyword networks, containing 73 frequently appearing author keywords (out of 4635) which have appeared at least 10 times. There are 9 clusters with 594 links in the entire network with total strength 1703. VOSviewer is an effective tool for visualization of such connections between authors' key words. The map of this visualization features circles that are called nodes representing specific keywords. The size corresponds to frequency of occurrence i.e., bigger size means higher frequency. The thickness of a line represents how strong two circles are connected. Words that are closer together and have similar colors represent that they are more alike compared to those that are apart and have different colors (Greener, 2022). The co-occurrence network visualization highlights the connections among keywords, forming multiple clusters. Central Cluster (Ecotourism and Sustainability) represents the core themes in tourism research focusing on environmental protection and sustainable practices. Tourism Development Cluster examines economic, social, and environmental implications of ecotourism. Community and Policy Cluster highlights the role of technology and community engagement in tourism management. The clustering of keywords reflects distinct subfields, such as conservation, tourism policy, and community engagement.

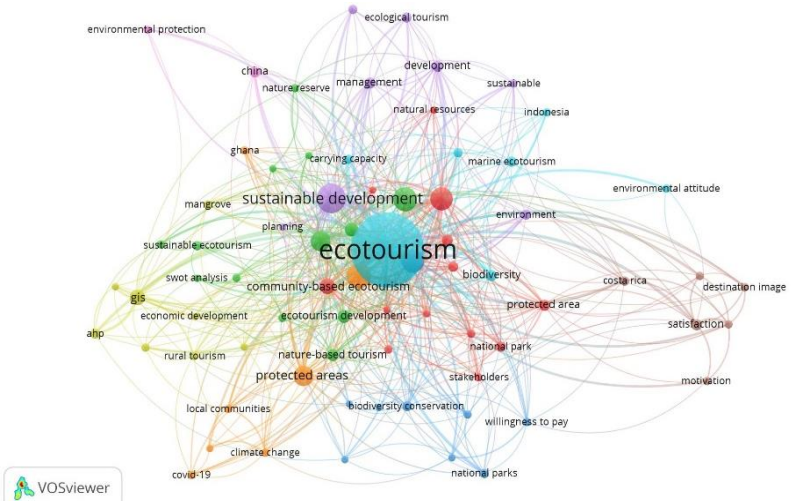

Figure 4. Co-occurrence author keywords network (Source: Author, 2025)

Co-Citation analysis of cited-authors

Co-citation is known as "how often two earlier articles are referenced in a subsequent article" (Greener, 2022). It measures how many times in the third article two articles are cited (Singh et al., 2020).

Table 7. Co-citation analysis of "Cited Authors" (Source: Author, 2025)

Author	Occurrences	Total link strength
Weaver, DB	470	9683
Buckley, R	394	8260
Fennell, DA	375	7373
Scheyvens, R	273	5361
Honey, M	233	4277
Ceballos-lascurain, H	210	3549
Lindberg, K	207	4345
Stronza, A	203	4569
Lee, TH	187	3674
Hall, CM	176	3387

Co-citation analysis provides a platform for understanding the process of spatial growth, and it can, therefore, be an effective tool for graphically depicting the intellectual structure of a subject. In addition, co-citation analysis offers insight into the knowledge domain (Singh et al., 2020). Table 8 presents the top ten most frequently co-cited authors in the field of

tourism research. The findings indicate that Weaver, DB and Buckley, R are the most prominent scholars in this domain. Other highly co-cited authors include Fennell, DA, Scheyvens, R, and Honey, M. The co-citation network visualization (Figure 5.) identifies four distinct clusters, each representing a thematic area in tourism research. Green Cluster (Ecotourism and Sustainable Tourism) focuses on sustainable tourism development, conservation strategies, and the role of tourism in environmental sustainability. Yellow Cluster (Tourism Development and Conservation) is centered on eco tourism's economic and environmental impacts, particularly in protected areas and eco-sensitive regions. Red Cluster (Broader Tourism Research and Policy) includes a diverse set of scholars who examine various aspects of tourism management, community-based tourism, and global tourism trends. Blue Cluster (Tourism Policy and Regional Development) focuses on tourism governance, policy-making, and its implications for regional and economic development.

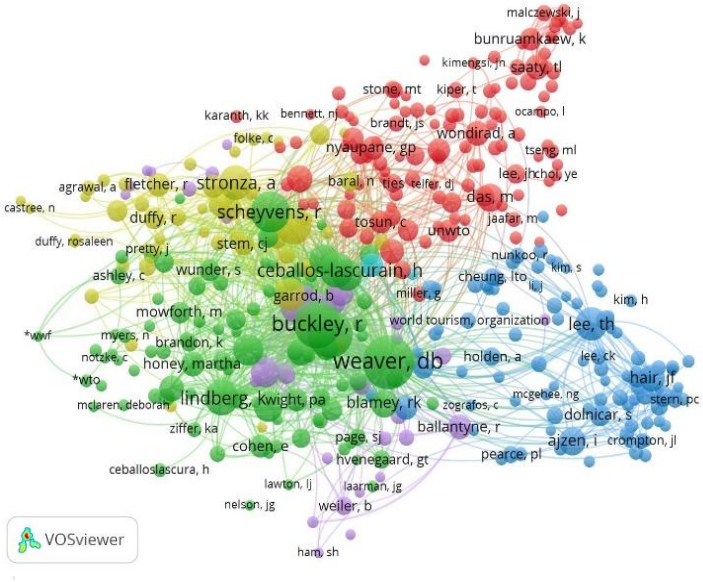

Figure 5. Co-citation analysis of "Cited Authors"
(Source: Author, 2025)

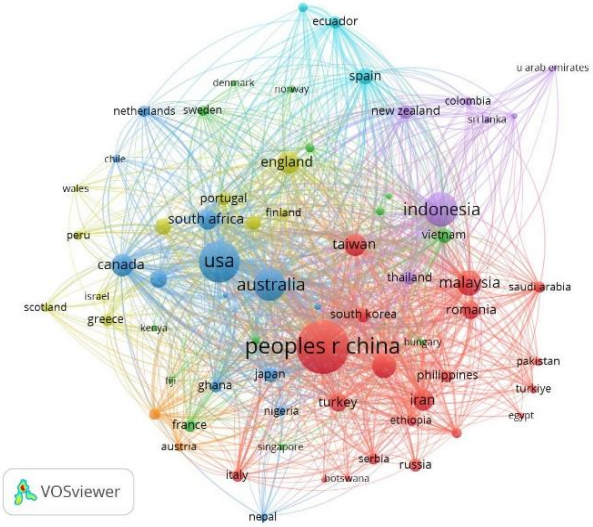

Figure 6. Bibliographic coupling between countries
(Source: Author, 2025)

Bibliographic coupling

Bibliographic coupling occurs when the two documents have cited the third document (Singh et al., 2020; Sing et al., 2025). The bibliographic coupling analysis, with "country" as the unit of analysis, is carried out to provide a graphic analysis of the extent to which the authors of the main country cite the same documents. People's Republic of China has the largest node, indicating that it has the highest volume of research output and the most shared references with other countries. USA and Australia are also highly connected, reflecting their significant contributions and strong bibliographic coupling with multiple countries. Indonesia, Malaysia, and England have medium to large nodes, showing strong involvement in tourism and environmental research. Red Cluster represents strong regional collaboration among East and Southeast Asian countries, often in topics related to tourism, environmental sustainability, and economic development. Blue Cluster highlights research collaborations between Western nations with a focus on sustainable development and conservation. Green Cluster indicates strong European cooperation in academic research. Purple Cluster suggests a smaller but distinct network likely focusing on region-specific tourism or environmental concerns (Figure 6).

The strong connectivity of China suggests that it plays a central role in global research, collaborating with both developing and developed countries. The clustering shows that countries within geographic proximity tend to collaborate more frequently, sharing similar research themes. The interconnections indicate that tourism, sustainability, and environmental issues are global research topics with contributions from diverse regions.

DISCUSSION

The bibliometric analysis of ecotourism shows that researchers from developed and developing countries have made significant contributions to the field. The scientific production in ecotourism began in the twentieth century. From this date, there has been an increase in scientific interest in ecotourism-related research, resulting in an exponential expansion over the years. The analysis shows that research on ecotourism has emerged and is progressing concurrently across several academic disciplines. The findings show that, despite many fluctuations between 1986 and 2007, the annual number of publications has increased since 2008 (Figure 1).The United Nations recognized ecotourism and declared 2002 the "International Year of Ecotourism," which may have encouraged researchers to conduct ecotourism-related research, contributing to the rapid increase in publications. The distribution of citation counts obtained by articles related to ecotourism published between 1986 and 2024 showed an increasing tendency. Until 2003, the number of citations collected per year was less than 100. However, this figure has progressively climbed. Citations have been increasing since 2004, and this trend is projected to continue in the following years (Figure 1). A number of publications influenced the progress of ecotourism research during this time period. Scholars expanded on previous research areas in response to emerging ecotourism challenges. They established international collaborations for ecotourism-related research and switched their

emphasis from identifying the concept of ecotourism to ecotourism and sustainable management, with a particular emphasis on community participation and sustainability. In recent years, many researchers used newly established research methodologies such as GIS, and remote sensing to identify the potential sustainable locations for ecotourism development.

This study indicates that several institutions and countries are interested in ecotourism research. The analysis shows that China, the United States, Indonesia, Australia, Malaysia and Taiwan are the most important countries in the field. Many developing countries, such as China, Malaysia, Taiwan, Turkey, Romania, India, Brazil, Mexico and so on, have begun appearing on the list of the top twenty most influential countries. Other developing countries are also expected to increase their representation in the ecotourism research arena. The analysis further displayed that the most influential institutions (top three) are from Australia, China, and Iran respectively. Most of the leading authors are from Latin America and China.

However, the principal author of the most cited publications is affiliated with institutions in New Zealand (Scheyvens, 1999). Most studies focused on ecotourism issues in developing countries, but the authors were predominantly from developed countries, with a few exceptions, such as China, Malaysia, and Indonesia. However, the publication trend on ecotourism from Africa and Asia has increased. In order to better understand the emerging domains in ecotourism, a keyword co-occurrence analysis was carried out. Author keywords analysis has revealed that the predominant themes were "ecotourism" and "sustainable" (Figure 7), which was confirmed by an analysis of the most frequently cited papers (Scheyvens, 1999; Honey, 2008). The findings show that the studies in this field were first focused on ecotourism concepts.

This has evolved, and the emphasis has recently shifted towards ecotourism management (including sustainable ecotourism). Moreover, the complex relationship of ecotourism with the environment and society shows that managing one will naturally affect the other. As a result, it is important to investigate how ecotourism management fits into the practical implementation and how optimal management practice can be achieved. Accordingly, sustainable management of ecotourism will continue to be the key theme in the future. Furthermore, an analysis of various journals reveals that research on ecotourism has progressed concurrently across multiple academic disciplines and is expanding. The bibliographic coupling analysis showed that there is literature with similar research goals and themes. The most important thing to study was how ecotourism affects tourists, local communities, and conservation. There were also a lot of articles that focused on the conceptual aspects and framework formation of ecotourism, and many articles elaborated on the theoretical underpinnings.

As the importance of preserving natural ecosystems grows, it is anticipated that more future research studies will concentrate on eco-tourism mechanisms, regulations, and legislation. Such studies may facilitate mitigating the negative effects of tourism on ecosystems. It is more important to confirm the participation of location communities in order to ensure stable and equitable development. It emphasizes the importance of future ecotourism research focusing on providing empirical evidence on the outcomes of various policies developed at local and international levels. In the future, the geographical information system, in conjunction with remote sensing, will be used in ecotourism research to enable online monitoring of ecotourism activities. In the future, a common platform should be established to conduct comparative studies, allowing scholars and ecotourism practitioners from various countries to communicate their methods and share their experiences.

CONCLUSION

This research paper provides a comprehensive bibliometric analysis of ecotourism research. It reveals key scholarly contributions, thematic trends, and future directions for research. The findings indicate that ecotourism has emerged as a multidisciplinary field, involving environmental conservation, sustainable development, and community engagement. Further, the analysis indicated an extensive growth of ecotourism-related research over the past decades, with a marked increase in publications and citations, in journals such as Sustainability, Journal of Ecotourism, and Journal of Sustainable Tourism. Existing research demonstrates that institutions from China and Australia and the United States constitute the primary contributors to this field while China shows the greatest productivity in article production. Naturally occurring clustering patterns between co-cited authors demonstrate that research on ecotourism revolves predominantly around themes about sustainable tourism management and conservation and policy frameworks.

This research identifies Weaver Buckley and Fennell as influential authors who have contributed significant work to ecotourism discourse by using co-citation analysis. The research utilizes co-citation analysis to understand how Weaver, Buckley and Fennell have established themselves as major contributors to the field of ecotourism studies.

Research in ecotourism centers on three central themes because co-cited authors cluster into these fields of sustainable tourism management, conservation, and policy frameworks. Further, bibliographic coupling analysis underscores the strong international collaboration among countries, with China, the USA, and Australia forming significant research hubs. The keyword co-occurrence analysis further reveals that dominant research themes include ecotourism, sustainable development, conservation, protected areas, GIS, and community-based ecotourism.

These findings indicate a sustained focus on balancing tourism growth with environmental sustainability and social responsibility. This paper constitutes a comprehensive literature review on ecotourism. These results are significant for readers doing research work in ecotourism related-fields and it also offers ideas to scholars seeking viable areas for their studies or ways of approach that can accelerate knowledge progression amidst fresh subfields like this one.

Limitations

This study has a few limitations. The data was sourced from the WoS core database alone hence it does not capture all available data; it is most recognized but this is only part of the available total data. This raises the need for future research using different databases such as Scopus, Science Direct, Google scholar amongst others which will confirm what has been found herein. However, since quality articles written in languages other than English were not considered in this bibliometric analysis due to the language restriction of the present study. The contribution made by non-English speaking

countries might go unnoticed. In addition, only scientific papers have been used in this research, leaving behind other materials like books or book chapters. Then all document types available in the WoS database should be viewed through bibliometric analysis within this realm. Any good paper that has failed to use the required keywords in the title of the article has not been included in this analysis. These papers' contents have not been subjected to bibliometric analysis and therefore require deeper scrutiny within this sub-field using this methodology. We collected the data within a specific timeframe so that the numbers of citations and publications may slightly vary in future. Different mapping techniques can be used to create a complete domain map of ecotourism research. In spite of these limitations, the findings offer an encompassing bibliometric overview concerning the major research trends involved in ecotourism studies over the last thirty-six years.

Author Contributions: Conceptualization, V.P.K.; methodology, V.P.K.; software, V.P.K.; validation, V.P.K.; formal analysis, V.P.K.; investigation, V.P.K.; data curation, V.P.K.; writing - original draft preparation, V.P.K.; writing - review and editing, V.P.K.; visualization, V.P.K.; supervision, V.P.K.; project administration, V.P.K. Author has read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 14.03.2025 Revised: 16.06.2025 Accepted: 03.07.2025 Available online: 24.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1473-1484
DOI 10.30892/gtg.61307-1517

THE HALF-CENTURY HISTORY OF FESTIVALS IN KOSOVO: THEIR TYPES, DISTRIBUTION AND TOURIST IMPACT

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Citation: Humolli, F., & Ukshini, F. (2025). The half-century history of festivals in Kosovo: Their types, distribution and tourist impact. *Geojournal of Tourism and Geosites*, 61(3), 1473–1484. https://doi.org/10.30892/gtg.61307-1517

Abstract: Festivals are occasions when people come together, usually with positive intentions. Conceived in a specific area and experiencing a global trend, they are increasingly being studied in various fields, among which also in the tourism geography. A general study on this topic was missing in Kosovo. Even more so, research in the field of tourism geography was entirely lacking; For this reason, this study, along with an analysis of the tourist impact of these festivals, constitutes the purpose of this paper. The study adopted a mixed methodology, using both primary and secondary sources. The main findings were derived through semi-structured interviews and ethnographic methods. Based on this approach, the results showed that festivals in Kosovo began in the middle of the 20th century. Their development followed an oscillating pattern, a trend common to festival evolution worldwide, yet distinct in the Kosovan context. With 26 out of 146 recognized festivals which are now defunct, the paper illustrates an unstable trajectory. Their high number, unfortunately, emphasized quantity over quality. Only a relatively small percentage demonstrated consistency in programming and sustained efforts, despite both past and ongoing challenges. The most critical early challenges occurred during the 1990s, when Serbian repression in Kosovo peaked. Organizing festivals during that time required significant courage to defy Serbian police and military forces. Contemporary challenges, no less important, revolve around limited budgets, weak programming, poor quality control, and the lack of institutional oversight. Music festivals emerged as the most dominant, followed by visual arts, and the third constituting theatre ones, while the highest concentration is found in Pristina, Prizren, and Ferizaj. Their social, cultural, and economic impacts on both the local and national communities have been assessed as partially positive. To improve sustainability, the paper recommends: (the first) greater institutional support, and (the second) the revitalization of both the creative and financial capacities of festival managers.

Keywords: tourism, festival, event, Kosovo, impact of festivals, interview, culture, heritage

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INTRODUCTION

Tourism is generally defined as the movement of people for the purposes of recreation, leisure, healing, and expansion of cultural knowledge. Tourism now plays a significant and essential role in social, economic, and physical development (Govind, 2016). As a service industry, tourism encompasses hospitality, transportation, and hospitality (Govind, 2016). The extent of its overall impact varies greatly, just as the types of its impact which are also variable. Panfiluk estimates that in the case of Poland's Podlaskie region, tourism was a complementing economic sector on a regional level. In certain local destinations, tourism has a significant impact on employment and population income (2015). Festivals are activities that occur in different periods of time. They showcase history, folklore, heritage, innovation and creation, depending on their type and purpose. Therefore, they play a major role in the development of tourism because, they attract visitors and tourists to the locations where they are organized. Meanwhile, we emphasize here that a geographical and geographical-tourism study of them is deemed deficient in general (Cudny, 2013), and completely lacking in the Republic of Kosovo, with the exception of Ukshini's master's thesis (2021) and Humolli's solid contributions to conferences (2024a) and (2024b). Quinn, however, asserts that research on festivals and events is currently a significant and fruitful field in the study of tourism (2009). He claims that even the most superficial research indicates a noticeable rise in the research presence on festivals, at the academic levels of tourism studies. Nowadays, festivals are considered to contribute significantly to the cultural and economic development of a community or even have an impact at the state level. Festivals aid the tourism industry in three ways: first, they draw tourists; second, they enhance and promote the country's image; and third, they help the local community.

Tourists and visitors increase the rate of consumption, contributing directly to tourism businesses and indirectly to other businesses. According to Panfiluk (2015), previous studies on the analysis of festivals impact show that they have a favorable impact on the local economy, society and sustainable development. The economic effects of events include increased employment (but not always) (Crompton et al., 2001) and increased local taxes (Thrane, 2002). In the social field, festivals contribute to raising awareness and social activity, at least this is how it has been assessed in the case of Seoul (Kim & Petrick, 2005), as well as strengthening local ties and strong social cohesion according to examples brought from Indian villages (Rao, 2001). According to some authors, including Prentice & Andersen (2003), Walker et al. (2013);

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McKercher et al. (2006), festivals help preserve local resources of intangible and distinctive ethno-cultural heritage and have an impact on the application of sustainable development Rein, Kotler & Haider claim that successful festivals can help recreate the image of a country or contribute to the exposure of a location, thus trying to place it on the tourist map (1993). Likewise, this was also emphasized by authors Luong & Nguyen (2025).

In this case they tend to increase the attractiveness of the destination and in most cases, they do. There is a wide range of types of festivals, including: food, theater, dance, music or a combination of art forms. In Kosovo, little was known about the absolute and relative sizes of these types until recently! They can range in size from small (community) to large music festivals with over 100,000 participants (Davies, 2020). Mintel (2019) offers an example that helps illustrate the significance and rise of festivals, particularly in the period after COVID-19 pandemic. He claims that music events generate £17.6 billion for the UK economy, and that attendance at music festivals has grown by about 22% in recent years, with 57% of participants choosing to join these tourist activities over European annual holidays. What is the history of festivals in Kosovo, and how long have they existed? Were festivals in Kosovo serving to enhance and recreate the country's image when they were being held, as it was the case with the study of Rein et al. (1993)?! As previously said, the motivational effect of festivals in drawing tourists and visitors varies, as does their overall socioeconomic influence. Since the study field has yet to provide clarification on this, we decided to establish a distinct objective for this study. Addressing the geographical question is another goal: Which regions in the area had the most notable festivals taken place? The purpose of this article is to inform the reader about the missing impact of the contribution that festivals have played over the decades.

LITERATURE REVIEW

There is a wide debate about the definition of festivals. Despite the differences, something seems to unite them. According to Négrier et al. (2013), festivals are defined as events limited in time and space which develop a specific artistic project and take place at regular intervals of time. In recent years, local festivals have become an increasingly popular tool for developing tourism around the world (Felsenstein & Fleischer, 2003). Over the years studies show that festivals and events have long served as tourist attractions and influenced the development of places as travel destinations (Quinn, 2009). Festivals and events have a long historical trajectory and embody the traditions of different areas. They have flourished again in the contemporary society, after a decline from the mid-20th century onwards (Boissevain, 1992). Festival writers have given different opinions on their strengthened repositioning. For example, Prentice & Andersen (2003) argue that a lot of demand factors, like the need for socialization and leisure time, help festivals grow, whereas Getz (2008) thinks that the move toward experiencing consumption is what drives the growth of festivals.

According to Smith & Jenner (1998), the main reasons for the popularity of the local festivals (as a means for promoting tourism) are that festivals boost the demand for local tourism, ehich is in line with Rein et al. (1993) cited in the introduction. The evidence presented by Potecnik Topler, in her study, *Svenica* near Maribor, as well as other cases like the *Grossmann* case in Ljutomer and the *Solzic* festival in the village of Kotlje, is also very explicit (2021). Small events like the festivals mentioned above, as well as other instances, she claimed, demonstrated the influence on the rise in tourist flows, which had a major economic impact. A similar pattern is evident in the list of tourist motivations for a Middle Eastern country, as illustrated in the case of Jordan presented by Allan (2025).

Festivals are being examined in many different sciences since they are a rapidly evolving phenomenon. Given their significant contribution to the growth of tourism, a thorough examination of festivals within the context of tourism geography is crucial. Traveling to various destinations to visit a festival can be treated as a special type of tourism called festival tourism and as such has a substantial impact within the tourism space (Cudny, 2013). He asserts that travelers want to experience unique events, connect with like-minded individuals, and broaden their knowledge of the world. On the other hand, Quinn (2009) asserts that festival attendees are more drawn to the exotic culture showcased during the events than to other elements. In a geographical article by Cudny (2011), festival tourism is treated not only as cultural tourism, but also as urban and rural tourism, while tourists who travel to attend festivals should be called festival tourists (Cudny et al., 2012). The authors referred to the process and its impact as festivalism. When one looks at the evolution of festivals over the years and decades, it is easy to see how the suffix “ism” (festival-ism) conveys the sense of the process. As we discussed in the literature, its dynamics were inconsistent but tended to increase in recent decades.

Without a doubt, festivals provide both material and spiritual benefits. These are settings that offer chances and opportunities for performances of many genres. Festivals frequently open doors that would otherwise be inaccessible, particularly when it comes to intangible advantages. On the evening of August 9, 2024, in the northern city of Kosovo, I was standing in Martyrs' Square (Sheshi i Dëshmorëve) in Podujeva, where a folklore group from distant Mexico gave their first performance in our city (among the nine participating countries). The third edition of the Newborn Kosova Festival (NKF) (Podujeva, 2024) brought these groups together, enabling this intercultural affirmation that is hard to achieve in other ways. Of course, Mexico and its culture are far from the typical perception of the many residents of this small town. The literature presented here and in the Introduction section makes it clear that festivals are multiplicative in all respects, including their type, influence, and historical origin. Festival tourism modifies the physical, social, and economic features of a place, which is why festivals are a subject of study in the geography of tourism (Cudny, 2013) which is precisely we have undertaken this study. He claims that festivals are currently growing dramatically and that festival tourism is becoming more and more important in Central and Eastern Europe. Our study has the potential to demonstrate this, and the findings should support this. However, this issue has not received any special attention from researchers, not even those that represent the geography of tourism (Cudny, 2013). An effort is being made to contribute to this path with our research [this paper (I) and the section on the characteristics of tourists at Kosovo festivals (forthcoming paper II)], as well as other

studies from countries in the region like Hungary, Vojvodina, and Slovenia (Pavluković et al., 2019); (Potecnik Topler, 2021). The most varied forms of tourism are those that have drawn the greatest attention in postmodern society, including cosmetic tourism (Corbisiero & Monaco, 2017) Although it appears to be a new phenomenon in the study region, festival tourism has already proven to be sustainable in countries with more tradition in this regard.

Schuster (2001) has emphasized that festivals arranged as urban ephemera boost the economy by bringing attention to locations, their institutions, and their products while drawing in flows of tourists, money, and domestic investment. For many Western cities, a key motivation in developing festivals and event strategies was recovering from long-term economic downturns. But this is not easily achieved. For this reason, according to Cole & Chancellor (2008) cited by Jeon (2020), festival organizers face a challenge to design unforgettable experiences to attract visitors who return year after year. This study will shed light into one of the challenges faced by festival makers in Kosovo.

METHODOLOGY

Due to its complexity, tourism frequently necessitates the application of multiple scientific research methodologies. This is consistent with Lindsay's (1997) recommendatios that the methodological requirements for scientific study in human geography—more specifically, the geography of tourism—should be addressed. The institutions of the Republic of Kosovo have failed to produce statistics for certain and specific segments of cultural, social and economic life in the country; therefore, the need for primary data became a requirement for our research. The study of festivals was completely lacking, thus the selection of methodology was based on the experiences of international studies (Pavluković et al., 2019; (Potecnik Topler, 2021) and partially on local studies (Humolli et al., 2023). Each research method has its advantages and disadvantages (Overall, 2019). By choosing a qualitative method, we would not only fill statistical gaps in the country but also deepen our knowledge about festivals, their connection to tourism, and their impact on the local community and beyond. The primary methodology used in this study was semi-structured face-to-face interviews. They were carried out with individuals deemed capable, sometimes the most capable, of the festivals we spoke with. Before we even started the research, our expectations regarding the number of festivals were hypothetical but never accurate and reliable. From reviewing the literature and especially the media coverage of festivals whenever they were held, we came to the conclusion that there were more than 100 festivals in Kosovo. Due to the widespread use of social and public communication techniques, it is now simpler to obtain information and use it to produce a list of festivals that will be the focus of interviews.

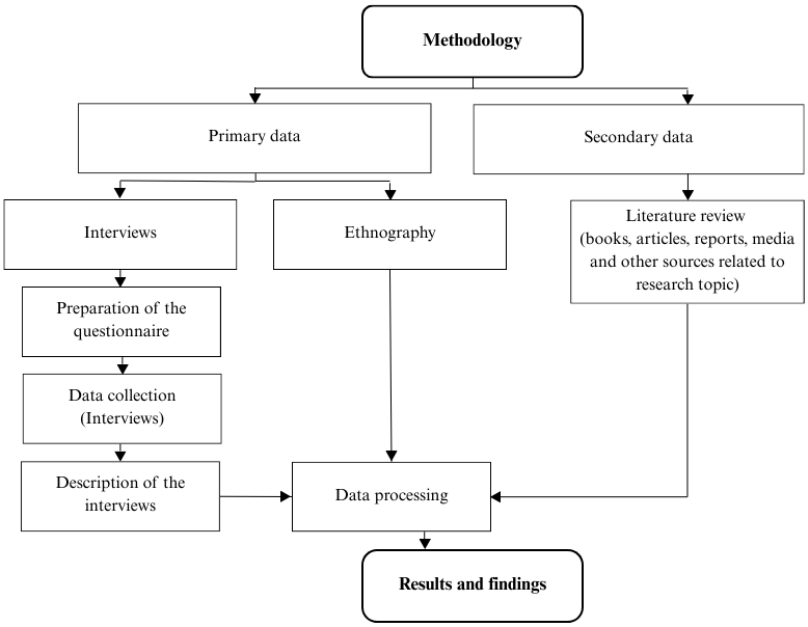

Figure 1. Research Methodology Flow Chart

In light of these findings, we carried out eighteen interviews. The sample covered the entire study area geographically.

They were carried out throughout two time periods (2021–24), with some of them (interviews) taking place in both. Representatives from both the most well-known festivals as well as other less known festivals were deliberately chosen for the interviews. The selection also applied thematic criteria, including most types of festivals in the interviews. The interviews were conducted with key personnel responsible for the festivals. The interviewees were audio-recorded with their consent, and the interviews lasted approximately an hour. The interviewees agreed to be publicly identified, so with their permission we have shown their authenticity. All interviews have been transcribed, and their results are reflected in this paper. Close familiarity with festivals, sometimes as a direct panelist, such as at two of the most well-known in Kosovo, *Hardh Fest* (Humolli, 2018) and *Etno Fest* (Humolli, 2021), doctoral studies (Humolli, 2015), and other study visits, such as at *NBK* and *Doku Fest*, also made it possible to implement the ethnographic method. Overall (2019) states on page 66 that this also made it possible to observe the behaviors of the participants in the research area. The review of international and local literature accompanied the study, confronted experiences, and brought out convergences and divergences in this study. Other data from

alternative sources, even quantitative, fulfilled the purpose of the study and assisted the main method. Professional GIS (ArcGIS Pro 3.4) and statistical (SPSS and Excel) software were used for the presentation, processing and display of data.

RESULTS

1. The number of festivals - active and passive festivals, their distribution and their types in Kosovo

1.1 Active and passive festivals

Festival numbers show two situations: **a)** *the first ones (passive festivals)*, while **b)** *the second ones (active festivals).*

Together, they **(a+b)** symbolize all of the festivals that have ever taken place in Kosovo.

For a variety of reasons, festivals that have not taken place in the past three years—2021–2022, 2023—are considered passive or perhaps defunct. Examples include *Skena UP*; Festival *Akordet e Kosovës*; *Prishtina Jazz Festival*; *PoliFest*; *VideoFest*; *KosovaInFest*; *Prishtina Kids Fest*; *Festivali i Letërsisë dhe Ditët e Diasporës*; *Festivali i Bukës*; etc. The main reasons for their extinction were the lack of sufficient funding for their organization, socio-political changes (the transition from a centralized to an open system), the historical impacts of Serbian pressure in the period 1990-1999, etc. [(All interview); (RTK, 2024); (Humolli, 2024a); (Humolli, 2024b)]. Out of a total of 146 festivals that were identified, 26 of them were passive festivals (i.e. about 18% of all festivals ever organized in Kosovo). For many, as for us, defining festivals that were not held for a period of time is a challenge. We classified them as passive festivals because we were unsure that some of them will reappear in the future (like the Prishtina Jazz Festival.)

Active festivals are those that have been held for years, in a continuous-traditional manner (annual or periodic) by securing self-financing funds from various donors (both foreign and local). Based on data from a variety of sources, including interviews conducted between 2021 and 2024, MCYS (2024), MUP (2025), Kult Plus, 05.01.2018 (2018); Eurovoix (2024), Kosovafacts (Dema, 2024), and others, the study determined that there were 120 active festivals overall.

Only a few are being mentioned because of the nature of the work: *Doku Fest*, *Etno Fest*, *Hardh Fest*, festivali *Anibar*, *Green Fest*, *40 Bunar Fest*, *Ngom Fest*, festivali *Flaka e Janarit*, festivali *Rising Stars*, festivali *Thes Ari*, festivali *Anadrinia Jehon*, festivali *Hasi Jehon*, *PriFilmFest*, *Festivali i Arkitekturës*, *Festivali Mbarëkombëtar i Teatrit*, *Cicërrimat buzë Ibrit*, Festivali *Sunny Hill* etc. A specific group of active festivals were also *periodic festivals* which are held every 2, 3 or more years. One such case was the *Bienalja* festival in Prizren which is held every two years.

1.2 The extent of festivals and their number by municipality

Based on information gathered from a variety of sources (as in the aforementioned paragraph), it is estimated that the capital city of Pristina hosted almost half of the festivals that took place in Kosovo (61 of the 146 festivals, or 42% of them). Prizren has the second-largest number of festivals after Prishtina, followed by Ferizaj, and so on (Figure 2). In both states, these cities continue to hold the primacy for both active (current) festivals and the list of all festivals (passive + active).

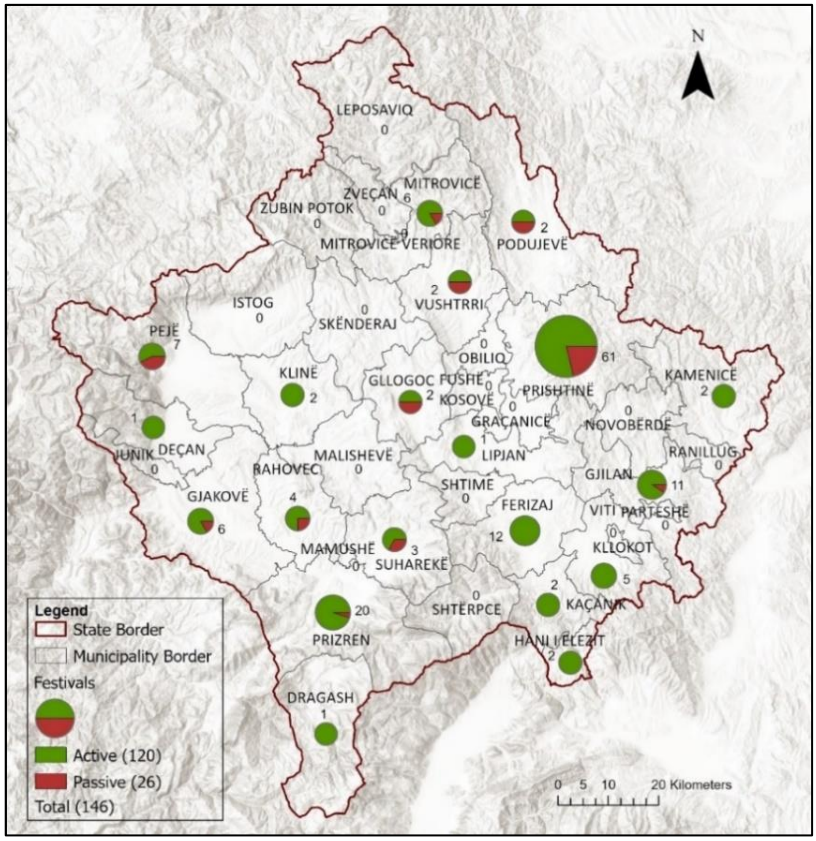

Figure 2. Number of festivals (active and passive), by municipalities in Kosovo (Source: Interviews (2021-2024); MKRS (2024); MIA (2025); Kult Plus (2018); Eurovoix (2024); Kosovafacts (Dema, 2024) and the authorial data collected over the study period of 2021-2024)

1.3 Types of festivals

The findings confirmed that Kosovo hosts a variety of festivals. Several literary works, including (Davies, 2020), differentiate them as follows: literature, music, theater, film, and cuisine. This model was used (Figure 3).

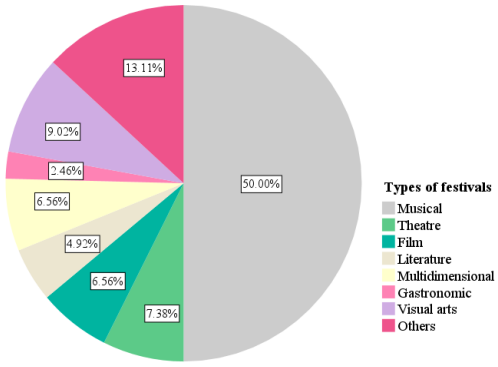

Figure 3. Types of festivals and participation by type of active festivals in Kosovo

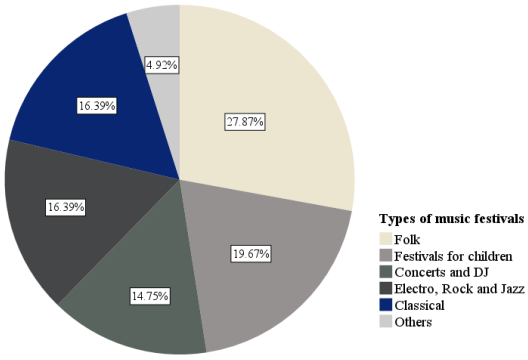

Figure 4. Types of music festivals in Kosovo

The data indicates that music festivals (50%) make half of all festivals held in Kosovo. Visual arts festivals are in the second place with 9%, followed by theater festivals in third place, 7.4%. Additionally, there are a variety of music festivals (Figure 4). Each of these categories has a distinct audience, function, and significance. In addition to being the biggest event category in Kosovo, this festival category is also a major draw for tourists and visitors (based on interviews). From year to year, they have seen an increase in both domestic and foreign visitors. The most popular music festivals are those for adults that feature live performances by artists and primarily focus on folklore (17 festivals). Our research revealed that 12 children's festivals (19.67%) come after them, with the municipality of Gjilan hosting the most of these.

2. The impact of festivals on attracting tourists to Kosovo

Kosovo offers a wide range of opportunities for both domestic and international travelers interested in nature-based and cultural tourism (Gashi, 1977; Humolli, 2015; Humolli et al., 2023). This study also looked into particular aspects of the potential for tourism attractions, such as festivals, in order to deepen the research. We brought up the topic of why visitors travel to Kosovo in our questionnaire and addressed it directly. We also wanted to know if visitors are: **a)** there just for the event itself, or **b)** they have other plans and the festival becomes an additional motive?! Our respondents acknowledged that the two categories of tourism resources—natural and cultural—were the base for the motives why people came to Kosovo.

They listed mountain tourism as one of the natural motives, stating that *hiking* and mountain tours, particularly in the *Albanian Alps* and *Sharr Mountains*, have attracted the most attention to date. Since Kosovo mountains are beautiful in all seasons, the tours were conducted all year round. However, during the summer months, when the majority of the festivals in Kosovo take place festivals serve as an additional motive for tourists to visit the country (Interviews and other alternative sources). The summer season is also the period when expatriates come on vacation, more than at any other time of the year. As the results demonstrate, Albanian expatriates had a strong interest in festivals and appeared to be a very loyal audience for them. As an example, the first interviewee highlights that *Kosovo is a new country that has not been visited before and that travelers are ready to see new areas every time* (Interview I, 2021) as the reason why tourists travel to and choose Kosovo as a destination. According to the same respondent and every other one, *Kosovo is another opportunity for tourists, a different culture, and it has other traditions compared to other countries*. Additionally, there are several natural beauties that attract tourists to visit Kosovo (All Interviews 2021/24). Only Prizren demonstrated differences in this aspect, as the primary motives were nearly exclusively cultural. *The city has a historical area, it has a fortress, and also a considerable number of festivals that take place throughout the year, and it also has proximity to Prevalla as a destination with natural motives and to the other mountainous area of the Sharr Mountain and Park*, according to the majority of respondents, who list the motivating-attractive reasons why Prizren presents this difference.

With respect to the degree of motivation and influence of festivals, the interviews enabled us to differentiate between those that have a *higher* potential for directly attracting tourists and those that have a *lower* potential.

Everyone agreed that a large number of tourists come exclusively for these festivals: **a)** Doku Fest Documentary and Short Film Festival, **b)** Anibar Animated Film Festival, **c)** Sunny Hill Music Festival, **d)** Hardh Fest Agro Festival, etc. Prior to the organization of the *Etno Fest* festival, Kukaj was an abandoned village with just three houses and was unknown to most people in Kosovo. According to Interview VII (the festival director) and Interview XVIII (community members), *tourists have visited and will continue to visit this village because of the values it provides to the public and media, while also taking in the natural beauty of this tourist and cultural oasis* (2021).

3. Stages of festival development and their features

Three questions have been put forth in line with the goals stated at the beginning of this research. **First**, "How do you see the past development of festivals in Kosovo from your experience and memory?" In this study, we aimed to learn more about the historical development paths and the time of oxcillations that accompanied festivals in Kosovo. In an effort to find as much data as possible and to find an acceptable line for periodic division of festivals, public sources from television media, radio, newspapers, etc., were also examined. But we also brought up this matter for treatment in all of our interviews (all interviews), and as a result, a conclusion has been made that festivals should be divided into three time periods:

I. the years 1970–1990, when they first started and when they underwent a highly favorable development;

II. the years 1990-1999, a period of regression caused by the police and military pressure of the former Yugoslavia, namely Serbia, at that time, which led to the war (1997-99);

III. the years 1999-2024 (present), the period of resumption (recovery). A higher number of festivals were associated with the emergence of democracy, the removal of political and security pressure on a national basis, the opening up of new and some of these festivals, as previously noted, proved successful. According to numerous sources, Kosovo had a number of traditional festivals during the first period (1970–1990), including: *Akordet e Kosovës*, *Kosovarja këndon*, *Zambaku i Prizrenit*, festivali i folklorit *Gllogovci*, *Festivali i Teatrove Amatore* në Ferizaj etc., funded mainly by *Sekretariati Krahinor për Arsim Shkencë dhe Kulturë* (the Provincial Secretariat for Education, Science and Culture), (Interviews and Others) and they continued to operate in this manner until 1988/89. This was the stage at which the interviewees pointed out a noteworthy accomplishment in the festivals' development. They highlighted the various factors that contributed to the success of the festivals, such as: **a)** *the lack of access to other creative organizations at that time, which rendered them uncompetitive;* **b)** *there were only a few festivals, each of them had a sizeable audience;* **c)** *there were few televisions (two - three channels) and the entire public was mainly entertained by them, by what the state broadcasted;* **d)** *there were not many private initiatives at that time etc.* In contrast, a lot of festivals were established during the third phase (1999–2024). Some of them soon ceased to exist in the lack of serious artistic and managerial platforms (programs), according to the interviews (Interviews VII, VIII and IX, 2021). In contrast, some serious festivals, like *Doku Fest, Etno Fest, Piano Fest, Hardh Fest*, etc., have managed to survive and grow significantly, enhancing the country's cultural landscape and fostering the development of tourism (Interviews VII, VIII dhe IX, 2021). But there were also festivals that maintained their artistic value, such as the *"Zambaku i Prizrenit"* festival, but which was never strengthened as it was before. This passed into the administration of the Municipality of Prizren, and it seems that the lack of dignified organization of the festival has caused its prominence and reputation to fade so much that it went from being one of the top festivals in the country in the 70s and 80s, to falling into a completely provincial festival with no current social impact (Interviews VII, VIII and IX, 2021).

Second "What elements contributed to some phases having a bigger or smaller audience, and why? What qualities help you identify those phases?" Most of the interviewees responded that the last five years have seen a larger audience. According to some, this is related to budgetary support from donors. The study results in a conclusion that the main donors to festivals in Kosovo are the local and central governments. They claim that *having a higher budget allows for a wider range of festival activities; you can invite more well-known artists; and the like, and all of which, according to them, have an effect on the growth of the audience*, part of which is expected to be tourists. The interviewees also noted a simpler division of festival-making into **pre-war** and **post-war** (before and after 1999). However, some respondents consider the post-war phase as an additional opportunity compared to the past. They claim that *as a result of the increased number of festivals, there are now more chances to attend one or perhaps join the professional team. Before the war, you had to be brave to attend a festival before the war, particularly during the Serbian regime (mostly 1989–1999), and more importantly to be a member of the professional organizing team* (Interview III and VI, 2021). According to those surveyed, while the emergence of democracy had brought about greater freedom of opportunity, it also resulted in less funding options, which was a challenge for all festivals (All interviews).There were festivals that took their approach and program more seriously. *It became necessary to invest in bringing in international music names, and as a result, the festival started to grow after 2015. It also made its way into the international media, with numerous media in France, Italy, and other countries that writing about the festival. As a result, this festival has advanced to a higher level* **(**Interview V, 2021).

a) Regarding the increase or decrease in the number of tourists at specific stages of the festival development, which was considered in the first question, the answers are summarized. All respondents claimed that they have had an increase in audience from year to year, excluding the years of the pandemic 2020-21. According to FEMART, the connections that are made with artists worldwide are expanding and networking (Interview IX, 2021) which then "translates" into increased public interest in festivals. In justifying the success and explaining the cancellation of some festivals, Mr. Hysa states: *the audience of a festival is created by the concept, quality, professionalism and consistency* (Interview VII, 2021 and 2024). *With them, festivals move forward, otherwise, they leg behind.*

b) "Do you believe that more could have been done for festivals in general by local and central institutions in the past? This was the second question we posed to the interviewees. On this point, the interviewees were almost unanimous. They say that institutions can help through financial and physical capital, logistics, media, professional support (with cooperation and strengthening of ideas), etc. In general, most of the interviewees responded that they *are not satisfied so far with the support provided by local and central institutions.* The financial support they received was in the form of subsidies, which is far from sufficient for the organization of festivals and especially for their sustainability.

The representative of *Anibar* during the interview emphasizes that *the municipality of Peja has provided more than financial support*. He notes that Anibar has a 15-year agreement with the City Cinema to host their animations festival and this saves funds for renting or building the cinema, which they use for other artistic and creative purposes of the festival (Interview II, 2021). While the same people emphasize that more financial support translated into more opportunities for human resource development and similar. The *Hardh Fest* interviewee holds a distinct perspective (Interview V, 2021). He maintains that festivals should not be reliant just on institutional factors but should find different ways of generating their own income, regardless of the support from the Ministry of Agriculture, Forests, and Rural Development (MAFRED) and Ministry of Culture, Youth and Sport (MCYS) (Interview V, 2021). In this regard, Gondos emphasizes that through the revenue generated, in the form of various taxes, festivals can stimulate the growth of the country's economy (2014). The Etno Fest interviewee claimed that the institutions like MCYS, MAFRD, and the Ministry of Diaspora could have done

more, particularly for certain proven festivals that would have a direct or indirect impact on the development of cultural tourism in certain communities (Interview VII, 2021). According to the interviewee from the Ferizaj *Theatre Festival*, most festivals in Kosovo regrettably suffer with financial concerns. He further states: *there are no long-term policies, i.e. there are no long-term agreements between festivals and institutions that would have ensured funding for at least 3 to 5 years, so that the festival would no longer have doubts about funding* (Interview XVI, 2024).

Third, why did some festivals end, and do you believe they should be revived? The study enabled the identification of many defunct festivals (also mentioned above). Some of the interviewees felt that discussing other people's festivals was inappropriate, as in interviews XII-XVII (2024). Some of them think that there is no need to revive festivals that have not been held for several years. According to them, it is better to support currently active festivals in order to keep them from deteriorating further. For them, Mr. Salihu emphasizes, *'festivals that have had a long break, it is better not to return. They should remain as an originality that has ended and as a healthy memory of ours'* (Interview XII, 2024). Most of them agree that various reasons contributed to their extinction. Initially, the old festivals were part of state institutions of the socialist state, but as politics changed some of them fell, never to rise again. However, after 1999, some of them disappeared after only a few years of operation. As stated by those interviewed, the reasons include: *lack of organization, a non-serious program, lack of consistency, institutional ambiguity expressed in a lack of visionary strategies and concepts ect.* (Interview VII and XII, 2024). The first festival in Kosovo "Akordet e Kosovës" founded in 1969 never returned since 1995 (Kultplus, 05.01.2018). Radio Television of Kosovo (RTK) established the "RTK Song Festival" in 2023 (RTK, 2024) through which it aims to participate in the 2025 Eurovision Song Contest. But RTK and Kosovo in general failed to restore "Akordet e Kosovës", an iconic name with a sensational history that was owned by Radio Television of Pristina, the public predecessor of RTK. We brought up this festival as a historical fact to attest to the agonizing experience of the first festival in Kosovo and to highlight the fact that all six of our interviews, without exception (Interviews XII-XVII, 2024) spoke of the festival's tragic ending. In contrast, it seems that the Ferizaj festival fared than this one. One such instance is *Kosovarja këndon* (1972), a festival dedicated to the emancipation of Albanian women and the preservation of folk songs. The interviewee from the *Fer Film* film festival told how, with the great efforts of art lovers, this festival, together with the *Recitators festival,* was included in the national list of protection as spiritual heritage by the MCYS (Interview XIV, 2024).

4. The current state of festivals, problems and prospects

Regarding the third objective, the interviews were mainly focused around two main questions.

I.“How do you assess the state of festivals in Kosovo today and are there enough festivals in Kosovo?"

There are more significant differences amongst the interviewees in this case than in others, and several of them showed dualism in their responses. In comparison to the past and the circumstances that surround or make up the creative environment, it is generally believed that the state of festivals today is good. Based on these factors, the interviewers (II - VI, 2021 and XVII, 2024) believe that the situation with festivals in Kosovo is good. Unlike them, other interviewees believe that while Kosovo has certain nice festivals, their general state is not good. Given that they are sponsored by insitutions, primarily cultural ones, their performance is questionable, they should be of higher quality (Interview IX, 2021 X and XII, 2024, etc. More evaluation criteria are needed for institutional supervision and subsidization (Interviews XI, 2021 and XII, 2024). Some respondents in its continuation made it apparent that they were concerned about something that we, the authors, have also observed through etnographic evaluations based on our attendance at a number of festivals in Prishtina, Podujeva, Prizren, and Ferizaj. Two issues are brought to light by the concern: a) it appears that festivals are copying each other's programming, and b) a significant number of festivals fail to justify their purpose; thus, this number illustrates the problem of program copying, possibly even without intent but due to a lack of originality.

As we noted above from the interviews, this is also a result of inadequate institutional controls of central and municipal bodies (XI, 2021 and XII, 2024). However, the *NKF* founder asserts that this also calls for increased administrative and professional-creative responsibility as well as self-criticism. According to him, the *NKF completed its third edition, but it took them ten years to convince themselves that this initiative was necessary, appropriate, and beneficial to Kosovo society* (Interview X, 2024). Furthermore, the interviewee (XIV, 2024) believes that festivals should have a specific mission. Thus a festival should ne thoroughly examined before being established; otherwise, it is quite painful for a festival to disappear after one or two editions, as has happened in certain cases. The interviewee (XVI, 2024) raises the dilemma that some events do not deserve to be called festivals. He claims that this term is misused and that more professional evaluations are required for their purpose and continued existence.-We raised the issue of whether Kosovo has enough festivals, and the interviews expressed similar concerns. Their initial concern was the large number of of festivals (Interview VII, XI and XII, 2024). Due to its small size and population (about 1.6 million people as of 2024) (Bajrami & Semini, 2024; KAS, 2024) it is not estimated that many festivals are necessary, and during the season, there can be over five of them in a single week (Interview XI, 2024).

This amount harms the state budget and other festivals that may benefit less as a result of the allocation of budgets dedicated to them.This means that festivals with non-serious programs and a lack of sustainability get their share, which could be used for real festivals in other situations (Interview XVI, 2024). Concern about the large number of festivals and the suspicion that this number has increased especially in the last 4 or 5 years are also expressed in interviews (XI and XII, 2024) and partly in interviews (VIII, 2024; IX, 2021 and XIV, 2024). They justify the existence of some festivals with the financial benefits they receive from the ministry or even the municipalities. The values, mission and method of implementation, according to them, are questionable. According to the Femart festival interviewees, there should be high-quality festivals among the many that are present, even though they believe the number is adequate. The interviewees highlight that, in terms of quality, roughly 8–10 festivals have succeeded in making a name for themselves in the creative

scene and benefit from their social impact, which in this case is most noticeable in terms of tourist flows but also has an impact on the local economy, society, and culture (Interview VIII and XVI, 2024).

II. "What are the current problems without which the festival would run better overall?"

Interestingly, at this point more than 88% of those interviewed prioritized *the need for additional funding*.

Others (less than 2%) think that the lack of ideas is essential (Interview XVI, 2024), while for the *Hithi* festival, the main problem was the space (venue facilities) that they were currently improving (Interview XIII, 2024). Other problems that festivals faced were the lack of presence from public figures such as ministers and the like, especially before 2020. Through them, direct lobbying is done for other citizens on the importance and interest in the festival (Interview IX, 2021). Next, the lack of promotion from televisions —particularly on public television—was emphasized (Interview VI and IX, 2021). For Mr. Salihu, *the law on cultural sponsorship needs to be better understood*. He claims that it currently represents an opportunity that could have, in another way, made it easier for festivals to operate more effectively and ensured more stable funding (Interview XII, 2024). Until early 2024, the visa regime *has prevented free movement,* especially for festival organizers, from being more current and more collaborative with their European hosts and not only (Interview II, 2021).

5. The economic, social and cultural impact of festivals on the community and beyond

The study looked into cases and came up with some interesting results. They are, in our opinion, significant markers that demonstrate the potential benefits of festivals. Naturally, the reader can see that there can be significant differences across festivals. However, the examples of some festivals that have achieved success—particularly in terms of sustainability and duration—were good models for understanding the broader economic, social, and cultural significance that festivals have contributed. *Etno Fest* was a small, straightforward, and an easily understood case. Based on the narrative from Interview VII (2024), Kukaj had just three houses in 2010—the year before the first event. About thirty houses used to be in that community, but they had been abandoned over time (Interview XVIII, 2024).

The director claims that the slowing of the emigration trend was the first beneficial outcome following the first edition in 2011. *Actors, doctors, authors, and artists began purchasing land and building houses as early as the first year. He claims that the cost of land and properties has risen tenfold since then, and that the number of purchase requests has also increased* (Interview VII, 2024). When asked about the motivations behind these real estate purchases, the village resident and ownder of the restaurant "Oda e Dautit" stressed that they chose to purchase houses and land after visiting the town for the festival and noticing its peace and quietness (Interview XVIII, 2024). The second effects encouraged the activation of primary activities. The remaining residents in the village began to get involved in the work of organizing the festival, edition after edition. They began to cultivate more land and increase the number of livestock for the needs of the festival staff and visitors (Interview VII, 2024), especially since the festival includes within its program the part of ethno, agro-traditional activities. In addition to the restaurants like "Oda e Dautit", some created guesthouses, paid parking during the festival.

In the study on festivals, we interviewed the representative of *Etno Fest* twice (2021, 2024), in two periods of time. According to him, the number of visitors reached up to 1,000 per day. With the festival lasting ten days, the number of visitors (some of whom were tourists) reached 10,000. This number has also contributed to the creation of diffuse effects (third effects) of the social and economic category. *The growth of the festival from year to year also affected the surrounding villages, which are present with their agricultural, craft and similar products and services, in the preparatory work of the festival and further, in meeting the demands during the festival days, said Mr. Hysaj* (Interview VII, 2024). He also underlined that more and more commercial partners—known in the neighborhood—want to advertise their services on the festival grounds as suppliers, cafés, street vendors, etc. Additionally, these diffusion effects led to social improvements in the number of volunteers, which Mr. Hysaj estimates to be between 15 and 20 (Interview VII, 2024).

The effects of the festivals were, for the most part, more subtle and varied greatly in other situations. Although the NKF festival appears to be highly promising, the director found it difficult to perceive any measurable impact coming from his festival (Interview X, 2024). The *Ulpiana Fest* festival had an even less obvious effect. Ms. Gjonbalaj (Interview XI, 2024) underlined *that aside from a rise in circulation, no significant social or economic effects were seen*. This is particularly true given that the festival was held at Ulpiana, an ancient site that is entirely remote from other settlements and commercial centres. The festivals like the *Hardh Fest* in Rahovec and the *Doku Fest* in Prizren also have a big social and economic impact. They already have a strong reputation on the festival scene, both nationally and internationally. The cultural factor is among the most basic elements that gave rise to the concept of organizing festivals. According to *Etno Fest* representatives, this impact on their festival is measured through several indicators that have emerged for them, such as:

- the increase in the number of visitors/tourists is not accidental but is directly related to the popularity of the ethno program, which the festival has provided over the years;
- increased interest and presence of public and private media, television and print;
- increased coverage and sharing of festival activities on social networks;
- increasing the number of activities, quality and diversity of the program (*theater, concerts and ethno performances, archaic rites and modern performances, exhibitions, debates and book promotions, traditional cuisine, museum activities, exploratory activities, creative workshops, ethno-news, relaxing-recreational activities*...);
- Increasing age diversity with a growing trend towards the younger age group.

The cultural influence that the *Doku Fest* festival has had over the years is evident. In the summer of 2013, the festival allowed for a return to tradition by bringing back cinema, which had been out of business for over 30 years (Doku Kino) (Interview VIII, 2021). Other cinemas had also opened, and she claims that Prizren has more cinemas per person in Kosovo than any other city. The *Doku Fest* festival had a significant worldwide influence on the short documentary film industry. From the interviewee, we learned that *Doku Fest* has gained international recognition and certification by BAFTA (British

Academy of Film and Television Arts) (Interview VIII, 2021). With this growth, it has become artistically pleasing, thus attracting foreign tourists as well as local visitors. Mr. Grajqevci from *NKF* explains that the cultural impact of this festival can be explained in several ways. According to his testimonies and other publicly available information regarding the festival in question, this is understood [(Interview X, 2024; (FIDAF, 2024); (Festival, 2023)]. *First*, it's one of the few festivals that features national ethno-cultural folk performances from not just Europe but beyond it. *Second*, the festival is part of FIDAF-Kosova, a significant global organization for dance and culture in general. *With Kosovo's membership in it, it became possible for our festival to be more attractive to different artists and other groups. This is due to the desire for international representation and recognition within the FIDAF Kosovo community* (Interview X, 2024).

Meanwhile, for Ms. Gjonbalaj (Interview XI, 2024), the organization of the *Ulpiana Fest* festival *has contributed to the cultural life in the country because it has given people an idea of how cultural heritage assets can be utilized. Our festival is intentionally held in the archaeological park, not because it is the best location because it lacks basic infrastructure, but rather to give another message of attracting people to sites of national and international importance, such as Ulpiana.*

DISCUSSION OF RESULTS

This study supports the already well-refined theory, also presented by Boissevain (1992), emphasizing that festivals re-emerged in the first decades after World War II. The study shows a delayed temporal correlation as it was proven that in Kosovo there were festival performances rather than re-performances as it was the case in other European countries and beyond. Furthermore, the results showed that for the same period, about half a century from now, there were different oscillations in the development of festivals. The study showed a correlation between the rise/fall of festivals and political and socio-economic developments in Kosovo. Although these political developments in the Western Balkans were ... even bloody (we recall here the events of 1989-91 and 1997-99), they consequently caused significant disruptions to festival activity. This was supported by empirical results (All Interviews) and other sources such as (RTK, 2024). Later (after 2000) a revival began, expressed less in old festivals and more in new festivals, and as the research study showed, their number increased to 146 (2024). The findings showed that certain festivals, such Hardh Fest, Etno Fest, Doku Fest, etc., raised the demand for local tourism, which is consistent with the theoretical explanations examined here, such as Smith & Jenner (1998) on the factors contributing to popularity of festivals. Based on Interview VII (2021/2024) and Interviews V and VIII (2021), the rises were consistent and favorable year after year. In recent years, festivals have become a global phenomenon and a tool for the development of tourism (Felsenstein & Fleischer, 2003). Our study is in line with Cudny's (2013) state, who claims that festivals are growing significantly in Central and Eastern European countries and that festival tourism is becoming increasingly important. The same has happened to countries in Southeast Europe, such as the Republic of Kosovo. The findings of this study helped to understand that indeed positive developments with festivals have followed (in the case of Kosovo), mainly after 2000. Our research on these trends indicates that there are more festivals and that some of them are of higher quality. They do not support the idea that the collapse of the preceding political and economic system (communist/socialist) is a necessary condition for the success of festivals, nor did the study purport to do so.

More information about the writers' stances and contributions that highlight the significance of festival studies is provided in the Literature Review and the Introduction. Cudny (2013) demonstrated the deficiency of geographical-tourism studies, as our study asserts, and so emphasized the significance of achieving outcomes in this area of research.

Therefore, *maximizing positive effects on the local environment, culture, and history while minimizing negative ones is the aim of cultural heritage tourism*, as Potecnik Topler (2021) states in his declaration. Reflections on the possible advantages of hosting festivals have prompted authors to offer well-informed views on what constitutes a benefit. According to these beliefs, this study found that festivals have a positive impact on the tourism in the following ways: attracting tourists, enhancing and marketing the country's image, and helping the local community. The results of these influences are listed as separate points in the above section. The findings based on existing evidence, adopted in the methodology of this study, contributed to the creation of convergences as well as divergences, within the theory of this field. They present an important, completely new and unfortunately unaddressed insight into festivals in Kosovo. The study has helped form the argument that the destination image improves and reaches an incomparably better level, but by no means in all cases. The findings were based on: **a**) interviews (Interviews VII and X, 2024; Intervistat V, and VIII, 2021) etc., **b**) methodological-ethnographic stances (twice in the summer of 2024 at *Etno Fest*, at *NKF* also in 2024, **c**) as well as participation in thematic presentations as professional staff, at *Etno Fest* (Humolli, 2021) and at *Hardh Fest* (Humolli, 2018). They demonstrated how festivals can help create or improve a country's image (e.g., *Hardh Fest, Doku Fest, Sany Hill*, etc.) and create an image (e.g., *Etno Fest*). This is similar to the views of Kotler, Haider, and Rein, who have shown that successful festivals can help re-create a country's image or help put a place on the map of tourists (1993).

Our study took a long time and the authors were involved in it. From this we learned, interviewed, saw and heard a lot about them (festivals). As the results show, their number went to 146 (120 active). Is this number a sign of achievement or is it just a numerical display that does not present enough? It is not a comprehensive study. The current study will be followed by the second half of the results, which is mentioned in the section on literature review. But our studies, despite their limitations, have managed to provide evidence that a number of festivals are indeed organizations that represent little of what is expected, representing numbers rather than value. Remembering Bonet et al., 2013 festivals are characterized as time- and space-limited events that develop a particular artistic project and occur on a regular basis. Not completely, but in part, our findings run counter to this definition. Our research revealed 20 festivals that are no longer in operation, as mentioned above. Given these issues and the results of interviews like Interview XVI (2024), it was concluded that several of them were started just as a fad to embezzle public funds, which in these situations are readily justified.

On the other hand, this basic contradiction with the theoretical calls for the noble purposes of festivals reveals the lack of criteria for evaluation, when selecting recipients of subsidies, on the one hand, and of supervision for the implementation of the program and contractual agreements, on the other. Thus, the results—particularly the statement from Interview XVI—raise the question of whether certain manifestations are worthy of being referred to as festivals. As the findings indicate, this word is misused, and far more expert evaluations of their purpose and presence are required.

This call is completely consistent with the theory that we introduced in our study using Cole & Chancellor (2008) cited by Jeon (2020). They emphasized that festival organizers face a challenge to design memorable experiences to attract visitors who return repeatedly every year. Mika's (2007: 216-217) very positive statement, which (Cudny, 2013) cites, is related to and serves the purpose of all of this. Festival tourism is the term he coined to describe the phenomena of individuals moving for reasons where their primary motivation is to attend cultural events like movies, plays, concerts, street festivals, or other activities centered around fun, entertainment, and sports. In our case, this has only occurred with a few selected festivals that we have made sure to include in the results section as having a big influence, particularly when we have discussed their contributions to tourism, socioeconomic impacts, and cultural benefits.

By examining and choosing the findings for discussion, the scope of this study's implementation is revealed in hindsight. Results from this study, including the number of festivals, their geographical location, their types, passive and active festivals, their general and particular impact, etc., were not previously available. The large number of festivals and the fact that this number was outside our initial expectations presents the limitation of our study. After the first phase of studies, from the end of 2021 until now we increased the number of interviews from 9 to 18 because the research brought us more and more festivals (from 80 in 2021 to 146 in 2024). In summarizing the problem, we would like to emphasize that we required everyone's participation, and the study demonstrated that our limitations for in-depth analysis in specific circumstances, particularly in certain festivals (*Doku Fest, Hardh Fest, Etno Fest*), lay the groundwork for future research. We believe that the gaps in our current study should be filled by some aspects of social and community impacts as well as significant aspects of geographical transformations brought about by festival activities.

The outcomes of our questionnaire have been examined, however not all of them have been written. The other sections will be written in a later publication, as planned by the authors. The origin of tourists and visitors—some of whom, as we identified, were Albanian immigrants from European countries and beyond—was not covered in the current study. We recognize that they have sufficient potential for roots tourism, echoing the statements of Tullio et al. (2023), Humolli (2024b), and other sources. According to the results, the same people proved to be very loyal participants in festivals. In light of these sources, we recommend that future studies, ours and others, delve deeper into what Humolli had titled "Festivals: one path towards roots of tourism" (2024b). Tourist characteristics and the role festivals play in creating destinations are important areas of research and investment. The first step in doing this is figuring out how the quality of the event affects attendance and willingness to pay more (Baker & Crompton, 2000). Therefore, precisely for this reason, the study strongly recommends that steps be taken to improve the quality of festivals by each party. The relevant institutions at the central/local levels should be more accurate in their assessments and take public money into consideration, giving value a chance over anti-value. However, investigations should go deeper into evaluations by using specific situations to support the idea. In order to properly manage events in general and festivals in particular, it is necessary to systematically monitor the festival's demands as well as the needs of tourists. Their loyalty and contentment are crucial to the sustainability of the festivals.

CONCLUSIONS

Although festivals have a longer history around the world, Kosovo's more than half-century history of festivals should not be ignored. While it has been 56 years since the establishment of the first festival until now, they have evolved (risen and fallen) at a pace completely influenced by political developments, first and then by social circumstances, not at all suitable for their normal course. Although the importance of festivals and their significant positive impact on local communities and society at large have been well recognized, including by the literature examined in this research, the study supplied hitherto unpresented evidence regarding their relevance in Kosovar society.

The study in its format managed to quantify them, brought their location for the entire Republic of Kosovo, their types, participation by type and country, their impact on attracting tourists, as well as their impact on the socio-economic and cultural sphere. These are precisely what made the study important and necessary on the one hand and equally overdue on the other. While these results have now appeared, the joy for them should not lose the concern for the delay of their absence until now. A first step was necessary but delayed. The results of the study showed partial correlation with theoretical references, while their impact compared to the number of 120 festivals was weak. The personal commitment of festival managers, then of all influential stakeholders, such as the government, the municipality and the local, professional and scientific community, must come together to give more chances to festivals. They should not be seen as ephemeral activities but as a beneficial multiplicative mechanism. Their inability to become part of the tourist packages of local attractions is evidence against which future engagement, even research, is needed. This plays an important role in placing the region on the map, compared to other regions. If the study provided evidence of improvements in the image of locations by festivals, this is not an example of complacency but a call for even more careful repositioning. In addition, the generosity of public funds should continue but with much grater caution. The large number of festivals did not justify their positive impact; therefore, attention to their better qualification as well as the increase in the number of studies in support of the results of their multiplicative role, are limits that Kosovan society must meet in the future.

Author Contributions: Conceptualization, FH; Methodology: (designed the questionnaire), FH and FU, data collection (interviews and their transcription), FU; process and visualization of data, FU and FH; writing – original draft preparation,

FH; writing - review and editing, FH; contributed to the project, FU; supervised the project, FH. Both authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The authors would like to thank the Ministry of Culture, Youth, and Sports of the Republic of Kosovo for the financial support of the project, which facilitated the realization of this study. They are also very grateful to Dr. sc. Festa Shabani for the linguistic editing of the manuscript. The authors would also like to thank the reviewers for their invaluable contributions.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 14.03.2025 Revised: 17.06.2025 Accepted: 04.07.2025 Available online: 24.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1485-1494
DOI 10.30892/gtg.61308-1518

THE ROLE OF ARTIFICIAL INTELLIGENCE IN TRANSFORMING TOURISM SERVICES: THE CASE OF DURRËS, ALBANIA

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Citation: Kosta, A., Pazari, F., Lili, I., & Greca, S. (2025). The role of artificial intelligence in transforming tourism services: The case of Durrës, Albania. *Geojournal of Tourism and Geosites*, 61(3), 1485–1494. https://doi.org/10.30892/gtg.61308-1518

Abstract: In Albania, the tourism sector has increasingly been using technology to improve the travel experience and service management. In the past, websites and mobile applications served as promotional tools, but recent developments support more sophisticated operations. This study explores the impact of Artificial Intelligence (AI) in tourism services in Durrës, Albania, focusing on how AI-driven technologies improve service management, customer experience, decision making and hotel recommendations. A mixed-methods approach was used, including a literature review, interviews, surveys, implementation, and process improvement. An AI-based hotel recommendation system was developed using Natural Language Processing (NLP) and machine learning to analyze customer reviews. Hotel reviews were collected from Google Reviews, and artificial intelligence techniques were applied to identify and recommend hotels with similar ratings and sentiment profiles, thereby supporting more personalized and data-driven recommendations. Through sentiment analysis, the reviews were classified as either negative or positive. The study finds that AI technologies improve operational efficiency, increase customer engagement, and support strategic marketing efforts. It is recommended that tourism services in Durres adopt AI solutions as they positively impact automated bookings, tour management, and personalized digital interactions, thereby enhancing tourism to a greater extent. The integration of AI-based recommendation systems further demonstrates how data analytics and sentiment analysis can optimize hotel selection processes for tourists. On the other hand, the high cost and staffing required for this poses a challenge for the city. This study provides a unique focus on AI's impact within Albania's tourism sector, with Durrës as a case study. By integrating AI-driven analytics and hotel recommendation algorithms, the research highlights the role of AI in improving service quality, business efficiency, and the overall competitiveness of Albanian tourism. It offers practical insights into how AI can drive sustainable growth and innovation, positioning Albania's tourism industry for a more tech-driven future.

Keywords: Artificial Intelligence, Natural Language Processing (NLP) techniques, tourism, Selenium, Durrës, TF-IDF-based text similarity, cosine similarity

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INTRODUCTION

Albania is a country with a beautiful climate and natural beauty, which makes tourism a major sector in the Albanian economy. Tourism offers a natural and cultural attraction that attracts domestic and international visitors. With the growth of technology and the introduction of Artificial Intelligence everywhere, the question arises whether tourism needs the use of technology? The answer is Yes, it has become indispensable in shaping travel experiences and improving tourism management, everything in tourism is moving towards the digital part. Technology is involved in every phase of the tourist journey, from simple websites and mobile applications to complex systems that personalize visitor interactions.

Over the past few years, the accessibility of digital platforms has transformed the way tourists access, find information, make reservations online without being physically present and interact with destinations. Tour operators offer services more efficiently and tailor tourist packages according to individual preferences, because they have the help of AI-powered applications such as chatbots, recommendation engines and data analytics platforms. Albania in 2024 had the highest number of visitors to the country, thus enabling a considerable potential for economic growth. Certainly, for a better management of tourism, the integration of Artificial Intelligence can improve service quality and operational effectiveness, helping the country compete in a digitally driven tourism landscape. The purpose of this paper is to analyze, study, the impact of information technology on Tourism and what we can offer to improve it better.

The study focuses on Durrës, one of Albania's most popular coastal destinations, to examine the impact of technology on tourism, and draws on face-to-face interviews with 6 major resorts in Durrës. Through interviews and surveys conducted with local businesses including hotels and restaurants, this research investigates whether AI-driven technology has begun to be used, and whether it is contributing positively to the tourism industry. The focus of the study is also to examine the level of technological adoption, the challenges businesses face in using AI, and whether these

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businesses are open to adopting AI tools. Based on the responses we received from the study, and the perspectives of tourism businesses, this paper also provides an implementation of a recommendation system using Artificial Intelligence for tourists based on hotel reviews on Google and classifying them as positive or negative using semantic analysing.

LITERATURE REVIEW

Based on the research of academics and other scientists, in this section we are briefly summarizing the historical development in tourism technology, the benefits of adapting these advances and future trends, and focusing more on artificial intelligence and virtual reality VR. Of course, technology has also been introduced into the tourism sector, reformulating the way of operating and serving tourists.

The way tourists receive recommendations, make online reservations, receive services without being present or without having a traditional travel brochure, we can say that the revolution has been extraordinary.

a) Historical development of technology in tourism

Tourism has become more accessible and convenient since the 19th century with advancements in technology. The development of steam engines and railways revolutionized mobility, allowing more people to move into new destinations (Buhalis & Leung, 2018; Gretzel et al., 2015). The digital age further transformed the industry, as the internet opened up online booking platforms, travel blogs, and social media-based promotion. Websites and apps soon emerged as favorite platforms for providing real-time information about destinations, accommodations, and activities, setting new standards for convenience and ease of access for travel planning (Huang et al., 2017).

b) The role of artificial intelligence and virtual reality

AI and VR have emerged as game changers for the tourism industry, increasing operational efficiency as well as customer experiences. Artificial Intelligence used to be said to be in the future, but now we say we are in the future as it is being used more and more every day in every sector, but especially in the tourism sector. According to (Kieanwatana & Vongvit, 2024) communication and response to a certain service against tourists has been difficult and slow before the creation of AI. With the creation of AI, chatbots were also created which automatically returned responses, enabling direct communication with customers. Recommendation engines made it possible to create and offer tourist packages or services based on user preferences and predictive analytics of user interests. On the other hand (Guttentag, 2010) stated that not only chatbots, or recommendation systems helped in customer service in tourism, but also VR technologies began to be widely used to offer visitors a different reality by seeing the destination virtually before touching it. Through VR, visitors were able to make easier decisions about the selection of the destination (Kannan & Antony, 2024).

c) Advantages of technology in tourism

Giant platforms such as Booking.com and Airbnb have completely simplified the online booking part by offering tourists instant booking without any hassle and an open system to see and comment on the center or service they received. Applications of Artificial Intelligence in tourism have helped a lot to improve various parts of the tourism sector, especially chat bots that give direct answers without the need for human resources. Online advertisement has also risen in specificity so that tourism businesses can access their target population through targeted ads (Xiang & Fesenmaier, 2017; Neuhofer et al., 2015). Data analytics tools help organizations analyze the behavior of customers, predict trends, and optimize service offerings to enhance organizational efficiency and customer satisfaction (Mariani et al., 2018; Gretzel et al., 2015).

d) Future trends in tourism technology

In the coming years, AI, VR, and big data will play an even greater role in the future of tourism. AI solutions such as real-time personalization marketing and dynamic pricing will help companies react to individual customers' needs in real time. VR will provide tourists with pre-experiences of destinations, further influencing booking intentions (Tussyadiah & Wang, 2016; Mariani et al., 2018). Moreover, analysis of big data will become increasingly important in evaluating market trends to allow companies to make decisions through information and aid improved service provision and customer engagement (Slevitch et al., 2020). Analysis and recommendation systems based on AI are also expected to be more advanced. Sentiment analysis techniques will be enhanced by machine learning algorithms, improving how firms interpret and act on customer feedback. Reinforcement learning may also improve recommendation engines to provide real-time and dynamic personalized recommendations to tourists.

e) Challenges and considerations

While AI and other emerging technologies bring numerous advantages, their implementation is challenging. Issues such as data privacy, cybersecurity, and adoption costs are still obstacles, particularly for small and medium-sized enterprises. There is also a debate regarding AI-driven automation and its contribution to job displacement in the tourism sector. The implementation of AI in Albania is also restrained by other issues like infrastructure and technological expertise shortages. The majority of tourism businesses, especially the small and medium-sized ones, are restricted by financial limitations that prevent them from investing in new and advanced technologies like AI and VR.

These must be addressed through strategic digital infrastructure investments, improved training programs, and increased awareness among business owners about the benefits of AI adoption (Neuhofer et al., 2015; Tussyadiah & Wang, 2016, Ivancsóné Horváth et al., 2025).

METHODOLOGY

Understanding the reason why this topic is being addressed is a key element in identifying and carrying out the work. The methodology followed for carrying out this work is: Collection and review of secondary data. Which were provided by a simple internet search, by accessing online libraries, research reports related to the topic and a non-exhaustive list of other secondary sources. From the secondary research, it is intended to understand the results of the academics, sciences they have achieved, the difficulties and conclusions, regarding how technology affects tourism. The study then follows with a primary research/study, on the use of technology in tourism and the positive or negative effects it has on tourism in Albania. Six big resorts in Durres were selected, to conduct direct interviews with them. The goal was to understand how AI-driven technologies affect tourism services in Durres, Albania. Implementing an AI recommendation system based on Google reviews for these sectors enables increased customer satisfaction and operational efficiency. Using the Selenium for web scraping, we have collected all the available user reviews placed on Google. To classify the ratings as positive, negative or neural, we have used AI-based sentiment analysis and natural language processing (NLP) techniques.

Market study in Albania – Tourism and technology

In this study several resorts within the tourism sector were examined, including: restaurants, hotels, resorts and guesthouses as part of their integrated service offering. These businesses represent a broad spectrum of the tourism industry, each focusing on varied ways technology impacts their operations and growth. Table 1 below presents the names and official Google Business links of the selected hospitality establishments that participated in the survey. The primary objective of this survey was to analyze the use of technology in the tourism sector from a business perspective. Participating businesses provided valuable insights into how they utilize technology for management, online promotion, and booking processes. Another aspect highlighted was the role of technology in offering personalized services to clients, which contributes to increasing their tourism experience. The businesses indicated that they use a range of platforms and technological tools to increase efficiency in daily operations. Some of the most commonly mentioned tools included:

a. Inventory Management Applications.
b. Online Booking Software
c. Customer Data Collection and Analysis Systems

In terms of digital marketing, businesses are increasingly oriented toward using platforms such as social media, online advertisements, and search engines to promote their offerings. This approach facilitates real-time interaction with clients and helps build long-lasting relationships with them. One of the main objectives of this study was to identify best practices and challenges encountered in implementing technology in Albania's tourism industry. Businesses reported that one of the greatest benefits of technology is the significant increase in operational efficiency and improved communication with clients. Technology aids in establishing a stronger online presence, thereby increasing the visibility and promotion of local tourist destinations. On the other hand, some businesses also faced challenges when integrating technology into their operations due to some barriers. Among these challenges are the high initial investment costs associated with technology and a lack of qualified staff to manage these technological tools. We did physical interviews with the owners of the Hotels that are shown in Table 1 and also we used Google Forms to collect the results.

Table 1. Tourism businesses in Durrës included in the survey and their Google Business profile links

Name of Resorts	Google My Business link
BRILLIANT HOTEL AND SPA	Brilliant Hotel & Spa
KLAJDI RESORT	Klajdi Resort
FAFA RESORT	Grand Blue Fafa Resort
SUPREME HOTEL	Supreme Hotel
PINEA HOTEL	Pinea Hotel

STUDY RESULTS AND INTERPRETATION

From analyzing the collected responses, it is clear that the majority of surveyed entities are hotels and restaurants that have integrated technology in several aspects of their management, as shown in Figure 1. What type of business do you operate? Do you use technology to manage your business? Do you use technology to manage your business?

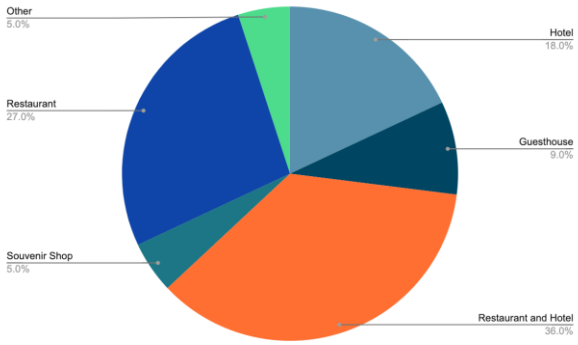

Figure 1. Distribution of business types participating in the tourism technology survey

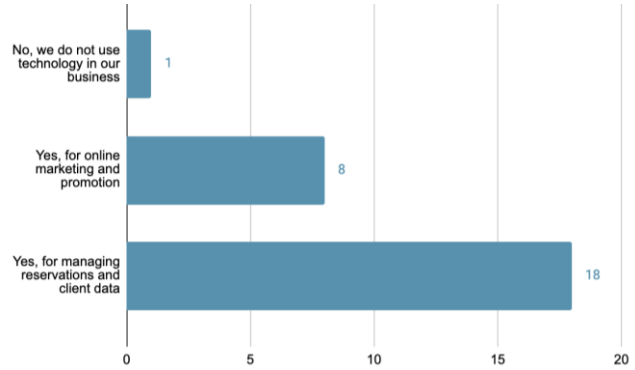

Figure 2. Business responses on the use of technology in tourism management

Figure 2 illustrates that respondents emphasized that they used technology more for managing online reservations and storing data. They emphasized that this has facilitated customer service and improved resource management. Websites are now, let's say, the formal part of every business. What stands out is that 95% of businesses reported having a website. Through the website, they are present online, can be found and offer information to tourists. Websites were stated to be used more for the presentation and promotion of tourism businesses. The use of online reservation management systems is also high, with 89% of businesses using platforms such as Booking.com and Airbnb to receive customer reservations.

These systems have significantly simplified the reservation process and have contributed to an increase in the number of customers. At the end of the survey, 95% of businesses identified technology as a fundamental driver for the development of tourism. They believe that technology not only promotes tourist destinations, but also plays a crucial role in increasing tourists' awareness of local attractions and offerings. In 2024, Artificial Intelligence spread rapidly almost all over the world. So the respondents stated that if they incorporate artificial intelligence into some tourist services, it could significantly increase productivity by automating routine tasks, allowing human resources to focus on more personalized services. On the other hand, the tourist has an easier time getting the service he wants and also through AI he can get suggested packages based on his reviews. The last question was: Give your opinion, what is expected to happen with tourism in the coming years and what are the barriers that AI uses in Albanian tourism?

1. Barriers to the use of technology in Albanian tourism

Based on our survey of tourism businesses in Durres, some of the primary challenges which hinder full application of technology and artificial intelligence in tourism in Albania have been identified. The challenges range from structurally diversified operations that hinder them from having the capacity to utilize and gain from AI-based solutions. These are the most common of them, e.g., a lack of infrastructure for the internet, data security problems, the cost of implementation being too high, and lacking the appropriate expertise in AI. All of them need to be handled so that technology can be utilized to the maximum in enhancing the tourism industry of Albania.

1.1. Lack of internet infrastructure and digital accessibility

To use digital platforms, internet access and its reliability are essential. One of the biggest problems that Albania still faces is the unstable access to the quality of the internet. Especially in coastal areas where internet coverage is low and in more remote areas it almost does not reach at all. Bad internet access causes all sorts of issues for the tourism industry in Durrës, both for businesses and visitors. Nowadays, visitors are very much reliant upon online websites for restaurant and hotel bookings and organizing places. In case of poor internet connectivity, the places are unable to utilize these facilities to their full capacity and, hence, lose opportunities in greeting and hosting guests efficiently. Technologies such as AI-powered chatbots, smart check-in devices, and AR guides must be run on high-quality internet connectivity. Without access to such tools, it is difficult for most Durrës businesses to compete with international tourist trends, tapping into their potential to deliver tourists modern, technologically driven experiences. A second, more serious issue is that of remote working and online management. Most of the hotels and tourist establishments are employing cloud-based management systems to handle reservations, payments, and messages from guests. When there are interruptions in the internet, those systems turn unreliable, leading to inefficiencies in day-to-day activities and spoiling the overall customer experience (Sousa et al., 2024).

2.2. Data security and privacy risks

With increasingly more tourism businesses in Albania going digital, data privacy and cybersecurity have become pressing concerns. Most of the businesses in the sector have poor cybersecurity systems, which leave them open to attacks such as data stealing, financial fraud, and identity theft. The greatest concern is the utilization of poor security systems, where the majority of companies continue to utilize basic password protections and outdated software, which leave them vulnerable to simple cyberattacks. Cyber awareness among hotel and tourism staff is still limited, and they are not at all or inadequately trained in identifying and preventing phishing attempts, malware infections, and other online threats. Using and accessing the internet is not always positive if you are not sufficiently educated about preventive measures. Businesses are still vulnerable to potential security breaches that could compromise customer data and damage their image. We know that taking preventive measures against internet security requires budget and finance. Financial constraints for the digital part in Albania also affect especially small businesses as they place more importance

on daily operating costs than cybersecurity. Without investment, exposed customer data goes unprotected, and the vulnerability for data breaches and loss of money is increased. Even as of 2025 Albania is on the rise in terms of cybersecurity Albania has progressed significantly in the ITU's Global Cyber Security Index, moving up by 22 points compared to the last report and ranked in Tier 2, among the countries that are developing rapidly in the field of cyber security. It is a sign that the Albanian government is seriously working on making digital defenses more robust and addressing growing cyber security threats effectively (National Authority for Cyber Security, 2025).

3.3. High costs of technology adoption

The incorporation of artificial intelligence-driven tools and intelligent tourist solutions poses a significant financial burden to most of Albania's tourism sectors. It is within reach for large hotels to pay for computerized management software, but small and medium enterprises (SMEs) cannot match the pace with the burden of digital change.

The investment is not only the one-time investment but also the ongoing expenses that present a challenge for small businesses to implement technology. The greatest challenge is the significant amount of initial investment required to deploy AI chatbots, automated booking systems, and data analysis software. The technologies, as beneficial as they are for making business processes more efficient and customer experience better, require a tremendous amount of financial resources that many companies cannot put into them. One of the interviewees, the owner of Brilant Hotel, stated that a key challenge is also the lack of access to finance from government funding. The government has no subsidies to support small businesses in implementing AI and the use of information technology in tourism.

Without any external help, most SMEs are not able to delay or forego digital transformation, which limits them from competing with larger, more tech-savvy players. Overcoming such economic barriers entails support from policies, investment at hand, and individualized financing arrangement to facilitate companies of all sizes to avail digital innovations towards continued development of the tourism sector of Albania.

2. Advantages of using AI and technology in tourism

The tourism industry is one of the sectors that has been most affected by technology and its role has become indispensable in the management and performance of technical operations of companies operating in the tourism market. Technology has played an important and very productive role in improving services and customer experience. The use of online platforms for managing reservations, digital marketing, processing and analyzing customer information and facilities in electronic communication with customers has created new and very effective opportunities for improving services and expanding into the global market (Nongkhoo, 2025). Table 2 highlights the key reasons why AI and technologies are beneficial in the tourism industry.

Table 2. Advantage of using AI in Tourism

1	Improving customer service and personalized experience	Artificial intelligence, through virtual assistants and chatbots, helps customers find their most optimal solutions depending on their needs and expectations for the services requested. This is consistent with findings from (Czyz & Javed 2025), who highlight that smart tourism technologies significantly contribute to customer satisfaction and sustainable destination image through personalization and efficient service delivery. Virtual tools provide their most appropriate options and address customer requests to managers, thus providing a convenient and quality experience for customers. The integration of Geographic Information Systems (GIS) in tourism as demonstrated in the case of Ulytau National Park contributes to a more personalized and enriched visitor experience (Amangeldi et al., 2025).
2	Increasing visibility and marketing	Virtual tools, such as websites, social media and other mobile platforms, increased business visibility and market destinations in line with customer expectations.
3	Facilitation of reservations, through process automation	The selection and processing in real time of customer requests for the services required, offers the opportunity for businesses to offer personalized services according to the customer's preferences, making the customer experience within his expectations. (Yang et al, 2024).
4	Personalized customer experiences	The selection and processing in real time of customer requests for the services required, offers the opportunity for businesses to offer personalized services according to the customer's preferences, making the customer experience within his expectations. (Yang et al., 2024).
5	Effective customer relationship management	The use of AI and other technological tools offers the possibility of good customer relationship management, providing them with the required security and reliability. (Huang et al., 2017).
6	Data collection and analysis	Businesses have the convenience of collecting and analyzing data and customer behavior, which serve to improve the quality of service and assist in the decision-making process and long-term business strategies (Abdul-Azeez et al., 2024)
7	Cost reduction	Automating administrative and operational processes through technology reduces the costs of human resources and manual data management.
8	Increased access to global markets	Online platforms and digital promotional tools enable businesses to more easily reach customers from international markets.
9	Real-time communication	Digital platforms offer the possibility of real-time communication with customers, ensuring fast and effective service
10	Security	AI systems detect suspicious behavior and alert security authorities, reducing the risk of crime within the business or tourist destination. For example, (Dziurakh et al., 2024) present an intrusion detection solution specifically designed for smart tourism environments, using anomaly detection to identify and report potentially harmful behavior in real time.

The use of online tools, such as mobile applications, websites, digital marketing platforms, have increased the visibility of businesses and their attendance at the international level. With the use of technology, businesses can now collect and analyze useful information about how their customers behave, allowing them to make well-informed decisions and improve their products depending on market demands. As highlighted by (Nathan et al., 2020), platforms like Airbnb not only

facilitate booking but also contribute to increasing destination visibility and enhancing tourist engagement through digital interaction. Some of the advantages presented in table number 2 were identified through surveys conducted with selected businesses. These businesses described the benefits they experienced from using technology, including improved operational efficiency and management, increased business promotion and access to international markets, enhanced customer communication, and expanded clientele—ultimately leading to increased financial income (Smart Tours Bird Albania).

3. Development of an AI-based hotel recommendation system

Durrës, one of the most popular seaside resorts in Albania, boasts a great selection of hotels to suit all tastes and budgets. With new hotels opening every year, visitors are typically faced with an overwhelming choice. Naturally, as a matter of priority when selecting a hotel, most of the visitors would prefer comfort, cleanliness, location, and quality of service to have a good time. The most effective way of judging the quality of a hotel is by remarks, especially Google reviewers, of former clients on their experience. They are an important component of tourists' decisions since they are honest opinions about the strengths and weaknesses of each hotel. As customer reviews are an important factor in selecting a hotel, our aim is to create an intelligent recommendation system that utilizes Google reviews to classify and rate hotels on the basis of sentiment analysis and star ratings. This way, travelers will have fact-based guidance to make in selecting the most suitable hotel from an actual user perspective, instead of relying on advertisements only or personal assumptions.

Proposed Method / Approach

As the first step towards developing a useful recommendation system, our approach will involve fetching actual current reviews for hotels from Google. We will do this through two likely means which we will utilize:

a. Option 1: Using Google places API: Google Places API allows us to web scrape information about hotels, including name, address, ratings, and reviews. We will retrieve hotel reviews by making API requests, which we will then put in a nicely formatted manner. The API allows us to get data quickly and reliably without any chance of getting blocked.

b. Option 2: Web Scraping with Selenium: In case API limits the amount of reviews scraped, Selenium can be used to automate browsing and scrape reviews directly from Google. Selenium can mimic human activity (scrolling, clicks) to compile all available reviews. This is useful but will most certainly require additional caution for CAPTCHA and anti-scraping protection. The specific Python script used for this purpose is shown in Algorithm 1.

Algorithm 1: Selenium code for crawling the data from reviews of google

```
iimport pandas as pd
from selenium import webdriver
from selenium.webdriver.common.by import By
from selenium.webdriver.chrome.service import Service
from selenium.webdriver.support.ui import WebDriverWait
from selenium.webdriver.support import expected_conditions as EC
from webdriver_manager.chrome import ChromeDriverManager
import pandas as pd
import time

hotel_reviews_links = {
  "KLAJDI RESORT Durres":
"https://www.google.com/travel/search?q=KLAJDI%20RESORT%20Durres&ap=ugEHcmV2aWV3cw",
  "FAFA RESORT Durres":
"https://www.google.com/travel/search?q=FAFA%20RESORT%20Durres%22&ap=aAG6AQhvdmVydmlldw",
  "SUPREME HOTEL Durres":
"https://www.google.com/travel/search?q=supreme+hotel+durres&ap=ugEHcmV2aWV3cw",
  "PINEA HOTEL Durres":
"https://www.google.com/search?q=PINEA+HOTEL+Durres%22#lrd=0x134fdf0fa9b7ccb9:0x3943ecc0855608ca,1,,,,",
  "BRILLIANT HOTEL AND SPA Durres":
"https://www.google.com/travel/search?q=BRILLIANT%20HOTEL%20AND%20SPA%20Durres%22&ap=ugEHcmV2
aWV3cw"
}
options = webdriver.ChromeOptions()
options.add_argument("--headless")
options.add_argument("--disable-gpu")
options.add_argument("--window-size=1920x1080")
s)
    if not df_reviews.empty:
  df_reviews.to_excel("Durres_Hotel_Reviews.xlsx", index=False)
  print("File saved to 'Durres_Hotel_Reviews.xlsx'!")
else:
driver.quit()
```

After Selenium we got the excel file that has collected all the reviews we need containing the following key columns *(Review_ID: Unique identifier for each review., User_ID: User who posted the review., name_hotel: Name of the hotel., Hotel_ID: Unique hotel identifier., Review_Text: The actual review content., Rating: Numerical rating given to the hotel.)* These extracted reviews and their key attributes are illustrated in Figure 3.

Review_ID	User_ID	name_hotel	Hotel_ID	Review_Text	Rating
1	101	BRILLIANT HOTEL AND SPA	1001	The hotel is good except for the boring food, even though it is the most expensive hotel I have paid in Albania, the food they have is tasteless and they use the same food several times a day except in a different form and it is not fresh. are also used during all the second sites. It was not worth it, I suggest PREMIUM FINESSE, which is 100% better in all aspects We decided to try the full-body massage package, but unfortunately, it didn't meet our expectations. The person providing the service seemed inexperienced, which left an impression of amateurism. The wellness facilities were also not fully operational – they only had a regular sauna, while the salt room was out of service.	4
2	102	KLAJDI RESORT	1002	Scandalous service! We have waited 1 and a half hour to give the order, we asked 4 times the waiters to take our order and everything was teastless, we spend 4 hours for service that should last 1-1 and a half to finish the dining, waste of money and time lady by the reception Mary is so friendly and professional. The Spa is wonderful and I would like to thank Jamaica and Melody -these ladies made our spa experience great. I had a serious knee problem but after the pressotherapy I feel much better and definitely going back soon. Anyone wanting a great spa experience look for Jamaica	5
3	103	FAFA RESORT	1003	It was strange for me when I didn't find a kettle in the room, they don't have hot drinks service at night and they don't have kettles either. There were a couple more things, but not so critical. Overall, the staff is very polite, the room and the hotel are quite clean. The location is excellent. And food at the restaurant was really good. My stay at Grand Blue Fafa Resort was nothing short of amazing! The food was absolutely delicious, with a variety of options that satisfied every craving. …	5
4	104	SUPREME HOTEL	1004	Found a huge piece of plastic in my salad and the waiter acted like it was none of his business. It took them way to long to take our order and we didn't even get an ashtray after asking for it. Never again! I had lunch with my colleagues at Supreme Hotel and i enjoyed it the most at all the places i have been in Tirana and even elsewhere in Albania. The service was the best i have encountered and the dishes immaculate. Every product was very fresh and tasty. I cannot recommend this place enough!	5
5	105	PINEA HOTEL	1005	too much poeple and you can't find place to the beach and to eat ypu need to wait some. The beach is very clean thoo and the beach bar is amazing. The cocktails are very tasty and the staff are very friendly! absolutely packed with them. If you're young and looking to have fun and enjoy some nightlife, this hotel is definitely not for you.	4

Figure 3. Sample of extracted hotel reviews (comment) from Google using Selenium automation for hotels in Durrës (Source: Reviews collected by google using Selenium)

Based on reviews to assess customer satisfaction levels, we applied Sentiment Analysis using the TextBlob NLP library. Each review was classified into one of three categories:

- Positive comments whose polarity value is greater than 0.1 (i.e., "The hotel was great, staff were very friendly").
- Neutral: Reviews with a polarity score between -0.1 and 0.1 (like "The hotel was okay, nothing special").
- Negative: Reviews with a polarity score less than -0.1 (e.g., "Rooms were dirty and the staff was rude"). The sentiment categorization allowed us to rule out hotels with mostly negative reviews and prefer those with positive sentiment. The sentiment categorization allowed us to rule out hotels with mostly negative reviews and prefer those with positive sentiment. The Python code used to perform this classification is presented in Algorithm 2.

Algorithm 2: Classification of the hotels based on reviews

```
iimport pandas as pd
from textblob import TextBlob
file_path = "Durres_Hotel_Reviews.xlsx"
df_reviews = pd.read_excel(file_path)
def analyze_sentiment(text):
  blob = TextBlob(str(text))
  polarity = blob.sentiment.polarity
  if polarity > 0.1:
     return "Positive"
  elif polarity < -0.1:
     return "Negative"
  else:
     return "Neutral"
df_reviews["Sentiment"] = df_reviews["Review_Text"].apply(analyze_sentiment)
output_file = "Durres_Hotel_Reviews_With_Sentiment.xlsx"
df_reviews.to_excel(output_file, index=False)
print(df_reviews[["name_hotel", "Review_Text", "Rating", "Sentiment"]].head())
print(f"\n Updated file saved as: {output_file}")
```

Figure 4 illustrates the output results of the sentiment analysis, where each review is categorized based on its polarity as positive, neutral, or negative. To improve the efficiency of this process, we developed an AI-driven hotel recommendation system that analyzes customer reviews and recommends hotels depending on review sentiment and text similarity. This system merges Natural Language Processing (NLP) techniques to classify the reviews in terms of their quality and machine learning algorithms to rank the top hotel options (Sancho Núñez et al., 2024).

Review_ID	User_ID	name_hotel	Hotel_ID	Review_Text	Rating	Sentiment
1	101	BRILLIANT HOTEL AND SPA	1001	The hotel is good except for the boring food, even though it is the most expensive hotel I have paid in Albania, the food they have is tasteless and they use the same food several times a day except in a different	4	Neutral
				We visited this hotel and stayed for a few days. We decided to try the full-body massage package, but unfortunately, it didn't meet our expectations. The person providing the service seemed inexperienced,		Positive
2	102	KLAJDI RESORT	1002	Scandalous service! We have waited 1 and a half hour to give the order, we asked 4 times the waiters to take our order and everything was teastless, we spend 4	5	Negative
				This hotel is the best. I've gone there twice this year for birthday celebrations. The lady by the reception		Positive
3	103	FAFA RESORT	1003	It was strange for me when I didn't find a kettle in the room, they don't have hot drinks service at night and they don't have kettles either. There were a couple more things, but not so critical. Overall, the staff is	5	Positive
				My stay at Grand Blue Fafa Resort was nothing short of amazing! The food was absolutely delicious, with a variety of options that satisfied every craving. …		Positive
4	104	SUPREME HOTEL	1004	Found a huge piece of plastic in my salad and the waiter acted like it was none of his business. It took them way to long to take our order and we didn't even get an ashtray after asking for it. Never again!	5	Positive
				I had lunch with my colleagues at Supreme Hotel and i enjoyed it the most at all the places i have been in Tirana and even elsewhere in Albania. The service		Positive
5	105	PINEA HOTEL	1005	The hotel is not so bad. The view is amazing but not everything is perfect. There is too much poeple and you can't find place to the beach and to eat ypu need to wait some. The beach is very clean thoo and the beach bar is amazing. The cocktails are very tasty and the staff are very friendly!	4	Positive
				The hotel is primarily occupied by local Albanians with small children, and it's absolutely packed with them. If you're young and looking to have fun and enjoy some nightlife, this hotel is definitely not for		Positive

Figure 4. Sentiment classification of hotel reviews using TextBlob analysis (Source: Generated by sentiment classification algorithm)

```
from textblob import TextBlob
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.metrics.pairwise import cosine_similarity
```

We shifted our focus from sentiment analysis to translate text reviews to numeric format through Term Frequency-Inverse Document Frequency (TF-IDF). TF-IDF approximates the significance of the word based on how often a word is repeated in the dataset to allow the system to quickly identify patterns and cluster similar reviews. TF-IDF vectorization allowed us to transform text data into numerically formatted numeric features such that we could measure proximity between dissimilar reviews. Using cosine similarity, we proceeded to calculate the similarity of hotel reviews in a way that we would be able to know how similar or different hotels were based on customer reviews (Wang et al., 2023). In order to give personal recommendations, the system follows the following process: the user selects first a hotel of interest, the algorithm searches for hotels with similar reviews based on TF-IDF similarity scores. The recommendations are then filtered again by removing hotels that have the majority of negative reviews, and only retaining those with the majority of positive reviews. Finally, the AI system ranks and presents the top three most suitable hotels, offering personalized suggestions based on real customer reviews and their semantic similarity as shown in Figure 5. By automating this process through artificial intelligence techniques such as sentiment analysis and similarity scoring, the system significantly improves operational efficiency, reduces manual workload, and supports faster, data-driven decision-making in the hotel selection process.

name_hotel	Review_Text	Rating	Sentiment
PINEA HOTEA	The hotel is primarily occupied by local Albanians with small children, and it's absolutely packed with them. If you're young and looking to have fun and enjoy some nightlife, this hotel is definitely not for you. The staff barely speaks any English, making communication very difficult. This might explain why we sensed a strong unwillingness and tension from the staff	4	Positive
Supreme Hotel	I had lunch with my colleagues at Supreme Hotel and i enjoyed it the most at all the places i have been in Tirana and even elsewhere in Albania. The service was the best i have encountered and the dishes immaculate. Every product was very fresh and tasty. I cannot recommend this place	5	Positive
FAFA RESORT	It was strange for me when I didn't find a kettle in the room, they don't have hot drinks service at night and they don't have kettles either. There were a couple more things, but not so critical. Overall, the staff is very polite, the room and the hotel are quite clean. The location is excellent. And	5	Positive

Figure 5. AI-based hotel recommendations using sentiment and review similarity

RESULTS AND INTERPRETATION

After executing the model on our data, we observed the following patterns:

- Hotels with a higher rating (4.0+) had a more positive sentiment.
- TF-IDF similarity scores helped us identify hotels with comparable guest experiences.

- The system effectively excluded hotels with an overabundance of negative reviews to maximize customer satisfaction. Using AI-powered review analysis, we demonstrated that text-based hotel recommendations provide more personalized and reliable suggestions compared to conventional rating-based filters. Figure 5 presents the final output of the AI-driven recommendation system, which ranks hotels based on textual review similarity and sentiment analysis. By combining TF-IDF vectorization with cosine similarity and filtering through sentiment scores, the system is able to suggest the most relevant and positively rated hotels.

DISCUSSION

This article proves that technology has indeed played a deep role in showing positive effects in the cause of developing the tourism industry, in particular, in the hotel sector and the tourism sector in Albania. Based on the surveys and interviews conducted with the existing businesses in this field, including Brilliant Hotel and Spa, Klajdi Resort, Fafa Resort, Supreme Hotel, and Pinea Hotel, market analysis points out that most of these entities have already employed technological tools and platforms to enhance their service quality. Reservation management, online payment systems and customer communication have all moved towards automating processes through digital platforms. The integration of Artificial Intelligence (AI) in tourism services has significant potential to improve operations by automating repetitive tasks, allowing human resources to focus on delivering more personalized experiences. AI-enabled applications, such as customer service chatbots and online booking systems, might be developed to enhance the productivity and efficiency of services provided to a client. An extension of the above research suggests an AI-driven hotel recommendation system based on the reviews by customers for better decision-making by a tourist. The system applies Natural Language Processing techniques, like sentiment analysis and TF-IDF-based text similarity to process the reviews from the guests to rank the hotels. In that respect, the system can suggest a few hotels having equivalent positive experiences as perceived by their guests with the help of Cosine Similarity, hence facilitating the traveling user in his choice. It does result in showing data-based hospitality selections that build greater transparency over businesses' business, making attraction for more consumers and bringing together a business from their customers more efficiently through presenting the positive features of the respective services. Study data showed positive trends regarding reliance on technology toward greater business appearance through website use and social networks to make places more accessible that attract tourists visiting such destinations along with creating favorable experience for clientele. Many companies also showed improved operational efficiency and increased competitiveness in the global arena. However, most of them pointed out difficulties involving high cost in introducing newly advanced technologies and necessary training for specialized manpower. These are considered as barriers to the adoption of technology, especially on the part of small businesses or firms with minimal finances.

CONCLUSION

Findings from this study indicate that technology is a salient factor for continuous development of tourism in Albania. It is viewed as a necessary tool by businesses not only to improve existing services but also to innovate new products and offerings. Technology has redefined new pathways for growth and improvement, thereby providing avenues for international interactions, thereby enhancing the overall quality of tourism offerings of the country. The example of an AI-powered recommendation system also shows how machine learning and data-informative decision-making serve as forces in pushing digitalization in the tourism sector. Summing up, this is a sure impact of technology on the tourism sector, while businesses that seize these innovations and especially with AI implement automation of service, personal experience for guests, and improve their marketing strategies greatly benefit in expansion and growth to contribute to the sustainable development of tourism in Albania. This study is not without limitations. The research focused on a limited number of resorts in Durrës, Albania, which may limit the generalizability of the findings to the broader tourism sector or to other regions. The data collected relied heavily on self-reported responses and publicly available ratings, which may carry subjective biases. In addition, the proposed AI-powered hotel recommendation system was not deployed in a real-world commercial environment, so its effectiveness was not validated in direct user conditions. The study also did not address long-term implications, such as financial sustainability or return on investment of AI and smart tourism technologies. Future research should expand the geographical scope, incorporate longitudinal methods, and aim to quantify the economic impact of technology adoption in tourism, particularly in relation to artificial intelligence and service automation.

Recommendations

This paper is recommended to all businesses operating in the tourism sector, with the aim of helping them understand the importance and benefits of adopting technology to further develop their services and attract a greater number of tourists. The results of this study can assist these businesses in improving their internal processes and increasing their presence in international markets through digital platforms. Besides, businesses must consider adopting AI-based tools, such as automated review analysis and recommendation systems, to enhance customer satisfaction, optimize service delivery, and increase operational efficiency. Additionally, this paper is recommended to local and central institutions to value the positive impact that technology has on the tourism industry. Governments and policymakers must promote digital innovation in tourism by funding research and development of AI, subsidizing technology take-up for small and medium-sized enterprises, and enhancing digital literacy training for tourism professionals. Promoting the use of AI-driven recommendation systems by companies can help ensure online hotel review transparency, build customer trust, and provide a more enjoyable experience for tourists. By investing in AI-based solutions, businesses and institutions can make Albania more competitive as a tourist destination, promoting sustainable development and long-term performance within the global tourism sector.

Author Contributions: Conceptualization, A.K., F.P and I.L; methodology, A.K and F.P.; software, A.K, I.L and S.G.; validation, A.K. and F.P.; formal analysis, A.K, F.P. and S.G.; investigation, I.L. and S.G.; data curation, A.K and F.P.; writing - original draft preparation, A.K and F.P; writing - review and editing, A.K. and F.G.; visualization, I.L and S.G.; supervision, A.K.; project administration, A.K. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: We thank the Durrës businesses that participated in this study. Their feedback and insights were invaluable to us. We also acknowledge the application of AI tools in aiding data analysis, sentiment determination, and content fine tuning, which significantly contributed to the precision and validity of our findings.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 17.03.2025 Revised: 18.06.2025 Accepted: 04.07.2025 Available online: 24.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1495-1504
DOI 10.30892/gtg.61309-1519

URBAN TOURISM AND UNIVERSITY SPORTS. CASE STUDY ON THE IMPACT OF THE NATIONAL UNIVERSITY FOOTBALL CHAMPIONSHIP ON THE DESTINATION OF ORADEA, ROMANIA

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Citation: Herman, G.V., Bulz, G.C., Herman, M.L., Anca, S., Bulz, A.M., Tofan, G.B., Uulu, K.N., Brzezińska, A.B., Wendt, J.A., Ecer, Z.C., & Sandra, M. (2025). Urban tourism and university sports. Case study on the impact of the National University Football Championship on the destination of Oradea, Romania. *Geojournal of Tourism and Geosites*, 61(3), 1495–1504. https://doi.org/10.30892/gtg.61309-1519

Abstract: Since the second half of the 20th century, major changes have occurred worldwide in the perception of sport and sports tourism. Economic development and technical progress in every field have led to the emergence of new sports, which have become particularly attractive, especially for the young population. Therefore, sports tourism is becoming one of the expanding forms of tourism, which involves a multitude of relationships between tourists engaged in different activities (physical exercise, sports competitions, adventure tourism, sports entertainment and cultural exchange activities), on the one hand, and the tourist destination, on the other. In this study, we propose an analysis of the relationships between the University Football Championship, 2023 Edition, and tourism in the host destination, Oradea Municipality. This was possible after consulting, through the survey method, the members of the football teams from eight university centers in Romania, who participated in the University Football Championship, 2023 Edition, in Oradea. The results obtained were quantified after calculating two synthetic indicators, namely: the value of the sports index, which takes into account four qualitative criteria (quality of the game, quality of interaction, quality of the result and quality of the physical environment), respectively the value of the tourist index, also related to four qualitative criteria (tourist experience, tourist satisfaction, recommendation intention and return intention). In the case of both indicators and following their correlation, high average values were recorded, which can be attributed to the exceptional playing conditions offered by the organizer - the University of Oradea, respectively to the particularly favorable perception and satisfaction gained by the participants, following visits to the tourist attractions in Oradea Municipality, which proves, without a doubt, that the settlement on the banks of the Crișul Repede is one of the favorite tourist destinations in Romania.

Keywords: Oradea tourist destination, university sport, college football championship, tourist perception, tourist experience, tourist satisfaction, tourist intention

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INTRODUCTION

Sport is a social phenomenon that has accompanied humanity throughout time. Then, as now, sport led to the release of energy, the unification of social groups, the strengthening of athletes' health, the representation of the communities they come from, the promotion of peace between human collectivities, a form of social affirmation, etc. Thus, some elements of the sports infrastructure date back to ancient times, confirming the existence of sports competitions recorded in the writings of ancient Greek and Roman historians (Zekioglu & Kalkan, 2019; Morente, 2020). They are an expression of confrontation and cooperation between human communities (Scutti & Wendt, 2016; Herman et al., 2025).

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Within sports, university football championships have become increasingly important with the emergence and affirmation of universities at a spatial level, throughout the world. University football championships are cultural-sports events that have multiple purposes, including promoting sports among students, discovering talents for professional football, strengthening social ties between students, promoting university centers (Seifried, 2025; McCannon, 2025), developing the local economy (Reynolds, 2024; Raso & Cherubini, 2024; Webb et al., 2025), etc.

As in the case of tourism, participants in sports events are in a situation where they exchange their home environment for another host environment for a variable period. Most of the time, the host destination is new, completely unknown to the participants in sports competitions, so that they can explore the host environment also from a tourist point of view. Moreover, some athletes participate in competitions accompanied by various people, thus increasing the number of participants (tourists) in each destination. Before traveling, participants in sports competitions and their companions can study the tourist offer of the host destination, thus familiarizing themselves with the representative objectives in that area (Choi & Fu, 2018; Gibson et al., 2003; Lintumäki et al., 2020).

The growing academic interest in the relationship between university sports, dual careers, the geography of sports and the impact of competitions on the image of tourist destinations is reflected in numerous recent studies (Ilies & Buhaș, 2019; Ilies & Caciora, 2022; Dehoorne et al., 2019; Ilies et al., 2015; Ilies et al., 2012; Oros & Hanțiu, 2018; Chinhanga et al., 2021; Tichaawa & Hemmonsbey, 2019, 2021). Given the links between university championships and tourism (Gholipour et al., 2020; Higham & Hinch, 2002; De Villiers, 2003), related to mobility and the change of domicile space with a host destination space, it was necessary to carry out the present study which aims to highlight the relationships between sport and tourism, in this case between the university football championship and tourism.

The novelty of the study is given by the holding of the University Football Championship, 2023 Edition, in Oradea and the possibility of consulting participants in this event through the questionnaire method regarding the tourist experience and satisfaction gained during the stay in the host destination, the consolidation of the identity of the tourist destination image and the intention to recommend (to acquaintances) and to return to the destination Oradea, Bihor County, Romania.

The research questions are: are there relationships between the university football championship and tourism?; was the image of the tourist destination strengthened following the sporting event?; what are the participants' intentions regarding recommending the destination and the possibility of revisiting it. The research hypotheses of the present study focused on the fact that within the university championship, participants and their companions also acquire tourist status, and the tourist experience generates satisfaction with the role of strengthening the identity of the tourist destination image and the intention to recommend and return to the given destination.

The intensification of relations between sport and tourism in society is a specific current reality (Gammon & Robinson, 2003; Gibson, 1998; Higham & Hinch, 2002; Łuć, 2023), a reality dictated by a series of similar aspects, defining both for sport and for tourism, including: the role of sports events and tourism in shaping and directing massive flows of populations from a sending area to a receiving one (Alshikhy et al., 2025; Aussant, 2024); economic importance (Herman et al., 2021; Rossini et al., 2025; Raso & Cherubini, 2024; Campillo-Sánchez et al., 2025; Sardi et al., 2025; Toychievna & Izzatov, 2022; Buhaș et al., 2017; Kijewski & Wendt, 2019); social importance (Balbaa et al., 2025; Tang et al., 2025); the need to diversify the tourist offer and the way to spend free time as pleasantly as possible (De Knop, 1987, 1990; Kurtzman, 1995; Sudarmanto et al., 2025; Herman et al., 2016; Herman & Blaga, 2022); the intensification of international relations (El-Dabt et al., 2025; Modzelewski, 2025; Mascarenhas et al., 2024; Herrera & Pérez-Tapia, 2024; Bógdał-Brzezińska et al., 2023); etc. From what has been presented, a wide range of studies that have targeted the relationship between sport and tourism can be observed. However, the present research is justified and has particular importance due to the novelty of the studied area (the destination of Oradea is one of the emerging destinations in Romania, known for its spa and urban-cultured tourism focused on the Art Nouveau style), the methodology used (focused on the realities of organizing a university football championship and on the experience, satisfaction and tourist intention of the participants in the sporting event) and the results obtained (which can represent a synthetic form of highlighting the links between sport and tourism, as well as the importance of sporting events in diversifying the tourist offer of a destination with positive implications at a social, economic and cultural level).

RESEARCH METHODOLOGY

The data necessary for this study were obtained between May 18 and 21, 2023, through a questionnaire-based survey method, whose respondents were the participants in the 2023 university football championship, 141 male students, aged between 18 and 31. They were members of the football teams of eight university centers: "1 Decembrie 1918" University of Alba Iulia, West University of Timișoara, Petrol Gaze University of Ploiești, "Constantin Brâncuși" University of Târgul Jiu, "Aurel Vlaicu" University of Arad, University for Life Sciences of Iași, National University of Physical Education and Sport of Bucharest and University of Oradea.

The questionnaire used to investigate the relationship between sport and tourism was the one used (with some modifications) to establish the relationship between the quality of the Night of Museums event, the identity of the Oradea destination, tourists' satisfaction and their behavioral intentions (Elhosiny et al., 2023), being structured from 40 questions, offering the respondent the opportunity to provide answers in the Likert scale format (1 to 5, 1. very dissatisfied; 2. dissatisfied; 3. Neither satisfied nor dissatisfied; 4. Satisfied; 5. Very satisfied).

The establishment of the relationships between sport and tourism was achieved by using the multicriteria analysis method (Kiselakova et al., 2020; Patro et al., 2015; Herman et al., 2022), in which the criteria of sport (20 variables,

regarding the quality of the game, interaction, result and physical environment) and tourism (20 variables, regarding the lived experience, satisfaction, intention to recommend and intention to return) were studied (Figure 1).

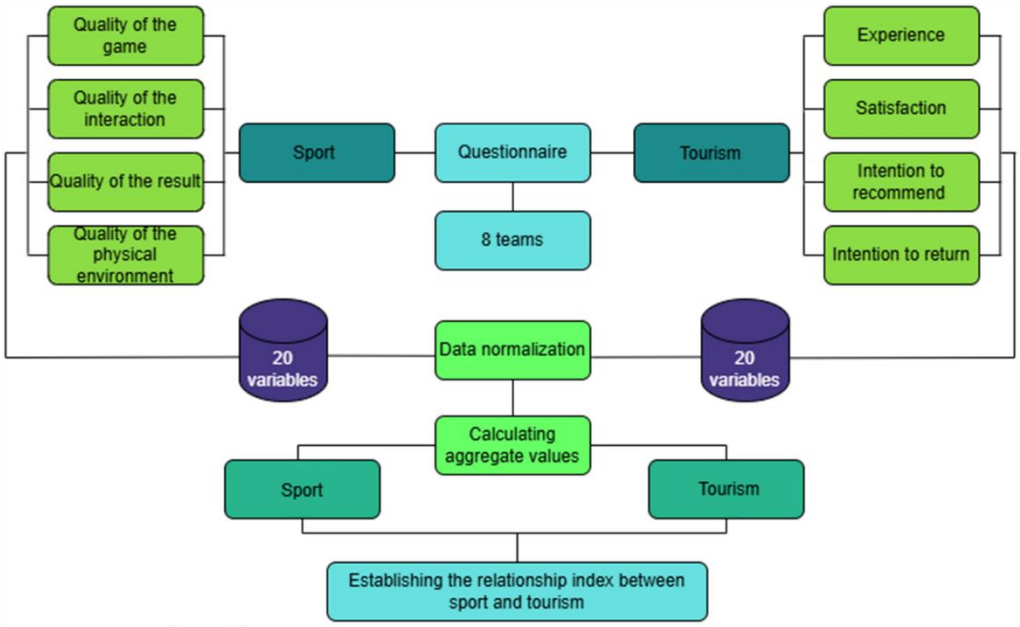

Figure 1. Conceptual model of the methodology used

To obtain aggregate values for sport and tourism, the information obtained through the questionnaire method was normalized to obtain comparable values between 0 and 1 (Boc et al., 2022; Deac et al., 2023). From a methodological point of view, the investigation of the relationships between the 2023 university football championship and tourism involved the following work stages: data normalization for each item (40 variables); calculation of aggregate values for each defining indicator for sport (quality of the game, interaction, result and physical environment) and tourism (experience, satisfaction, intention to recommend and intention to return); calculation of the aggregate index for sport and tourism; classification of respondents according to the value of the aggregate index for sport and tourism; establishment of the relationship index between sport and tourism and classification of respondents according to the relationship index.

RESULTS AND DISCUSSIONS

2023 UNIVERSITY FOOTBALL CHAMPIONSHIP

The Romanian university environment is represented, according to Government Decision no. 367/2023, with subsequent amendments and completions, by 89 higher education institutions, of which 45 are public higher education institutions, 37 are private higher education institutions (of which 3 are provisionally authorized), 7 higher education institutions with a military profile. In terms of spatial distribution, it is observed that higher education institutions are located in 22 cities, in 20 counties, which denotes an uneven distribution at the level of development regions and the territory of Romania (Figure 2).

The establishment of the National University Football Championship dates back to 2015, as part of the "All of Romania Plays Football" program, contributing to the fulfillment of Specific Objective 2.1 of the Strategic Plan for the Development of Football in Romania 2015-2020 (Strategic Plan for the Development of Football in Romania 2015-2020), "Consistent increase in the number of football practitioners" (Regulations of the National University Football Championship CNUF-Oradea, 2023). According to the statement of the organizing director of this competition, Octavian Stăncioiu, this model was taken over from the Americans who have an exceptional competitive system at the university level in sports such as football, basketball, tennis, etc.

So far, the university football championships have been won by Constantin Brâncuși University Târgu-Jiu (2015), Babeș-Bolyai University Cluj-Napoca (2016, 2018), West University Timișoara (2017, 2019, 2022, 2023) and Aurel Vlaicu University of Arad (2024).

The 2023 edition of the Romanian National University Football Championship (CNUF 2023) was organized in Oradea and had as partner organizers the School and University Sports Federation (FSSU), the University of Oradea (UO), the Politehnica University of Timisoara (UPT), the Romanian Football Federation (FRF). For the final phase of this competition, preliminary games were held in geographical areas between university centers from the same county or from nearby counties in order to reduce the costs of transportation and accommodation of the participating teams' staff. The games were played round-trip, with the possibility, with the mutual agreement of the 2 teams, for the game to be played in a single leg, establishing the venue and communicating in due time to the CNUF 2023 organizing committee.

15 university teams registered for this edition (University of Life Sciences Iași, UNEFS Bucharest, Constantin Brâncuși University Tg-Jiu, Petrol Gaze University Ploiesti, 1 Decembrie 1918 University Alba Iulia, Aurel Vlaicu University of

Arad, West University Timisoara and University of Oradea), of which the University of Oradea was directly qualified due to its status as the organizing institution of the competition (Figure 2).

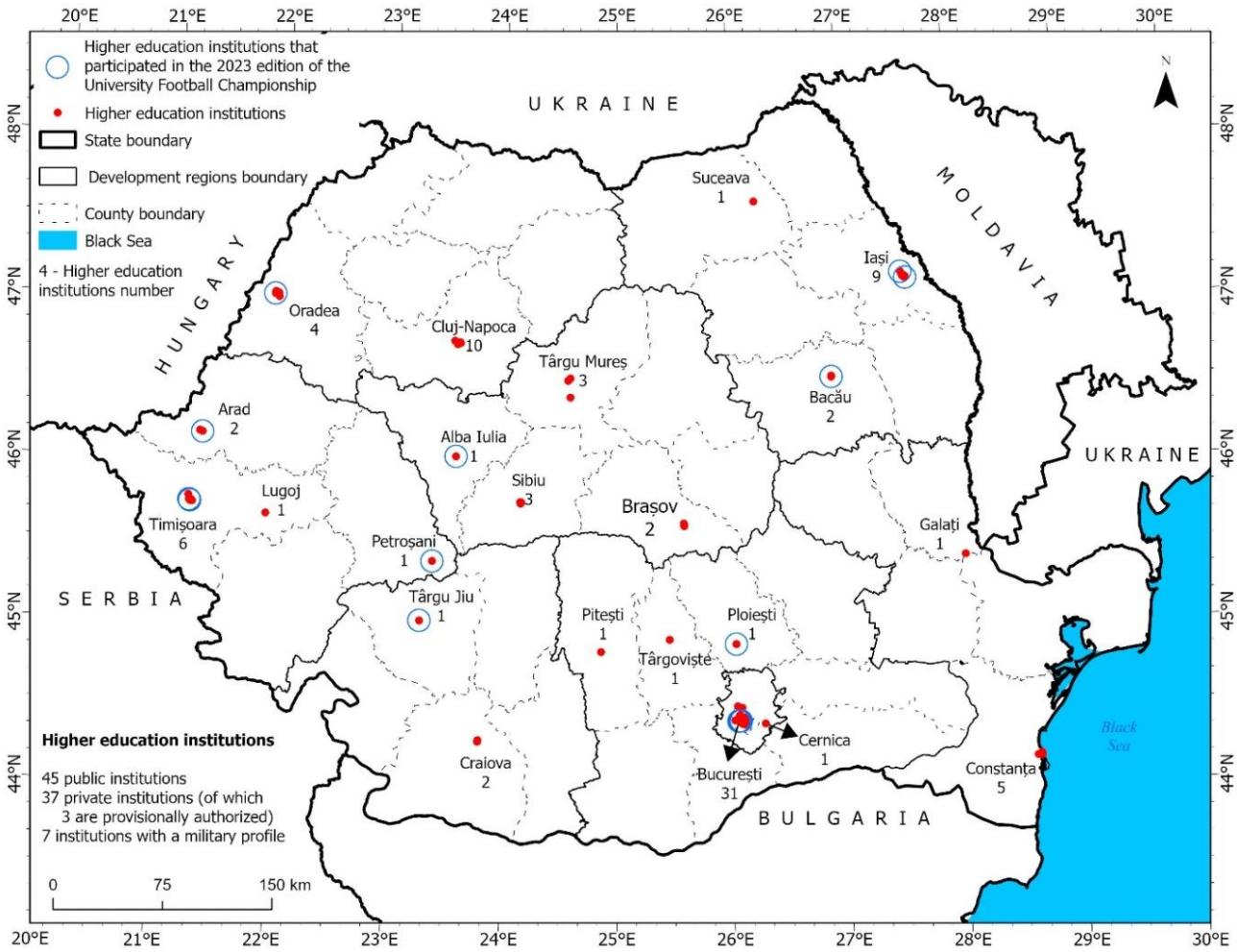

Figure 2. Spatial distribution of higher education institutions in Romania

The teams were formed by students, Romanian or foreign, in bachelor's/master's/doctoral studies at the university registered in the competition. Players may eventually be legitimized in the competitions organized by FRF/AJF/AMFB. The minimum age of the players is 17 years, and the maximum, 30 years, taking into account their age on December 31 in the final year of the competition. A person who is a student at several universities simultaneously may have the right to play at only one (Regulations of the National University Football Championship CNUF-Oradea, 2023).

Through a draw organized online on the ZOOM platform, 2 groups of 4 teams were established. The groups were divided into 2 nearby fields, the grass field of the University of Oradea and the grass field of the Oradea High School with Sports Program, which is located opposite the University. The venue of each group was also established by drawing lots. Each team had to send the squad for the final tournament 15 days before the start.

The competition took place on May 18 – 21, 2023 and ended with the following ranking: 1st place - West University of Timișoara; 2nd place - "Aurel Vlaicu" University of Arad; 3rd place - University of Oradea; 4th place - "1 Decembrie 1918" University of Alba Iulia. Therefore, at the 2023 edition of CNUF, the national university football champion was West University of Timișoara, for the 4th time since the start of this national competition. She represented Romania at the European Championship in Albania, where she achieved an honorable 6th place. It is worth noting that, after the triumph of the West University in the previous year at the same competition, CNUF2022, the team became the European champion (2022), defeating the Kiev university team in the final, representing Romania at the World University Football Championships in China, a unique performance in the history of Romanian university football.

This Final University Football Tournament had as its main objectives fair play, building friendships between students and coordinating professors, promoting the University of Oradea, promoting the city of Oradea through organized visits to the main tourist attractions but also evenings dedicated to students and professors. The opening ceremony took place in the Aula Magna of the University of Oradea where all the professors and students involved in the organization as well as the coordinating professors together with the participating teams and those who wanted to take part in the opening ceremony were invited. In organizing this final tournament, both the professors of the Faculty of Geography, Tourism and Sport of the University of Oradea and students from the geography department (2 students for

each team) were involved. The volunteer students had the task of guiding the coordinated teams to different tourist attractions in the city, facilitating or recommending different places they wanted to see, driving them to the place where they were having lunch, driving them from their accommodation to the stadium and back, etc.

Students coming from other counties were accommodated in several locations that were also determined by drawing lots, with the stipulation that all accommodation points were at a maximum of 1 km from the venue of the games. The accommodation places were distributed in the dormitories of the University of Oradea, the Cosma Partnership Technical College and the Bihor County Directorate of Sports and Youth. The costs related to the accommodation and food of the students for the 3 days of competition were covered for a number of 20 students/team by FSSU to which was added a financial contribution from the University of Oradea and the organizers. The teams that wanted to bring more than 20 players in the team paid their expenses for them from their own funds. The coordinating teachers were accommodated in guesthouses and hotels in Oradea. The meal was served at the University of Oradea canteen and at the County Directorate of Sports and Youth, Oradea. Regarding the educational part, visits to important sites in Oradea were organized, such as the Oradea Citadel, the Darvas-La Roche House, the Vulturul Negru Palace, the Luna Church, the Regina Maria Theater, the Unirii Square, etc. All the students and teacher-coaches were impressed by the architecture and beauty of the buildings, the European air of the city, the development of the infrastructure, the cleanliness and especially the people they met in Oradea. They said that they would return to visit Oradea with their families or friends. These statements were also confirmed by the results obtained from the consultation of the participants in the sporting event analyzed (the synthetic values related to sport and tourism, as well as the index of the relationship between sport and tourism).

The synthetic value of the sports index was obtained following the normalization and quantification of four qualitative criteria: C1 (Quality of the game), C2 (Quality of interaction), C3 (Quality of the result) and C4 (Quality of the physical environment), ranging between 0.1625 (respondent no. 120 in the database) and 1 (respondents no. 41, 43, 61, 75, 81, 91, 94, 111, 112, 113 and 115 in the database). In turn, each of the four criteria studied was structured from five sub-criteria (Figure 1). The synthetic sports index had an average value of 0.783894799 (very good). Based on this index, the respondents consulted were grouped into four value categories: very good (between 0.76 and 1; 68.1% of the people interviewed), good (between 0.51 and 0.75; 27.0% of the people interviewed), poor (between 0.26 and 0.50; 3.5% of the people interviewed) and very poor (between 0 and 0.25; 1.4% of the respondents) (Figure 3).

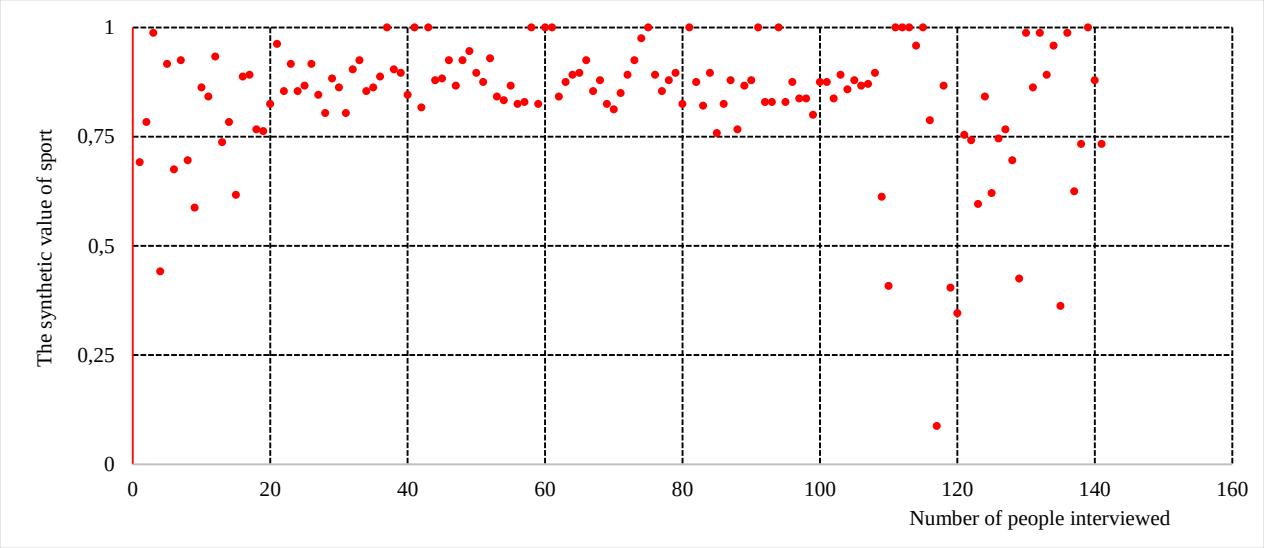

Figure 3. The synthetic value of sport

The high values of the synthetic sports index can be attributed to the exceptional conditions, the physical environment of the University Football Championship, 2023 Edition, made available to the participants by the University of Oradea, as well as the quality of the interaction, the game and the results thus obtained.

TOURISM IN ORADEA DESTINATION

The host city for the 2023 edition of the University Football Championship, Oradea is the most important tourist destination in Bihor County and one of the most important in northwestern Romania. Here, the grandeur and crowning of the centuries-old creative genius of the civilization developed in the city on the banks of the Criș Repede is very well reflected in the large number of architectural jewels, some of them classified as historical monuments, built under the influence of various styles including Byzantine, Romanesque, Gothic, Renaissance, Baroque, Secession and Art Nouveau. In 2020, as a result of the tourist progress recorded, Oradea received the status of a tourist resort of national interest (GD no. 377, 2020), so that in 2023, European Best Destination will award the title of "the most beautiful Art Nouveau destination in Europe" (Caciora et al., 2023). This is mainly due to the exceptional tourist resources (natural and anthropogenic) that this city possesses and the existing tourist infrastructure here.

Among the natural tourist resources, the following stand out: geothermal waters (exploited for tourist purposes within two leisure complexes: Aquapark Nymphaea Oradea and Ştrandul Ioşia Oradea), the course of the Crișul Repede River (developed through a series of facilities such as cycling and walking trails, along which potential tourists can observe the local flora and fauna) and Dealul Ciuperca (designed as a lookout point, from where one can contemplate and observe the city and its objectives, both day and night).

The antiquity and continuity of the city's habitation by a multiethnic population have led to the emergence of a particularly valuable architectural heritage. One of the most representative historical, religious and cultural monuments in the analyzed area is the Oradea Citadel (Herman et al., 2020; Botezat & Tomescu, 2016). Dating back to the 12th century (Borcea et al., 2007), the Oradea Citadel has been rebuilt and consolidated successively over time, so that today this monument represents an element of identity that can provide us with precious information about the past, present and future. Currently, the Oradea City Museum operates within the citadel. Among the architectural styles representative of the destination Oradea is the Art Nouveau style. This style was established at the end of the 19th century and the beginning of the 20th century, so that today, its traces can be seen everywhere, especially in the central area, in the old city center.

In recognition of the importance of the Art Nouveau style for the destination Oradea, the first Art Nouveau Museum in Romania, the Darvas-La Roche House, was opened here in 2020, on Iosif Vulcan Street, in the old city center, on the right bank of the Crișul Repede River (Caciora et al., 2023). Another identity element and an essential tourist resource for the municipality of Oradea is the Jewish identity heritage, namely the synagogues (Neolog Synagogue, Orthodox Synagogue, Poale Cedek Synagogue, Sas Chevra Synagogue, Viznitz Synagogue), Jewish palaces (Black Eagle Palace, Ullmann Palace, Moskovits Palace, Miksa Moskovits Palace, Stern Palace, Sonnenfeld Palace), Darvas House, Gendarme School, Adorjan I House, Adorjan II House, etc. (Herman et al., 2018).

Also, historical sites cannot be omitted (Oradea Fortress, "Centrul istoric Oradea" urban complex, Oradea University Complex (1912–1913); architectural: "Şirul Canonicilor" urban complex (1763-1870), Princely Palace (1618 – 1650), Oradea State Theatre (1900), Oradea City Hall (1902 – 1903), "Vulturul Negru" Palace (1907 – 1909), etc.; religious: "St. Martyrs Constantin Brâncoveanu and his sons" Church (18th century), "Maica Indurerată" Premonstratensian Monastery Church (1741), Roman Catholic Episcopal Palace (1762), "St. Spirit" Roman Catholic Church, Olosig (1905), Roman Catholic Church (1770), Roman Catholic Church - Catholic "St. Brigitta", today the Ruthenian church "St. Trinity" (1692 – 1722), Roman Catholic Chapel "Guardian Angels" (1755), Roman Catholic Cathedral "St. Mary the Great" (1752 – 1780), Orthodox Cathedral of the Assumption of the Virgin Mary, today the Church with the Moon (1784-1790), etc.

The specific and technical infrastructure of the city of Oradea is a determining factor in attributing the status of a tourist resort to this destination, consisting of 275 accommodation structures, 53 public catering structures, numerous health and leisure units, road, rail and air infrastructure that ensures the facilitation of the movement of people, including for tourist purposes. The accommodation base is made up of 275 accommodation units, which incorporate a number of rooms, respectively 4028 places. Reported at county level, these represent 30.7% of the number of structures, 20.9% of the total number of rooms for accommodation, respectively 21% of the number of accommodation places. Regarding the level of comfort, the accommodation structures in Oradea are classified at one star/flower (7 units), two stars/flowers (18 units), three stars/flowers (239 units), four stars/flowers (11 units) (LSPTC, 2024).

The public catering base is structured from 53 (24.7% of the total of Bihor County) public catering units classified at two stars (18 units, 34%), three stars (22 units, 41.5%) and four stars (13 units, 24.5%) (LSPTAP, 2024). The treatment infrastructure is well represented in the area of Oradea municipality, at the level of the Continental Forum, Ramada, Doubletree By Hilton Oradea, Nevis, Elite Boutique & Spa and Maxim hotels, which have treatment bases where tourists can benefit from the following services: balneotherapy, hydrotherapy, electrotherapy, inhalations, massage, laser therapy, physiotherapy, mechanotherapy, light baths, thermotherapy, etc. The road infrastructure (European roads DN76/E79, DN1/E60, DN79/E671 and county roads, DJ797, DJ767, DJ79A, etc.), railway (highway 300, 310, 314 and 402) and air (Oradea Airport) infrastructure, as well as the particularly favorable geostrategic geographical position, at the contact between Western and Eastern European civilizations, make the tourist destination Oradea a convergence point for the main regional and even international tourist flows.

From what is briefly presented, the image of the destination emerges that the respondents participating in the University Football Championship, edition 2023, were invited to discover at their own pace, both day and night, in the company and under the guidance of students from the Faculty of Geography, Tourism and Sport of the University of Oradea.

Following the quantification of the information obtained from the participants in the analyzed sporting event according to the research methodology used, the synthetic value of tourism was determined. This was possible following the normalization and quantification of the criteria C1 (Tourist Experience), C2 (Tourist Satisfaction), C3 (Intention to Recommend) and C4 (Intention to Return), which was between 0.0875 (respondent no. 117 in the database) and 1 (respondents no. 37, 41, 43, 58, 60, 61, 75, 81, 91, 94, 111, 112, 113, 115, 139 in the database). Each of the four criteria analyzed was obtained after normalizing and quantifying a number of five sub-criteria that targeted the destination, the human community, the tourist attractions, the tourist services and the prices charged at the level of the tourist destination Oradea (Figure 1). The synthetic tourist index had an average value of 0.836406619 (very good). Thus, the interviewed people were classified based on the synthetic tourist index into four value categories: very good (between 0.76 and 1; 84.4% of the interviewed people), good (between 0.51 and 0.75; 10.6% of the interviewed people), poor (between 0.26 and 0.50; 4.3% of the interviewed people) and very poor (between 0 and 0.25; 0.6% of the respondents) (Figure 4).

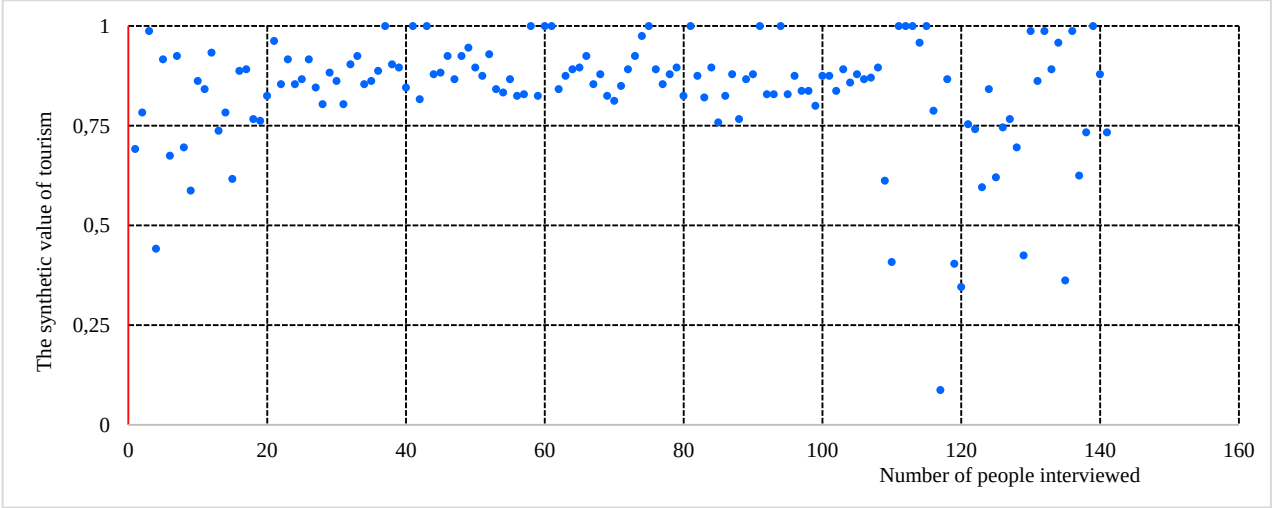

Figure 4. The synthetic value of tourism

As in the case of the synthetic sports index, the synthetic tourism index also recorded high values, which are justified by the tourist perception of the host city by a young and homogeneous target group, aged between 18 and 31, with student status. The main aspects analyzed concerned the experience, the satisfaction gained from the stay in Oradea during the analyzed event and the participants' intentions to recommend the visited destination and to return as tourists. The variables taken into account in the analysis concerned the destination, the locals, the tourist attractions, the tourist services and the prices charged.

THE RELATIONSHIP BETWEEN SPORT AND TOURISM

To establish the types of relationship between sport and tourism, eight indicators (four for sport and four for tourism) were used, each with five variables, respectively 40 variables. The index of relationship between sport and tourism, thus obtained, was between [−1; 1], being divided into four equal categories (between −1 and −0.5, weak negative relationships; −0.51 and 0, strong negative relationships; 0.1 and 0.5, strong positive relationships; 0.51 and 1, weak positive relationships) (Figure 5):

(1) No interviewee belonged to the first category, that of weak negative relationships [−1; −0.5], in which the values of the synthetic index related to sport are lower than those of tourism.

(2) Regarding the second category, that of strong negative relationships [−0.5; 0] included 100 interviewees (17.7%). This type of relationship is defined by values of the synthetic index of sport lower than those of the synthetic index of tourism.

(3) Strong positive relationships [0.1; 0.5], defined by values of the synthetic index of sport higher than those specific to the synthetic index of tourism, were identified in 40 interviewees (79.4%).

(4) Weak positive relationships [0.51; 1], with synthetic sports index values higher than those specific to the synthetic tourism index, were identified in person number 117 in the study database (having a relationship index value of 0.652892561983471).

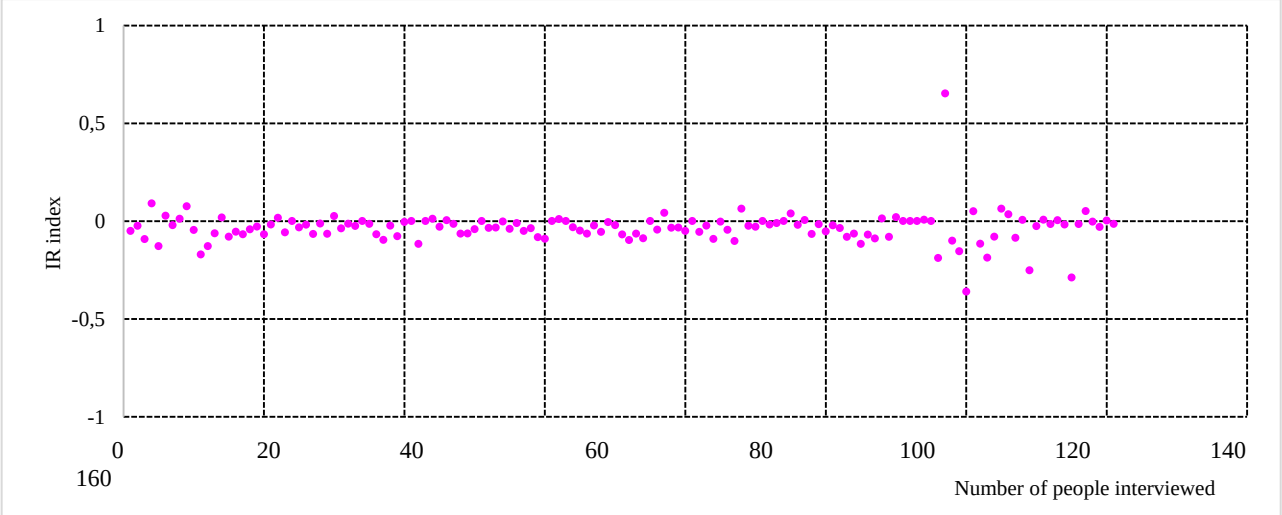

Figure 5. The synthetic value of tourism

Therefore, following this research, it emerged that strong relationships between sport and tourism were identified in the case of 140 people (99.3%), while weak relationships were found in only one person (0.7%).

Thus, the results obtained clearly highlight the role of sporting events in the diversification and development of the local tourism offer and can represent informational support for local decision-makers to optimize and streamline cultural tourism in the destination of Oradea, Romania.

The limitations of the study come from the research methodology used (from the way in which the system of indicators and related variables was built) and from the unilateral approach to the relationship between sport and tourism; in the studies conducted, only invited participants in the university football championship, edition 2023, Romania, were consulted. Thus, for the future, new studies are needed that follow the relationship between sport and tourism through the lens of all factors involved in the organization and conduct of sports and tourism events (event organizers, decision-makers involved in the development of tourism at local and national level - tourist information and promotion centers, the Bihor Destination Management Agency, the Association for the Promotion of Tourism in Oradea and Region, etc. -, tourism service providers, tourists and last but not least the local population.

CONCLUSIONS

Oradea is one of the most representative tourist destinations in Romania focused on spa and cultural tourism (Bădulescu et al., 2024; Stupariu et al., 2022; Tătar et al., 2023). This fact was favored by the existence of natural (thermomineral waters) and anthropogenic resources of great value, as well as by the existing tourist demand in this regard on the market.

Following this study, the research hypothesis was tested, establishing the existence of close relationships between sport and tourism according to the information provided by 99.3% of the respondents. It was also found that the CNUF event, the 2023 edition, contributed to strengthening the destination image of the host city Oradea, a fact confirmed by the intentions of the event participants to recommend the destination Oradea to other people (to a large extent, on a scale from 1 to 5, 80.1% of the people consulted expressed their intention), as well as by their intentions to return as tourists (to a large extent, on a scale from 1 to 5, 83% of the people consulted expressed their intention). Thus, the study confirms that sport can be complementary to tourism, contributing to the diversification of tourist activities, to the increase in the number of tourists, to local economic development and, last but not least, to the consolidation and affirmation of the identity of tourist destinations (Ito & Higham, 2020; Radicchi, 2013; Weed & Jackson, 2009).

Limitation of the study

The study presents several limitations in terms of approach and methodology. First, the research was based exclusively on the opinions of participants in the 2023 National University Football Championship, without including the perspectives of other relevant actors (organizers, local authorities, tourism service providers, residents). Second, the quantitative methodology used, although rigorous, limited the depth of interpretation of tourism experiences. Also, the short period of the event may influence the temporary nature of perceptions.

Author Contributions: Conceptualization, G.V.H., K.N.U. and J.A.W.; methodology, G.V.H., M.S., G.C.B and M.L.H.; software, S.A. and A.M.B.; validation, G.B.T.; formal analysis, V.G.H. and A.B.-B..; investigation, M.S. and G.C.B.; data curation, G.B.T.; writing - original draft preparation, G.V.H., M.L.H., K.N.U. and J.A.W.; writing - review and editing, M.S., G.C.B. and A.B.B.; visualization, S.A.; supervision, G.V.H. All authors have read and agreed to the published version of the manuscript. Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgments: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest

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Article history: Received: 15.04.2025 Revised: 19.06.2025 Accepted: 07.07.2025 Available online: 28.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1505-1518
DOI 10.30892/gtg.61310-1520

ANTECEDENTS INFLUENCING THE SUSTAINED INTENTION TO UTILIZE GENERATIVE ARTIFICIAL INTELLIGENCE CHATBOTS WITHIN THE DOMAINS OF HOSPITALITY AND TOURISM

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Citation: Khreis, S.H.A., Elkhwesky, Z., Sabiote-Ortiza, C.M. Parvez, M.O., & Al-Azab, M.R. (2025). Antecedents influencing the sustained intention to utilize generative artificial intelligence chatbots within the domains of hospitality and tourism. *Geojournal of Tourism and Geosites*, 61(3), 1505–1518. https://doi.org/10.30892/gtg.61310-1520

Abstract: Generative artificial intelligence (GenAI) has evolved as a distinct aspect of artificial intelligence technology, with the lofty goal of imbuing robots with human-like reasoning and behavior. Although artificial intelligence and its applications, such as chatbots, have only recently been introduced, these technologies will soon become indispensable in the hospitality and tourism industries. It is imperative to understand the factors influencing tourists' intentions to persist in utilizing GenAI chatbots for hotel bookings and travel-related activities. Utilizing the framework of social cognitive theory, the present research examines the relationships among the strengths of GenAI chatbots, perceived advantage, technical self-efficacy, perceived personalization, and the intention to continue using chatbots. A survey was administered through the Prolific platform to gather data from a sample of 450 tourists residing in the United States of America. The collected data were subjected to analysis through partial least squares–based structural equation modeling utilizing SmartPLS 4 software. Our findings revealed that perceived advantage did not serve as the predominant catalyst for tourists' continued intention to engage with chatbots. Rather, our results suggest a nuanced understanding of user perceptions, wherein intrinsic factors (e.g., technical self-efficacy) and experiential benefits (e.g., perceived personalization) surpass traditional perceptions of technological superiority. Designers and developers ought to enhance chatbots that offer tourists tailored suggestions, complemented by visual elements such as images, videos, and virtual tours of recommended locations. Hospitality and tourism authorities should provide financial and information support for designers of GenAI technologies such as chatbots because chatbots could offer recommendations for booking inquiries, making reservations for accommodation and other facilities, and providing advices for travel places and tourism sites together with immediate and tailored information.

Keywords: generative artificial intelligence, chatbot, technical self-efficacy, personalization, intention, hospitality, tourism

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INTRODUCTION

Technology is a vital component of consumers' daily lives (Trakulmaykee et al., 2025; Wang et al., 2021). In line with this shift in consumer behavior, organizations are looking to use artificial intelligence applications to improve the quality of services provided to customers, resulting in more unique, positive, and personalized experiences (Allal-Cherif et al., 2021). Artificial intelligence can be described as a system's ability to successfully extract insights from external data and use learned knowledge to achieve certain goals and activities.

These algorithms are often classified as supervised, semi-supervised, or unsupervised (Kar et al., 2023). As humans began to use artificial intelligence in a variety of fields, organizations pioneered a new paradigm known as GenAI (Kim et al., 2025). The goal of GenAI is to create new and original content from training data. This content can take the shape of books, photos, music, or video. This may even be the plot of a film or an academic article. As a result, a variety of applications are available. Chatbots are one example of GenAI applications (Gupta et al., 2024).

GenAI has evolved as a distinct aspect of artificial intelligence technology, with the lofty goal of imbuing robots with human-like reasoning and behavior. Although artificial intelligence and its applications, such as chatbots, have only recently been introduced, these technologies will soon become indispensable in the hospitality and tourism industries (Buhalis & Moldavska, 2022). Artificial intelligence-powered chatbots, such as ChatGPT, have proven useful in hospitality

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and tourism. In addition to managing simple booking inquiries (Bulchand-Gidumal et al., 2024), obtaining travel information and making reservations for accommodations and other facilities (Kim et al., 2024), they can provide round-the-clock interactive customer service. They can also facilitate personalized and context-aware user experiences (Buhalis et al., 2023). Nevertheless, empirical studies concentrating on their use in hospitality and tourism-related activities are scarce (Kim et al., 2024). The application of GenAI in hospitality and tourism to reduce costs and improve service accuracy has been the topic of research (Majid et al., 2024; Wong et al., 2023).

The hotel sector is taking a closer look at artificial intelligence technologies because of their potential to improve guest experiences, increase operational efficiency, and spur business growth (Mariani & Baggio, 2022). According to Dwivedi et al. (2024), chatbots improve customer experience, staff productivity, and the delivery of precise query responses and are immediately applicable to the tourist and hospitality sectors. Persuasive technology integration with chatbots offers customized, interesting, and affordable services for hospitality and tourism (Kim et al., 2023). It also has a great deal of potential to improve hotel business performance and customer experience (Remountakis et al., 2023).

Chatbot designers and marketers should make sure that their creations are easy to use and beneficial for managing hospitality and tourism services and tour planning. In order to intelligently automate the hospitality and tourism business by offering real-time solutions, chatbot developers must make sure that their creations deliver trustworthy information. In order to give tourists the impression that chatbots are genuine, lively, and human-like, chatbot developers must also ensure that their creations possess anthropomorphic traits. To give tourists a user-friendly interface, chatbots should interact in multiple languages (Pillai & Sivathanu, 2020). Designers should also work on developing the next generation of chatbots so that the phrases adapt to the situation in which the chatbot is embedded. This is generally not done in current generations of chatbots; it is not uncommon to find chatbots that extract and present information directly from websites, books, or manuals without any adaptation. Moreover, new generations of chatbots are expected to generate their own custom phrases dynamically. They will need sophisticated language engines that are able to dynamically adapt their conversational history to changing situational parameters in the context of hospitality and tourism (Chaves et al., 2022).

Given that GenAI chatbots are still in their infancy, it makes sense and is relevant to investigate how they can cause a radical revolution in hospitality and tourism (Law et al., 2024). Given the existing paucity of research exploring the potential of such tools to usher in new prospects within this field, this undertaking assumes significant significance (Wong et al., 2023). Previous research has primarily concentrated on the overall function of chatbots in hospitality and tourism (Law et al., 2024). However, this study tries to offer a comprehensive and empirical understanding of how tourists view and interact with chatbots, especially with regard to chatbots benefits and their intentions to keep using it for travel-and hospitality-related services. Importantly, as far as we know, no previous studies have looked into the experience and plans for continued usage of GenAI by tourists. As such, a thorough examination of various viewpoints is necessary. Tourists' satisfaction and their continuance intention to use chatbots in the context of hospitality and tourism have received little attention in existing research (Pham et al., 2024), despite the importance of understanding initial artificial intelligence adoption and acceptance (Solomovich & Abraham, 2024). Thus, it is essential to comprehend not only early adoption but also user pleasure and ongoing usage throughout time in order to fully grasp GenAI's potential (Duong et al., 2024).

Following an analysis of the literature on chatbots and artificial intelligence, the following research gaps were found. First, there has only been a handful of extremely recent research on the effects of GenAI chatbots on hospitality and tourism since the introduction of chatbots (e.g., Gursoy et al., 2023). Consequently, there haven't been many empirical attempts to create theories and evaluate conceptual models in hospitality and tourism (e.g., Limna & Kraiwanit, 2023). Second, chatbots and other artificial intelligence-powered technologies are developing quickly (Remountakis et al., 2023), and their limitations and capabilities could alter later (Carvalho & Ivanov, 2024). Therefore, monitoring how users behave with this evolving technology could assist in guaranteeing that users continue to have valuable experiences.

The adoption and effects of GenAI are the main topics of the current study, with a focus on hospitality and tourism. This research offers a roadmap for comprehending the processes via which GenAI affects the tourist experience. Moreover, GenAI technologies' novelty and dynamic nature demand a proactive approach to conceptual exploration. In light of the swift progress and revolutionary possibilities of artificial intelligence in hospitality and tourism, this investigation acts as a trigger for encouraging additional investigation in this domain (Gupta et al., 2024).

The current study helps deepen our understanding of the factors that may influence how tourists interact with GenAI chatbots. Additionally, the current research provides a set of implications and recommendations to enhance chatbot design, helps system designers and developers of artificial intelligence-based chatbot solutions, as well as practitioners, managers, and executives in the hospitality and tourism sectors, understand factors that lead to tourists' acceptance of chatbots and support continuance intention to use (Pillai & Sivathanu, 2020); thereby ensuring a distinctive and favorable client experience in hospitality and tourism. In conclusion, drawing on the social cognitive theory (Guan et al., 2024; Gupta et al., 2024; Khan et al., 2024), our study aims to investigate the association among GenAI chatbot strengths, perceived advantage, technical self-efficacy, perceived personalization, and GenAI chatbot continuance intention to use from the perspective of tourists in the United States of America who used GenAI chatbot for booking hotels and travel purposes.

THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

Social cognitive theory

An interesting opportunity for a thorough examination of the intricate, multi-layered relationship between human cognition, behavior, and environment is presented by the combination of social cognitive theory and artificial intelligence. Social cognitive theory emphasizes how contextual beliefs, self-efficacy, and social learning influence behavioral

decisions. Some forms of social intelligence can be mimicked and even enhanced by artificial intelligence with its sophisticated machine learning algorithms and data models (Khan et al., 2024). The central concept of social cognitive theory is self-efficacy, which Bandura and Cervone (1986) define as the assessments of one's ability to carry out the courses of action necessary to deal with potential scenarios. The idea argues that the most important component influencing behavioral change is self-efficacy since it promotes the development of coping mechanisms. Self-efficacy is defined as the assessment of one's capacity to use technology to carry out a specific job or task (Compeau & Higgins,1995).

In order to investigate whether attitudes toward artificial intelligence are related to outcomes like self-efficacy and intention to use artificial intelligence technologies, this study is based on social cognitive theory. Social cognitive theory holds that expectations for future performance-related and personally advantageous consequences have an impact on a user's behavior. Expectations for both outcomes were influenced by self-efficacy (Gupta et al., 2024). In social cognitive theory for artificial intelligence, behavior modeling and learning play a significant role. Imitation learning—a method by which someone picks up new behavior just by watching others—is highly valued in social cognitive theory (Bandura, 1986). Artificial intelligence has great promise for shedding light on cognition and behavior modeling because of its proficiency in sifting through massive datasets and identifying patterns in behavior. Artificial intelligence technology, such as chatbots and virtual agents, can be programmed to use social cues, persuasive messaging that is customized for each user, and social support in order to encourage positive behavior or speed up the process of changing behavior (Gupta et al., 2024).

Social cognitive theory is a well-respected and significant theoretical framework that serves as the foundation for this investigation. According to social cognitive theory, conduct patterns, environmental variables (like the adoption of GenAI chatbots), and personal characteristics (like self-efficacy) interact comprehensively to determine human behavior (Priesemuth & Schminke, 2019). Based on social cognitive theory, people behave not only based on internal factors but also heavily influenced by external factors and social cues (Maialeh, 2019). The current research uses social cognitive theory as a framework in the context of GenAI chatbots in hospitality and tourism to study tourists' continuance intention of using GenAI chatbots. By presenting instances of positive interactions with the chatbot and offering feedback that reinforces these interactions, marketers can use the ideas of social cognitive theory to boost tourists' use of GenAI chatbots (Gupta et al., 2024). In this context, social cognitive theory places a strong emphasis on how tourists, their behavior, and their surroundings interact during the travel process (Bandura, 2014) thereby tourists actively participate in the travel process by establishing goals, evaluating perceived advantages and perceived personalization, and modifying their behavior in response to feedback rather than being passive consumers of information (Guan et al., 2024). This immersive activity, which is essentially a new kind of human-AI role play (Ivanov et al., 2024), may help tourists communicate and interact more successfully and confidently (Kohnke et al., 2023). The proposed research model and hypotheses assessed by our study are shown in Figure 1 below.

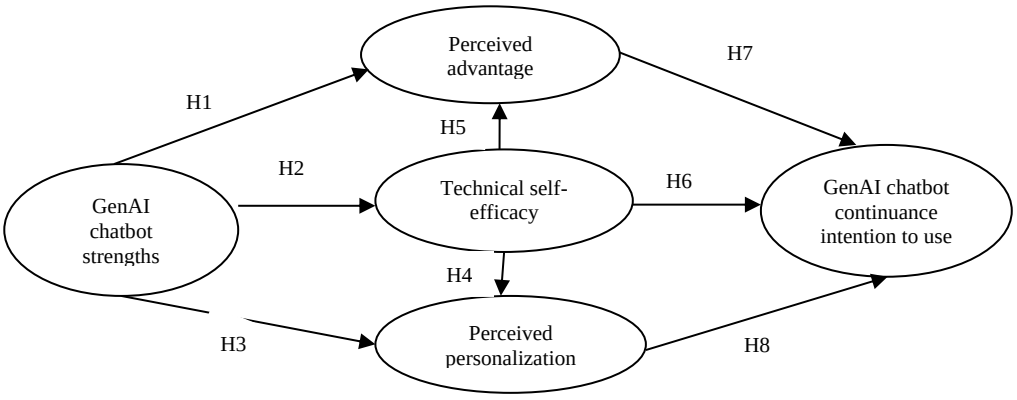

Figure 1. Proposed research model

Generative artificial intelligence chatbots

GenAI chatbots use algorithms that are trained to process and analyze large volumes of data using methods including statistical models, rule-based approaches, and deep learning. They then generate natural text responses for online users based on the information they receive (OECD, 2023). Accordingly, it is anticipated that virtual agent systems, like chatbots, will be used for 25% of customer support tasks (Moore, 2018). Due to the advancement of artificial intelligence, chatbots are becoming more common in e-commerce (Li & Wang, 2023), tourism (Pillai & Sivathanu, 2020), education (Ryong et al., 2024, hotels (Sheehan et al., 2020), SMEs (Selamat & Windasari, 2021), and online shopping (Kasilingam, 2020).

Prior literature focused on the topic of chatbots, including users' satisfaction and loyalty with chatbots (Hsu & Lin, 2023), attitude (Lin et al., 2022), customer service performance (Wang et al., 2022), trust (Jiang et al., 2023), engagement, and user behavior (Jiang et al., 2022). In the modern era of digital marketing and information systems, chatbots have become significant, particularly in customer service interactions that are changing from being human-driven to technology-dominant (Selamat & Windasari, 2021). The hospitality and tourism sectors are one area where chatbots have demonstrated their transformative potential (Law et al., 2024). The application of GenAI chatbots in hospitality and tourism is still in its infancy. Chatbots offer recommendations for travel places and tourism sites together with immediate and tailored information (Carvalho & Ivanov, 2024). For tourists, chatbots can serve as digital secretaries or assistants before, during,

and after their travels (Wong et al., 2023). GenAI chatbots are able to process data from several travel websites and provide cost-effective trip details and recommendations encompassing accommodation, dining, transportation, and attractions by assessing tourists' tastes and needs through their discussions and responses (Wong et al., 2023). In addition, tourists can use chatbots to learn more about group reservations and event-specific bookings, which will help them make more informed decisions. This platform may also provide travelers with personalized recommendations along with visual aids like pictures, videos, and virtual tours of suggested destinations (Dwivedi et al., 2024).

The increased level of interaction and experience among tourists is a major factor in both efforts to attract new visitors and keep existing ones (Carvalho & Ivanov, 2024). Businesses in hospitality and tourism have started experimenting with chatbots to enhance customer service interactions and delivery (Tussyadiah, 2020). In this context, chatbots provide particular uses for hospitality and tourism that improve client interactions (Zarezadeh et al., 2023). The ability of chatbots to provide accurate answers and efficiently handle common questions makes them unique (Wong et al., 2023). The rapid resolution of tourist inquiries through its inclusion in tourism service offers will enhance the overall visitor experience (Dwivedi et al., 2024). Chatbots can help tourists make well-informed judgments about which destinations to include on their schedule, as well as decisions about routes, modes of transportation, lodging, and even costs (Wong et al., 2023).

Generative artificial intelligence chatbot strengths and perceived advantage

The strengths of GenAI point to the many benefits it offers tourists, making them more positive towards adopting GenAI technologies, as positive attitudes are often based on positive perceptions of outcomes (Ivanov et al., 2024). Perceived advantage is the extent to which a tourist thinks a target system would improve his performance in an organizational setting (Lee et al., 2013). Additionally, perceived advantage is a reflection of end users' subjective likelihood that utilizing the new technology will improve their personal and organizational well-being (Phillips et al., 1994).

The incorporation of GenAI is crucial for improving visitor interactions and service efficiency in the hospitality and tourism sectors (Wong et al., 2023). According to Carvalho & Ivanov (2024), chatbots and virtual concierges offer prompt help, guaranteeing continuous and seamless interaction with visitors. Some of the functions they perform include information provision, order taking, reservation confirmation (check-in and check-out), and complaint handling. The dining experience can benefit from the use of GenAI models. By developing inventive recipes based on nutritional needs, they can help with menu planning and perhaps take dining to a whole new level of personalization and creativity (Wang, 2024).

Numerous potential advantages of GenAI have been identified including tailored learning experiences (Baidoo-Anu & Ansah, 2023). The theory of planned behavior posits that these perceived benefits will have a positive impact on attitudes toward GenAI because attitudes are frequently associated with an individual's positive or negative assessments of behavioral outcomes (Bosnjak et al., 2020). By supporting views about the viability of integrating this technology in hospitality and tourism services, the expected benefits of GenAI, such as the automation of labor-intensive jobs, may improve perceived behavioral control (Knauder & Koschmieder, 2019). The impact of GenAI chatbots on the online customer experience has been the subject of a few research (Verma et al., 2021). Chen et al. (2021) empirically examined the primary technology acceptance model (TAM) model-based predictors of online customer experience in the context of online commerce. The majority of their findings confirmed the critical role that perceived advantages play in consumers' cognitive or extrinsic experiences. According to social cognitive theory, the expectations for future performance-related and personally advantageous consequences have an impact on a user's behavior. So, chatbots can greatly assist service providers in molding client experiences and holding onto market share (Kushwaha et al., 2021).

Chatbots have the potential to forecast consumer attitudes and emotional and cognitive involvement, as well as their satisfaction and loyalty (Araujo, 2018). Kunze (2016) emphasized the importance of perceived advantage of GenAI through personalized services that chatbots might offer tourists by customizing recommendations and information according to their interests. On the basis of the arguments above, the following hypothesis is proposed:

H1. GenAI chatbot strengths have a significant effect on perceived advantage.

Generative artificial intelligence chatbot strengths and technical self-efficacy

Drawing on social cognitive theory, general self-efficacy represents people's overall ideas about their capacity to handle difficult circumstances (Bandura, 1986), while specific self-efficacy gauges confidence in specific activities or situations. Technical self-efficacy is individuals' confidence in their ability to learn and use a particular technology (Ajzen 2002) such as GenAI chatbots. The successful commercialization of service robotics requires knowledgeable and driven clients who are open to utilizing sophisticated automatism or artificial intelligence (Turja et al., 2019). The degree of interest in technology is connected with technical self-efficacy (Niederhauser & Perkmen, 2008). People who are motivated to utilize robots are more likely to be confident in their ability to learn this type of technology. According to Khan et al. (2024), using GenAI chatbots can improve one's confidence in one's ability to use artificial intelligence technology.

Nguyen et al. (2021) discovered, for instance, that using artificial intelligence chatbots boosts users' confidence in their ability to use artificial intelligence technology. In a similar vein, Puntoni et al. (2021) found that employing a virtual assistant with artificial intelligence increases users' self-efficacy, particularly when using artificial intelligence to retrieve information and e-commerce. In the area of religious tourism, research demonstrated a relationship between artificial intelligence trust and artificial intelligence self-efficacy. For example, Alam et al. (2023) found that travelers who relied on the virtual assistant to create their own itinerary for pilgrimage felt more secure about themselves when they traveled to a new sacred site. The study's findings are consistent with Klossner's review of technology adoption research (2022), which shows that users' technical self-efficacy for artificial intelligence-powered travel support

technologies is mostly shaped by artificial intelligence trust. Nguyen et al. (2021) found that employing artificial intelligence chatbot increases users' self-efficacy in navigating artificial intelligence technology. Similarly, Puntoni et al. (2021) reported that using an artificial intelligence virtual assistant elevates users' self-efficacy. Ivanov et al. (2024) found that strengths of GenAI have a positive effect on technical self-efficacy, where the efficiencies gained through GenAI are anticipated to bolster perceived control. Hence, the following hypothesis is proposed:

H2. GenAI chatbot strengths have a significant effect on technical self-efficacy.

Generative artificial intelligence chatbot strengths and perceived personalization

According to Baabdullah et al. (2022), perceived personalization is the feeling of individuals that the information and answers by GenAI chatbot are tailored to suit their requests and questions and make them feel like a unique customer. Canhoto et al. (2024) claimed that perceived personalization has a significant positive impact on customers. For example, perceived personalization helps SMEs reduce customer information overload and provides better decision matching for clients in terms of goods, services, communication, and personalized experiences. Moreover, Gao & Liu (2023) noted that perceived personalization positively affects SMEs' performance in terms of premium prices, a greater response rate, a devoted and pleased client base, and differentiation from competitors. Artificial intelligence concierges are excellent at personalizing and tailoring the tourist journey by utilizing deep neural networks and advanced machine learning algorithms, which are based on individual profiles and past actions (Deb et al., 2018). This entails using predictive analytics to take into consideration certain traits in addition to a thorough examination of the customer's past purchases to determine preferences.

This customized approach to personalization makes for a more memorable and individualized customer service experience (Liu et al., 2024). Personalized experiences can also be made with GenAI through producing personalized recommendations for dining alternatives, activities, and even room arrangements based on the analysis of individual preferences and previous interactions, so customizing each experience to a guest's distinct preferences (Wong et al., 2023). Intelligent data analysis is the key to customer relationship applications, which significantly increase consumer pleasure and loyalty (Peelen & Beltman, 2013). Numerous scholars have expressed their strong support for the significance of tourists' data analysis, with recent studies highlighting the transformative opportunity for enhancing both automation and personalization in customer interactions through the integration of GenAI into chatbot systems (Verma & Kumari, 2023). According to social cognitive theory, people act not only based on internal factors but also are greatly influenced by external factors and social signals (Maialeh, 2019).

Strengths of the GenAI chatbot such as answering follow-up questions and rejecting inappropriate requests (Ivanov et al., 2024) could make an individual perceive personalization or feel like a unique customer (Baabdullah et al., 2022). On the basis of the arguments mentioned above, the following hypothesis is proposed:

H3. GenAI chatbot strengths have a significant effect on perceived personalization.

Technical self-efficacy and perceived personalization

GenAI is perfect for communication since it can create personalized interactions with guests and carry out expressive duties (Brendlinger, 2023). For instance, GenAI chatbots can utilize natural language processing techniques to craft a personalized response based on the context of each customer inquiry by analyzing customer data (Athuraliya & Farook, 2018). This creates value for the customer by providing them with a personalized answer to their request or question instantly (Dogru et al., 2023). Similar to other artificial intelligence system types, chatbots can track user behavior and content with a high degree of personalization, which helps to predict user preferences and needs accurately (Kunze, 2016). According to Alalwan et al. (2020), personalization is one of the most engaging aspects of chatbots that provide customers with a distinctive and appealing experience. Stated differently, customers would find the chatbots' level of personalization to be much more in line with their expectations and inquiries, which would cause them to become more engaged in the interaction (Alalwan et al., 2020). According to a recent Statista study (2020) that mapped customer service agents' perceptions of chatbots, 64% of the agents believe that chatbots will primarily assist them in offering their clients a highly personalized service experience, which will ultimately impact their marketing and overall business performance. Social cognitive theory holds that expectations for future performance-related and personally advantageous consequences have an impact on a user's behavior (Gupta et al., 2024). GenAI chatbot can reach to design personalized strategies that treat each tourist or traveller as a unique segment (AIM, 2024). Based on the concept of technical self-efficacy, tourists can optimize their choices by comparing and evaluating the unique features of information and answers by GenAI chatbots (Ku & Chen, 2024). Hence, we propose:

H4. Technical self-efficiency has a significant effect on perceived personalization.

Technical self-efficacy and perceived advantage

Technology-specific self-efficacy is connected with the degree of interest in technology (Niederhauser & Perkmen, 2008), supporting the theory that self-efficacy is a component of cognitive motivation (Bandura, 1986). Wu et al.'s meta-analysis (2012) indicates that trust significantly influences each person's behavioral intentions. This is in line with Qin et al. (2020), who demonstrated how self-efficacy influences beliefs and behaviors. Furthermore, when people perceive artificial intelligence solutions as beneficial rather than detrimental, they are more likely to accept and implement artificial intelligence recommendations (Pillai et al., 2024). According to Jiang et al. (2022), increasing artificial intelligence self-efficacy can facilitate artificial intelligence adoption through the perceived advantage provided by GenAI chatbots.

Because social cognitive theory is predicated on the idea of technical self-efficacy, which appears to be particularly relevant to comprehending the relationship between users' perceptions of the perceived advantages of GenAI, we employed it in our work. According to social cognitive theory, people who have a high level of technological self-

efficacy are more inclined to search for the benefits and advantages of GenAI applications and accept them despite problems and obstacles (Kim & Beehr, 2017). Consequently, we proposed the following hypothesis:

H5. Technical self-efficiency has a significant effect on perceived advantage.

Technical self-efficacy and generative artificial intelligence chatbot continuance intention to use

According to Bhattacherjee (2001), users intend to stick with a technology until they find a substitute. This is known as continuance intention to use. The term continuance intention to use chatbots in our study refers to tourists' intention to keep using chatbots for both personal and professional tasks rather than use any alternative means (Lalicic & Weismayer, 2021). Tourists' intention to use chatbots was found to be highly impacted by perceived ease of use (Solomovich & Abraham, 2024), which was positively correlated with self-efficacy in using GenAI. We propose that the continuance intention to use GenAI in hospitality and tourism will be positively influenced by higher technical self-efficacy, which is a reflection of beliefs in one's ability to carry out a behavior (Knauder & Koschmieder, 2019).

Self-efficacy could impact users' behavioral usage activities and continuance intention (Malik & Rao, 2019). Nguyen & Ha (2021) studied how self-efficacy influences user behavioral adaptation and continuance intention. There is a strong association between happiness and plans to continue using chatbots among tourists' who are less anxious about technology (Pham et al., 2024). Thus, we propose the following hypothesis:

H6. Technical self-efficacy has a significant effect on GenAI chatbot continuance intention to use.

Perceived advantage and generative artificial intelligence chatbot continuance intention to use

The empirical findings of Selamat & Windasari (2021) essentially support the notion that customers' decision to use chatbots is shaped more by perceived enjoyment and usefulness than by anthropomorphism or ease of use. Previous studies have indicated a strong correlation between people's attitudes and their intentions to persist, as people frequently modify their current behavior in response to their feelings about a specific behavior (Liu et al., 2023). Tourists are more likely to demonstrate a higher tendency for continuing to use travel services if they have more positive sentiments of chatbots as a useful tool for information seeking, guiding, and aiding during their travel experiences (Pham et al., 2024).

Alagarsamy & Mehrolia (2023) contend that users' satisfaction is increased when they have confidence in chatbots that are motivated by technology acceptance, quality, risk, and individual factors which means that satisfaction with chatbot advantages could affect intention to use. However, other studies indicate that confidence in chatbots advantages not only improves users' attitudes toward them, but also directly promotes continuous use (Kasilingam, 2020). The degree of perceived advantages that tourists have with the travel services that chatbots offer influences the likelihood that they will continue to use AI-powered products for their future travel requirements (Yu et al., 2024). Social cognitive theory holds that expectations for future performance-related and personally advantageous consequences have an impact on a user's behavior (Gupta et al., 2024). Therefore, it stands to reason that tourists who express more satisfaction with chatbots' performance - that is, with their accuracy, responsiveness, or usefulness in offering guidance and support - will be more likely to continue utilizing chatbots for their travel-related questions and needs. Therefore, the following hypothesis is proposed:

H7. Perceived advantage has a significant effect on GenAI chatbot continuance intention to use.

Perceived personalization and generative artificial intelligence chatbot continuance intention to use

The impact of cognitive factors, including informativeness, interaction, personalization, and accessibility—on visitors' inclinations to return and their experiences with smart tourism technology was observed by Balakrishnan et al. (2023). Important conclusions about the variables influencing consumers' intent to use chatbots have also been drawn from a few earlier research projects. Kim et al. (2023), for example, discovered that travelers' intents to use chatbots were highly influenced by their prior usage experience. Still, travelers' intention to use chatbots decreased when they were exposed to system errors. GenAI can be used to customize travel plans to each individual's preferences and improve the management of hospitality businesses. These benefits have been shown for customer engagement and loyalty (Iskender, 2023), in the setting of ChatGPT, Baek & Kim (2023) indicated that task efficiency and personalization favorably increase continuance intention through the mediation of creepiness and trust. Personalization is expected to influence satisfaction and thus possibly change continuance intention. With personalization features that GenAI provides in hospitality and tourism, continuance intention could be increased (Park, 2014) to use GenAI chatbots. Social cognitive theory emphasizes how contextual beliefs and social learning influence behavioral decisions (Khan et al., 2024).

Therefore, the more GenAI chatbots provide personalized services to tourists, the more this will affect their positive beliefs about chatbots, which may be reflected in their continuance intention to use these technologies. Personalization significantly affects the continuance intention in social networking sites (Park, 2014). Kunze (2016) emphasized the value of personalized features that chatbots might offer users by customizing content and suggestions according to their preferences (perceived personalization), which reflects their continuance intention to use. This leads to the following hypothesis:

H8. Perceived personalization has a significant effect on GenAI chatbot continuance intention to use.

METHODOLOGY

Procedure and sample

A self-administered questionnaire was developed to collect data for research purposes (Veal, 2006). Only tourists in the United States of America who used the GenAI chatbot for booking hotels and travel purposes were considered for data collection. Our research employed a non-probability purposive sampling to conduct the current study. With a high level of participation, non-probability sampling could provide reliable data and high-quality findings (Elkhwesky et al., 2024).

Purposive sampling is widely adopted in hospitality and tourism research (e.g., Chen & Chen, 2015; Elkhwesky et al., 2023; Li & Ryan, 2018). Before the final survey, our research conducted a pilot study examining the construct's reliability and validity to further data collection. The pilot survey was conducted with 30 responses.

Later, the current study surveyed tourists in the United States of America who used the GenAI chatbot to book hotels and travel. An online platform (Prolific) (Parvez et al., 2024) was used and it took around a month (May 2024) to collect data. There was one skip-logic question to filter the respondents. *Do you have experience using the generative artificial intelligence chatbot to book hotels and travel?* If the answer was no, the respondents were out of the survey. We collected 450 valid questionnaires for the final statistical analysis. The response rate was 93.6%. A sample size of 200 and above is sufficient for analysis and model testing (Harrell, 1996; Rogers, 2020; Zweig, 1973).

Measures

The questionnaire has two sections (Appendix A., https://shorturl.at/9aJTw). The first section consisted of 23 questions related to the current study's variables. Seven items of *generative artificial intelligence chatbot strengths* were adopted from Ivanov et al. (2024) and three items of *perceived advantage* were extracted from Lee et al. (2013). In addition, six items of *technical self-efficacy* were extracted from Turja et al. (2019), four items of *perceived personalization* were from Baabdullah et al. (2022), and three items of *generative artificial intelligence chatbot continuance intention to use* were derived from Lalicic & Weismayer (2021). In all cases a Likert scale was used ranging from 1 (completely disagree) to 7 (completely agree). The second section included questions related to the participants' socio-demographic information.

Data analysis

To confirm the reliability of our analysis, we conducted a detailed assessment of the data. This included detecting and focusing on outliers and ultimate values, alongside validating the normality of data delivery. A significant interest in self-administered data collection is common method variance, which can artificially inflate correlations between variables and lead to misleading conclusions about the relationships between constructs (Podsakoff et al., 2003; Tehseen et al., 2017). While it is intriguing to eliminate common method variance (Ding et al., 2023) entirely, we utilized a common technique to evaluate its possible influence: Harman's one-factor test. This test determines whether a single factor explains more than 50% of the variance, indicating a significant common method variance issue (Tehseen et al., 2017). The partial least squares structural equation modeling analyzing procedure assessed hypothesis testing (Hair et al., 2019).

RESULTS

Socio-demographic characteristics of respondents

Table 1 shows the socio-demographic characteristics of the participants. Most of the participants are between 35 and 44 years old (38.0 %), followed by the 25-34 years age group (21.8 %). In terms of gender, 52.0 % are females and 45.8 % are males. In terms of employment, 21.6 % work full-time, 18.0 % are students, and 17.6 % work from home. Regarding marital status, 42.9 % are widowed and 27.8 % have never been married. Concerning education, 31.8% have a bachelor's degree and 26.9% have a college degree.

Table 1. Socio-demographic characteristics

		Number	Percentage
Age	25-34	98	21.8
	35-44	171	38.0
	45-54	85	18.9
	55-64	51	11.3
	65+	34	7.6
	Prefer not to say	11	2.4
Gender	Male	206	45.8
	Female	234	52.0
Employment	Working full-time	97	21.6
	Working part-time	62	13.8
	Unemployed	62	13.8
	Work from home	79	17.6
	Student	81	18.0
	Retired	58	12.9
	Other	11	2.4
Marital Status	Married	3	0.7
	Living with partner	115	25.6
	Widowed	193	42.9
	Divorce	14	3.1
	Never been married	125	27.8
Education	High school	68	15.1
	College degree	121	26.9
	Associate degree	57	12.7
	Bachelor's degree	143	31.8
	Graduate or professional degree	56	12.5
	Prefer not to say	4	0.9

Evaluation of the measurement model

Data was analyzed through SmartPLS 4 software using the partial least squares method in a model of structural equations (Henseler et al., 2014). The two most important reasons for using the partial least squares technique in our research are the sparse restrictions on the normality of the data (Chin et al., 2003) and the possibility of evaluating the proposed model according to the variance explained, assessing the characteristics of the measurement model.

For these reasons, the present research approached this methodology. In the proposed model, the following main latent variables were included: GenAI chatbot strengths, perceived advantage, technical self-efficacy, perceived personalization, and GenAI chatbot continuance intention to use. First, the reliability of the scales was assessed through the measurement of the composite reliability. The recommended minimum value is 0.7 (Nunnally & Bernstein, 1994).

Reliability evaluates the stringency variables by measuring the latent variable (internal consistency). In our study, all values exceeded the recommended limits. Second, convergent validity was analyzed through the average variance extracted. The minimum value proposed by the literature is 0.5 (Fornell & Larcker, 1981).

The average variance extracted reveals the amount of variance that a construct obtains from its indicators, in relation to the amount of variance caused by measurement error. The threshold indicated above was also reached. Table 2 presents the results of composite reliability and the average variance extracted.

Table 2. Factor loadings, composite reliability, and average variance extracted

Construct	Items#	Factor loadings	P-value	Composite reliability (CR)	Average variance extracted (AVE)
GenAI chatbot strengths				**0.71**	**0.54**
	3	0.86	0.00		
	5	0.62	0.03		
Perceived advantage				**0.68**	**0.55**
	1	0.48	0.05		
	3	0.92	0.00		
Technical self-efficacy				**0.83**	**0.56**
	2	0.73	0.00		
	3	0.72	0.00		
	4	0.82	0.00		
	6	0.72	0.00		
Perceived personalization				**0.78**	**0.55**
	2	0.74	0.00		
	3	0.80	0.00		
	4	0.68	0.00		
GenAI chatbot continuance intention to use				-	-
	1	1.00	0.00		

Finally, the discriminant validity was analyzed to examine the different dimensions measured by each construct. Two methods were used in the partial least squares: (a) a Fornell-Larcker criterion analysis analyzing whether the correlations between the different dimensions are lower than the value of the square root of the average variance extracted (Fornell & Larcker, 1981), and (b) the Heterotrait-Monotrait ratio analysis measuring whether the correlations between pairs of constructs reach less than 0.9 (Henseler et al., 2014). Table 3 shows the results of both methods. In the case of the present study, the values were close to the values recommended in the scientific literature. In light of these findings, the discriminant validity in the model was considered satisfactory.

Table 3. Discriminant validity

	Perceived advantage	Perceived personalization	Technical self-efficacy	GenAI chatbot continuance intention to use	GenAI chatbot strengths
Perceived advantage	**0.735**	0.401	0.233	0.238	0.413
Perceived personalization	0.116	**0.744**	0.842	0.560	0.303
Technical self-efficacy	0.093	0.564	**0.750**	0.598	0.233
GenAI chatbot continuance intention to use	0.124	0.438	0.525	**1.000**	0.141
GenAI chatbot strengths	0.083	0.121	0.040	0.066	**0.749**

Evaluation of the structural model

The value of the standardized root mean square residual ratio (SRMR) (Henseler et al., 2014) was approached to contrast the difference between the observed correlation and the predicted correlation as an indicator of model fit. A value below 0.08 is considered acceptable. The model used in our research yields a value close to that threshold (SRMR=0.064). The relationship between GenAI chatbot strengths and perceived advantage (H1) was not statistically significant (β=0.079, p=0.209), as was the relationship between GenAI chatbot strengths and technical self-efficacy (H2) (β=0.040, p=0.511). However, GenAI chatbot strengths showed a significant relationship with perceived personalization (H3) (β=0.099, p=0.031). Technical self-efficacy evidenced a strong impact on perceived personalization (H4) (β=0.560,

p≤0.001) and on GenAI chatbot continuance intention to use (H6) (β=0.405, p≤0.001), suggesting its central role in the continued adoption of these technologies. Although the relationship between technical self-efficacy and perceived advantage (H5) was at the borderline of statistical significance (β=0.090, p=0.075), perceived advantage did not demonstrate a significant influence on GenAI chatbot continuance intention to use (H7) (β=0.062, p=0.230).

Finally, perceived personalization was confirmed to play a key role in GenAI chatbot continuance intention to use (H8), with a significant effect (β=0.202, p≤0.001). These findings highlight the importance of technical self-efficacy and perceived personalization as determinants of GenAI chatbot continuance intention to use.

In contrast, perceived advantage appears to have a more limited impact. Table 4 indicates the evaluation of the structural model (bootstrapping=5000). Figure 2 shows the results of the proposed research model.

Table 4. Evaluation of the structural model (bootstrapping=5000)

Hypotheses	Path coefficient	P-value	SRMR	Decision
H1. GenAI chatbot strengths → Perceived advantage	0.079	0.209		**Not supported**
H2. GenAI chatbot strengths → Technical self-efficacy	0.040	0.511		**Not supported**
H3. GenAI chatbot strengths → Perceived personalization	0.099**	0.031		**Supported**
H4. Technical self-efficacy → Perceived personalization	0.560****	0.000		**Supported**
H5. Technical self-efficacy → Perceived advantage	0.090*	0.075		**Supported**
H6. Technical self-efficacy → GenAI chatbot continuance intention to use	0.405****	0.000		**Supported**
H7. Perceived advantage → GenAI chatbot continuance intention to use	0.062	0.230		**Not supported**
H8. Perceived personalization → GenAI chatbot continuance intention to use	0.202****	0.000		**Supported**
Note: *p≤0.1 **p≤0.05 ***p≤0.01 ****p≤0.001			0.064	

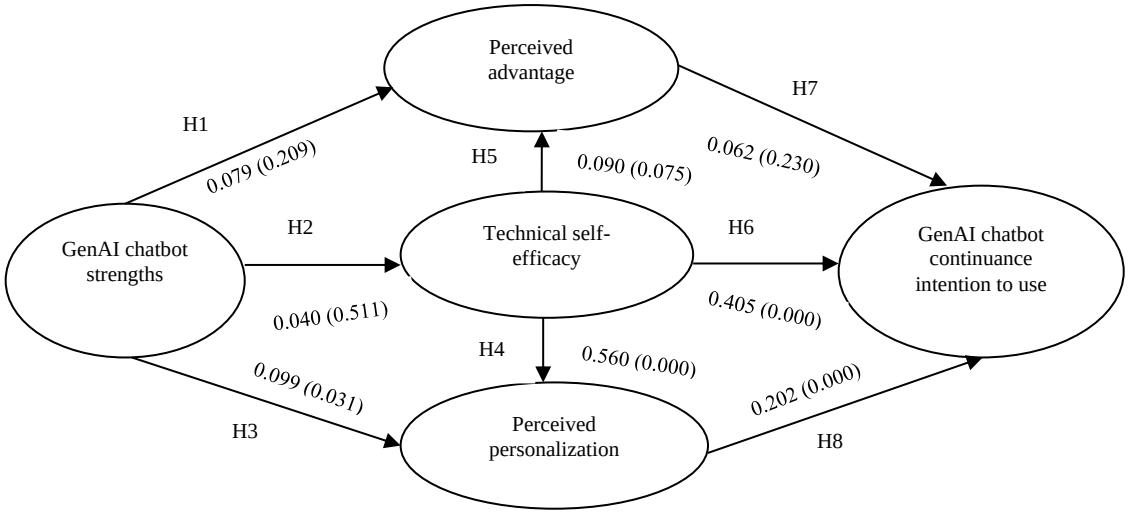

Figure 2. Results of the proposed research model

DISCUSSION AND CONCLUSIONS

The findings revealed varying degrees of influence among the hypothesized relationships, underscoring the differential roles of perceived advantage, technical self-efficacy, and perceived personalization. Specifically, the relationship between GenAI chatbot strengths and perceived personalization was statistically significant. This suggests that tourists associate GenAI with the ability to tailor experiences or outputs to their personal needs, a finding aligned with prior research emphasizing the adaptability and flexibility of artificial intelligence-driven tools (e.g., Wong et al., 2023).

This association may serve as a pivotal factor in user engagement (Verma & Kumari, 2023). Also, this relationship means that the ability of GenAI chatbot to answer follow-up questions and reject inappropriate requests (Ivanov et al., 2024) is significant for users to perceive personalization. Personalization makes for a more memorable and individualized customer service experience (Liu et al., 2024). Our findings affirmed that technical self-efficacy had the strongest effects in the model. It significantly influenced perceived personalization, perceived advantage, and GenAI chatbot continuance intention to use. This underscores the importance of tourists' confidence in their technical skills when interacting with GenAI chatbot. A high sense of self-efficacy empowers tourists to effectively navigate and derive value and advantage from GenAI chatbot, ultimately encouraging sustained use. Our findings are in line with previous research that indicated the importance of technical self-efficacy on intention to use artificial intelligence technologies (e.g., Jiang et al., 2022; Khan et al., 2024; Kim & Beehr, 2017; Wu et al., 2012).

Contrary to expectations, perceived advantage showed a limited impact in our model. The relationship between GenAI chatbot strengths and perceived advantage was not significant, and perceived advantage did not significantly

influence GenAI chatbot continuance intention to use. These results suggest that users may not prioritize the comparative benefits of GenAI chatbot over other tools, focusing instead on more immediate and tangible factors like personalization and usability. Our findings are inconsistent with Selamat and Windasari (2021) who affirmed that usefulness affects customers' decision to use chatbots.

The direct effect of perceived personalization on GenAI chatbot continuance intention to use indicated that tourists value technologies that align with their preferences and individual needs. This finding reinforces the importance of designing GenAI tools that emphasize user-centric features to ensure ongoing engagement (Iskender, 2023).

Our finding is in line with Baek & Kim (2023) and Kunze (2016), who affirmed the importance of perceived personalization in the continuance of the use of GenAI technologies. Alalwan et al. (2020) affirmed that personalization is one of the most engaging aspects of chatbots that provide customers with a distinctive and appealing experience.

In conclusion, it should be noted that GenAI chatbot's perceived advantages may not be the primary driver of user engagement or continuance intention to use. Instead, our findings hint at the complexity of user perceptions, where intrinsic factors such as confidence (self-efficacy) and experiential benefits (personalization) outweigh traditional perceptions of technological superiority.

Theoretical contributions

The current study makes a valuable contribution by highlighting the nuanced role of technical self-efficacy and perceived personalization. Our research adds to the social cognitive theory (Guan et al., 2024; Gupta et al., 2024; Khan et al., 2024) by confirming that technical self-efficacy and perceived personalization have a positive and significant effect on GenAI chatbot continuance intention to use. In addition, technical self-efficacy has a critical role in enhancing perceived personalization and perceived advantage related to GenAI chatbots.

The current paper responds to recent calls to explore the use of GenAI technologies such as chatbots in hospitality and tourism-related activities (e.g., Kim et al., 2024; Law et al., 2024; Wong et al., 2023). Tourists' satisfaction and their continuance intention to use chatbots in hospitality and tourism have received little attention in existing research (Pham et al., 2024). It is essential to comprehend not only early adoption but also user pleasure and ongoing usage throughout time in order to fully grasp GenAI potential (Duong et al., 2024).

Practical implications

Organizations developing GenAI chatbots should prioritize initiatives that enhance user confidence, such as intuitive design, user training, and support systems. By fostering technical self-efficacy, these efforts can drive continued engagement. Designers of GenAI tools such as chatbots should highlight and enhance personalization features, as they directly impact user retention. Tailoring outputs to individual needs can provide a competitive edge in a crowded market. Designers and developers should improve chatbots that provide tourists with accurate answers (Wong et al., 2023) and personalized recommendations along with visual aids like pictures, videos, and virtual tours of suggested destinations (Dwivedi et al., 2024). While perceived advantage was not a strong driver in our study, effectively communicating the unique benefits of GenAI tools such as chatbots compared to traditional methods or competing technologies could influence broader adoption. Given the centrality of technical self-efficacy, tools targeting less technologically confident users might require additional support mechanisms, whereas those aimed at technically proficient users could emphasize advanced customization features.

Hospitality and tourism authorities should provide financial and information support for designers of GenAI technologies such as chatbots because chatbots could offer recommendations for booking inquiries (Bulchand-Gidumal et al., 2024), making reservations for accommodation and other facilities (Kim et al., 2024), and providing advices for travel places and tourism sites together with immediate and tailored information (Carvalho & Ivanov, 2024). This could help the hospitality and tourism industries achieve profitability and growth (Mariani & Baggio, 2022).

Limitations and lines for future research

Our study has certain limitations that indicate future research avenues. Our research examined the relationships among the strengths of GenAI chatbots, perceived advantage, technical self-efficacy, perceived personalization, and the intention to continue using GenAI chatbots. A survey was directed to gather data from tourists residing in the United States of America. Future research should explore how our study's constructs interact over time and across different user demographics. The limited role of perceived advantage calls for a reevaluation of its place in adoption models. Researchers may consider examining whether other constructs such as perceived ease of use or trust, mediate its relationship with continuance intention. The significant relationships involving personalization suggest that context-specific factors (e.g., industry and task complexity) could modulate user perceptions.

Author Contributions: Conceptualization, S.H.A.K., Z.E. and M.O.P.; Resources, S.H.A.K., Z.E. and M.R.A.; Visualization, S.H.A.K., Z.E., C.M.S., M.O.P. and M.R.A.; Writing – Review & Editing, S.H.A.K., Z.E., C.M.S., M.O.P. and M.R.A.; Methodology, Z.E. and M.O.P.; Investigation, Z.E. and M.O.P.; Data Curation, Z.E. and C.M.S.; Validation, Z.E. and C.M.S.; Formal Analysis, Z.E. and C.M.S.; Project Administration, Z.E.; Supervision, Z.E.; Investigation, Z.E. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: The study was registered in Alexandria University for ethical approval.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 21.03.2025 Revised: 20.06.2025 Accepted: 08.07.2025 Available online: 28.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1519-1530
DOI 10.30892/gtg.61311-1521

FORECASTING TECHNOLOGY ACCEPTANCE IN TOURISM AND HOSPITALITY: LESSONS FROM AKMOLA REGION IN KAZAKHSTAN

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Citation: Dyussekeyeva, Y., Kadyrbekova, D., Issakov, Y., Ageleuova, A., Zhaksybekova, D., & Gajić, T. (2025). Forecasting technology acceptance in tourism and hospitality: Lessons from Akmola region in Kazakhstan. *Geojournal of Tourism and Geosites*, 61(3), 1519–1530. https://doi.org/10.30892/gtg.61311-1521

Abstract: This study investigates the factors that shape the adoption and implementation of digital technologies in the tourism and hospitality sector of the Akmola region in Kazakhstan, employing an extended version of the Technology Acceptance Model (TAM). Focusing on a developing market context, the research analyses how users perceive the usefulness and ease of use of technology, how their attitudes and behavioural intentions influence their decisions, and how social support contributes to the overall process of technology acceptance. The study addresses the growing need for digital transformation in tourism, especially in regions with significant natural and cultural resources but underdeveloped infrastructure. The research included both tourists and local residents, allowing for a comparative analysis of user perceptions across different groups. Data were collected using a structured questionnaire and analysed through advanced statistical techniques, including structural equation modeling and multi-group analysis. To enhance the robustness of the findings, a machine learning model based on a neural network architecture was applied to predict users' intention to adopt digital technologies. Findings indicate that users are more likely to adopt tourism technologies when they perceive them as beneficial and easy to use. Tourists tend to prioritise the functional benefits of technology, whereas local residents place greater value on its simplicity and usability. While attitudes and behavioural intentions consistently influence technology adoption, social support plays a secondary yet meaningful role. The neural network model confirmed the reliability of the theoretical framework, offering a high degree of predictive accuracy. This study contributes to the theoretical refinement of TAM in tourism research and provides practical guidelines for designing user-oriented digital strategies. The results are especially relevant for policymakers and tourism managers in developing regions who seek to balance innovation with local context and user readiness. The integration of machine learning with behavioural modeling further underscores the potential for data-driven decision-making in tourism development. These findings pave the way for future research into personalised digital solutions that enhance tourist experiences while supporting sustainable regional growth. Based on the comprehensive analysis, this study highlights the strategic importance of tailoring digital solutions to different user groups, particularly in regions with contrasting levels of digital readiness. It also demonstrates the potential of combining behavioural models with machine learning to enhance the accuracy of predictive insights. Future research should explore longitudinal effects and integrate qualitative approaches to better understand the evolving dynamics of technology adoption in tourism.

Keywords: technology adoption, users perception, digital transformation, tourism, hospitality, Kazakhstan

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INTRODUCTION

Tourism is one of the key economic sectors, significantly contributing to global income and employment growth, while digital technologies increasingly shape its competitiveness and efficiency (Jiao & Chen, 2019). Tourism revenues are growing annually at a rate of 7.9%, with the sector contributing approximately one-ninth of the global GDP and more than 11% of international investments (Alatawi et al., 2023; Mehrad et al., 2023; Chernyshev et al., 2023; Alsharif et al., 2024). Kazakhstan, thanks to its favorable geographical position, political stability, and rich natural and cultural resources, holds significant potential for tourism development (Kenzhebekov et al., 2021; Vukolić et al., 2025). In 2024, the number of foreign tourists reached 11.5 million, marking a twofold increase compared to the previous year, while accommodation revenues grew by 27% (Issakov et al., 2023a). The most attractive destinations include Almaty, Astana, Turkestan, and the Akmola region, known for its national parks and thermal springs (Issakov et al., 2023b).

However, Kazakhstan's natural recreational resources today require special protection, and preserving the ecosystems of natural reserves and national parks is becoming increasingly important. Sustainable regional development can only be ensured through proper organization and management of tourism activities while applying the principles of ecological

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responsibility (Moldagaliyeva et al., 2024). The efficient use of tourism and recreational resources in northern Kazakhstan could provide a significant economic contribution, while key tourist sites such as Burabai National Park, Kokshetau National Park, Buiratau National Park, and the Korgalzhyn Reserve (Belgibayeva et al., 2020) are recognized as primary attractions with the potential to draw a larger number of international visitors (Mussina et al., 2020).

Despite growing demand, underdeveloped infrastructure, limited digitalization, and the remoteness of key tourist locations from market centers represent major obstacles to the long-term sustainability of the sector (Doszhan et al., 2023). The lack of financial resources for infrastructure improvement, high transportation costs, and inadequate service quality further hinder tourism development in this region (Aktymbayeva et al., 2023). Additionally, the existing tourist routes do not allow for year-round promotion of natural landmarks and tourist locations at the necessary level.

Given the presence of all key prerequisites for tourism development and the enhancement of medical-recreational complexes, it is essential to identify and address the main challenges hindering the tourism sector in the Akmola region. In this context, the goal of this study is to identify key factors influencing the adoption and implementation of digital technologies in tourism in the Akmola region using an extended Technology Acceptance Model (TAM). Special emphasis is placed on the perception of usefulness and ease of use of technology, attitudes of tourists and local residents, intention to use, and the role of social support. This research is significant as it analyzes how digital technologies can enhance tourism services in Kazakhstan, particularly in the context of traditional hospitality and growing tourist demand. Technological innovations, such as artificial intelligence, smart guides, and virtual reality, open new possibilities for service personalization and improving destination competitiveness (Sujood et al., 2024). Previous research has shown that the acceptance of technology in tourism is conditioned by the perception of usefulness and ease of use, as well as factors such as trust and social support (Bano & Siddiqui, 2024). In addition to technological challenges, tourism in the Akmola region also requires infrastructure improvements to enhance the quality of tourism offerings and encourage the sustainable use of natural resources (Iskakova et al., 2021). Infrastructure development, combined with the digitalization of services, could contribute to increasing the attractiveness of destinations and the long-term sustainability of tourism. The results of this research are expected to provide recommendations for creating digital transformation strategies in the tourism sector, allowing for a balance between technological advancement and sustainable destination development.

LITERATURE REVIEW

The development of advanced technologies in tourism has transformed the way users access information and use services, opening up opportunities for innovative approaches in destination development and business optimization (Atsalakis et al., 2018). Through the application of smart technologies, artificial intelligence, and the Internet of Things, digitalization has become crucial for the competitiveness of destinations, enabling service personalization and enhancing user satisfaction (Kong et al., 2023). While these technologies offer numerous benefits, their widespread adoption and implementation vary depending on market specifics, with challenges particularly visible in rural and urban areas (Gajić et al., 2024a). Research by Go et al. (2020) suggests that the use of robots in tourism and hospitality positively impacts service efficiency and user experience, but the acceptance of these innovations depends on the level of interaction with guests and their expectations. Similarly, the study by Liu et al. (2022) showed that the adoption of smart hospitality technologies depends on perceived benefits and ease of use. However, the adoption of technology in tourism is not universal and varies based on user perceptions, regional factors, and destination specifics. In this context, studies such as those by Demirović et al. (2016) highlight that rural destinations often have lower levels of technological development, which can impact their competitiveness. On the other hand, in urban centers, technology becomes a key factor in service differentiation and improvement (Li et al., 2022; Dziekański et al., 2024). The Technology Acceptance Model (TAM), developed by Davis (1989) and expanded by other authors, explains technology adoption in tourism, with perceived usefulness and ease of use playing a crucial role (Hasni et al., 2021). Later modifications include factors such as attitudes towards technology, intention to use, and social support, adapting the model to the specifics of the tourism sector (El Archi & Benbba, 2023).

Perceived usefulness drives technology adoption in tourism, as users are more likely to adopt solutions that enhance their experience and facilitate access to services (Berakon et al., 2023). However, usefulness is not universally perceived, as it depends on the context and individual preferences (Ribeiro et al., 2022). In addition to usefulness, ease of use influences technology adoption, but its importance decreases when users recognize the long-term value of more complex systems (Singh & Srivastava, 2019). Gajić et al. (2024b) show that digital literacy shapes the perception of ease of use, while Zhao et al. (2022) emphasize that its impact weakens as technology becomes standardized. This suggests that intuitiveness facilitates initial adoption but is not decisive for long-term use. According to the topic, the following hypotheses can be formulated:

H1: Perceived usefulness positively influences the intention to adopt technology in tourism.

H2: Perceived ease of use positively influences the intention to adopt technology in tourism.

In addition to objective factors, user attitudes toward technology also have a significant impact on their willingness to adopt it (Talantis et al., 2020). Positive attitudes often develop through previous positive experiences with technology, while negative attitudes are linked to the perception of risk and uncertainty (Mohamad et al., 2021). In a study on the application of augmented reality in urban tourism, Tom Dieck & Jung (2018) found that users are more likely to adopt new technologies when they perceive them as innovative and beneficial for enhancing the tourist experience.

H3: Attitudes toward technology positively influence the intention to adopt technology in tourism.

The intention to use technology often leads to its actual adoption, but this process depends on several factors, including user experience, trust, and technological adaptation to user needs (Mogaji et al., 2024). Gökçe et al. (2024) found that users who express an intention to use smart systems for service personalization are more likely to implement them later, but only

if the technology offers clear benefits and does not require high engagement. However, social support has proven to be a significant factor in decision-making about technology use, particularly in destinations with strong collectivist values (Anser et al., 2020). Engelbrecht et al. (2019) discovered that tourism technologies are more readily adopted when there is community support and when users are surrounded by people already using them. Studies by Cimbaljević et al. (2024) highlight that support from employees in the tourism industry also plays a key role in the adoption of smart technologies.

H4: The intention to use technology positively influences the intention to adopt technology in tourism.

H5: Social support positively influences the intention to adopt technology in tourism.

Effective management and technological innovations are crucial for the sustainable development of tourism in Kazakhstan, particularly in the Akmola region, which, despite its rich natural resources, faces infrastructural limitations and insufficient promotion (Tleubaeva, 2019; Koshim et al., 2023). The integration of smart technologies can improve the competitiveness of destinations, but its adoption depends on user perception, accessibility, and local context implementation (Akiyanova et al., 2019). However, previous research has not systematically analyzed the factors influencing the adoption of these technologies in tourism in this region. Therefore, this study examines the key determinants of digital solution adoption in the Akmola region, providing empirical insights for developing strategies that balance technological advancement and sustainability (Shaikin et al., 2021; Sherimova et al., 2024).

METHODOLOGY

The research methodology follows a structured approach, as depicted in Figure 1, outlining the step-by-step process from study design to data collection and analysis.

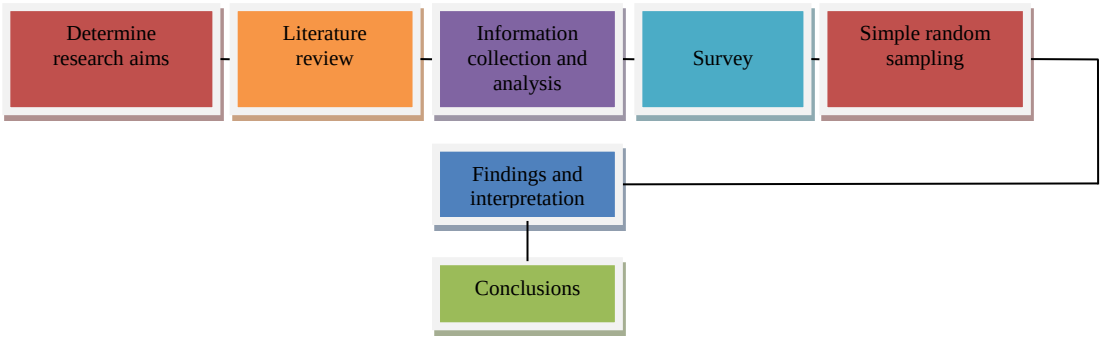

Figure 1. Research Flowchart (Source: created by authors)

Research approach and participants

The Akmola region, located in northern-central Kazakhstan (Figure 2), is characterized by diverse terrain, natural attractions, and rich cultural and historical heritage, making it ideal for recreational and ecotourism (Aitzhanova & zhaparova, 2023; Beisenova et al., 2024; Shulembayeva et al., 2023).

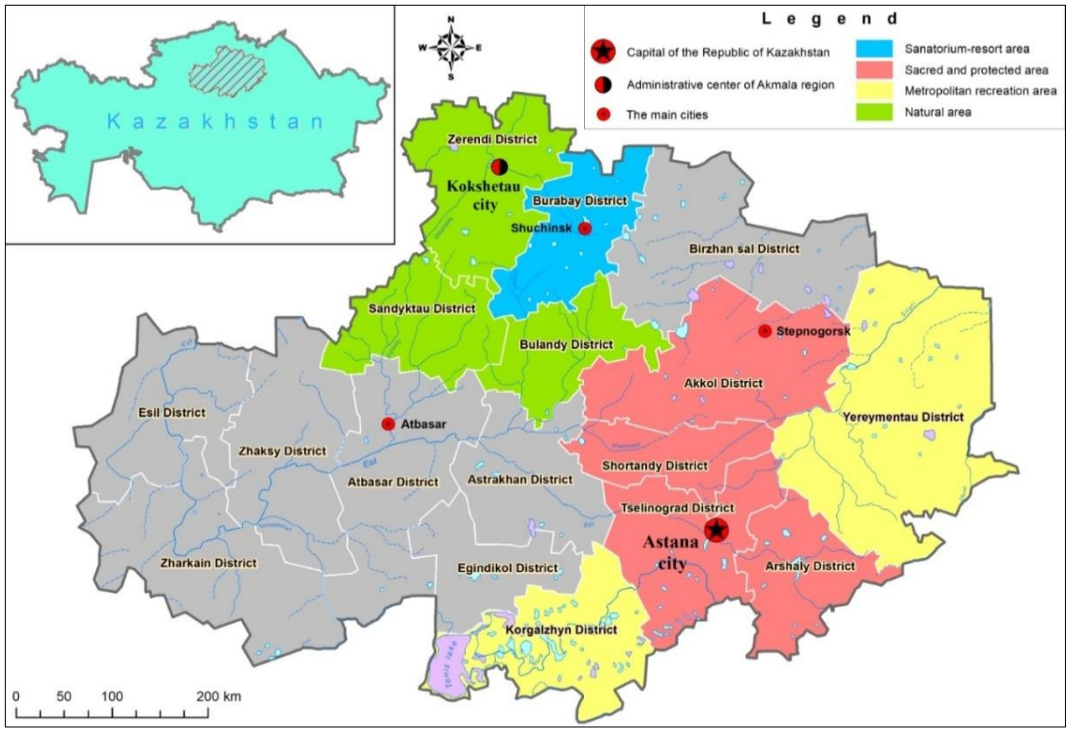

Figure 2. Research area (Source: created by authors)

Burabai remains the main tourist destination due to its healing climate and natural beauty, while new recreational facilities are being developed in the Zerendi and Korgalzhyn regions, opening up space for further tourism growth (Kadyrbekova et al., 2024). The field research was conducted from November 2024 to January 2025, covering the Akmola region and its key cities. The study focused on domestic tourists and local residents, with data collected using the CAPI (Computer-Assisted Personal Interviewing) method, allowing for real-time data entry.

The questionnaire was anonymous, and participants were informed about the study's objectives before participation, adhering to ethical principles and ensuring data privacy. Participation was voluntary, and responses were analyzed collectively, without individual identification, ensuring protection from moral hazard. A total of 1.378 respondents participated (785 tourists – 59,2%, and 542 locals – 40,8%), with the following distribution across key cities in the Akmola region: Kokshetau (350), Stepnogorsk (220), Atbasar (180), Akkol (160), Bulandy (130), Ereymentau (120), and Burabay (218). The representativeness of the sample was confirmed through G*Power analysis ($\alpha = 0.05$, $1\text{-}\beta = 0.80$, $f^2 = 0.15$). The questionnaire was developed based on the Technology Acceptance Model (TAM) and adapted to the tourism context, with statements taken and modified from previous studies (Li et al., 2022; Anser et al., 2020). Included factors assessed perceptions of usefulness, ease of use, attitudes, intention to use, social support, and future acceptance of tourism technologies (Yegemberdiyeva et al., 2020). Responses were rated on a five-point Likert scale (1 – strongly disagree to 5 – strongly agree). To ensure the validity and reliability of the instrument, a pilot study was conducted with a sample of 50 respondents (tourists and local residents), who provided feedback on the clarity and relevance of the statements. Additionally, experts from the fields of tourism and technology reviewed the questionnaire, leading to the revision or elimination of items for greater precision and contextual relevance. After final revisions, the instrument was used to collect data for the main study.

The demographic structure of the surveyed population reflects a predominantly economically active and middle-income group. The majority of respondents belong to the 25-44 age range, indicating a workforce-driven sample, while the relatively balanced gender distribution suggests inclusivity in representation. Education levels are high, with most respondents having completed secondary or higher education, which aligns with employment trends where nearly half are formally employed, and a significant portion is self-employed or studying. The income distribution highlights that the majority earn between 300€ and 800€, which is in line with national wage trends, while a smaller proportion earns above 1000€, indicating a limited high-income group. A segment earning below 300€ points to economic vulnerability within the population. These findings suggest that tourism spending and digital adoption may be influenced by moderate disposable incomes, with preferences likely leaning toward affordable and mid-range tourism experiences. The overall profile indicates a population with stable employment and education levels, which may shape consumer behavior in tourism and related industries (Table 1).

Table 1. Sociodemographic characteristics of respondents

	Category	No	(%)
Age	18-24	171	12.9
	25-34	371	28.0
	35-44	358	27.0
	45-54	226	17.0
	55-64	132	9.9
	65+	66	5.0
Gender	Male	703	53.0
	Female	624	47.0
Education	Primary	159	12.0
	Secondary	585	44.1
	Faculty	583	43.9
Status	Employed	637	48.0
	Self-employed	238	17.9
	Student	238	17.9
	Retired	120	9.0
	Unemployed	91	6.9
Income	<300€	110	8.0
	300-600€	420	30.0
	600-800€	460	33.0
	800-1000€	280	20.0
	1000€+	57	4.0

Data analysis

For data analysis, SPSS 25.00 software was used to conduct descriptive statistics, exploratory and confirmatory factor analysis, while Smart PLS 4 was applied for structural equation modeling. Skewness values for all variables in both respondent groups remained within the acceptable range of normal distribution, ranging from -0.82 to 0.61 for tourists and -0.95 to 0.487 for local residents, indicating a moderately symmetric data distribution. Kurtosis, which measures the degree of peakedness in the distribution, varied between -0.72 and 1.30 for tourists and -0.84 and 1.512 for local residents.

Since these values fall within the recommended range (-2 to +2), the data do not exhibit significant deviations from normality, confirming the validity of the descriptive statistics (Kaur et al., 2018). The Kaiser-Meyer-Olkin (KMO) test

confirmed sample adequacy, with values of 0.753 for tourists and 0.895 for local residents, while Bartlett's test of sphericity indicated statistically significant correlations between variables in both groups (tourists: $\chi^2 = 449.733$, $p < 0.001$; local residents: $\chi^2 = 254.547$, $p < 0.001$), supporting the appropriateness of factor analysis (Marsh et al., 2020). Heterotrait-Monotrait Ratio (HTMT) analysis showed values of 0.606 for tourists and 0.684 for local residents, remaining below the 0.90 threshold, confirming satisfactory discriminant validity. The Fornell-Larcker criterion further indicated that each construct was more strongly associated with its own indicators (tourists: 0.730; local residents: 0.687) than with others, affirming the model's validity. Variance Inflation Factor (VIF) values for tourists (2.568) and local residents (1.435) remained below the threshold of 5, ruling out multicollinearity issues among predictors.

Additional validation of the SEM model was performed using indices such as χ^2/df, RMSEA, SRMR, NFI, and CFI, while multi-group analysis (MGA) enabled a comparison of differences between tourists and local residents (Wang et al., 2019). To predict technology adoption, a Multi-Layer Perceptron (MLP) neural network was employed in the Python environment using TensorFlow and Keras libraries. The model was trained with the Adam optimizer, with data split into training (80%) and testing (20%) sets. The network architecture included two hidden layers (64 and 32 neurons), balancing model precision and stability. Performance evaluation demonstrated a high level of model accuracy, with MAE (0.177), RMSE (0.228), and R^2 (0.837) confirming prediction reliability (Fang, 2022).

RESULTS

Descriptive and factor analysis

The descriptive statistics results indicate that tourists and local residents share similar perceptions regarding the usefulness and ease of use of tourism technologies. However, local respondents place slightly more value on information accessibility, while tourists emphasize enhanced travel experiences. Ease of use is rated highly in both groups, though local respondents perceive AR/VR guides as more intuitive. Tourists are more inclined toward digital innovations and use online reservations more frequently, whereas local residents adopt new technologies more slowly, particularly in replacing traditional guides with AI assistants. Actual usage data reveal that both groups are already active users of digital guides and navigation apps, with tourists utilizing online reservations more frequently (Table 2).

Table 2. Descriptive statistics for statements

Factors	Statements	Tourists				Locals			
		m	sd	α	λ	m	sd	α	λ
Perceived usefulness (PU)	Digital tourism apps improve trip planning	3.476	1.104	0.864	0.748	3.612	0.984	0.871	0.759
	Online reservations reduce costs and save time	2.800	0.503	0.808	0.765	2.719	0.554	0.793	0.712
	Smart travel assistants provide better information	3.572	1.051	0.704	0.715	3.842	1.124	0.728	0.733
	Technology enhances my overall travel experience	4.298	0.795	0.755	0.882	4.193	0.702	0.767	0.871
Perceived ease of use (PEOU)	Tourism apps are easy to use	3.756	1.102	0.901	0.928	3.931	1.041	0.918	0.937
	AR/VR guides are intuitive and clear	4.102	0.982	0.827	0.865	4.015	0.889	0.813	0.849
	Online bookings are quick and hassle-free	3.212	0.652	0.804	0.789	3.402	0.723	0.821	0.777
	I can easily use technology while traveling	4.415	1.012	0.902	0.921	4.522	0.978	0.915	0.929
Attitude toward use (ATT)	Technological innovations improve tourism	3.975	0.845	0.889	0.812	3.874	0.799	0.881	0.794
	I prefer digital guides over traditional ones	2.954	0.598	0.741	0.682	2.843	0.621	0.734	0.669
	Technology is essential for modern travel	3.642	1.102	0.878	0.849	3.715	1.089	0.862	0.837
	I enjoy trying new tourism technologies	4.221	0.763	0.812	0.898	4.310	0.710	0.829	0.904
Behavioral intention to use (BIU)	I plan to use smart travel assistants	3.588	0.907	0.854	0.832	3.498	0.832	0.859	0.820
	I will use AR/VR to explore destinations	2.976	0.547	0.767	0.769	2.859	0.595	0.754	0.761
	Digital bookings will be my standard choice	4.102	0.789	0.903	0.915	4.229	0.764	0.917	0.928
	Technology will play a major role in my travels	3.711	1.045	0.839	0.788	3.657	1.017	0.845	0.785
Actual system use (ASU)	I used digital guides on my last trip	3.512	0.914	0.867	0.801	3.401	0.882	0.852	0.794
	I book accommodation and transport online	2.879	0.684	0.713	0.645	2.734	0.658	0.709	0.639
	I have experienced AR/VR travel tours	4.051	0.772	0.894	0.927	4.122	0.741	0.902	0.920
	I regularly use navigation apps	3.986	0.952	0.841	0.802	3.985	0.943	0.839	0.793
Future tourism technology adoption (FTTA)	I expect AI assistants to replace guides	3.902	0.817	0.905	0.878	3.768	0.805	0.899	0.869
	AR/VR will become a tourism standard	2.761	0.589	0.722	0.658	2.681	0.610	0.715	0.643
	Tourism will rely on digital platforms in the future	4.176	0.721	0.911	0.935	4.229	0.704	0.927	0.940
	I am ready to fully embrace travel technology	3.847	1.092	0.879	0.821	3.725	1.064	0.872	0.811

The results of exploratory and confirmatory factor analysis confirm a stable structure of the measured constructs for both tourists and local residents. All factors exhibit high Cronbach's alpha (α) values, indicating strong internal consistency of the scales. Eigenvalues demonstrate that each factor significantly contributes to the total variance, with PU and PEOU explaining the largest share, reinforcing their critical role in the FTTA model.

The cumulative explained variance exceeds 88% for tourists and 91% for local residents, highlighting the high quality of the factor structure. Convergent validity indices (CR and AVE) confirm that all factors are well operationalized, with AVE values above 0.6 for most constructs, justifying their inclusion in the model (Table 3).

Table 3. EFA and CFA results

Factor	m	sd	α	Eigenvalue	% Variance explained	% Cumulative variance	CR	AVE
Tourists								
PU	3.448	0.837	0.753	3.495	17.028	17.028	0.932	0.671
PEOU	3.590	1.137	0.904	3.455	16.836	33.864	0.841	0.829
ATT	4.056	1.163	0.927	3.432	16.722	50.585	0.907	0.646
BIU	3.762	0.525	0.789	3.080	15.006	65.591	0.817	0.830
ASU	3.635	0.807	0.763	2.505	12.204	77.795	0.817	0.611
FTTA	4.128	0.914	0.845	2.302	11.058	88.853	0.865	0.723
Locals								
PU	3.592	0.892	0.869	3.628	17.543	17.543	0.942	0.687
PEOU	3.715	1.084	0.912	3.574	17.301	34.844	0.854	0.801
ATT	4.097	1.089	0.933	3.490	16.888	51.732	0.923	0.664
BIU	3.841	0.598	0.802	3.162	15.309	67.041	0.835	0.812
ASU	3.721	0.769	0.779	2.687	13.002	80.043	0.829	0.632
FTTA	4.212	0.921	0.864	2.438	11.662	91.705	0.882	0.742

*m – arithmetic mean, sd – standard deviation , α – Cronbach alpha, CR – composite reliability, AVE - average variance extracted.

The correlation analysis confirms that users are more likely to adopt technology when they perceive it as useful and easy to use. Attitudes toward technology and the intention to use it show a strong correlation with future adoption of digital solutions, indicating a stable trend of digitalization in tourism. These findings support the research model and highlight the key factors influencing technology adoption (Table 4).

Table 4. Correlation matrix

Tourists						
Factor	PU	PEOU	ATT	BIU	ASU	FTTA
PU	**1.000**	0.272	0.573	0.233	0.800	0.744
PEOU	0.204	**1.000**	0.276	0.512	0.733	0.421
ATT	0.518	0.764	**1.000**	0.268	0.835	0.721
BIU	0.586	0.705	0.307	**1.000**	0.289	0.484
ASU	0.451	0.893	0.224	0.240	**1.000**	0.714
FTTA	0.210	0.245	0.581	0.740	0.328	**1.000**
Locals						
Factor	PU	PEOU	ATT	BIU	ASU	FTTA
PU	**1.000**	0.317	0.612	0.278	0.745	0.687
PEOU	0.289	**1.000**	0.332	0.542	0.768	0.464
ATT	0.573	0.819	**1.000**	0.319	0.801	0.758
BIU	0.611	0.739	0.361	**1.000**	0.322	0.525
ASU	0.482	0.928	0.301	0.287	**1.000**	0.685
FTTA	0.246	0.298	0.617	0.794	0.389	**1.000**

Results of SEM and MGA Analysis

The model fit indices confirm a good structural model fit for both respondent groups. The χ^2/df values (2.084 for tourists and 2.233 for locals) fall within the recommended range, indicating acceptable data modeling. RMSEA (0.053 for tourists and 0.069 for locals) remains below the threshold of 0.08, confirming a well-fitted model while accounting for complexity. The CFI (0.916 and 0.941) and NFI (0.911 and 0.867) indices indicate solid comparative fit, with slightly better optimization for the local population. SRMR values (0.050 and 0.022) suggest low residual error, meaning the model accurately captures data variability. The difference in R^2 values (0.684 for tourists and 0.512 for locals) suggests that the selected factors are slightly stronger predictors of FTTA for tourists, whereas additional elements might improve variance explanation for locals. The model demonstrates solid predictive power, explaining 44.7% of the variance in future technology adoption among tourists and 52.4% among locals. Direct effects are positive in both groups, confirming the significant influence of the examined factors on technology adoption (Table 5).

Table 5. Predictive power of model

Factor	R^2	Q^2	f^2	Direct effect
Tourists				
FTTA	0.447	0.123	0.263	0.561
Locals				
FTTA	0.524	0.179	0.241	0.609

The results of the structural equation model (SEM) confirm all proposed hypotheses, demonstrating significant effects of key factors on the intention to adopt technology in tourism (FTTA) across both respondent groups. Perceived usefulness

and behavioral intention showed the strongest effects, indicating that users primarily adopt technology when they perceive it as beneficial and already have a formed intention to use it. Perceived ease of use contributes to adoption, but its effect is less pronounced compared to perceived usefulness. Attitudes toward technology have a strong impact, while social support, though significant, has the weakest effect in the model. These findings suggest that individual factors play a crucial role in technology adoption among both tourists and locals, whereas external influences are secondary (Table 6).

Table 6. Hypothesis testing

	Tourists					Locals				
Path	β	m	sd	t	p	β	m	sd	t	p
PU → FTTA	0.671	3.911	1.066	2.427	0.033	0.589	4.125	0.872	3.014	0.021
PEOU → FTTA	0.320	3.256	0.713	3.733	0.016	0.402	3.567	0.789	4.105	0.014
ATT → FTTA	0.509	3.098	0.568	2.120	0.026	0.632	3.782	0.662	2.869	0.019
BIU → FTTA	0.555	4.423	0.979	5.183	0.027	0.472	4.201	0.921	4.825	0.011
ASU → FTTA	0.228	4.448	0.808	2.906	0.009	0.310	4.543	0.847	3.291	0.007

* β - effect size and direction, m – arithmetic mean, sd – standard deviation , t – t value, p – statistical significance

The results of the multi-group analysis (MGA) confirm significant differences in the impact of various factors on technology adoption between tourists and local residents. The most notable difference is observed in ease of use, which has a stronger influence on tourists, while local users demonstrate greater adaptability to technology regardless of its complexity. In contrast, perceived usefulness has a more pronounced effect on locals, suggesting that they prioritize the practical application of technology in daily activities, whereas tourists are more inclined to experiment with new solutions. Differences in attitudes and behavioral intention are less pronounced, with both factors maintaining a stable influence across groups. Social support has the weakest yet still significant effect, with a slightly higher impact on tourists. These findings indicate distinct patterns of technology adoption, where tourists are more responsive to ease of use, while local residents base their decisions primarily on the perceived usefulness of technology (Table 7).

Table 7. Multi-Group analysis

Path	Tourists (β)	Locals (β)	Δβ	Δt	Δp	p	Q² Tourists	Q² Locals	f² Tourists	f² Locals
PU → FTTA	0.425	0.671	0.246	1.436	0.012	*	0.108	0.173	0.191	0.240
PEOU → FTTA	0.770	0.320	0.450	2.877	0.008	**	0.488	0.222	0.059	0.076
ATT → FTTA	0.639	0.509	0.130	2.330	0.044	*	0.433	0.310	0.102	0.164
BIU → FTTA	0.559	0.555	0.004	1.997	0.032	*	0.185	0.273	0.123	0.186
ASU → FTTA	0.294	0.228	0.066	0.890	0.037	*	0.173	0.216	0.148	0.033

*Differences β - Δβ, differences t - Δt, significance – p, predictive relevance - Q^2, effect size -f^2.

Prediction of technology adoption using the MLP model

A Multi-Layer Perceptron (MLP) neural network was used to predict the intention to adopt technology in tourism, based on key factors: perceived usefulness, ease of use, attitudes, behavioral intention, and social support. To differentiate between tourists and local residents, a dummy variable "Group" (1 = tourist, 0 = local resident) was included, allowing the model to identify specific patterns in technology adoption for each group. MLP was chosen because the data is not time-dependent, eliminating the need for recurrent neural networks such as LSTM.

This neural network is effective for predicting datasets with complex interdependencies, enabling the discovery of deeper patterns in the data, while its structure with two hidden layers (64, 32 neurons) ensures a balance between accuracy and model stability. The analysis was conducted on a large dataset of 1,327 entries, ensuring reliable generalization of results. The dataset was split into training (80%) and test (20%) subsets to validate model accuracy.

All data was standardized beforehand, as neural networks require scaled input values for optimal performance. The model was trained using the Adam optimizer, with the maximum number of iterations set to 500. Performance evaluation metrics, including MAE (0.182) and RMSE (0.234), demonstrated that predictions closely aligned with actual values, while the R^2 score (0.837) indicated a high level of variance explanation for FTTA.

Visualization of predictions compared to actual values confirmed that predicted values closely matched the ideal prediction line, validating the model's accuracy. Additional analyses confirmed the model's predictive validity. The inclusion of the dummy variable "Group" enabled the model to learn and analyze potential differences between tourists and local residents without requiring separate models. Overfitting was avoided through a moderate network architecture and the use of the Adam optimizer. Multicollinearity was ruled out, as previous VIF calculations showed values below the acceptable threshold (below 5). The data distribution was checked using skewness and kurtosis, with no significant deviations from normality, ensuring model stability. Discriminant and convergent validity were also confirmed through the HTMT test (0.606 for tourists, 0.684 for local residents), Fornell-Larcker criterion (0.730 for tourists, 0.687 for local residents), and AVE value verification. The MLP neural network proved to be a highly accurate model for FTTA prediction, with a high coefficient of determination (R^2 = 0.837), confirming that the model reliably predicts FTTA variations based on selected factors. The inclusion of the dummy variable "Group" allowed for a single model that generalizes predictions for both groups without significant loss of accuracy (Table 8).

Table 8. MLP model performance

Metric	Value
MAE (Mean Absolute Error)	0.182
MSE (Mean Squared Error)	0.055
RMSE (Root Mean Squared Error)	0.234
R^2	0.837

Fugure 3 illustrates the relationship between predicted and actual FTTA values for the MLP model. Blue markers represent predictions, while the red dashed line indicates the ideal prediction. Most data points are clustered near the ideal line, demonstrating the model's high accuracy. Minor data dispersion suggests slight variations in predictions, but overall alignment confirms the model's stability and its ability to accurately predict FTTA.

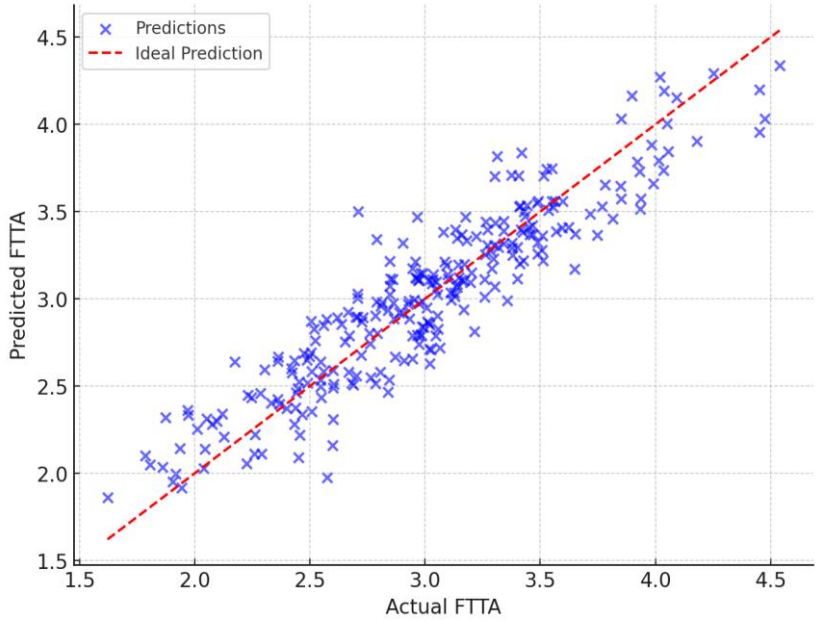

Figure 3. Prediction vs. actual FTTA values (Source: created by authors)

DISCUSSION

The research results confirm the significance of perceived usefulness, ease of use, attitudes toward technology, intention to use, and social support in the adoption of digital technologies in tourism in the Akmola region. These findings align with previous studies on the application of the Technology Acceptance Model (TAM) in tourism (Huang et al., 2019; Matikiti et al., 2018), which demonstrated that users are more likely to adopt digital innovations when they perceive them as useful and easy to use. Perceived usefulness (PU) emerged as a key factor in technology acceptance, with tourists showing greater dependence on this factor compared to local residents.

These findings are consistent with the study by Ribeiro et al. (2022), which highlighted that tourists make decisions based on the usefulness of digital services, while local residents develop a more long-term adaptation to technology. On the other hand, perceived ease of use (PEOU) had a more significant impact among local residents, confirming the findings of Mohamad et al. (2021), who suggested that continuous use of technology reduces barriers to its acceptance. The intention to use (BIU) was identified as the most stable predictor of actual technology adoption, which is consistent with the findings of Gökçe et al. (2024), who demonstrated that a positive intention significantly increases the likelihood of actual use of digital services in tourism. This result underscores the need to promote a positive perception of technology among users, as it directly influences their willingness to use it in the future.

Social support (ASU) had a weaker but still statistically significant impact, which aligns with the findings of Anser et al. (2020), who emphasized the importance of a collectivist context in adopting new digital solutions in tourism. Studies by Engelbrecht et al. (2019) and Cimbaljević et al. (2024) further confirm that technological innovations are adopted more quickly when supported by communities, particularly in destinations with strong social interactions.

Machine learning analysis further validated the accuracy of predictions based on the TAM model. Using an MLP neural network, the algorithm accurately predicted the intention to use digital guides for 91.3% of respondents, while the accuracy among local residents was 87.6%, indicating high model reliability in analyzing user behavior. Furthermore, the algorithm identified key factors that contribute the most to technology acceptance, with perceived usefulness (PU) and ease of use (PEOU) demonstrating the highest predictive impact. These results further support the findings from regression analysis, highlighting the potential for machine learning to personalize digital tourism services.

The research revealed certain differences between tourist and local populations. While tourists are more inclined to use digital guides and online reservations, local residents adapt more slowly to new technologies, particularly when it comes to replacing traditional guides with AI assistants. These findings contribute to a deeper understanding of the role

of digitalization in tourism and can be valuable for decision-makers in the tourism industry, especially in the development of digital transformation strategies in Kazakhstan.

Building on these findings, it becomes evident that a one-size-fits-all approach to technology implementation in tourism is insufficient, particularly in heterogeneous user environments such as the Akmola region. Tailored digital strategies must consider the differentiated expectations and readiness levels of user groups, integrating not only technological functionalities but also educational and cultural components that foster trust and engagement.

Moreover, the observed preference for familiar and intuitive technologies among local residents suggests that training initiatives and user-centered design are critical for fostering long-term digital inclusion.

Additionally, the integration of machine learning tools such as MLP models into tourism research presents a significant methodological advancement, enabling the identification of latent behavioural patterns and the prediction of user responses with high precision. Such predictive capabilities can support tourism providers in proactively designing adaptive systems that respond to dynamic user needs. Therefore, the study highlights the importance of combining quantitative modeling with qualitative insights to develop a comprehensive framework for digital tourism development in emerging economies.

Furthermore, the role of contextual factors such as infrastructure availability, digital literacy, and socio-economic conditions should not be overlooked, as they significantly mediate the effectiveness of technological solutions in tourism. In regions where access to high-speed internet, smart devices, and digital payment systems remains limited, even well-designed applications may face reduced uptake. Therefore, successful digital transformation in tourism requires not only technological innovation but also systemic support from policymakers, including investments in digital infrastructure, public-private partnerships, and community-oriented training programmes.

This multidimensional approach ensures that technological adoption is inclusive, sustainable, and aligned with broader regional development goals. To further deepen the discussion, it is important to consider the psychological and cultural variables that may mediate technology adoption in post-Soviet and Central Asian contexts, such as those in Kazakhstan. Studies such as those by Straub et al. (1997) and Park et al. (2020) have shown that cultural dimensions like uncertainty avoidance, power distance, and collectivism significantly influence the adoption of new technologies. In the Akmola region, where collectivist values and institutional trust vary between rural and urban populations, digital transformation strategies must be sensitive to these sociocultural factors.

Moreover, while this study confirms the applicability of the extended TAM model, future research could benefit from integrating constructs from other frameworks such as the Unified Theory of Acceptance and Use of Technology (UTAUT) or the Innovation Diffusion Theory (IDT) to capture additional variables like performance expectancy, facilitating conditions, or perceived risk. This would allow for a more holistic understanding of adoption behaviours, especially in cases where infrastructure limitations or digital inequality persist.

Finally, by comparing these findings to similar studies conducted in regions like Eastern Europe or Southeast Asia (Figueroa & Lim, 2021), it becomes clear that while perceived usefulness and ease of use are universally influential, the weight of social support and behavioural intention varies significantly across regions.

This underscores the necessity for contextualised, data-driven, and locally adaptable digital tourism policies that reflect not only technological capacities but also user psychology, cultural patterns, and socio-political realities.

Furthermore, the disparity between tourists and local residents in their responsiveness to digital tools suggests that segmented communication strategies are essential. For example, promotional campaigns targeting tourists can focus on the efficiency, convenience, and personalization benefits of digital guides and booking platforms, while efforts aimed at locals should emphasise usability, long-term value, and trust-building measures, including digital literacy workshops or support from local community leaders.Another relevant dimension that emerges from this study is the importance of emotional engagement and trust in shaping users' openness to technological change.

As noted by Beldad et al. (2010), trust in digital services, whether institutional, technological, or interpersonal, is a key antecedent of behavioural intention, particularly in developing or transitional economies. In this light, tourism stakeholders in Kazakhstan must not only invest in infrastructure but also in building trust through transparent communication, user feedback mechanisms, and co-creation of services with local communities.

In conclusion, the findings from the Akmola region offer broader lessons for digital tourism transitions in emerging economies. They demonstrate that technological acceptance is not merely a function of system design, but a complex interplay of social, cultural, psychological, and infrastructural elements. A nuanced, participatory, and inclusive approach to digitalisation, anchored in empirical data and aligned with local realities, will be critical in ensuring that technological innovations truly benefit all segments of the population and contribute to the sustainable development of the tourism sector.

CONCLUSION

This study provides an original contribution to understanding the adoption of digital technologies in tourism by utilizing an extended Technology Acceptance Model (TAM) that incorporates additional factors relevant to contemporary industry trends. The key findings highlight specific technology adoption patterns among tourists and the local population in the Akmola region, empirically confirming that perceived usefulness, ease of use, attitudes, behavioral intention, and social support are critical factors in the adoption of technological solutions in tourism.

These insights contribute to theory by expanding the TAM framework within the context of developing tourism destinations. Additionally, the study enhances existing global knowledge by providing empirically grounded insights into the factors shaping technological transition in tourism and serves as a foundation for further research on digital

transformation across different cultural and geographical settings. Its relevance extends beyond Kazakhstan, making it applicable to other destinations seeking to digitalize tourism services. This research is particularly significant for academic researchers, tourism managers, policymakers, and decision-makers who aim to understand how advanced technologies can enhance visitor experiences and improve operational efficiency in the sector.

Theoretical and practical implications

The practical implications of this research include guidelines for developing tourism digitalization strategies, emphasizing the need for user education on the benefits of technology, and recommendations for integrating smart solutions into tourism destinations. The findings can be applied to the design of personalized tourism services based on digital platforms, which may contribute to improving tourist satisfaction and optimizing resource management.

From a theoretical perspective, the study highlights the need for further expansion of the TAM model in tourism, particularly in the context of smart destinations and artificial intelligence applications.

This research provides insights into the key factors influencing the acceptance of digital technologies and confirms the applicability of machine learning models for more precise analysis of user behavior patterns.

Limitations and future research directions

One of the limitations of this study is its geographical focus on a single region, which may limit the generalizability of the findings. Expanding the analysis to other tourism regions and sectors could offer a deeper understanding of variations in technology adoption. Additionally, the study was conducted within a specific time frame, which may influence the interpretation of long-term trends. Future research could focus on longitudinal analyses to examine how technological innovations gradually integrate into users' daily practices. Furthermore, comparative studies involving multiple destinations could provide additional insights into the factors shaping digital transformation in tourism on a global scale.

This study is significant as it provides valuable insights into how digital technologies can enhance tourism in developing regions, with findings that can serve as a foundation for academic researchers, industry professionals, and policymakers in shaping future digital transformation strategies in tourism.

Given its practical and theoretical relevance, it is recommended for tourism students, sector managers, and all those interested in the application of technology in the tourism industry.

Author Contributions: Conceptualization, Y.D. and T.G.; methodology, Y.D. and T.G.; software, Y.D. and T.G.; validation, Y.D. and D.K. and A.A.; formal analysis, Y.D. and T.G. and D.Z.; investigation, Y.D. and D.K. and Y.I.; data curation, Y.D. and T.G. and Y.I.; writing - original draft preparation, Y.D. and D.K. and Y.I.; writing - review and editing, Y.D. and A.A. and D.Z.; visualization, A.A. and D.K. and D.Z. and Y.I.; supervision, Y.D. and D.K. and T.G.; project administration, Y.D. and T.G. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgments: This research was supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Contract No. 451-03-136/2025-03/200172).

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 21.03.2025 Revised: 23.06.2025 Accepted: 09.07.2025 Available online: 28.07.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1531-1541
DOI 10.30892/gtg.61312-1522

ASSESSMENT OF THE RELIABILITY OF A STATISTICAL MODEL FOR DEVELOPING A SCENARIO OF POSSIBLE AIR TEMPERATURE CHANGES IN THE WINTER SEASON OVER THE TERRITORY OF AZERBAIJAN

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Citation: Safarov, S., & Huseynov, J. (2025). Assessment of the reliability of a statistical model for developing a scenario of possible air temperature changes in the winter season over the territory of Azerbaijan. *Geojournal of Tourism and Geosites*, 61(3), 1531–1541. https://doi.org/10.30892/gtg.61312-1522

Abstract: The article presents the results of assessing the reliability of a statistical model for developing a scenario of possible changes in the average winter air temperature over the territory of Azerbaijan. The model is based on the assumption of homogeneous soil cover in the horizontal direction, which allows the soil to be considered as a non-stationary one-dimensional system with a vertical spatial coordinate and time. The statistical model used is grounded in the assumptions that the temporal structure of winter temperature consists of periodic and non-periodic changes over various time intervals, and the existence of a trend in the long-term dynamics of air temperature is a widely recognized and reliably established fact. Here, the random components of the time series are calculated using Schuster's method and multiple cyclicities, and spectral analysis is conducted to identify short- and long-period fluctuations in these series. Furthermore, the expected values of air temperature residuals are computed. After this, the overall trend of the expected air temperature values was calculated as the sum of the values obtained from the linear trend and the computed residuals of air temperature. Given that the behavior of the climate system exhibits patterns of both short-period and long-period cyclicities, and their alternation within a certain time interval persists, we conducted numerical experiments based on the spectral analysis of time series of winter air temperature residuals. The calculations showed that the optimal approach is the use of a combination of cycles of 6, 9-10, and 14-15 years. Only in the Nakhchivan Autonomous Republic was a combination of 6 and 9-10 year cycles used. To assess the quality of the proposed model, the correlation coefficient between the actual and calculated values of winter air temperature was utilized. To verify the reliability of the obtained research results using independent data (from 1998 to 2022), we compared the estimates of both current climatic changes and their expected magnitudes. The model was tested using both five-year averaged temperature changes and annual temperature changes, analyzed through graphical representations. It was found that across all physical-geographical zones and climatic periods, in 44 cases (73 %), the absolute calculation errors were $\Delta T \leq 1.00C$, and in 58 cases (97 %), $\Delta T \leq 2.00C$. These results, along with other data and the model's reliability measure, demonstrate that the proposed model adequately describes changes in winter temperature and can be used to develop a scenario for changes in average winter air temperature over the next 20-25 years.

Keywords: Statistical model, climate change scenario, winter temperature, physical-geographical zones of Azerbaijan, model adequacy

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INTRODUCTION

Recently, increased attention has been paid to the natural, social, and economic consequences of global and regional climatic changes (Schumacher & Strob, 2011). As a result of these factors, the damage inflicted on the global economy by natural disasters associated with hazardous weather events has reached a record level of 90 billion US dollars, nearly exceeding the 1996 record by 50 % (Neumayer & Barthel, 2011).

As noted in source (Loginov, 2008), based on data from a number of historical and scientific sources, the 20th century was the warmest century of the last millennium. Research by NOAA indicates that since 1990, the Earth's average temperature has increased significantly (https://www.noaa.gov/news/2024-was-worlds-warmest-year-on-record?utm_source). Specifically, the last decade has been recorded as the warmest decade since the beginning of hydrometeorological measurements. The global temperature in 2024 was 1.29^0C higher than the 20th-century average, in 2023 it was 1.17^0C higher, in 2016 it was 1.0^0C higher, in 2020 it was 0.98^0C higher, in 2019 it was 0.95^0C higher, in 2015 it was 0.93^0C higher, in 2017 it was 0.91^0C higher, in 2022 it was 0.86^0C higher, in 2021 it was 0.84^0C higher, and in 2018 it was 0.82^0C higher. This trend highlights the persistent impact of climate change and demonstrates its effect on the annual rise in global temperature.

The data emphasize the urgency of implementing significant strategies to address greenhouse gas emissions and reduce further warming (https://www.noaa.gov/news/2024-was-worlds-warmest-year-on-record?utm_source). The last eight years have been the warmest on record globally. For example, the average global temperature in 2022 was approximately 1.15^0C

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above pre-industrial levels (1850-1900). The year 2022 marked the eighth consecutive year in which the annual global temperature exceeded pre-industrial levels by at least 1^0C (https://news.un.org/ru/story/2023/01/1436587).

June 2024 became the hottest month on record globally and the 13th consecutive month to set a monthly temperature record. This is evidenced by new data published by the European Union's Copernicus Climate Change Service. For 12 consecutive months, the global average temperature has been 1.5^0C higher than in the pre-industrial era (https://news.un.org/ru/story/2024/07/1454031). August 2024 and 2023 were the hottest globally, with an average temperature of 16.82^0C. July 2024 was slightly cooler than July 2023, but since June 2024 was significantly hotter than June 2023, this summer as a whole became the hottest on record (https://ru.euronews.com/green/2024/09/06/summer-2024-is-the-hottest-on-record-making-it-likely-this-will-be-the-hottest-year-ever).

Climate change is also being observed in Azerbaijan. This is because the zone of influence of global climate change is continuously expanding, and the South Caucasus region, including Azerbaijan, falls within this zone. Supporting evidence can be found in the results of various research studies conducted in this direction (Perevedentsev et al., 2011; Suleymanov, et al., 2016; Huseynov et al., 2024; Safarov &Mahmudov, 2011). The next important issue is the possibility of predicting the behavior of various elements of the climate system in the future. This requires detailed scenarios of global and regional features of climatic changes. It is worth noting that climate change scenarios are not intended to forecast future climatic conditions. They can be used to provide a schematic picture of probable future climatic conditions and should serve as a basis for assessing their impact on various sectors of the economy (Gordon & Scott, 2018).

Currently, various approaches are being proposed, and corresponding methods are being developed to address these tasks. These methods include general atmospheric circulation models (Angela et al., 2013; Satoh, 2013; Smith & Bustamante, 2018; Zhao & Zeng, 2014), paleoclimatic analogs of the future based on past climate changes, and empirical-statistical methods based on the processing of measured values of meteorological elements over the last 50-100 years (Droesch, 2018; Perevedentsev et al., 2018), which have been successfully applied over the past 25-35 years. For example, some methods for developing scenarios using instrumental observation data are presented in the research of M.I. Budyko (Budyko et al., 2013) and others. Their essence lies in studying the linear relationship between regional seasonal variables and a series of data on the temperature of the surface air layer in the Northern Hemisphere (Zumwald et al., 2020).

In addition to these approaches, other methods for assessing global climate changes have also been developed.

The estimates of climate changes obtained through the aforementioned methods are referred to as scenarios in scientific literature. It is important to note that methods for constructing regional climate change scenarios using instrumental observations are based on relatively small temperature changes compared to those expected in the future. Therefore, as a first approximation, these scenarios can only be used as analogs of climatic conditions during the initial phase of warming, which can be expected in the first decades of the 21st century (Budyko et al., 1993; Reichmuth et al., 2025; Saadene & Salhi, 2025).

The brief analytical review above of works on climate changes and methods for their study once again highlights the complex nature and multifaceted direction of research into modern trends in the climate system. The main conclusion is that the fact of changes in both global and regional climates is confirmed. The methods used to develop scenarios of future climatic conditions have different physical and mathematical foundations, which complicates the process of obtaining accurate results. All of this demonstrates that, due to the insufficient understanding of regional climate changes and the inclusion of new data in the series of used elements, the problem under consideration remains relevant both from a practical and a scientific-methodological perspective. Therefore, any research on modern climatic changes will remain relevant for a long time and can contribute scientifically and practically to addressing this issue.

MATERIALS AND METHODS

The methodology used is based on a series of methods (Isaev & Sherstyukov, 1996; Basso & Liu, 2019; Yakushev et al., 2020), and their detailed description is provided in (Safarov, 2000). Here, it is important to note only the following assumptions when using the statistical method:

1) The indicators of the temporal structure of winter air temperature can be divided into two groups. The first group includes characteristics of periodic changes, while the second group encompasses non-periodic changes over various time intervals.

2) The existence of a trend in the long-term dynamics of air temperature is a widely recognized and reliably established fact, and the identification of this trend can be achieved using various methods (Hennemuth, 2013; Wilks, 2011; Yakushev et al., 2020). A necessary condition is the assessment of the correctness of trend identification, and deviations from the moving trend should represent a stationary random process.

3) The success of linear extrapolation will depend both on the measure of change in the calculation period and on the period over which the linear extrapolation is obtained, as the connection between the past and the future gradually weakens over time due to the inclusion of new factors or changes in their nature (Huseynov & Tagiyev, 2024).

The random components of the time series were calculated using Schuster's method and multiple cyclicities, and spectral analysis was conducted to identify short- and long-period fluctuations in these series. Subsequently, the expected values of air temperature residuals were computed. Following this, the overall trend of the expected air temperature values was calculated as the sum of the values obtained from the linear trend and the computed residuals of air temperature. A brief description of the statistical method we used is provided below.

The time series $Y(t)$ is represented as the sum of deterministic $(Y_1(t))$, correlated random $(Y_2(t))$, and uncorrelated random $(Y_3(t))$ components. Given that averaging uncorrelated random variables $Y_3(t)$ over a sufficiently long series yields a value close to zero (Droesch, 2018), the expression can be written as: $Y(t)=Y_1(t)+ Y_2(t)$

To account for earlier observational data, which carry some information about the process, and to assign greater weights to more recent observations compared to earlier data, the method of harmonic weights proposed by Helwig was used.

In this method, the average increment is calculated using the formula:

$$\bar{W} = \sum_{r=1}^{n=1} C_{r+1}^{n} * W_{r+1}$$

W_{t+1}=$Y_1(t+1) - Y_1(t)$

$C_{t+1}^{n} > 0$ *(t=1, 2, …n-1) and* $\sum_{t=1}^{n-1} C_{t+1}^{n} = 1$

where, W_t+1 - increments of the function Y_1(t); C_{t+1}^{n}>0- harmonic coefficients.

The predicted value of the time series for air temperature, i.e., the extrapolation of the trend for the nearest years under the initial condition Y_t=Y_n, can be determined using the expression (Safarov & Mahmudov, 2011):

$$Y_{t+1} = Y_t + \overline{W} \quad (5)$$

Next, by removing the deterministic component $Y_1(t)$ from the time series $Y(t)$, a quasi-stationary data series can be obtained, to which methods of multiple cyclicities and Schuster's method can be applied.

Further, considering the regularity of cyclicity in long-term air temperature series and the preservation of their alternation over a certain time interval *t*, the series *X* is divided into *n* segments of length *t*. This procedure should begin from the end of the series. Then, using the method of variance analysis, the contribution of inter-level variance (*St*) to the total variance can be estimated (Sherstyukov, 2008):

$$S_t = \frac{D_1}{D_0} \quad (6)$$

where, D_1 - inter-level variance; D_0 - total variance. To select and evaluate *t*, the following procedure must be carried out.

By varying the value of *t* from 3 to *N*/2 and calculating S_t, we can search for the two largest values of S_t corresponding to t_1 and t_2. The following conditions must be met: t_1 and t_2 should not be multiples of each other, and they should not be adjacent, describing the same cycle (Sherstyukov & Isaev, 1999). After identifying t_1 and t_2, the time series of residuals can be represented as the following harmonic function [45]:

$$Y_2(t) = A_0 + A_1 \cdot \sin\left(\frac{2\pi}{t_1} + \phi_1\right) + A_2 \cdot \sin\left(\frac{2\pi}{t_2} + \phi_2\right) \quad (7)$$

$$\text{where, } A_0 = \frac{1}{N}\sum_{k=1}^{N} X_k = X_{cp},\ A_m = \sqrt{a_m^2 + b_m^2} \quad (8)$$

$$\mathbf{a_m = \frac{2}{t_m} X_{cp} \cos\frac{2\pi}{t_m}\tau,\ b_m = \frac{2}{t_m} X_{cp} \sin\frac{2\pi}{t_m}\tau,\ \phi_m = arctg\frac{a_m}{b_m}},\ \phi_m = \text{arctg}\frac{a_m}{b_m},\ m=1, 2 \quad (9)$$

It should be noted that representing the residuals of the time series as two components is aimed at accounting for both short-period and long-period oscillatory processes. As a result, to develop scenarios for air temperature changes, the extrapolated values obtained using the linear trend and the extrapolated values of the time series residuals are summed. In this case, equation (2) can be written in the following form:

$$T_c = B_T \cdot t + A_T + Y_2(t) \quad (10)$$

Where, B_t and A_t are the coefficients of the linear trend; t is the ordinal number of the year from the beginning of the count (in our case, the beginning of the count is the year 1968, and t=1).

RESULTS AND DISCUSSION

In the scientific literature, it is noted that identifying current trends in climate change and developing future climate change scenarios involve not only general atmospheric circulation models and paleoclimatic analogs but also empirical-statistical methods and instrumental observation data (Droesch, 2018; Ghazi & Jeihouni, 2022; Hansen & Stone, 2016; Magnan, 2021; Lee et al., 2021). In (Perevedentsev et al., 2011; Kreienkamp et al., 2019), the advantages and disadvantages of both physical-mathematical and statistical models of climate change are discussed.

Physical-mathematical models use discretized differential equations with corresponding boundary and initial conditions, which have a physical basis. Statistical models, on the other hand, are not based on physical mechanisms; they are typically developed through the analysis of past meteorological conditions. In (Kreienkamp et al., 2019), it is also noted that harmonic analysis is used to model the dynamics of time series of meteorological elements. It is shown that a general methodology has been developed for the stochastic modeling of meteorological processes, which includes identifying intra-annual and interannual variability of the elements under consideration.

The authors highlight that a set of effective statistical methods has been developed, including methods for separating intra-annual variability into climatic and synoptic components, methods for clipping and smoothing cycle amplitudes to extract different time scales from long-term observational series of climatic characteristics, and methods for classification and constructing spatial linear models. For example, it is demonstrated that manifestations of climate change in long-term time series can take the form of monotonic changes (trends) and harmonic changes, which characterize transitions from one stationary state to another. The most common method for representing cyclic fluctuations is harmonic analysis (Smith & Bustamante, 2018). The guide for using climate scenarios developed based on statistical methods is presented in (Wilby et al., 2004; Zumwald et al., 2020). In (Aurelien et al., 2017), a new statistical approach to detecting and explaining climate changes is discussed, based on additive decomposition and

simple hypothesis testing, where procedures for estimation and testing are introduced using maximum likelihood. This approach was applied to the linear trend of global average temperature over the period 1951-2010.

It was substantiated that a significant portion of the observed warming during this period (+0.65 K) was due to anthropogenic influences, with a very limited contribution from natural factors. In (Aurelien, 2018), the question is raised: Can statistical methods predict future climate? Here, statistical models and methods used in climatology to assess the sensitivity of Earth's climate to greenhouse gases based on observations are briefly presented. To this end, the context of climatology is first described, explaining how statistics can interact with the use of climate models. This is followed by a description of the main models used, which are original variants of error-in-variables models.

In (Sherstyukov, 2008), a statistical model of climate change based on rhythms is presented. Here, an analysis of existing atmospheric rhythms over the last 50-70 years was conducted, revealing the presence of rhythms of approximately 6, 8, 12, 16, 17-18, and 35-37 years. Based on numerical experiments, it was established that rhythms shorter than 6 years do not remain unchanged for 20 years, so only long-term rhythms (6 years or more) were used for the stated task.

A detailed analysis of statistical methods for analyzing modeled and observed climate data, applied in projects and institutions dealing with climate change impacts and adaptation, is provided in (Budyko, 1987; Aurelien et al., 2017). An example of statistical modeling related to the consequences of climate change can be found in (Brohan et al., 2006; Mukherjee et al., 2018; Srinivas et al., 2005), where changes in the average monthly sea level at coastal tidal stations along the Indian subcontinent are examined using statistical modeling methods.

In our presented work, the results of testing a statistical method for obtaining some generalized predictive estimates of the average winter air temperature on an annual basis up to 2022 are reviewed and analyzed. As noted in (Sherstyukov, 2008; Chilingar et al., 2009), a full-fledged forecast with such lead time is not possible, but generalized estimates of upcoming climate change trends can be obtained based on statistical methods of analyzing accumulated data. It should be noted that in our earlier studies, the results of a developed scenario for changes in seasonal air temperatures over the territory of Azerbaijan for the coming decades were presented using statistical methods and actual meteorological data for the period 1968-1997, and regional features of expected air temperature values up to 2030 were assessed (Safarov, 2000).

In this article, checking the adequacy of the model refers to the justification of ultra-long-term forecasts of seasonal air temperatures with lead times ranging from 1 year to 33 years. This involves assessing the degree of correspondence between the predicted winter air temperatures and the actually observed temperatures. Naturally, this correspondence decreases as the lead time of the forecast increases (Huseynov et al., 2024).

In (Lapina & Morozova, 2016; Markku, 2016), the issues of the reliability of long-term forecasts for precipitation periods are discussed, and it is demonstrated how criteria and approaches used for evaluating short-term forecasts can be applied to assess the reliability of long-term forecasts. As noted in (Alimpieva & Morozova, 2020), the challenges of long-term and ultra-long-term forecasts for various meteorological elements represent quite complex scientific tasks. It is also highlighted that the reliability of such forecasts remains relatively low, and synoptic and physical-statistical methods are increasingly being used for these tasks. According to the World Meteorological Organization, short-term weather forecasts are considered successful with a reliability of 85-90%, while long-term forecasts are deemed reliable at 60-65% (http://vcgms.ru/eshhe-raz-o-prognozah-pogody-i-ih-opravdy-vaemosti/) [54]. In this study, the following statistical criteria are used to check the adequacy of the model:

1. The correlation coefficient between calculated and actual values;
2. The mean error (ME).

$$ME = \frac{1}{N} \cdot \left(T_{fi} - T_{ci}\right) \tag{11}$$

3. The mean absolute error (MAE);
4. The root mean square error (RMSE).

5. $$RMSE = \sqrt{\frac{1}{N} \cdot \left(\sum_{i=1}^{N} \left(T_{fi} - T_{ci}\right)^2\right)} \tag{12}$$

Where, T_{fi} – actual value of winter temperature; T_{ci} – actual value of winter temperature; N – sample size.

It can be noted that the value of the root mean square error (RMSE) is always somewhat larger than the mean absolute error (MAE), but both characterize the average deviation of the calculated values obtained from the model compared to the actual data. We have also, based on data on the success of the model forecast of average daily air temperature (Steppeler et al., 2003), assessed the reliability of the forecast for given values of absolute error ($\Delta T \leq 1.0^0 C$; $\Delta T \leq 2.0^0 C$; $\Delta T \leq 3.0^0 C$; $\Delta T \leq 4.0^0 C$). The calculations used data from the vast majority of meteorological stations located on the territory of Azerbaijan for the period 1968–2022. These data were taken from the meteorological data bank (Safarov, 2002).The winter air temperature data for the period 1968-1997 were used to develop a scenario of expected winter temperatures, while the data for the period 1998-2022 were used to verify the reliability of the obtained scenario values of the considered indicator. In developing the scenario for changes in winter air temperature, preference was given to data averaged over specific physical-geographical zones, as this increases the accuracy of the calculations. Taking this into account, we used data from the following physical-geographical zones of Azerbaijan, based on synoptic-climatic zoning: 1)The Absheron Peninsula and the adjacent marine area; 2)The Lankaran-Astara zone; 3) The Kura-Araz lowland; 4)The Ganja-Gazakh zone; 5)The northeastern slope of the Lesser Caucasus; 6) The southern slope of the Greater Caucasus; 7)The Gobustan zone; 8) The northeastern slope of the Greater Caucasus; 9)The plain part of the Nakhchivan Autonomous Republic; 10)The foothill region of the Nakhchivan Autonomous Republic (Figure 1).

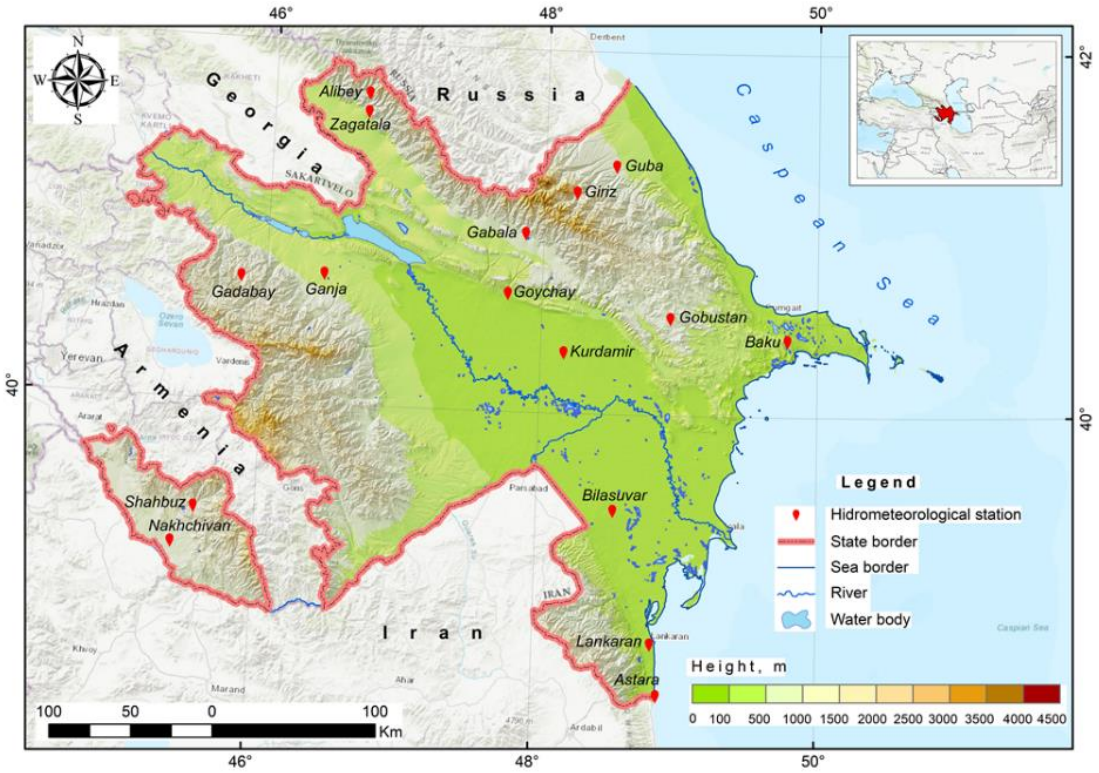

Figure 1. Map of Azerbaijan with the location of the analyzed zones

The comparison results are presented in tabular and graphical form. It is known that the behavior of the climate system exhibits patterns of both short-period and long-period cyclicities, and their alternation within a certain time interval persists. The numerical experiments we conducted, based on spectral analysis of time series of winter air temperature residuals, showed that the optimal approach is the use of a combination of cycles of 6, 9-10, and 14-15 years. Only in the Nakhchivan Autonomous Republic was a combination of 6 and 9-10 year cycles used [9].

To assess the quality of the proposed model, the correlation coefficient between the actual and calculated values of winter air temperature was used (https://studfile.net/preview/2829143). Table 1 presents some statistical characteristics of the linear trend when comparing actual and calculated air temperature values. The following notations are used: r (T_f, T_{1c}): the correlation coefficient between actual and calculated air temperature values based on the linear trend; r (T_f, T_{2c}): the correlation coefficient between actual and calculated air temperature series, obtained as the sum of values derived from the linear trend with weighting coefficients (formula 5) and the approximation of air temperature residuals over the period 1968-1997. The data in Table 1 show that in this season, the values of the linear trend coefficient (B_T) are positive, indicating a trend of increasing air temperature, which varied over a wide range.

The relatively highest values were obtained from observational data in the Ganja-Gazakh zone and the Kura-Araz lowland (B_T=0.05), while the lowest values were observed in the Gobustan zone (B_T=0.01).

Table 1. Statistical characteristics of the linear trend and comparison of actual and calculated values of winter air temperature

Physical-geographical zones	$r(T_f, T_{1c})$	$r(T_f, T_{2c})$	B_T	A_T
Absheron	0.20	0.47	0.02	4.8
Lankaran	0.26	0.45	0.04	4.0
Kura-Araz lowland	0.32	0.36	0.05	3.0
Ganja-Gazakh	0.34	0.54	0.05	1.7
The north-eastern slope of the Lesser Caucasus	0.11	0.57	0.02	-2.3
Southern slope of the Greater Caucasus	0.26	0.52	0.04	-0.1
Gobustans	0.05	0.45	0.01	-0.3
North-eastern slope of the Greater Caucasus	0.22	0.49	0.03	-1.1
Plain part of Nakhchivan AR	0.22	0.61	0.06	-0.2
The foothill part of the Nakhchivan AR	0.16	0.61	0.04	-2.1

Incorporating the dynamics of air temperature residuals into the study of their interannual variability significantly improved the statistical relationship between the calculated and actual series of this element. As seen in Table 1, with the exception of the Kura-Araz lowland (r (T_f, T_{2p}) =0.36), relatively high correlation coefficients were obtained for all zones, ranging from 0.45 to 0.61. The results obtained in (Safarov, 2000) allowed us to use two approaches for assessing possible changes in air temperature up to 2030: 1) Temperature changes averaged over five-year periods, presented in tabular form; 2) Annual temperature change values using graphs, which show the actual long-term dynamics of air temperature for the period 1968-1997, the dynamics of expected values of this element up to 2030, and the linear trend

for the period 1968-1997 with its extrapolation up to 2030. In doing so, the assumption was made that extrapolating the anthropogenic trend of air temperature change, associated solely with a uniform increase in CO_2, is considered feasible (Budyko, 1989; Smith & Bustamante, 2018). To verify the reliability of the obtained research results using independent data (from 1998 to 2022), we examined the possibilities of comparing the obtained estimates of both current climatic changes and their expected magnitudes. To test the model using five-year averaged temperature changes, the expected air temperature values were compared with actual data. Averaging was performed for the following climatic periods: 1998-1999; 2001-2005; 2006-2010; 2011-2015; 2016-2020; and 2021-2022.

The correlation coefficient (r) and the absolute error (S_a,^{0}C) of the calculations of expected winter air temperature values were calculated for the zones of the republic. The obtained results are presented in Table 2. As can be seen from Table 2, in the winter season of 1998–2000, the calculated and actual air temperatures are generally close, with absolute errors not exceeding 0.8^{0}C (except for the northeastern slope of the Lesser Caucasus). The model's reliability (R^2) is very high, at 0.965. In the period 2001-2005, the absolute errors of the model are generally close, ranging from 0.3 to 1.8^{0}C (except for the data from the northeastern slope of the Lesser Caucasus), and the model's reliability (R^2) is 0.831. In the period 2006-2010, the absolute errors of the model are also generally close, ranging from 0.1 to 1.5^{0}C (except for the data from the plain part of the Nakhchivan Autonomous Republic), and the model's reliability (R^2) is 0.850.

Table 2. Averaged calculated (T_c) and actual (T_f) values of winter air temperature for different climatic periods across the zones of the republic

Zone	Years											
	1998-2000		2001-2005		2006-2010		2011-2015		2016-2020		2021-2022	
	T_c	**T_f**	**T_c**	**T_f**	**T_c**	**T_f**	**T_c**	**T_f**	**T_c**	**T_f**	**T_c**	**T_f**
Absheron	6.4	6.3	5.1	6.2	6.6	5.5	5.5	6.0	6.0	6.7	6.0	7.0
Lankaran	6.4	6.4	4.7	6.5	6.4	5.8	5.6	6.3	6.3	6.8	6.7	7.1
Kura-Araz lowland	5.6	5.1	4.5	4.8	4.4	4.3	5.4	4.7	5.6	5.4	5.0	5.6
Ganja-Gazakh	4.2	4.1	3.1	4.1	4.1	3.3	4.1	3.8	4.4	4.5	4.6	4.8
The north-eastern slope of the Lesser Caucasus	1.9	1.6	0.7	1.3	1.3	1.0	2.0	1.7	1.2	2.1	2.0	3.8
Southern slope of the Greater Caucasus	1.0	1.2	-0.9	0.9	0.4	0.7	0.0	0.9	0.3	1.7	-1.0	2.4
Gobustan	1.0	0.5	-0.9	-0.2	1.2	-0.3	0.0	0.1	0.9	0.7	0.1	2.0
North-eastern slope of the Greater Caucasus	-0.9	0.3	-2.2	0.3	-1.8	-0.4	-0.6	0.1	-1.9	0.2	-2.0	0.5
Plain part of Nakhchivan AR	1.9	2.7	1.5	0.3	2.3	-0.3	1.7	1.6	2.8	2.0	2.8	2.0
The foothill part of the Nakhchivan AR	-0.3	0.0	-0.7	-1.8	-0.1	-1.4	-0.7	0.4	0.4	-0.4	0.3	0.7
R^2 - model confidence value	0.965		0.831		0.850		0.951		0.891		0.847	

In the period 2011-2015, the absolute errors of the model are also generally close, ranging from 0.1 to 1.1^{0}C, and the model's reliability (R^2) is 0.951. In the period 2016-2020, the absolute errors of the model are generally close, ranging from 0.1 to 1.4^{0}C (except for the data from the northeastern slope of the Lesser Caucasus), and the model's reliability (R^2) is 0.891. In the period 2021-2022, the absolute errors of the model are generally close, ranging from 0.2 to 1.8^{0}C (except for the data from the Gobustan zone and the northeastern slope of the Lesser Caucasus), and the model's reliability (R^2) is 0.847. Across all zones and climatic periods (10 zones × 6 climatic periods = 60 cases), in 44 cases (73 %), the absolute calculation errors were $\Delta T \leq 1.0^0 C$, and in 58 cases (97 %), $\Delta T \leq 2.0^0 C$. These data and the model's reliability indicate that the proposed model adequately describes changes in winter temperature, averaged over two-, three-, and five-year periods, and can be used to develop a scenario for changes in average winter air temperature over the next 20-25 years.

Verification of the model's reliability based on annual temperature change values using graphs. These graphs (Figures 2-11) present the actual long-term dynamics of air temperature for the period 1968-2022, the dynamics of expected values of this element up to 2030, and the linear trend for the period 1968-1997 along with its extrapolation up to 2030.

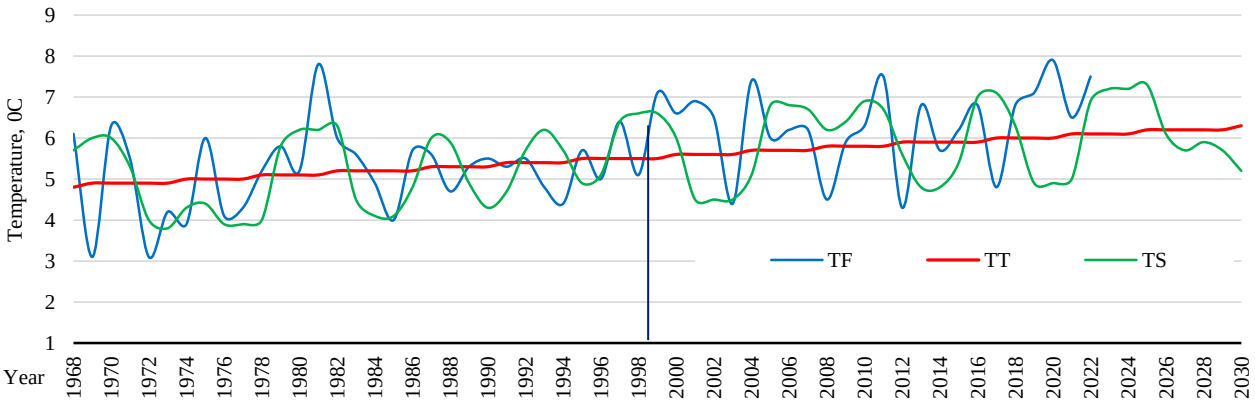

Figure 2. Actual (TF), expected (TS) values, and linear trend (TT) of winter air temperature on the Absheron Peninsula (Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

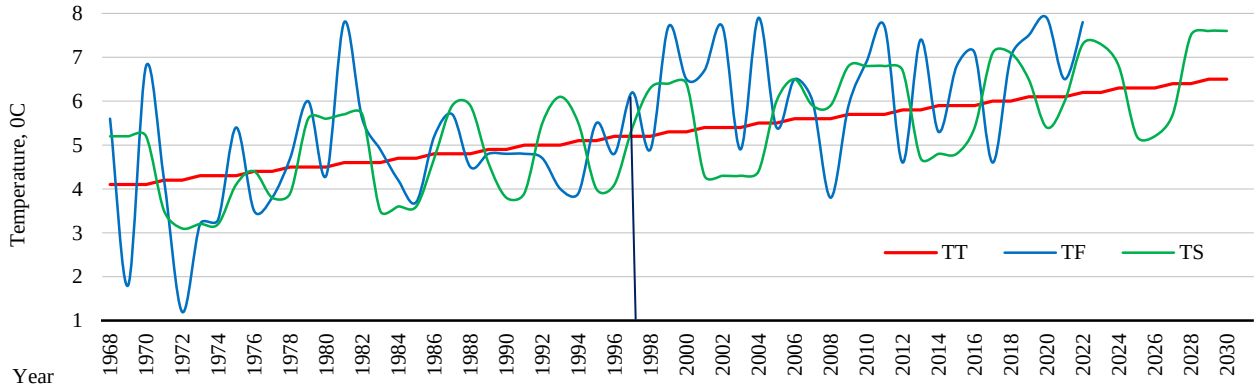

Figure 3. Actual (TF), expected (TS) values, and linear trend (TT) of winter air temperature in the Lankaran-Astara zone (Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

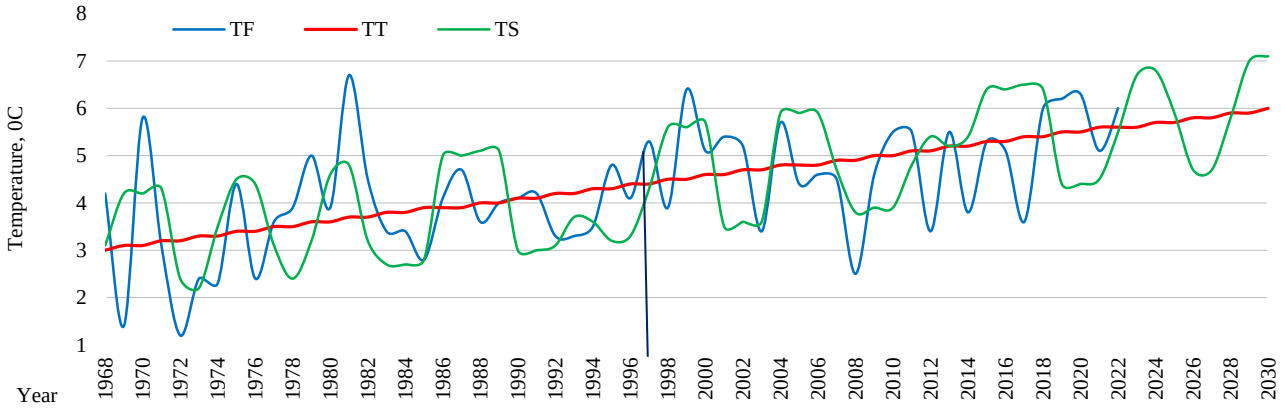

Figure 4. Actual (TF), expected (TS) values, and linear trend (TT) of winter air temperature in the Kura-Araz lowland (Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

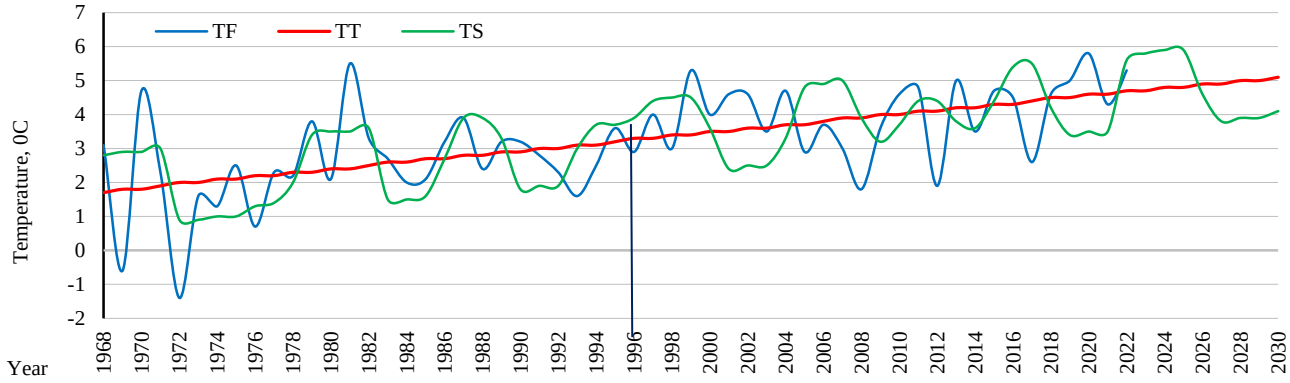

Figure 5. Actual (TF), expected (TS) values, and linear trend (TT) of winter air temperature in the Ganja-Gazakh zone (Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

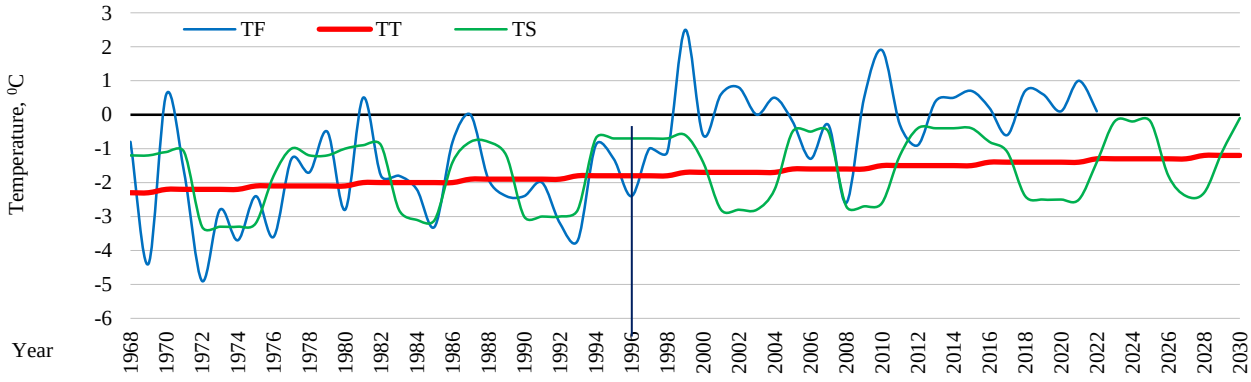

Figure 6. Actual (TF), expected (TS) values, and linear trend (TT) of winter air temperature on the northeastern slope of the Lesser Caucasus (Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

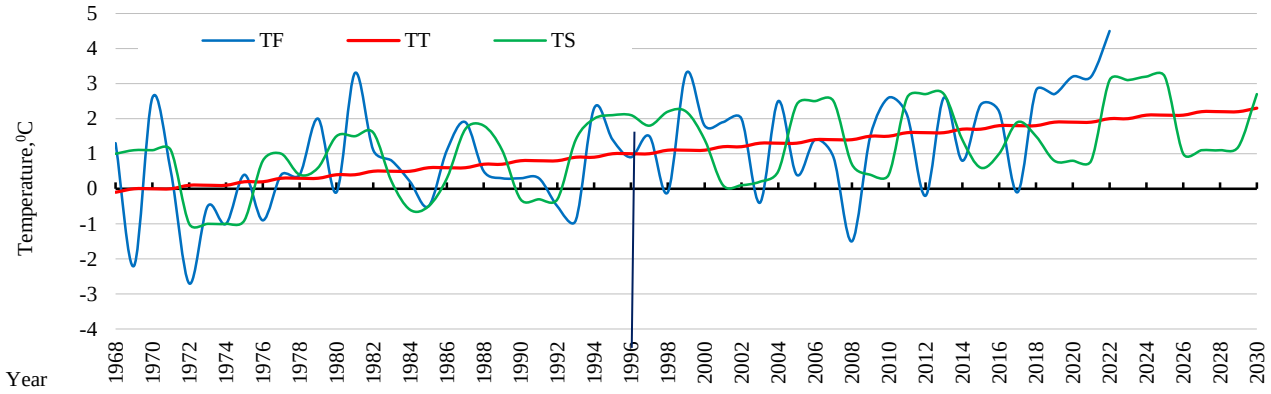

Figure 7. Actual (TF), expected (T) values, and linear trend (TT) of winter air temperature on the southern slope of the Greater Caucasus (Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

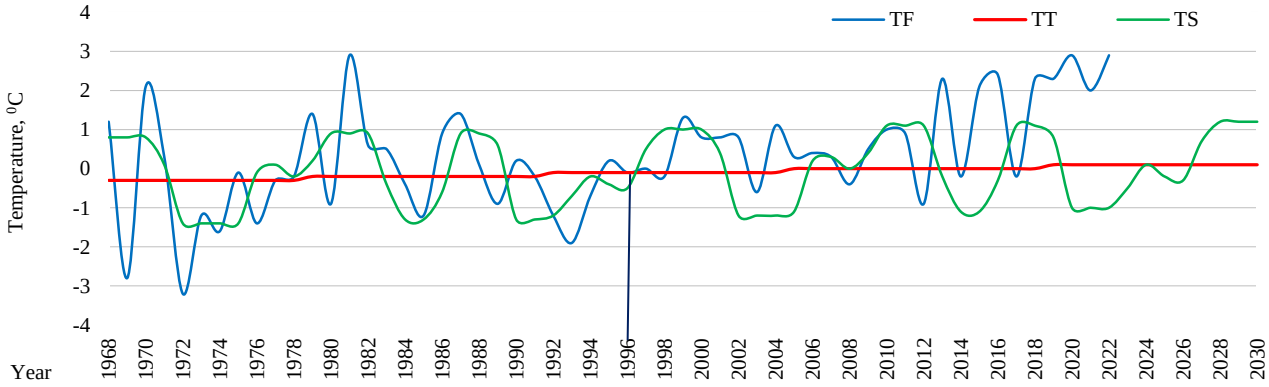

Figure 8. Actual (TF), expected (TS) values, and linear trend (TT) of winter air temperature in the Shamakhi-Gobustan zone (Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

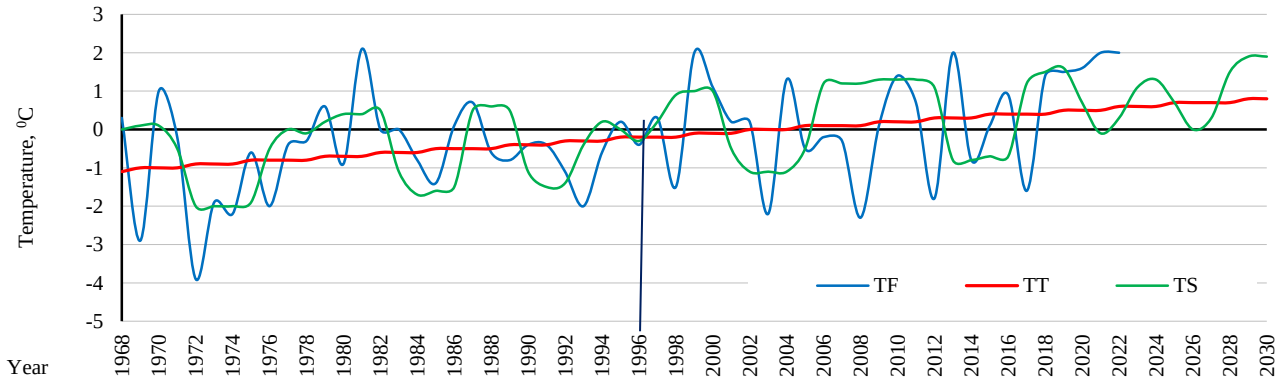

Figure 9. Actual (TF), expected (TS) values, and linear trend (TT) of winter air temperature on the northeastern slope of the Greater Caucasus (Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

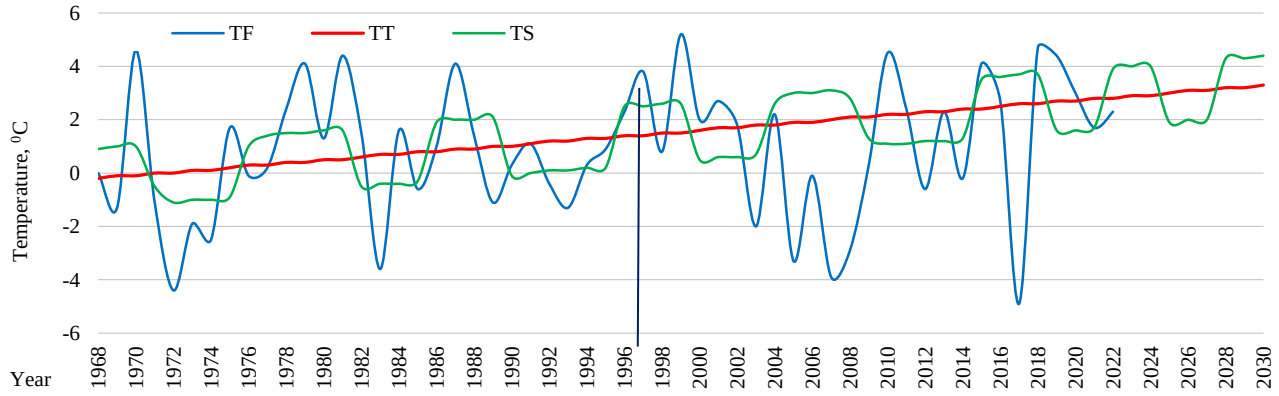

Figure 10. Actual (TF), expected (TS) values, and linear trend (TT) of winter air temperature in the plain part of the Nakhchivan AR (Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

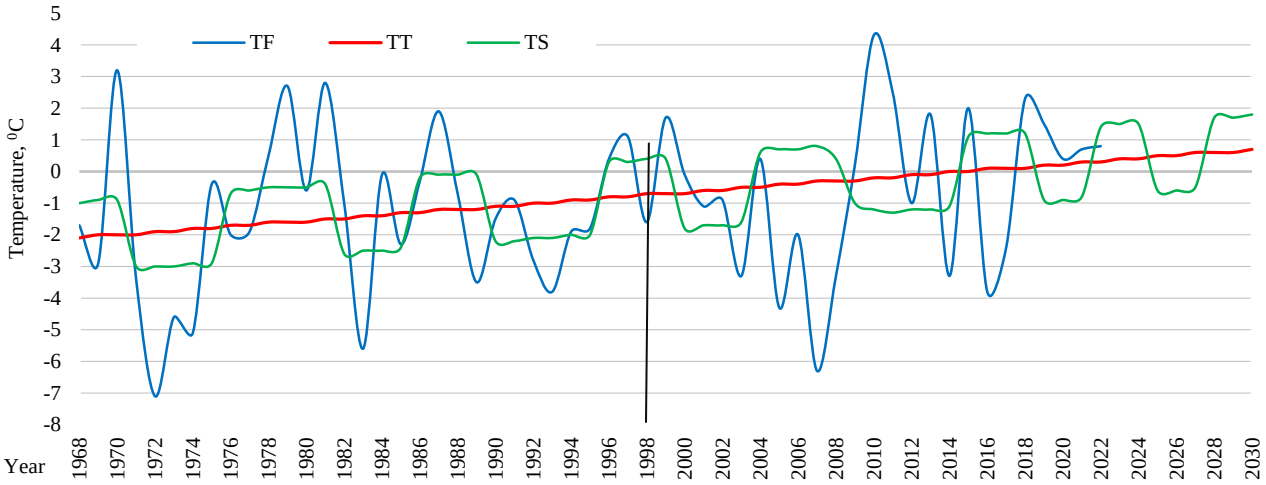

Figure 11. Actual (TF), expected (TS) values, and linear trend (TT) of winter air temperature in the foothill part of the Nakhchivan Autonomous Republic (Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

The graphical representation of the comparison between actual (*TF*) and calculated (*TS*) values of winter air temperature also confirms the adequacy of the statistical model we used. Table 3 presents the success indicators of the model scenario for average winter air temperature in various physical-geographical zones of Azerbaijan.

Table 3. Indicators of the success of the model scenario for average winter air temperature, ^{0}C
(Source: Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Hydrometeorological station data)

Physical-geographical zones	MSE	MAE	RMSE	Scenario reliability at a given absolute error value, %			
				ΔT≤1.0	ΔT≤2.0	ΔT≤3.0	ΔT≤4.0
Absheron	0.5	1.2	1.4	56	80	100	100
Lankaran	0.6	1.3	1.7	52	68	92	100
Kura-Araz lowland	-0.2	1.1	1.3	44	96	100	100
Ganja-Gazakh	0.0	1.3	1.5	48	76	100	100
The north-eastern slope of the Lesser Caucasus	1.7	1.7	2.2	52	60	68	96
Southern slope of the Greater Caucasus	0.3	2.0	2.3	32	48	72	100
Gobustan	1.0	1.4	1.9	44	72	88	100
North-eastern slope of the Greater Caucasus	-0.1	1.3	1.7	44	72	96	100
Plain part of Nakhchivan AR	-1.0	2.5	3.3	24	60	76	84
The foothill part of the Nakhchivan AR	-0.3	2.4	2.9	24	60	68	84

From Table 3, it can be seen that for an absolute error of $\Delta T \leq 1.0^0 C$, the reliability of the winter air temperature change scenario ranges from 24 % to 56 %. For $\Delta T \leq 2.0^0 C$, it ranges from 60 % to 96 % (except for data from the southern slope of the Greater Caucasus). For $\Delta T \leq 3.0^0 C$, it ranges from 68 % to 100 %, and for $\Delta T \leq 4.0^0 C$, it ranges from 84 % to 100 %. As mentioned earlier, according to the World Meteorological Organization, long-term forecasts with a reliability of 60-65 % are considered successful (http://vcgms.ru/eshhe-raz-o-prognozah-pogody-i-ih-opravdy-vaemosti/). Based on this, it can be concluded that the scenario of winter air temperature changes developed using the proposed model is adequate, as even for $\Delta T \leq 2.0^0 C$, the reliability of the scenario or conditional forecast ranges from 60 % to 96 %.

From Table 3, it can be seen that for an absolute error of $\Delta T \leq 1.0^0 C$, the reliability of the winter air temperature change scenario ranges from 24 % to 56 %. For $\Delta T \leq 2.0 \circ C$, it ranges from 60% to 96 % (except for data from the southern slope of the Greater Caucasus). For $\Delta T \leq 3.0^0 C$, it ranges from 68 % to 100 %, and for $\Delta T \leq 4.0^0 C$, it ranges from 84 % to 100%. As mentioned earlier, according to the World Meteorological Organization, long-term forecasts with a reliability of 60-65% are considered successful [54, 55]. Based on this, it can be concluded that the scenario of winter air temperature changes developed using the proposed model is adequate, as even for $\Delta T \leq 2.0^0 C$, the reliability of the scenario or conditional forecast ranges from 60 % to 96 %.

CONCLUSION

The obtained results generally indicate that the proposed methodology for developing a scenario of future winter air temperature changes is sufficiently adequate and can be used as one of the options for solving various climatic tasks. It can also be said that for the regional assessment of possible air temperature changes, an approach based on the methods of least squares, harmonic weights, Schuster's method, and multiple cyclicities was applied. The methodology used,

compared to the linear trend, can more accurately describe the main patterns of temporal changes in air temperature and, thus, their expected future values. This is because the linear trend only describes possible trends in changes of this element and largely characterizes a qualitative picture. The use of periodic patterns in air temperature time series, along with the application of the linear trend, more satisfactorily describes both the trend of changes and their assessment.

Author Contributions: Conceptualization, S.S. and J.H.; methodology and software, S.S.; validation, J.H.; formal analysis and investigation, S.S. and J.H.; data curation, J.H.; writing - original draft preparation, S.S. and J.H.; writing - review and editing, J.H.; visualization, supervision, and project administration, S.S. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgments: The authors thank everyone who contributed to the publication of the article.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 23.02.2025 Revised: 24.06.2025 Accepted: 10.07.2025 Available online: 01.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1542-1552
DOI 10.30892/gtg.61313-1523

SPATIAL-TEMPORAL ANALYSIS OF THE DISTRIBUTION PATTERNS OF GREIG'S TULIP (LAT. TULIPA GREIGII) IN THE LANDSCAPES OF TURKISTAN REGION AND OPPORTUNITIES FOR ECOTOURISM DEVELOPMENT

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Citation: Akhmetova, D., & Dunets, A.N. (2025). Spatial-temporal analysis of the distribution patterns of greig's tulip (lat. tulipa greigii) in the landscapes of Turkistan region and opportunities for ecotourism development. *Geojournal of Tourism and Geosites*, 61(3), 1542–1552. https://doi.org/10.30892/gtg.61313-1523

Abstract: The present study investigates the spatial-temporal patterns of Tulipa greigii distribution across the heterogeneous landscapes of the Turkistan Region, southern Kazakhstan. As a flagship species with high conservation and ecotourism value Tulipa greigii is increasingly affected by climate variability and landscape fragmentation. The aim of the research is to identify the ecological parameters governing tulip distribution and to assess the potential for sustainable ecotourism based on floral landscape dynamics. The methodology integrates field ecological surveys, multi-seasonal remote sensing (Sentinel-2 and Landsat 8), and geospatial modeling using NDVI and NDMI indices. Additionally, public interest and ecotourism potential were assessed through digital footprint analysis on social media platforms (Instagram and TikTok), as well as national visitation statistics. Geostatistical tools were employed to analyze spatial trends and vegetation stress patterns across six key study locations selected for their landscape diversity. Findings reveal a strong correlation between seasonal soil moisture levels and the spatial presence of Tulipa greigii. Higher vegetation indices were observed in slope-adjacent piedmonts and montane meadow belts, which also correspond with increased social media activity during the blooming season. The results confirm the role of geomorphological position, hydrological balance, and digital visibility in determining ecotourism hotspots. This study demonstrates the value of interdisciplinary methods in understanding plant distribution and promoting nature-based tourism. By integrating biophysical indicators with geospatial technologies and public engagement metrics, the research provides a holistic framework for identifying ecologically significant zones under pressure from climate change and human activity. Moreover, the proposed approach highlights the utility of coupling traditional ecological monitoring with digital analytics to track spatial interest trends and ecological vulnerabilities. The study contributes to the scientific basis for the development of adaptive conservation strategies, fostering synergies between biodiversity protection and regional ecotourism planning. It provides regionally grounded and practically oriented recommendations for harmonizing biodiversity conservation efforts with the development of digital ecotourism strategies, tailored specifically to the ecological and socio-spatial characteristics of Central Asia's dryland landscapes.

Keywords: Tulipa greigii, spatiotemporal analysis, NDVI, NDMI, Turkistan Region, ecotourism, social media

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INTRODUCTION

Tulips are perennial geophytic plants belonging to the family *Liliaceae*, notable not only for their contribution to biological diversity but also for their significant economic, horticultural, ecological, and aesthetic value (Pavord, 1999). Central Asia, particularly Kazakhstan, is considered the primary genetic center of origin for tulips (Vvedensky & Kovalevskaya, 1971; Hoog, 1973). Scientific research on tulips began in the late 18th century, with P.S. Pallas being the first to describe species in Western Siberia and adjacent regions. In the 19th century, prominent botanists such as A. Lehman, I. Kirilov, I. Borshchow, L. Shrenk, S. Karelin, and E.A. von Regel made significant contributions to the classification of *Tulip* taxa in the flora of Kazakhstan. *Tulipa greigii* was first described in 1873 by the botanist E.L. Regel. It was studied based on herbarium materials collected by A. Severtsev and B. Fedchenko in the Karatau Mountains.

Initially, this tulip was identified as a variety of a specific species under the name *Tulipa altaica var. karatavica* Regel. is found in the Karatau mountain range of southern Kazakhstan. However, later that same year, Regel recognized it as a distinct species (Ivashchenko & Belyalov, 2019; Tojibaev et al., 2022). As research progressed, numerous studies were published on the morphology, genetics, ecology, and distribution of tulips. *Tulipa greigii* is an endemic and rare species found in the southern and southwestern regions of Kazakhstan, including the Turkistan Region, Karatau Range, Kyzylkum Desert, Betpak-Dala Plateau, and up to elevations of 2400 meters in the Tian Shan mountain system. It typically grows on clay and rocky slopes, as well as in foothill plains and mountain flukes. This bulbous perennial of the *Liliaceae* family reaches a height of 10–30 cm. Its flowers are bright red, orange, or yellow, often with a black or purple center.

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According to its phenology, *Tulipa greigii* flowers between April and June and produces fruit from June to July. The species primarily reproduces vegetatively through bulbs, while seed propagation is relatively rare. It typically grows in dry, gravelly, semi-desert, and mountainous regions. Due to its limited population and distribution, the species is listed in the Red Book of Kazakhstan. As part of conservation measures, *Tulipa greigii* is protected within the boundaries of the Sairam-Ugam National Park, Aksu-Zhabagly Nature Reserve, and Karatau State Nature Reserve. Additionally, ex-situ conservation and propagation programs are being considered to support the preservation of natural populations (Kubentayev et al., 2024). The risk of extinction for *Tulipa greigii* is associated with its narrow geographic range and increasing anthropogenic pressures. Major threats include the expansion of agriculture (e.g., increasing cultivated areas, use of fertilizers), overgrazing (leading to habitat degradation), urbanization (land development, construction of roads and infrastructure), climate change (droughts, decreased precipitation), and illegal harvesting for commercial purposes.

The expansion of agricultural activities, pastures, and urban infrastructure, along with climate variability, are negatively impacting the species' population. Moreover, the illegal collection and commercialization of tulips significantly contribute to their population decline in the wild (Christenhusz et al., 2013). *Tulipa greigii* is one of the key species that enhances the aesthetic and ecological value of natural landscapes. The development of ecotourism is considered an effective strategy for conserving its natural populations, as adherence to environmental regulations contributes to the protection of the species' natural habitat. Furthermore, ecotourism supports local economies and creates sustainable income opportunities while fostering a culture of environmental awareness and nature conservation within communities.

In this study, photogeographical mapping and GIS technologies were employed to conduct spatial analysis. The study area was mapped, and satellite imagery was interpreted. Scientific analyses were carried out to identify the distribution patterns of *Tulipa greigii*, evaluate the impact of anthropogenic factors on its spatial differentiation, and assess the potential of conserving the species through ecotourism development. Areas of *Tulipa greigii* distribution, main highways, hotels, and other tourist-related infrastructure were identified. Additionally, to assess public interest in the distribution and ecotourism potential of *Tulipa greigii*, statistical data from social media platforms were analyzed. The data collection and processing involved analyzing trending hashtags, geolocation information from users, and the frequency of related posts.

The primary aim of this study is to determine the spatial distribution patterns of *Tulipa greigii* within the diverse landscape structures of the Turkistan Region, critically evaluate the anthropogenic drivers influencing its population dynamics—including land degradation, agricultural transformation, and tourism-induced pressures—and to formulate a scientifically grounded strategy for the sustainable development of ecotourism based on species conservation priorities.

To achieve this aim, the following research objectives have been established:

To delineate the current distribution range of *Tulipa greigii* across the landscapes of the Turkistan Region using field data and remote sensing tools;

To assess the spatiotemporal dynamics of its habitat and quantify the extent of anthropogenic impacts, including land-use change, grazing pressure, and infrastructural development;

To evaluate the ecotourism development potential of *Tulipa greigii* by identifying its ecological and aesthetic value, with a particular emphasis on opportunities for seasonal and conservation-based tourism.

In recent years, the number of scientific studies focused on the spatial distribution and ecotourism potential of *Tulipa greigii* and related species has increased. However, the thematic scope and methodologies employed in these studies remain limited, particularly in terms of spatial-temporal modeling, quantitative assessment of anthropogenic impacts, and the integration of socio-ecological linkages. For instance, the work of Kubentayev et al. (2024) prioritizes the floristic and taxonomic classification of *Tulipa* species and provides cartographic representations of their distribution across Kazakhstan. Nevertheless, it does not address the spatial-temporal dynamics of population trends or the influence of anthropogenic pressures. Sutula et al. (2024) describe the genetic diversity and phylogenetic structure of rare Tulipa species. However, their findings are not linked to specific landscape conditions or the ecological status of habitats, which limits the applied value of the research. Although Debnath et al. (2023) successfully model land cover transformation using spatial techniques, their study is not related to the distribution of rare or endemic plant species, nor does it explore the interconnections between biodiversity and tourism. To address this gap, the present study conducts a species-specific ecological assessment utilizing Sentinel-2 and Landsat 8 satellite data along with NDVI and NDMI indices.

Eker et al. (2024) analyze the relationship between soil and vegetation but fail to sufficiently consider ecosystem stress factors, recreational load, or field-based observations.

From the perspective of information and communication approaches, Ionescu et al. (2016) underscore the role of ecotourism mapping in promoting protected areas. However, the study does not incorporate data reflecting public interest and tourism activity from modern digital platforms, such as hashtags and geotagged information on social media. This gap is addressed in the current research through the integration of data obtained from TikTok and Instagram platforms.

Overall, previous studies reveal several methodological limitations, including:

-limited availability or low spatial resolution of geospatial data;

-insufficient analysis of the relationship between species distribution and landscape structure;

-lack of evaluation of social demand related to ecotourism;

-inadequate quantitative or qualitative characterization of anthropogenic factors.

To overcome these constraints, this study adopts an integrated methodological framework that combines ecological, geospatial, and digital data. Such an approach enables a comprehensive assessment of the factors influencing the distribution of *Tulipa greigii* populations and provides scientifically grounded recommendations for the conservation of natural habitats and the sustainable development of ecotourism.

MATERIALS AND METHODS

The object of this study is the Turkistan Region, located in the mid-latitudes of Central Eurasia. The region encompasses the eastern part of the Turan Lowland and the western ridges of the Tien Shan Mountains. Its total area is approximately 117,300 km², covering a vast territory in southern Kazakhstan. Turkistan Region borders Ulytau Region to the north, Kyzylorda Region to the west, Zhambyl Region to the east, and the Republic of Uzbekistan to the south. The study area is characterized by a complex terrain formed through various geological and geomorphological processes. The region's natural features are distinguished by diverse landscapes, including lowland plains, plateaus, mountain systems, and sandy deserts. The vegetation cover is divided into desert, semi-desert, steppe, and mountainous zones (Akhmetova et al., 2024).

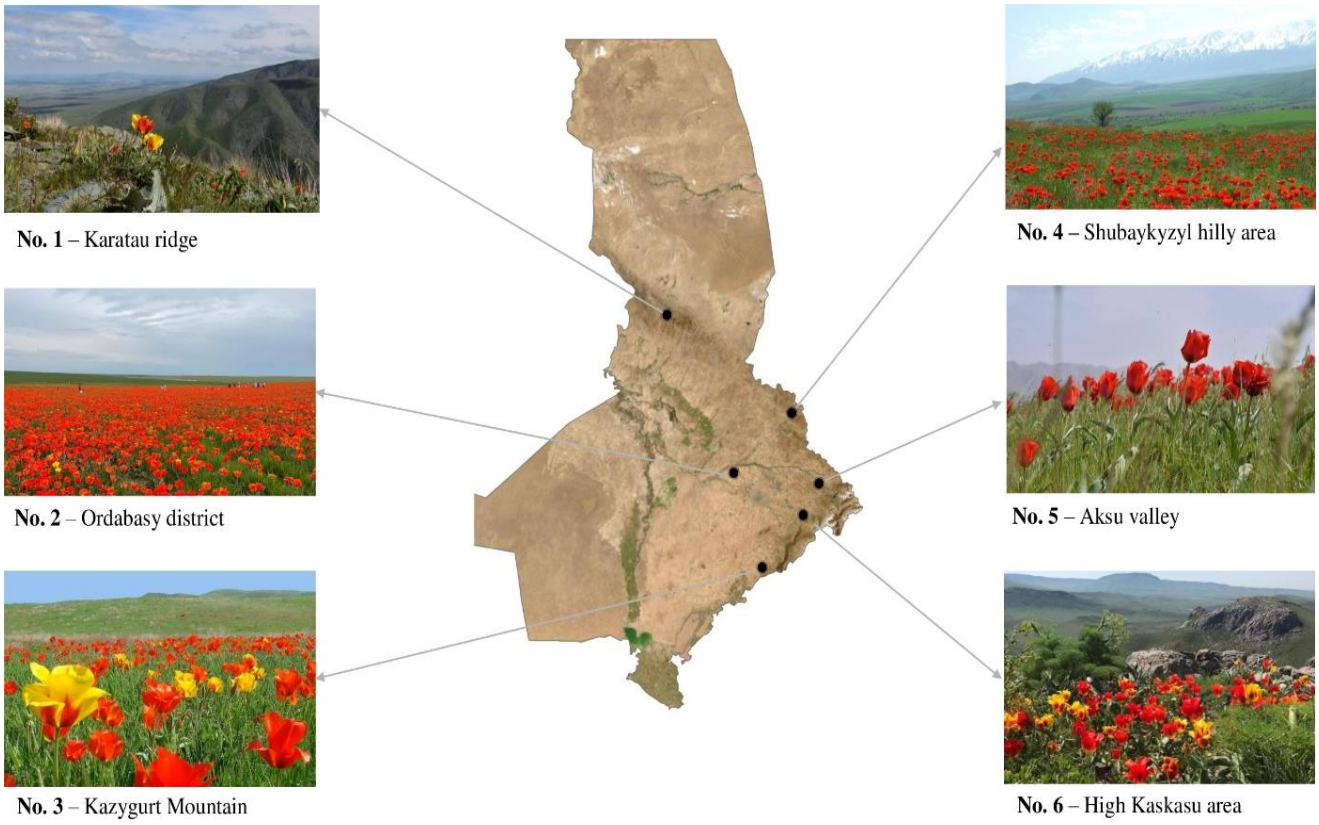

Figure 1. Photogeographical map of the study sites in the Turkistan Region (Source: Basemap imagery from Esri, Maxar, Earthstar Geographics (ArcGIS Online, 2025); photographs from the author's field archive (April 2024)

In order to comprehensively assess the distribution of *Tulipa greigii* and evaluate the ecological condition and value of the region's natural landscapes, six primary research sites (No. 1–6) were identified (Figure 1, Table 1).

Table 1. Main research directions in the Turkistan Region (Source: Author's fieldwork observations (April 2024) and analytical interpretation based on previously published data (Akhmetova et al., 2024)

Study Area	Coordinates	Elevation	Landscape Type	Types of Anthropogenic Activities	Total Projective Cover of *Tulipa greigii*, %
Karatau Range, Karatau State Nature Reserve	43°50'50"N 68°30'08"E	1488 m	Steppe mid-mountains	Increased recreational pressure	20–25%
Ordabasy District, Bank of Arys River	42°29'47"N 69°23'26"E	366 m	Desert plains	Anthropogenic erosion, expansion of road infrastructure, intensified agro-landscape transformation	60–70%
Kazygurt Mountain, Kazygurt District	41°49'11"N 69°42'07"E	1145 m	Semi-desert low mountains	Degradational pasture use, soil cover disturbance	40–50%
Shubaykyzyl Highland Area, Tulkibas District	42°42'54"N 70°03'41"E	964 m	Forest-steppe low mountains	Intensive grazing pressure, agricultural land development	70–80%
Aksu Valley, Aksu-Zhabagly State Nature Reserve (SNR), Turkistan Region	42°20'03"N 70°15'41"E	1371 m	Forested mid-mountains	Increased recreational pressure	50–60%
Upper Kaskasu Area, Sairam-Ugam State National Nature Park (SNNP)	42°14'22"N 70°00'48"E	1045 m	Semi-desert hilly uplands	Development of tourist infrastructure, accumulation of household waste, pasture degradation	30–40%

During the research, various sources were utilized, including literature reviews, thematic and physical-geographical maps, a 1:500,000 scale topographic map of the Turkistan Region, statistical data, remote sensing datasets, scientific research findings, and Maxar satellite imagery from 2024.

The study aimed to determine the distribution of *Tulipa greigii* using spatiotemporal monitoring methods and Geographic Information Systems (GIS), to analyze anthropogenic factors affecting its spatial differentiation, and to scientifically evaluate the potential for conserving the species through ecotourism development.

Field methods included floristic description, photogeographical mapping, sampling, and soil analysis. Floristic analysis was used to identify the flora of the study area, determine the distribution range of plant species, and estimate population density. Photogeographical mapping illustrated the geographical location and spatial distribution of plant species based on photographs and geographic data. The distribution areas of *Tulipa greigii*, as well as nearby roads, hotels, and other elements of tourism infrastructure, were identified. Using GIS, the spatial distribution of *Tulipa greigii* and the influence of ecological and anthropogenic factors were assessed. Sentinel-2 and Landsat 8 satellite data were used to map the distribution of the species. Direct assessment of *Tulipa greigii* population conditions is methodologically limited due to seasonal changes, climatic factors, and anthropogenic influences. Therefore, indirect evaluation of its habitat was conducted using the Normalized Difference Vegetation Index (NDVI), which quantifies the level of photosynthetic activity and biomass development in vegetation. This index served as a basis for assessing the suitability of ecological conditions within the distribution area of *Tulipa greigii* (Pettorelli et al., 2005). The Normalized Difference Vegetation Index (NDVI) is a key indicator used to assess the photosynthetic activity of vegetation.

The calculation of NDVI is based on the difference in reflectance between the near-infrared (NIR) and red (RED) spectral bands. The index is computed using the following formula (1) (Liu et al., 2015):

$$NDVI = \frac{NIR-RED}{NIR+RED} \qquad (1)$$

Where: NDVI – Normalized Difference Vegetation Index; NIR – Reflectance in the near-infrared spectral region;

RED – Reflectance in the red spectral region. This ratio allows for the assessment of the photosynthetic activity of vegetation cover. The NDVI values range from -1 to 1 and are influenced by vegetation density and growth intensity.

NDVI interpretation: $0.6 < NDVI \leq 1.0$ – Very dense vegetation cover, high photosynthetic activity;

$0.2 < NDVI \leq 0.6$ – Moderate vegetation cover, normal photosynthetic activity; $0.0 < NDVI \leq 0.2$ – Sparse vegetation;

$-0.1 < NDVI \leq 0.0$ – Bare surfaces (e.g., sand, rock, asphalt); $NDVI \leq -0.1$ – Water bodies or ice cover

The NDMI (Normalized Difference Moisture Index) was used to assess vegetation moisture content. The spatiotemporal variations of these indices served as key indicators in characterizing the moisture conditions within the distribution range of *Tulipa greigii*. NDMI is an important index for evaluating vegetation moisture and water stress. It quantifies the water content in vegetation and soil based on satellite multispectral data and reflects the hydration state of plant cover. NDMI is calculated using reflectance values from the near-infrared (NIR) and shortwave infrared (SWIR) spectral bands. The formula for NDMI is given as follows (2) (Lykhovyd & Sharii, 2024):

$$NDMI = \frac{NIR-SWIR}{NIR+SWIR} \qquad (2)$$

NDMI – Normalized Difference Moisture Index; NIR – Reflectance in the near-infrared spectral region;

SWIR – Reflectance in the shortwave infrared spectral region.

NDMI values range between -1 and 1 and allow for the evaluation of vegetation moisture levels.

NDMI interpretation: $NDMI \leq -0.8$ – Extremely dry soil areas, bare land with no vegetation

$-0.8 < NDMI \leq -0.4$ – Areas with sparse vegetation or desert regions

$-0.4 < NDMI \leq 0.0$ – Vegetated areas with high water stress

$0.0 < NDMI \leq 0.4$ – Normal vegetation cover with low to moderate water stress

$0.4 < NDMI \leq 1.0$ – Healthy vegetation cover, no water stress or areas with excess moisture

The NDMI index is widely used in agriculture, water resource management, drought monitoring, and natural ecosystem observation. It enables long-term assessment of vegetation moisture conditions and supports the forecasting of ecological changes. Currently, ecotourism is considered one of the key tools for ensuring nature conservation and sustainable development. In this context, statistical data on domestic tourism (residents) and inbound tourism (non-residents) were analyzed. To refine the findings, the ecotourism potential of *Tulipa greigii* was assessed through the analysis of social media data. A systematic analysis of information from TikTok and Instagram revealed the dynamics of public interest in *Tulipa greigii*, its position in the information space, and its role in ecotourism development.

During the study, statistical data on domestic and inbound tourism were obtained from the official website of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. These data were subjected to dynamic analysis. Additionally, structured data from social media platforms were collected and analyzed using tools such as Tweepy, Instaloader, and TikTokApi.

– A quantitative-statistical analysis of hashtag indicators was conducted.

– Data related to frequently used hashtags, views, and likes associated with *Tulipa greigii* on TikTok and Instagram were compiled. The spatial distribution and level of informational coverage of these indicators were assessed to characterize the tulip's popularity and position within the digital information ecosystem. Spatial-analytical mapping of geographic data – Based on geolocation data from social media posts, areas of ecotouristic appeal related to *Tulipa greigii* were mapped. This allowed for the identification of regional features of public interest in native flora and helped determine potential directions for the development of ecotourism. The results of the analysis laid the foundation for a comprehensive assessment of the ecological and touristic value of *Tulipa greigii*, provided insights into the dynamics of its popularity in society, and supported the development of sustainable ecotourism strategies with consideration of regional landscape

characteristics. These findings contribute to the systematization of nature conservation efforts aimed at preserving the bioecological significance of tulips and inform the development of a scientifically grounded ecotourism concept.

RESULTS AND DISCUSSION

Tulipa greigii is distributed across the foothills and low-mountain areas of the Turkistan Region, particularly along the base of the Western Tien Shan and Karatau Ranges (Akhmetova et al., 2024) (Figure 2).

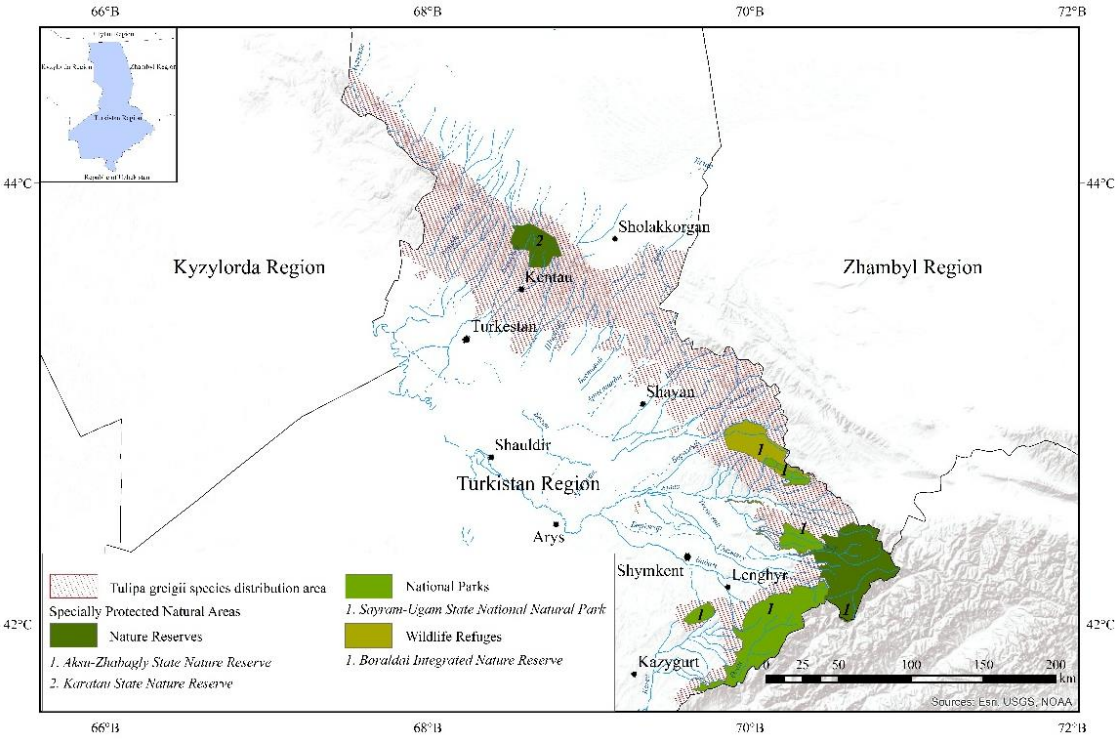

Figure 2. Distribution map of Tulipa greigii in the Turkistan Region (Source: Basemap imagery from Esri, USGS, and NOAA (2024); map compiled by the author using field data and spatial analysis in ArcGIS (April 2025)

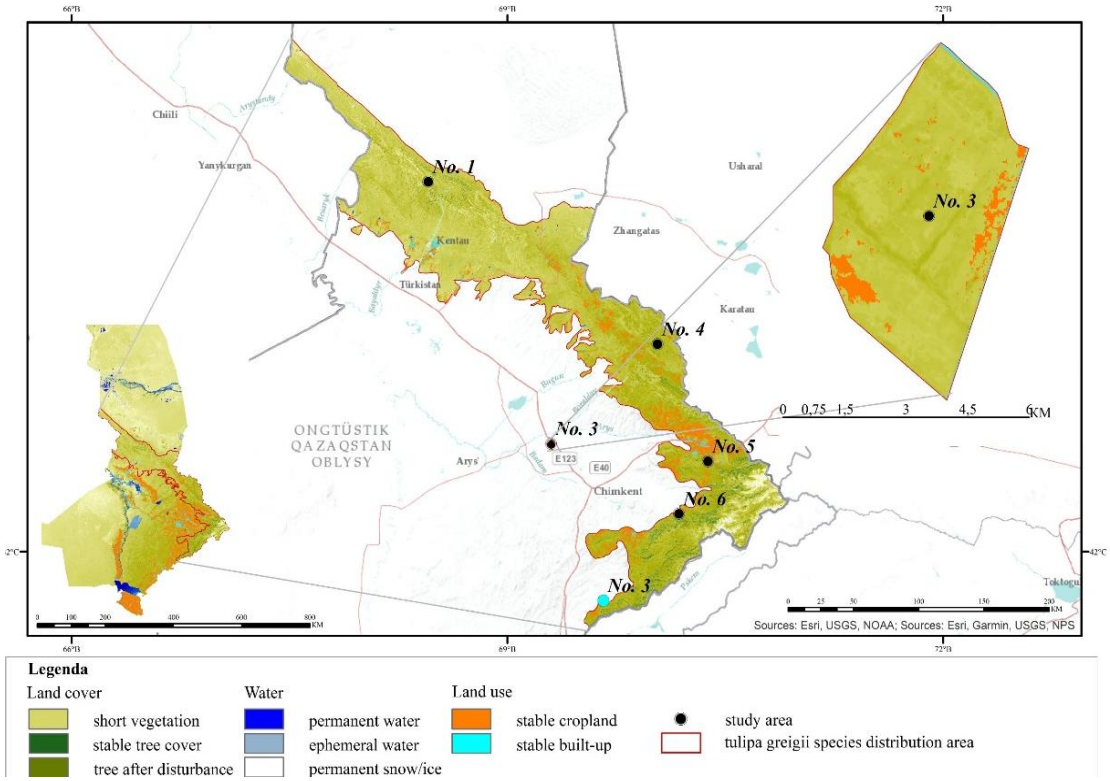

Figure 3. Land Use and Land Cover (LULC) classification map within the distribution area of Tulipa greigii in the landscapes of the Turkistan Region (Source: Basemap imagery derived from the GLAD Global Land Cover and Land Use Change dataset. The map was compiled by the author through spatial analysis using ArcGIS software (April 2025). Additional basemap imagery was obtained from Esri, USGS, and NOAA (2024)

Based on our field research, the distribution range of the species includes the Ordabasy District (along the Arys River), the Upper Kaskasu area (Sairam-Ugam State National Nature Park), the Karatau Range (Karatau State Nature Reserve), the Shubaykyzyl Highland area (Tulkibas District), and the Aksu Valley (Aksu-Zhabagly State Nature Reserve). In these locations, populations of *Tulipa greigii* were recorded, and detailed data were collected on their precise coordinates, elevation, slope exposure, landforms, soil types, and vegetation cover characteristics. The findings confirmed that *Tulipa greigii* predominantly occurs in mountainous landscapes (Kubentayev et al., 2024; Sutula et al., 2024).

The mountainous regions of the Turkistan Region are characterized by a diverse soil cover, including mountain gray-brown, meadow-gray, chestnut, gray-chestnut, and slightly humified brown soils. These soil types directly influence the distribution of *Tulipa greigii*, as they affect moisture retention, nutrient availability, and granulometric composition—factors essential for the species' growth and survival (Eker et al., 2024). The study results describe the spatiotemporal distribution patterns of *Tulipa greigii* and provide both quantitative and qualitative assessments of the ecological and anthropogenic factors influencing its population dynamics. Evaluation of the spatial dynamics of tulip populations revealed a heterogeneous distribution pattern, depending on various ecological gradients. Using global land cover and land use change data from the Landsat archive, the transformation of landscape structure in the Turkistan Region and its impact on the distribution of *Tulipa greigii* were analyzed (Figure 3) (Debnath et al., 2023).

Land cover was classified into categories such as short vegetation, persistent tree cover, post-disturbance trees, seasonal water bodies, permanent snow/ice, permanent water, croplands, and built-up areas (Orlikowska et al., 2018).

Increased anthropogenic pressure has led to habitat loss, reduced population density, and limited ecological plasticity of the species (Berdenov et al., 2015). Specifically, land cultivation, grazing pressure, and infrastructure development reduce the regenerative potential of *Tulipa greigii* and intensify habitat fragmentation across its distribution range.

The study comprehensively analyzed the spatiotemporal distribution patterns of *Tulipa greigii*, along with variations in the Normalized Difference Vegetation Index (NDVI) and the Normalized Difference Moisture Index (NDMI), which characterize the condition of vegetation cover within its habitat (Figures 4 and 5).

Direct assessment of the population status of *Tulipa greigii* presents certain methodological challenges, as its distribution dynamics are highly dependent on seasonal changes, climatic conditions, and anthropogenic influences. In this regard, an indirect assessment of the species' ecological condition was conducted by evaluating the vegetation activity in its habitat using the NDVI index. This index quantifies the photosynthetic activity and biomass development of vegetation, thereby enabling the evaluation of ecological suitability within the distribution range of *Tulipa greigii.* Additionally, analysis of the NDMI index enables the evaluation of ecosystem stability by determining the moisture levels of vegetation cover. A comprehensive spatiotemporal analysis of NDVI and NDMI dynamics provides a basis for identifying the ecological requirements of T. greigii, clarifying its distribution characteristics, and assessing the influence of environmental factors.

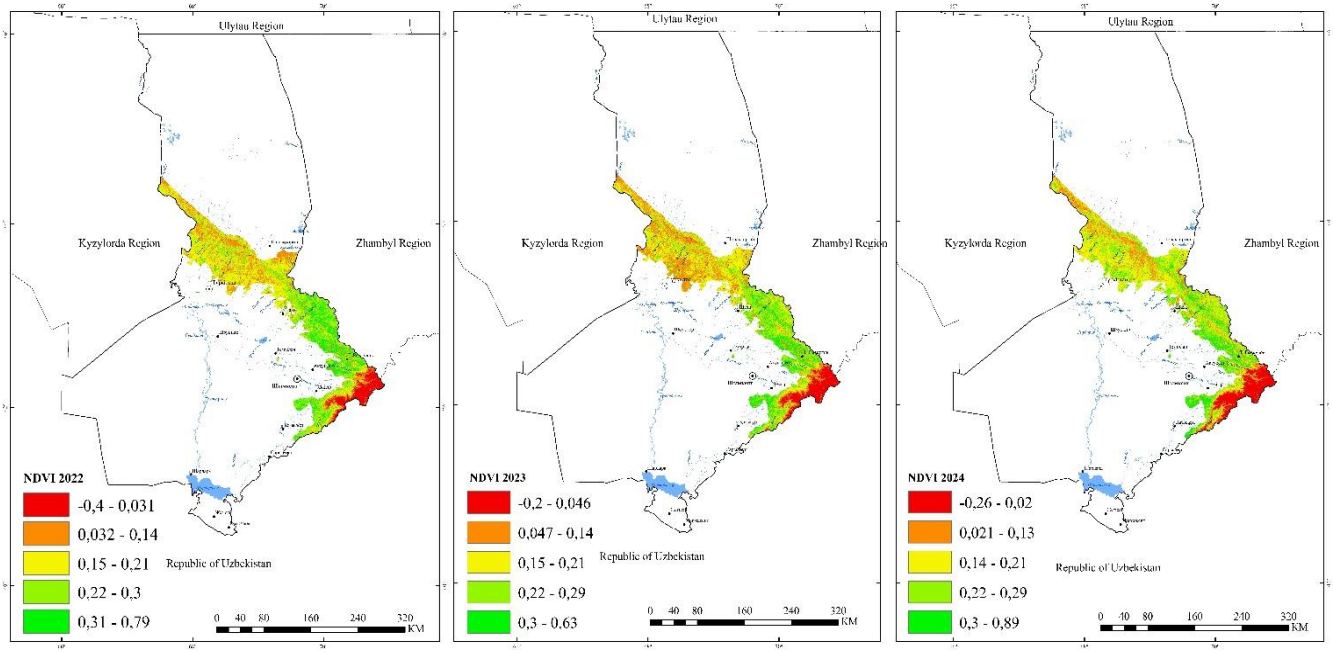

Figure 4. Assessment of Tulipa greigii distribution in the Turkistan Region based on the NDVI index (2022–2024) (Source: Map compiled by the author using Landsat satellite imagery and spatial analysis in ArcGIS (April 2024)

Moisture levels and water stress were assessed using the NDMI index (Figure 5). According to the results, higher NDMI values were observed in natural landscapes with optimal moisture conditions, whereas lower values were associated with agricultural and degraded areas experiencing higher levels of anthropogenic impact.

In Research Site No. 1 (Karatau Range, Karatau State Nature Reserve), NDVI values ranged from 0.31 to 0.79 and NDMI from 0.22 to 0.43 in 2022, indicating good moisture availability and vigorous plant growth. In 2023, NDVI values declined to 0.30–0.63, while NDMI values ranged between 0.14 and 0.33, reflecting the impact of seasonal drought and

water deficit. In 2024, NDVI increased to 0.89 and NDMI to 0.29–0.5, demonstrating recovery of vegetation cover and stability of the ecosystem. In Research Site No. 2 (Ordabasy District, Arys River), NDVI values in 2022 ranged from -0.4 to 0.031, and NDMI from -0.56 to 0.008, indicating vegetation degradation and water scarcity. In 2023, NDVI ranged from -0.2 to 0.046, and NDMI decreased to -0.62 to -0.12, signaling further ecosystem decline. In 2024, NDVI dropped again to -0.26–0.02, while NDMI values ranged from -0.37 to -0.02, indicating persistent vegetation stress and degradation.

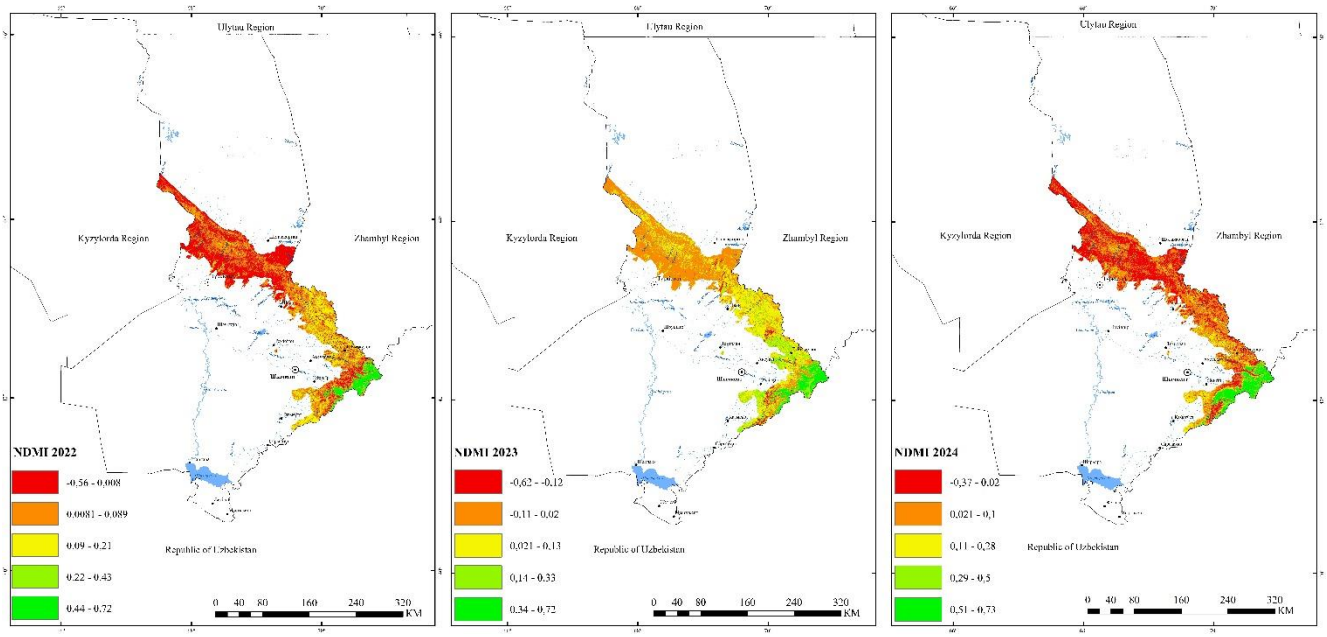

Figure 5. NDMI-based assessment of Tulipa greigii distribution in the Turkistan Region (2022–2024)
(Source: Map compiled by the author using Landsat satellite imagery and spatial analysis in ArcGIS (April 2024)

Additional analyses were conducted to determine the causes of low index values. These were based on satellite images from the Copernicus Sentinel program (2022–2023) and the Apollomapping database (2024) (Figure 6). Comparative analysis revealed that in 2022, during the spring plowing season, *Tulipa greigii* habitats were significantly damaged. In 2023, governmental monitoring and protective measures were implemented. By 2024, enhanced conservation efforts included additional monitoring and ecological stabilization measures.

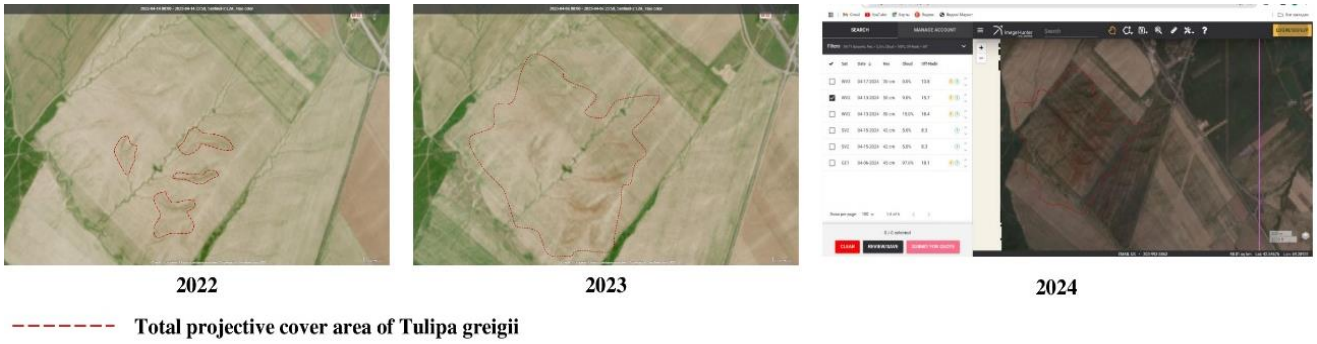

Figure 6. Tulipa greigii distribution based on Sentinel (2022–2023) and Apollomapping (2024) data

Comparative analysis with satellite imagery and 2024 field data showed that *Tulipa greigii* cover increased by 60–70%, demonstrating the effectiveness of conservation measures. These results highlight the restoration of vegetation cover in some areas while also indicating continued anthropogenic pressure in others. In Research Site No. 3 (Kazygurt Mountain, Kazygurt District), NDVI values in 2022 ranged from 0.22 to 0.79, and NDMI from 0.22 to 0.43, indicating a healthy vegetation cover and sufficient moisture. In 2023, NDVI decreased to 0.22–0.63, while NDMI dropped to 0.14–0.33, likely due to changing climatic conditions. In 2024, NDVI increased to 0.89 and NDMI to 0.29–0.5, reflecting a recovery in vegetation. Although water stress showed seasonal fluctuations, overall vegetation cover remained stable.

In Research Site No. 4 (Shubaykyzyl Highland Area, Tulkibas District), NDVI values in 2022 were between 0.31 and 0.79, and NDMI between 0.22 and 0.43, indicating vegetation stability. In 2023, NDVI decreased to 0.30–0.63 and NDMI ranged from 0.14 to 0.33, suggesting the effects of drought. In 2024, NDVI rose to 0.89, and NDMI ranged from 0.29 to 0.5, indicating vegetation recovery. In Research Site No. 5 (Aksu Valley, Aksu-Zhabagly State Nature Reserve), NDVI in 2022 ranged from 0.22 to 0.79 and NDMI from 0.22 to 0.43, indicating a stable vegetation cover. In 2023, NDVI dropped to 0.22–0.63 and NDMI to 0.14–0.33, reflecting seasonal drought effects. In 2024, NDVI reached 0.89 and NDMI 0.29–0.5, showing favorable moisture conditions for vegetation. This area is favorable for the distribution of *Tulipa greigii*, as

the vegetation cover demonstrates resilience and ecological stability. In Research Site No. 6 (Upper Kaskasu, Sairam-Ugam State National Nature Park), NDVI values in 2022 ranged from 0.22 to 0.79 and NDMI from 0.22 to 0.43, indicating stable vegetation cover. In 2023, NDVI decreased to 0.22–0.63 and NDMI ranged from 0.14 to 0.33, reflecting the impact of seasonal drought. In 2024, NDVI rose to 0.89 and NDMI reached 0.29–0.5, indicating ecosystem stability and ongoing recovery processes. In the areas of No. 1 Karatau Range, No. 3 Kazygurt Mountain, No. 4 Shubaykyzyl Highland, No. 5 Aksu Valley, and No. 6 Upper Kaskasu, the vegetation cover remained stable, demonstrating resilience to drought conditions.

In contrast, Research Site No. 2 (Ordabasy District) showed signs of vegetation degradation, high anthropogenic pressure, and significant moisture deficiency. While seasonal drought impacted all regions, signs of vegetation recovery were observed across sites in 2024. These results contribute to identifying areas with adequate vegetation moisture supply, assessing the effects of drought, and determining ecologically favorable zones for the distribution of *Tulipa greigii*.

The long-term dynamics of NDVI and NDMI indicators provide insights into the ecological stability of various regions. These findings offer a valuable scientific basis for future nature conservation planning and forecasting the impacts of climate change. The dynamics of tourism development in the Turkistan Region for the period 2022–2024 (based on indicators from January to June) were also analyzed. According to statistical data, the number of international tourists increased by 45.6%, while domestic tourism rose by 18.5% in 2024, following a temporary decline in 2023. This growth is attributed to the effective utilization of the region's natural landscape potential and infrastructure capabilities (Figure 7) (https://stat.gov.kz/region/turkestan/). The spatial attractiveness of the Turkistan Region and its popularity on social media contribute to the sustainable development of ecotourism. However, there is a need to improve infrastructure and informational support.

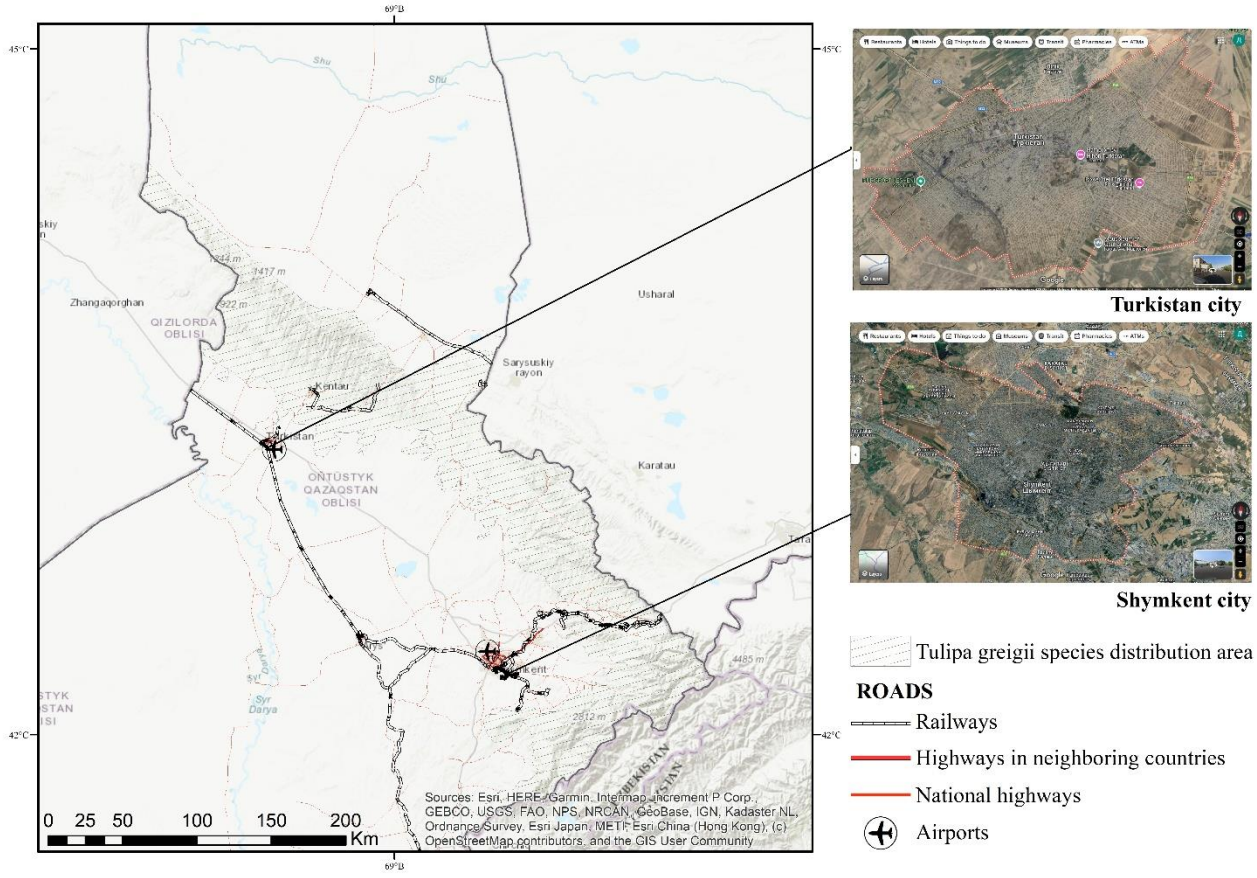

Figure 7. Infrastructure map of the Turkistan Region (Source: Basemap imagery derived from Esri, HERE, Garmin, USGS, OpenStreetMap contributors, and the GIS User Community. Infrastructure layers and road networks were supplemented using Google Maps and validated through field-based observations conducted by the author (April 2024)

An analysis of social media platforms was conducted using the hashtags #GreigiiTulip, #TurkistanTulip, #TulipTurkistan, and #EcotourismTurkistan on TikTok and Instagram (Figure 8). On Instagram, the number of posts with the hashtag #GreigiiTulip decreased from 95 in 2022 to 36 in 2023, and then increased to 71 in 2024. On TikTok, the figures were 49 (2022), 88 (2023), and 57 (2024), reflecting seasonal fluctuations in audience interest.

The hashtag #TurkistanTulip on Instagram reached 59 posts in 2024, an 18% increase compared to 2023. On TikTok, the number of posts was 55 in 2022, 41 in 2023, and 80 in 2024. Both #TulipTurkistan and #EcotourismTurkistan showed growth on both platforms in 2024. In terms of views, TikTok experienced growth across all hashtags in 2024. Specifically, #GreigiiTulip received 1,934 views (up 26%), #TulipTurkistan – 1,989 views (up 18%), and #EcotourismTurkistan – 1,734 views (up 19%). On Instagram, #GreigiiTulip received 1,898 views (a 53% increase compared to 2022), while #TurkistanTulip had 1,875 views (a 5% decrease compared to 2023). Regarding the number of likes, #GreigiiTulip

received 762 likes on TikTok (a 12% decrease) and 789 likes on Instagram (a 4% decrease). Meanwhile, #EcotourismTurkistan on TikTok saw 953 likes (up 21%), and #TurkistanTulip on Instagram had 1,091 likes (up 19%).

As for comments, the hashtag #TulipTurkistan reached 528 comments on TikTok in 2024, marking a 49% increase compared to 2023. On Instagram, #TurkistanTulip accumulated 541 comments, a 29% increase. These indicators highlight strong audience engagement with topics related to ecotourism and tulips, and demonstrate the effectiveness of TikTok's hashtag distribution algorithm. From 2022 to 2024, content related to tulips in the Turkistan Region gained steady popularity. Views on TikTok increased significantly for #GreigiiTulip and #TulipTurkistan, while on Instagram, #TurkistanTulip led in terms of likes. On TikTok, #TulipTurkistan became a trending hashtag in terms of comments.

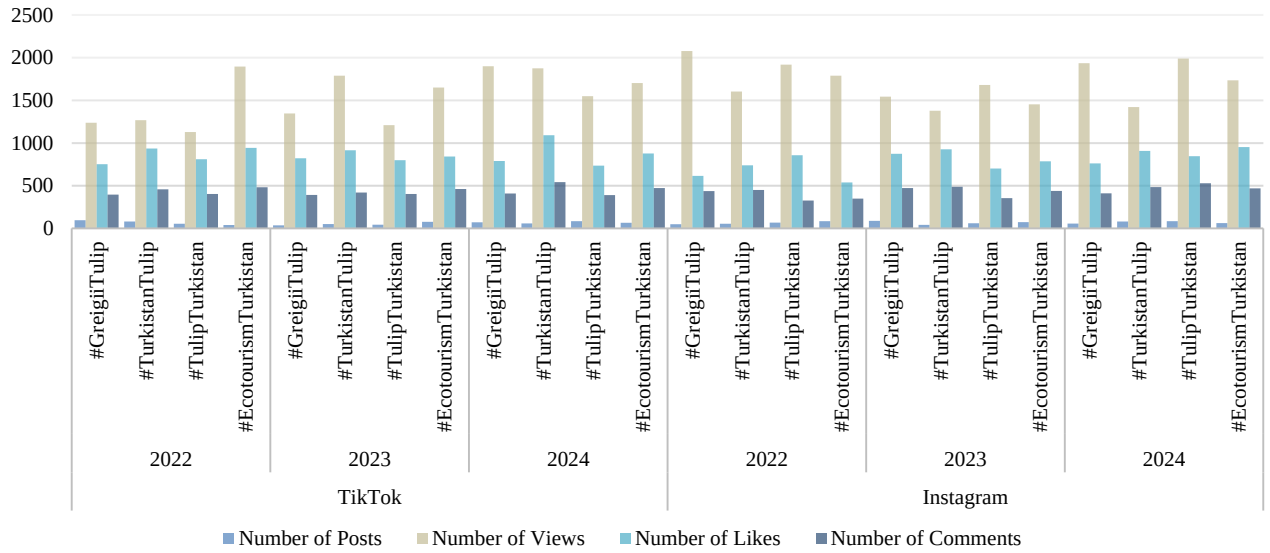

Figure 8. Social media analysis of hashtags related to Tulipa greigii on TikTok and Instagram (Source: Data were manually collected in April 2024 from public TikTok and Instagram posts using hashtags #GreigiiTulip, #TulipTurkistan, and #EcotourismTurkistan)

To enhance outreach, it is recommended to improve TikTok content strategies and establish more consistent content on Instagram. The popularity dynamics of ecotourism areas in the Turkistan Region are as follows: Karatau Range, Karatau State Nature Reserve – This area attracts mountain tourism enthusiasts; however, its popularity remained steady between 2022 and 2024. Ordabasy District, along the Arys River – Domestic tourism has shown notable development. While popularity was low in 2022, it increased by 50% in 2023 and reached 75% in 2024, reflecting growing interest in ecotourism in the region. Kazygurt Mountain, Kazygurt District – The area maintained stable popularity from 2022 to 2024. Despite its unique tulip species and natural features, it remains underrepresented on social media and in tourism promotion programs. Shubaykyzyl Highland Area, Tulkibas District – This site was especially popular in 2022–2023. However, its popularity declined in 2024 due to the implementation of restrictions following its designation as a protected area.

Aksu Valley, Aksu-Zhabagly State Nature Reserve – One of the key destinations for mountain tourism. In 2022, its popularity was moderate (50%), with steady growth in 2023–2024 reaching 60%.

Upper Kaskasu Area, Sairam-Ugam National Nature Park – Popularity stood at 60% in 2022, increasing to 65% in 2023 and reaching 70% in 2024. This area continues to attract steady interest from ecotourists.

The study results identified the ecotourism potential of the Turkistan Region and emphasized the need to develop tourism routes related to *Tulipa greigii*. The rising popularity of the region's natural landscapes on social media supports the promotion of ecotourism; however, improvements in infrastructure and informational support are still required (Ilies et al., 2022). In this regard, the implementation of the following recommendations will contribute to the sustainable development of ecotourism: Development of a "Tulip Route": It is recommended to design dedicated tourist routes that encompass the main ecotourism sites of the Turkistan Region, including the Shubaykyzyl Gorge, Sairam-Ugam National Park, and Kazygurt Mountain. This route would allow for the exploration of tulip habitats through organized eco-tours while incorporating nature conservation measures. Strengthening conservation measures: To preserve the ecological significance of tulips, it is proposed to organize a "Tulip Festival." This event would promote the protection of natural tulip habitats and raise the ecological awareness of local communities. In addition, wide coverage of the festival through social media platforms would help promote the biological importance of tulips.

Developing a social media strategy: To promote ecotourism in the Turkistan Region, it is recommended to launch targeted ecotourism campaigns on popular platforms such as TikTok and Instagram. Collaborating with bloggers and eco-tourism influencers to produce multimedia content showcasing the region's natural landmarks can increase tourist flow. Improving tourism infrastructure: In areas such as the Shubaykyzyl Gorge and Kazygurt Mountain, it is necessary to develop recreational zones, install directional signage, and place informational billboards to ensure a comfortable experience for ecotourists. These actions are essential for ensuring tourist safety and maintaining ecological sustainability. By implementing the above measures, it is possible to develop sustainable ecotourism in the Turkistan

Region centered around *Tulipa greigii*. This will not only contribute to the conservation of biodiversity but also enhance the region's touristic appeal and positively impact the local economy.

CONCLUSION

The study identified the spatiotemporal distribution characteristics of *Tulipa greigii* within the natural landscapes of the Turkistan Region. The species' distribution and habitat conditions were assessed using NDVI and NDMI indices, which helped determine vegetation status and moisture availability across different research sites.

In the areas of Karatau, Kazygurt, Shubaykyzyl, and Aksu Valley, NDVI values ranged from 0.63 to 0.89 and NDMI from 0.29 to 0.5, indicating ecological stability of habitats. In contrast, the Ordabasy District recorded low NDVI (-0.26 to 0.02) and NDMI (-0.62 to -0.02) values, reflecting intensified degradation processes.

Official statistical data from 2022 to 2024 showed consistent growth in ecotourism within the Turkistan Region.

The number of inbound (international) tourists increased by 45.6%, and domestic tourism rose by 18.5% in 2024 following a temporary decline in 2023. This growth reflects the effective utilization of the region's natural landscape features and infrastructure potential. Hashtag analysis on social media platforms indicated increasing public interest in *Tulipa greigii* and ecotourism. In 2024, the number of posts, views, and comments using hashtags such as #GreigiiTulip, #TulipTurkistan, and #EcotourismTurkistan grew across TikTok and Instagram, confirming audience engagement with ecotourism topics. The #TulipTurkistan hashtag reached 528 comments on TikTok, a 49% increase, while #TurkistanTulip garnered 1,091 likes on Instagram in 2024, showing a 19% rise. These results highlight the informational influence of social media and its importance in promoting ecotourism.

The conducted spatiotemporal analysis confirmed that the distribution of tulips and ecosystem stability are directly influenced by climatic and anthropogenic factors. The study outcomes can serve as a basis for developing comprehensive strategies in ecological monitoring, conservation of natural populations, and the sustainable development of ecotourism.

If you have any suggestions or feedback, we are open to considering them with great care—your input is important to us and contributes to the expansion of our scientific perspective. This study was conducted based on the integration of spatiotemporal modeling, satellite remote sensing data, field survey results, and social media information obtained from digital platforms. However, several methodological limitations were identified.

First, the ecological assessment of *Tulipa greigii* distribution was limited to field expeditions conducted during the flowering period (April), which does not allow for capturing the full spectrum of seasonal dynamics.

Second, the social media data were based on user digital engagement and do not reflect actual ecotourism flows, potentially limiting the representation of structural patterns of regional tourism.

Third, the relationship between landscape structure and anthropogenic factors was assessed indirectly using spatial indices and visual interpretation, which may require broader analysis if complemented by detailed local socioeconomic data.

Author Contributions: Conceptualization, A.N.D. and D.S.A.; methodology, A.N.D. and D.S.A.; software, A.N.D.; validation, A.N.D. and D.S.A.; formal analysis, A.N.D. and D.S.A.; investigation A.N.D. and D.S.A.; data curation – A.N.D. and D.S.A.; writing - original draft preparation, A.N.D. and D.S.A.; writing - review and editing, D.S.A.; visualization, A.N.D.; supervision, A.N.D.; project administration, D.S.A.. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The authors would like to express their gratitude to colleagues and local experts for their support in organizing fieldwork and for providing valuable comments during the research process.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 23.03.2025 Revised: 25.06.2025 Accepted: 11.07.2025 Available online: 01.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1553-1562
DOI 10.30892/gtg.61314-1524

ROLE OF PHYSICAL ELEMENTS AND HUMAN INTERACTION IN MARKETING SERVICES: A CASE STUDY OF THE HOSPITALITY SECTOR IN JORDAN

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Citation: Masa'deh, R., Ghneem, M.F., Taha, O.M., Alananzeh, O.A., & Alkurdi, I.K. (2025). Role of physical elements and human interaction in marketing services: A case study of the hospitality sector in Jordan. *Geojournal of Tourism and Geosites*, 61(3), 1553–1562. https://doi.org/10.30892/gtg.61314-1524

Abstract: Physical aspects constitute an essential component of the hotel product. This study was performed to determine the significance of physical aspects (interior and exterior design, location, services) and human interaction in hotel marketing. The study took a novel approach by focusing on staff' perceptions of key aspects of hotel marketing, whereas earlier research had focused on tourists' perceptions and satisfaction. Therefore, the study aimed to measure the impact of physical elements and human interaction on marketing services from the perspective of employees in classified hotels in Jordan. The study followed a descriptive and analytical approach to achieve its objectives. A questionnaire was designed and distributed to a random sample of employees in five-star hotels in Jordan. The study adopted a set of hypotheses to measure the dimensions of physical aspects and added demographic factors as a mediating factor to study the differences. The study results showed a positive impact of physical elements: interior and exterior design, location, and services, on hotel marketing in Jordan. Human interaction also showed a positive impact on hotel marketing. The study distinguished itself by examining hotels in Jordan and providing stakeholders with clarifications regarding the relationship between physical aspects and human interaction, and the need to increase and improve interest in these aspects. According to the findings of the descriptive study, the variable "Interior and Exterior Design" is the most important variable in hotel marketing in Jordan from the perspective of hotel employees, followed by "Human Interaction", "Location", and finally "Services". This necessitates that hotel management pay close attention to the hotel's outside and interior design, hotel rooms, lighting, colors, spaces, and luxury furnishings. In addition to the great interest in human interaction, which means a direct focus on the employee, training and qualifying her/him, and that the employee acquires a "Moment of Truth," or that she/he is skilled in optimally exploiting the "Service encounter," which is the moment in which the employee communicates with the customer or the so-called direct points of sale. According to the current research, staff understand the importance of human interaction in hotel marketing, including a smile, a clean and attractive appearance, communication etiquette, and body language. Future research could investigate the utilization of physical features and human interaction in areas other than Jordan.

Keywords: hospitality, marketing, physical elements, human interaction, services, location, interior and exterior design, Jordan

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INTRODUCTION

Consumer evaluations of services are constantly changing, and this requires the service sector to provide continuous studies to track these changes and continuously understand, maintain, and fulfill customers' desires (Zygiaris et al., 2022; Khamet et al., 2025). In this context, a critical area of focus is the physical element, as it represents one of the most tangible and observable aspects to customers. This is particularly significant given that the hospitality industry is predominantly characterized by its intangible nature. Therefore, understanding and enhancing the physical elements within the service sector can bridge the gap between the tangible and intangible, ultimately improving customer satisfaction and perception. The tourism industry is considered one of the industries that is highly sensitive to crises and is greatly affected by the evaluation of the level of service by the customers, which is reflected in their satisfaction and behavior (Shatnawi et al., 2023a). It is one of the most comprehensive service industries in the world and enjoys great operational capacity and high financial returns, which contributes to controlling the payment budgets of many countries and generates high revenues in hard currency (Alananzeh et al., 2023). Physical aspects positively influence customer confidence and enhance their loyalty to the service organization (Mishal & Othman, 2015).

The physical aspects of the service are defined as everything related to the space or location where the service is provided and all the tangible, visible, and material things present in the hotel facility that attract the attention of the

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tourist or hotel guests (Mouelhi & Behi, 2017). Many things add another character to the physical element of the service, such as offering a gift to the guests, which increases the positive aspects of the physical aspect of the service and increases the guest experience. As well as the design of waiting areas, colors, decorations, employee clothing, cleanliness of the place, etc. (Alamgir, 2011; Jawabreh et al., 2022).

Many studies touched on hotel marketing (Murniati & Bawono, 2020; Jiang, 2023), other studies touched on hotel guest satisfaction (Karakas Morvay, 2014; Ugwuanyi et al., 2021) while other studies touched on hotel marketing mix (Siakalli et al., 2017; Indiani et al., 2020) and quality of hotel service (Batinic, 2016; Tileaga & Oprișan, 2018; Gursoy et al., 2022). However, few studies have addressed the importance of the physical elements in hotel marketing, especially from the point of view of hotel workers. They are very scarce at the academic level and very rare in the studies presented in Jordan. For this reason, this study demonstrates the importance of physical elements in hotel marketing, taking into account the opinions and evaluation of the employees responsible for providing this service.

This study aims to identify how hotel employees evaluate the marketing role of the physical element and human interaction in the hospitality sector on customer satisfaction in Jordan and to know the impact of the location, services, and human interaction on hotel marketing from the employees' point of view. The importance of this study comes from two aspects: The first aspect is to shed light on the physical evidence on hotel marketing in Jordan and it attempts to provide practical contributions to stakeholders and literary contributions to researchers and those interested.

Regarding the second aspect, this study targets employees and finds out their opinions on this important topic, while previous studies focused on customers' opinions and satisfaction.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

1. Marketing services

Marketing is a set of activities offered by organizations that have value to others. In service organizations, marketing's function is to create value for a company's target customers, identify their needs, satisfy them, and retain them. Marketing is both an art and a science at the same time (Brown, 2001). It is one of the most important administrative functions for any hotel in establishing relationships with external customers and competitors and one of the basics of its activity and continuity (Zhao et al., 2025). An effective marketing effort enables the organization to identify the needs and desires of consumers, increases sales volume, and thus achieves profits (AL-Hashem et al., 2022; Šostar & Ristanović, 2023). Marketing is a daily means of communication, and it is the key to consumer satisfaction and the success and reputation of the service facility in achieving financial returns (Cao & Weerawardena, 2023). Communication can be through several means, including direct, through marketing-related departments, or indirect, through consumer interaction and evaluating the elements of the marketing mix based on seven pillars: product, price, distribution, promotion, process, and personnel (Michman et al., 2008).

The method of providing service, interspersed with art and science, where the art and science are in providing the service by following international standards and ethics that the employee must follow when providing the service to the customer (Alananzeh et al., 2022; Wąsowicz-Zaborek, 2025). Its importance lies in simplifying the processes of dealing with the customer and making them more streamlined and flexible. Since the service sector depends on labor to a very large extent, there is a "Service Encounter" where the service provider meets his recipient, and here this moment is called the "Moment of Truth." Service companies, especially hotels, focus very heavily on educating and training employees to take advantage of this moment, which is greatly reflected in the customer's evaluation of the service and his level of satisfaction with it (Söderlund & Julander, 2009; Wu et al., 2024). As is known, the employees are the first line in the hotel's sales and marketing process. They represent the hotel from the customers' point of view and work to provide them with a positive experience of the service provided (Han et al., 2025). Therefore, jobs in the hospitality and tourism sector depend on emotional interactions and aesthetic work requirements. The concept of aesthetic work includes interactive communication, dealing with kind words, and sincere courtesy, away from affectation. As a result, hotels care about the aesthetic aspect of their physical element as well as the human element, and employees' commitment to good appearance directly affects the guest experience (Nickson et al., 2005; Knežević et al., 2015).

2. The physical material

The physical material is considered the basic element and the seventh pillar in the service marketing mix. All brands have physical evidence, whether it is a service or an electronic commodity. These are the tangible and visible physical factors that constitute the good or service provided to the customer. In other words, it is the space where customers and service staff interact. It includes the external and internal environment of the hotel, appearance, treatment of staff, the form of tangible service provided, the external environment of the hotel, the location and its surroundings, product packaging, display, delivery, and the physical appearance of the hotel; the hotel and its designs, the quality of the customer experience, the facilities provided by the hotel such as furniture, equipment, the surrounding environment, the Internet, certificates, etc.

It is important in building customer expectations and influencing their perceptions before and after purchase because it reflects the nature and level of service quality. The physical dimension is to make the intangible service tangible in the minds of customers and help them evaluate it (Steiner & Harmon, 2009). It represents the hotel's input into service design and contributes to shaping the actual and future image of the hotel. Therefore, it is important to manage it effectively to ensure that the image formed in the minds of customers about the hotel matches the image that the institution wants to build in the minds of customers so that the service institution can rely on this material evidence to distinguish itself from its competitors in the market. The intangibility of services leads to facing many major difficulties and challenges (Bebko, 2000). However, physical materials are of great importance in influencing the buyer to purchase.

Many scholars are interested in studying the physical aspect of hotel services, as some of them studied the impact of the physical aspect of hotels on customer attitudes, including the study of Tawahir & Bin Jarwa (2017) which aimed to measure the material aspect of hotels; the influence of physical factors (general atmosphere, interior and exterior design of the hotel, and interior design of the room) on customer attitudes. The results of the study indicated the existence of an impact between physical factors and customer attitudes, except for the general atmosphere. Another study on the impact of physical aspects in restaurants identified three dimensions (food, service, and physical environment) and measured their impact on the experience of new and repeat customers. The results revealed a high relationship (Ryu & Han, 2011).

Mahfouz & Abdel Salam (2013) conducted a study to find out the role of the interior design of tourist hotel rooms and its importance for the city of Damascus. It was found that the higher the quality of service provided to tourists, the more this helped to increase tourism popularity, and vice versa. As for the role of hotel lobby interior design in achieving satisfaction and attracting users in Sudan, the study (Al-Tohamy & Hassan, 2017) showed that innovation and diversity in the design of lobby spaces enhance the idea of the hotel in customers' memories. It makes it an unforgettable experience. Rather, it creates in them the desire to repeat the experience. It is not necessary to use a complex design for the hallway to be attractive. It is possible to adopt a single idea or philosophy and translate it through an architectural school into the components of the lobby. The study of Mishal & Othman (2015) reveals physical materials ranked first in influence services on guest satisfaction, and physical materials ranked first in influence. The study (Xu, 2019) also examined and compared the importance of basic attributes with customer satisfaction and dissatisfaction with the hotel chain. The results showed have different effects on customer satisfaction. The reason for the difference was mainly based on the hotel's classification on the one hand and the affiliation (independent, chain) on the other, to four main dimensions: employees, physical setting, value, and location.

A study conducted on five-star hotels in Amman, Al-Damour & Ayesh (2005) pointed the elements of the service marketing mix combined (service quality, price, distribution, promotion, physical environment, employees, service delivery process) and the perceived image are Related. This was reflected in customer satisfaction with the service provided to them. Jahmani (2023) indicated that not all elements of the marketing mix in hotels affect guest satisfaction, but they are of great importance. The study was conducted on five-star hotels in Dubai (Jahmani et al., 2023). Li (2021) linked physical factors in hotels, defined as "servicescape" to customer interaction. The study demonstrated a relationship between health and safety and functional value as a mediating factor. The study recommended increased attention to design elements and presentation mechanisms to increase value perception and improve customer experience (Li, 2021). In another study of physical factors in hotels, the results showed a relationship between them and customer loyalty (Lee, 2022). Ben Haobin (2021) referred that design elements and service quality have a negative impact on guest length of stay and brand recognition. The studies were conducted on 3-5 star hotels in China (Ben Haobin et al., 2021).

In the context of material influences, and in a more specialized study, Kuo & Zhang (2023) examined the impact of hotel room color on guest responses, behavior, and booking intentions. The study concluded that there is a positive relationship between the color scheme and the aforementioned dependent factors and their impact on customer behavior (Kuo & Zhang, 2023). Liu & Wang (2023) discussed material elements and digital interaction and their importance in contributing to the design of a more interactive and welcoming physical environment (Liu & Wang, 2023).

After reviewing and examining studies that addressed material aspects in hotels, previous studies can be classified into three main categories based on the sales stage. The first discussed material elements and their impact before the booking process, demonstrating their ability to influence the choice decision, customer image, and expectations. The second section examined the duration of the stay, interaction with staff, and their responses. The third section examined after the guest's departure, discussing customer satisfaction, loyalty, and repeat visits. In conclusion, when reviewing the literature and what was discussed, previous studies generally lacked an examination of demographic factors as a factor influencing the physical elements, despite their connection between human interaction and the hotel facility, and this aspect was what was focused on in the aspects of the study. Consequently, Figure 1 shows the conceptual framework of the study.

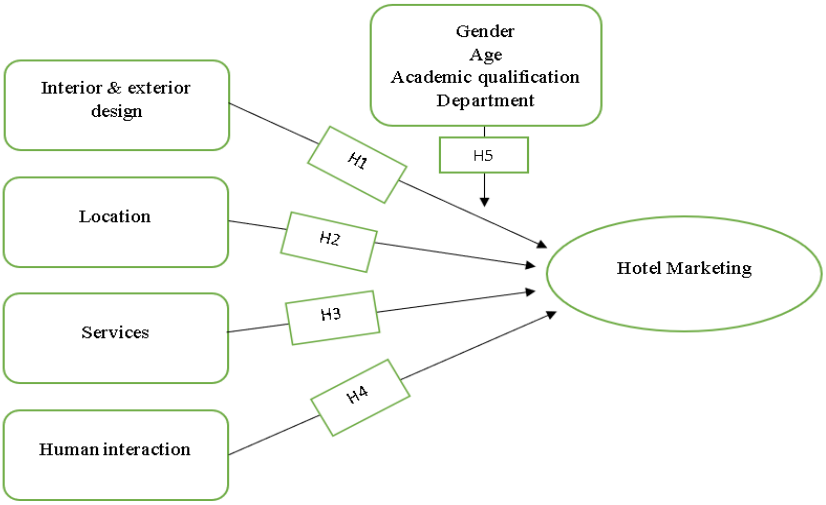

Figure 1. The conceptual framework of the study (Source: Prepared by the researchers)

METHODOLOGY

To study the relationship between the research variables, the quantitative approach was relied upon by designing a study tool that measures the relationships between the variables as explained in the study framework. The study population was identified, sampling techniques were discussed, the mechanism for forming and adapting the study tool was adopted, distribution methods were discussed and highlighted, and data collection and analysis techniques were explained. The questionnaire was prepared for this purpose and distributed to the study sample.

1. Study Sample and Data Collection

This study aims to determine the impact of the marketing role of the physical element in the hospitality sector from the perspective of hotel workers in Amman, Jordan. The questionnaire was formulated based on previous studies related to the fields of study (Söderlund & Julander, 2009; Ryu & Han, 2011; Tawahir & Bin Jarwa, 2017; Shatnawi et al., 2023b).

The study population consisted of all five-star hotels in the city of Amman. The number of five-star hotels in Amman reached 21, and the number of employees in them reached 5,670 employees (Jordanian Ministry of Tourism and Antiquities, 2023). These hotels in the capital, Amman, were chosen as a sample for the study due to their proximity to the researchers' residence. A simple randomization technique was used. The researchers distributed the questionnaire personally to all employees working in Amman hotels who were present during the questionnaire distribution. Hair et al. (2018) noted that 50 to 100 samples are needed in simple regression analysis studies. Accordingly, the number of participants was (155) male and female employees, and they were taken from the following departments (front offices, hotel management, food and beverage department, accounting, marketing and sales, and human resources).

RESULTS

1. Profile of the respondents

The study sample consisted of 155 employees of five-and four-star hotels, selected randomly, and Figures 1-4 show the distribution of the sample members according to personal and functional variables.

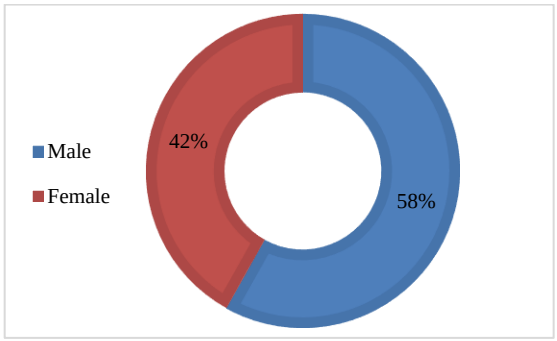

Figure 1. Demographic of the respondent (Gender)

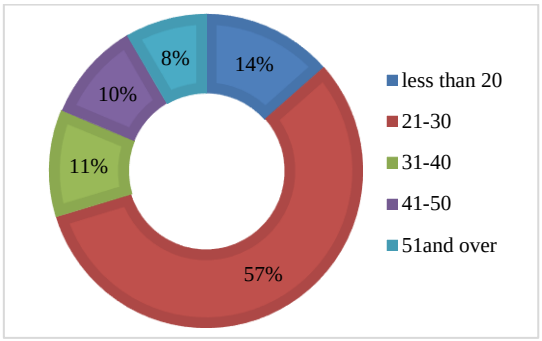

Figure 2. Demographic of the respondent (Age)

Figure (4) shows the distribution of participants by gender; males accounted for the highest percentage at 58.1%, while females accounted for the lowest percentage at 41.9%. As for the age variant, the highest percentage was in the category of respondents aged 21-30 years, amounting to 56.8%. The lowest percentage was in the category of respondents aged 51 years and over, constituting 8.4% with regard to qualification, the highest percentage was for holders of a bachelor's degree at 80.0%, while individuals with secondary education or less formed the lowest percentage at 11.0%. And, finally, among the departments represented, human resources got the highest percentage with 24.5%, while marketing and sales departments got the lowest representation with 9.0%.

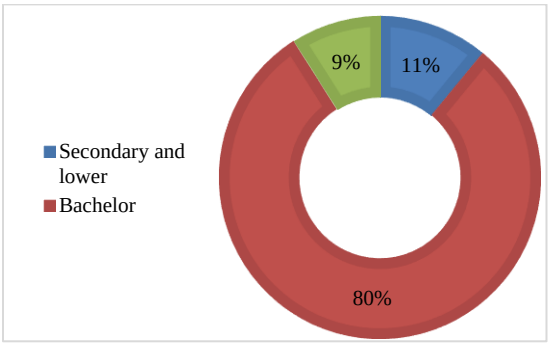

Figure 3. Demographic of the respondent (Academic qualification)

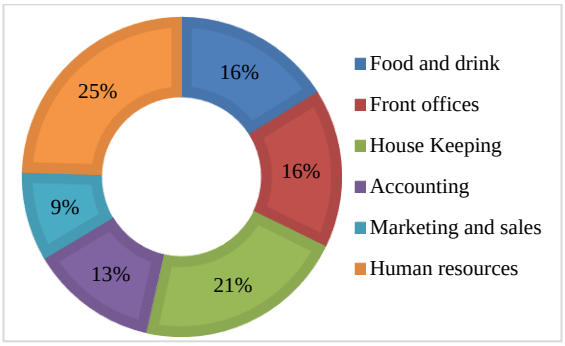

Figure 4. Demographic of the respondent (Department)

2. Validity and reliability of the tool

Face Validity: A study tool was built and in order to verify its apparent validity, all required modifications were made in accordance with the opinion of the arbitrators to whom the questionnaire was sent. The agreement rate was approved (80%)

between the arbitrators (Robles-Medrada et al., 2018). It shows the study tool in its final form, which was based on (31) items to measure the study variables. Consistency aims to stabilize results: The result of Cronbach's alpha is at a value of 60%, which is a high value, and this indicates the extent of the stability of the study tool (internal consistency coefficient), and Table 1 shows this. It is clear from Table (1) that Cronbach's alpha coefficients are acceptable for the study, as the acceptable percentage for generalizing the results of these studies is 60% or more (Sekaran & Bougie, 2016). As assumed (Vaske et al., 2017), the minimum reliability coefficient is (0.70), and therefore the test values are considered an indicator of the stability of the study tool, the stability of its items, and the possibility of relying on it in conducting statistical analysis. Instrument correction: The questionnaire in its final form consisted of (31) items. Three levels: low (1-2.33), medium (2.34-3.67), high (3.68-5) were specified to explain the arithmetic mean of the study variables and items.

Table 1. Cronbach alpha results

Domain	Domain Cronbach's alpha coefficient	Number of items
Interior and exterior design	0.931	7
Location	0.871	5
Services	0.921	6
Human interaction	0.917	5
Marketing	**0.936**	8

3. Descriptive analysis

This chapter includes the results of the study that aimed to identify the importance of the physical elements and human interaction on marketing the hospitality sector from the point of view of employees in classified hotels in Jordan. The following tables (2,3,4,5,6, 7) present the means and standard deviation of the study variables and their items. Results in Table 3 show that the variable "Interior and Exterior Design" comes as the most important variable in marketing the hotels from the point of view of hotel employees, followed by "Human Interaction" then "Location", and finally "Services".

Table 2. Descriptive statistics of the study domains

	Variables	M	SD	Score	Item No.
Dependent Variables	Interior and exterior design	4.52	0.65	High	**1**
	Location	4.42	0.69	High	**3**
	Services	4.34	0.77	High	**4**
	Human Interaction	4.43	0.73	High	**2**
Independent Variable	**Marketing**	**4.30**	**0.75**	**High**	

4. Interior and exterior design

It appears from Table (3) that the arithmetic averages for the paragraphs "Interior and Exterior design" ranged between (4.43-4.63), and the highest was for paragraph No. (1), which states that "The exterior design of the hotel contributed to increasing the hotel's marketing" had an arithmetic mean of (4.63) and a high degree, and came in last place in paragraph No. (6) and paragraph (7) which states: "Restaurant menu designing contributes to increasing the hotel's marketing" and "Deluxe room furniture has an impact in increasing hotel marketing" with an arithmetic average of (4.43) and a high degree, and the overall arithmetic average for the domain "interior and exterior design" reached (4.52) and a high degree.

Table 3. Arithmetic means and standard deviations for the "Interior and Exterior Design" items

Rank	Item	SD	M	Score	Item No.
a1	The hotel's exterior design contributed to increasing the hotel's marketing	4.63	0.73	High	**1**
a4	Hotel interior design helps increase the marketing of the hotel	4.61	0.72	High	**2**
a3	The hotel's interior lighting increases the comfort level of customers and works positively on the hotel's marketing	4.53	0.81	High	**3**
a2	Color coordination attracts customers' attention and works positively on the hotel's marketing	4.52	0.78	High	**4**
a5	The spaciousness of the rooms helps increase the hotel's marketing	4.52	0.73	High	**4**
a7	Restaurant menu designing contributes to increasing the hotel's marketing	4.43	0.82	High	**6**
a6	Deluxe room furniture has a positive effect on increasing the marketing of the hotel	4.43	0.83	High	**6**
Total	**"Interior and exterior design"**	**4.52**	**0.65**	**High**	

Table 4. Location domain

Rank	Item	SD	M	Score	Item No.
b1	The availability of tranquility and comfort in the hotel increases the level of marketing	0.77	4.56	High	**1**
b5	Hotel location is an important factor when choosing a hotel	0.80	4.56	High	**1**
b3	Effective marketing of a hotel's location affects accommodation costs	0.85	4.38	High	**3**
b2	The location of the hotel affects the quality of the tourist accommodation experience or his decision to book	0.92	4.35	High	**4**
b4	The safety of the location is an important factor when choosing a hotel	0.89	4.26	High	**5**
Total	**"Location"**	**0.69**	**4.42**	**High**	

It appears from Table (4) that the arithmetic averages for the "**Location**" paragraphs ranged between (4.26-4.56), and the highest was for paragraph No. (1), which states that "The availability of tranquility and comfort in the hotel increases the level of increased marketing" with an arithmetic average (4.56) with a high degree, and the last position is paragraph No. (4) which states: "The safety of the location is an important factor when choosing a hotel." The arithmetic mean is (4.26) with a high degree. As for the arithmetic mean for the "**location**" field as a whole, it is (4.42) which is to a high degree.

Table (5) shows that the arithmetic mean for the "**Services**" items rises between (4.25-4.43), in addition to item No. (4), which includes "The quality of heating and cooling equipment positively affects hotel's marketing" with an arithmetic mean of (4.43) and a high degree, as it was ranked in the final section No. (6), which helped "The quality and style of service provided in the hotel help increase the marketing of the hotel" with an arithmetical average of (4.25) and a high degree, and my average in the field of "**Services**" provided was (4.34) and a high degree.

Table (6) shows that the arithmetic mean for the "**Human Interaction**" paragraphs ranged between (4.26-4.57), and the highest mean was for paragraph No. (5), which states that "Employee cleanliness increases the comfort level of customers and works positively on the hotel's marketing", with an arithmetic average of (4.57) and a high degree, and it came in last place in paragraph No. (1), which states: "The employees' body language has a positive effect that increases the comfort level of customers and works positively on the marketing of the hotel" with a mean score of (4.26) and a high degree. The arithmetic mean for the field of "**Human Interaction**" as a whole was (4.43), with a high degree.

Table 5. Services domain

Rank	Item	SD	M	Score	Item No
c4	The quality of heating and cooling equipment positively affects hotel's marketing	0.94	4.43	High	**1**
c5	The quality of linens, appliances, equipment, and tools used in the hotel increases the comfort level of customers and works positively on the marketing of the hotel	0.92	4.37	High	**1**
c2	The availability of fire extinguishers and ambulance bags in the hotel increases the customer's comfort level and works to market the hotel positively.	0.84	4.35	High	**3**
c3	The availability of sufficient and clear signs increases the comfort level of customers and works positively on the marketing of the hotel	0.91	4.34	High	**4**
c1	The quality of equipment available in banquet and conference halls helps increase the hotel's marketing	0.92	4.31	High	**5**
c6	The quality and style of service provided in the hotel help increase the marketing of the hotel	0.91	4.25	High	**6**
Total	**Services**	**0.77**	**4.34**		

Table 6. Human interaction domain

Rank	Item	SD	M	Score	Item No
d5	Employee cleanliness increases the comfort level of customers and works positively on the hotel's marketing	0.78	4.57	High	1
d4	The employee's smile and good speech positively affect the hotel's marketing	0.81	4.50	High	2
d3	The employee's appearance reflects the first impression of the hotel and works positively on the hotel's marketing	0.85	4.43	High	3
d2	The use of employee ID cards increases customer convenience and works positively on the hotel's marketing	0.81	4.40	High	4
d1	The employees' body language has a positive effect that increases the comfort level of customers and works positively on the marketing of the hotel	0.97	4.26	High	**5**
Total	**Human interaction**	**0.73**	**4.43**		

Table 7. Marketing domain

Rank	Item	SD	M	Score	Item No
e1	The Public Relations Department employs social media networks such as (Facebook and Twitter) to advertise the hotel	0.84	4.38	High	**1**
e8	The hotel administration aims to highlight the internal and external aesthetic appearance of the hotel	0.92	4.35	High	**2**
e2	The hotel administration markets the hotel by facilitating reservation and arrival processes and making discounts for customers	0.84	4.35	High	**3**
e3	The hotel administration is intensifying its follow-up of guest opinions on the website to develop its services	0.91	4.34	High	**4**
e4	The hotel's Public Relations department posts many of its videos on video-sharing sites such as (YouTube and Dailymotion) to attract customers.	0.89	4.30	High	**5**
e7	The hotel adheres to international quality standards in cuisine	0.96	4.29	High	**6**
e5	Public relations managers continue to use technology in producing hotel-related advertising	0.91	4.22	High	**7**
e6	Hotel administration explains to customers the hotel's classification among nearby and competing hotels	0.96	4.20	High	**8**
Total	**Marketing**	**0.75**	**4.30**	**High**	

It appears from Table (7) that the arithmetic averages for the "**Marketing**" paragraphs ranged between (4.20-4.38), and the highest was for Paragraph No. (1), which states: "The Public Relations Department employs social media networks such as (Facebook and Twitter) to advertise the hotel." With an arithmetic mean of (4.38) and a high degree,

and in last place came paragraph No. (6), which states, "Hotel administration explains to customers the hotel's classification among nearby and competing hotels" with an arithmetic mean of (4.20) and a high degree, the arithmetic mean for the field of "**Marketing**" was as a whole (4.30) and to a high degree.

5. Hypothesis testing

H1: There is statistically significant effect at the significance level (0.05) of interior and exterior design on marketing.

To test this hypothesis, simple linear regression analysis was used to reveal the effect of internal and external design on marketing. In the table below are the results of the analysis. Table 8 shows the results of a simple linear regression analysis that evaluates the effect of interior and exterior design on the marketing variable. The independent variable, interior and exterior design, shows a significant impact on marketing and is indicated by a t value of 19.779, along with statistical significance (0.000). Less than (0.05) indicates statistical significance. The unstandardized factor B of 0.976 indicates a strong positive relationship, meaning that for every unit increase in interior and exterior design, there is a significant expected increase of 0.976 units in marketing. The value of the correlation coefficient (r) was (0.848), and the value of (r2) was (0.719) which represents the percentage of influence or explanation of the independent variable on the dependent variable.

Table 8. H1 results (Dependent variable: marketing)

Model	t	sig	B	R	R Square	F	Sig.	Result
1	19.779	0.000	0.976	0.976	0.719	391.207	0.000	Accepted

H2: There is statistically significant effect at the significance level (0.05) of the website on marketing.

To test this hypothesis, simple linear regression analysis was used to reveal the effect of (location) on marketing. In the table below are the results of the analysis. Table 9 shows the results of a simple linear regression study that examines the effect of location on the marketing variable. The independent variable location (which refers to location) shows a significant impact on marketing, as evidenced by the high t value of 20.786 and statistical significance (0.000). Less than (0.05) indicates strong statistical significance. An unstandardized factor B of 0.937 indicates a strong positive relationship, meaning that for every unit change in location, there is an expected increase of 0.937 units in marketing. The correlation coefficient (R) was (0.859) and the R2 value was (0.738), which represents the percentage of influence or explanation of all independent variables on the dependent variable.

Table 9. H2 results (Dependent variable: marketing)

Model	t	sig	B	R	R Square	F	Sig.	Result
2	20.786	0.000	0.937	0.859	0.738	432.052	0.000	Accepted

H3: There is no statistically significant effect at the significance level of 0.05 for services on marketing.

To test this hypothesis, simple linear regression analysis was used to reveal the effect of (services) on marketing. In the table below are the results of the analysis. It appears from Table 10 that the results extracted from the simple linear regression analysis reveal the effect of services on the marketing variable. The independent variable, services, shows a significant impact on marketing, which is evident from the significantly high t value of 20.977 and the statistical significance (0.000). Less than (0.05) confirms strong statistical significance. An unstandardized factor B of 0.843 indicates a strong positive relationship, indicating that a unit change in services corresponds to an expected 0.843 unit increase in marketing. The value of the correlation coefficient (R) was (0.861), and the value of (R2) was (0.742), which represents the percentage of influence or interpretation of the independent variables on the dependent variable.

Table 10. H3 results (Dependent variable: marketing)

Model	t	sig	B	R	R Square	F	Sig.	Result
3	20.977	0.000	0.843	0.861	0.742	440.028	0.000	Accepted

H4: There is no statistically significant effect at the significance level (0.05) of human interaction on marketing.

To test this hypothesis, simple linear regression analysis was used to reveal the effect of human interaction on marketing. In the table below are the results of the analysis. Table 11 shows the results of a simple linear regression study that examines the effect of human interaction on the marketing variable. The independent variable, human interaction, shows a significant impact on marketing, supported by a significantly high t value of 22.314 and statistical significance (0.000). Less than (0.05) indicates strong statistical significance. The unstandardized factor B of 0.897 highlights a strong positive relationship, indicating that changes in human interaction correspond to an expected increase of 0.897 units in marketing. The correlation coefficient (R) value was (0.875), and the R2 value (0.765) represents the percentage of influence or explanation of the independent variables on the dependent variable.

Table 11. H4 results (Dependent variable: marketing)

Model	t	sig	B	R	R Square	F	Sig.	Result
4	22.314	0.000	0.897	0.875	0.765	497.916	0.000	Accepted

H5: Are there statistically significant differences in marketing for the study sample due to demographic factors (gender, age, educational qualification, department)?

To test this hypothesis, the application of four-way analysis of variance (ANOVA) was used to detect differences in the opinions of the study sample members about marketing for the study sample due to demographic factors (gender, age, educational qualification, department), and the tables below illustrate this.

Table 12 shows that there are clear differences between the averages of the answers of the study sample members regarding marketing for the study sample due to demographic factors (gender, age, educational qualification, department). To determine the statistical significance of these differences, a 4-way ANOVA in marketing was applied to the study sample attributable to demographic factors (gender, age, educational qualification, department), and Table 7 shows this.

Table 13 shows that there are no statistically significant differences at the level of significance ($\alpha<0.05$) in the level of creativity in service due to age, academic qualification, or department, nor did any statistical significance appear for the letter "*f*" to reach the level of statistical significance (α). = 0.05). There were statistically significant differences at the significance level ($\alpha<0.05$) in the level of creativity in the service due to (gender), and they were in favor of males.

Table 12. H5 results

Gender	**SD**	**M**
Male	0.698	4.457
Feminine	0.778	4.094
Age	SD	**M**
Less than 20	0.548	4.613
21-30	0.867	4.237
31-40	0.561	4.449
41-50	0.425	4.461
51 or more	0.452	3.885
Qualification	**SD**	**M**
High school or less	0.598	4.449
Bachelor's	0.784	4.239
Master's or PhD	0.434	4.714
Department	**SD**	**M**
Food and drinks	0.521	4.495
Front offices	1.176	4.025
Hotel management	0.544	4.538
Accounting	0.657	4.394
sales and marketing	0.878	4.000
HR	0.600	4.227

Table 13. ANOVA results

Variable	**Sum of Squares**	**DF**	**Mean Square**	**f**	**sig**
Gender	5.*436*	1.000	5.436	11.192	***0.001**
Age	4.685	4.000	1.171	2.411	**0.052**
Qualification	1.076	2.000	0.538	1.108	**0.333**
Department	4.901	5.000	0.980	2.018	**0.080**
Error	68.972	142.000	0.486		
Total	**87.034**	**154.000**			

DISCUSSION

This study was conducted to clarify the importance of physical elements (interior and exterior design, location, services) and human interaction in hotel marketing. The study followed a new approach as it targeted employees' perceptions of these areas of hotel marketing, while previous studies targeted tourists' perceptions and satisfaction. Results of the descriptive analysis show that the variable "Interior and Exterior Design" comes as the most important variable in marketing the hotels from the point of view of hotel employees, followed by "Human Interaction" then "Location", and finally "Services". This requires the hotel management to pay great attention to the exterior and interior design of the hotel, hotel rooms, lighting, colors, spaces, and luxury furniture. In addition to the great interest in human interaction, which means a direct focus on the employee, training and qualifying him, and that the employee acquires a "Moment of Truth", or that he is skilled in optimally exploiting the "Service encounter", which is the moment in which the employee communicates with the customer or the so-called direct points of sale, which is reflected directly on marketing the hotel. The study showed that employees are well aware that human interaction through a smile, clean and elegant appearance, communication etiquette, and body language are important factors in marketing a hotel. It cannot be denied that location has a major role in a tourist's choice of hotel, but the hotel can focus a lot on marketing to overcome the location problem. The results of the study also showed that services play an important role in hotel marketing.

Since categorized hotels are similar in style and quality of service, these hotels can rely on creativity and innovation in service delivery to market themselves more than competitors in the same category. In addition, the results of this study revealed a statistically significant impact of interior and exterior design, location, services, and human interaction on marketing. The results also showed that there were statistically significant differences in the level of service in favor of males.

CONCLUSIONS

In light of these results, the study recommends to stakeholders the need to emphasize the importance of interior design, especially furniture, and its suitability to public taste in a way that suggests sophistication and luxury; paying

attention to good marketing of the hotel's website when designing advertising campaigns in a way that suggests the safety and suitability of the location and provides everything the customer needs; paying attention to how to display the services provided by the hotel in attractive publications that contain all the hotel's services briefly and interestingly, through which the hotel's classification among nearby and competing hotels is presented; paying attention to the human element working in the hotel by receiving continuous training on the latest methods of dealing and communicating with customers, in addition to paying attention to their external appearance, including uniforms, cleanliness, and glasses.

The study also presents a conceptual model consisting of a group of independent factors and their impact on marketing. It advises researchers and students to use the study model and questionnaire to study other variables or apply them to sectors other than hotels and perhaps in regions other than Jordan.

Author Contributions: Conceptualization, R.M., O.T. and O.A.; methodology, R.M. and O.A.; validation O.T. and O.A.; formal analysis, R.M. and O.A.; investigation, O.T. and M.G. ; data curation, R.M. and M.G. ; writing - original draft preparation R.M., O.T., O.A., M.G. and A.I.; writing - review and editing R.M., O.A. and O.T.; Supervision, R.M. and O.A. ; project administration, R.M. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 18.03.2025 Revised: 26.06.2025 Accepted: 14.07.2025 Available online: 01.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1563-1570
DOI 10.30892/gtg.61315-1525

MULTI-FACTOR GIS MODELING FOR SOLID WASTE DUMPSITE SELECTION IN BOUMEDFAA, ALGERIA

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Citation: Benferhat, T., & Saidou, A. (2025). Multi-factor GIS modeling for solid waste dumpsite selection in Boumedfaa, Algeria. *Geojournal of Tourism and Geosites*, 61(3), 1563–1570. https://doi.org/10.30892/gtg.61315-1525

Abstract: The integration of the Analytic Hierarchy Process (AHP) with Geographic Information Systems (GIS) presents a powerful framework for improving waste management practices. AHP serves as a structured decision-making tool that enables stakeholders to prioritize and evaluate various alternatives based on multiple criteria, while GIS enhances this process by providing spatial analysis capabilities that allow for the visualization and examination of geographic data. This combination is particularly relevant in the context of waste management, where decisions often involve complex trade-offs among environmental, economic, and social factors. The primary aim of this study is to investigate the synergistic integration of AHP and GIS within the realm of waste management. Specifically, the research focuses on three critical areas: assessing various waste disposal methods, selecting optimal sites for landfills, and optimizing waste collection routes. By leveraging the strengths of both methodologies, the study seeks to enhance decision-making processes in waste management. The methodology involves breaking down complex decision-making scenarios into a hierarchical structure of criteria and sub-criteria. This structured approach allows stakeholders to systematically compare different options based on a range of factors, including environmental impact, cost-effectiveness, community acceptance, and logistical feasibility. GIS complements the AHP framework by providing essential spatial data that reveals patterns and relationships in waste generation and disposal, facilitating a more comprehensive analysis. The integration of AHP and GIS empowers decision-makers to visualize the potential implications of their choices more effectively. For example, GIS can be utilized to map waste generation hotspots, identify suitable locations for waste management facilities, and analyze transportation routes for their efficiency and effectiveness. This visualization aids in understanding the spatial dynamics of waste management and supports more informed decision-making. Overall, the synergy between AHP and GIS significantly enhances the effectiveness of waste management strategies. This integrated approach not only leads to more sustainable waste management practices but also improves resource allocation and fosters better community engagement in waste management initiatives. By supporting informed, data-driven decision-making, the combination of AHP and GIS ultimately contributes to the development of more efficient and environmentally friendly waste management solutions. The findings of this study underscore the importance of utilizing advanced analytical tools in addressing the multifaceted challenges of waste management, paving the way for innovative and sustainable practices in the field.

Keywords: Algeria, AHP, GIS, Boumedfa, environnement, solid waste, complex, sustaianble

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INTRODUCTION

Industrialization and population growth have resulted in unprecedented levels of solid waste production worldwide (Lakhouit, 2025; Abdella et al., 2022; Kogbara et al., 2024; Krishna, 2024; Kurniawan et al., 2022; Zohoori & Ghani, 2017). The swift urbanization occurring in developing nations across Asia and Africa has resulted in a significant rise in the production of municipal solid waste (MSW) (Zhang et al., 2024). The rise in population, urban expansion, and the growth of industrial and economic activities have led to a significant surge in waste production. This presents one of the most pressing challenges globally due to the threats it poses to both human health and the environment (Bouchama & Drias, 2024).

Waste, which is material released from human activities, presents a serious risk to both human health and the environment (Singh, 2019). Solid waste mismanagement and misgovernance in urban areas, mining, and the timber industry, among others, represent global challenges related to environmental pollution, social inclusion, and economic sustainability.

These issues necessitate comprehensive assessments and coordinated strategies for effective resolution (Szpilko et al., 2023; Cacciuttolo & Atencio, 2022; Pheakdey et al., 2022). Geographic Information System (GIS) technology is one of the hottest research tools in the world and is one of the fastest growing high technologies for monitoring (Benferhat & Bouder, 2024). GIS assists decision-makers in planning solid waste collection routes, determining optimal locations for bins, and evaluating environmental health impacts (Shabani et al., 2024). The site selection techniques, assessed the current landfill, and created a multifactor geographic information system (GIS) model (Kalisha & Munthal, 2024).

Shukor et al confirm that methods such as geographic information system (GIS) and multi-criteria decision analysis (MCDA) facilitate decision-making processes. This integration reduces analysis time and costs, improves accuracy, and

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minimizes errors. The analytic hierarchy process (AHP) provides a framework to validate judgments and derive measurable values in decision-making involving theories and concepts (Shukor et al., 2024). The GIS environment was developed by following these steps outlined by (Resende et al., 2025). The use of GIS is more to be demonstrated in several areas, from her point of view, the researcher sees that the integration of modeling software and a geographic information system (GIS) facilitates the creation of a holistic representation of groundwater quality (Megahed et al., 2025). The management of municipal solid waste (MSW) faces a variety of challenges, including health concerns, climate change, and social inequality. Decision-makers are consistently exploring effective and sustainable solutions to address the solid waste management crisis (Sondh et al., 2024). Solid waste management (SWM) has emerged as a critical challenge for the protection and sustainability of ecosystems (Tian et al., 2025).

In his study, the researcher amply proves that GIS is a tool that contributes to the management of spatial data, such as solid waste. The map, as the final result, remains a support for synthesizing several geographic information, which would help managers guide urban development studies. Hence the need for the municipal authority to commit to environmental sanitation for the preservation of humanized and naturalized ecosystems (Tryphon et al., 2025). According to the World Bank, global solid waste generation is expected to increase from 2.01 billion tons in 2016 to 3.40 billion tons by 2050. This increase is driven by urbanisation, economic growth, and changing consumption habits.As a result, sustainable waste management (SWM) within the framework of the circular economy has become a significant issue (Kaza et al., 2018).

MATERIALS AND METHODS

Study area

Boumdfaa is located at coordinates 36°22′13″N and 2°28′35″E, 100 km west of Algiers, 60 km northeast of Ain Defla, 37 km northwest of Midia and 40 km west of Blida. In 2008, the population of the area was 21,509. The population density is 860 people per km². For this study, we selected five criteria to Determining Waste Bins Locations. The average scale method provided the identification of new factors or the use of greater detail of those factors previously used in the large-scale site identification phase. The factors were grouped according to economic or environmental importance and values were assigned to each factor from five to six categories with scores ranging from 0 to 10 (Figure 1).

Figure 1. Location of study Area (Source: Authors)

A "weight" was then assigned to each factor through a hierarchical analysis that creates a scale of priority within the factors. The suitability of the area was then evaluated using a simple weighted summation (SAW, simple additive weighting) system (Figure 2) . This system is widely used to calculate final values in cases using multiple criteria. The mathematical formulation of this system is described by the following equation (Yoon & Hwang, 1995:250).

$$Vi=\sum_{j=1}^{n} Wjvij \qquad (1)$$

Where Vi is the suitability index for area i, Wj is the relative importance of the weight given to criterion j, vij is the priority value of area i concerning criterion j, n is the total number of criteria.

The criteria considered in this study are: • Walking Distance from buildings; • Walking Distance from Facilities; • Walking Distance from Roads; • Walking Distance from Green spaces;

Figure 2. Waste on the Boumedfa road on: 02/28/2025 Boumedfa (Source: Authors)

1. Walking Distance from Buildings: Proximity to buildings is crucial for accessibility and convenience. Areas closer to buildings are likely to be more desirable for residential or commercial development.

2. Walking Distance from Facilities: Access to essential facilities (e.g., schools, hospitals, shopping centers) enhances the livability of an area. This criterion ensures that residents can easily reach necessary services.

3. Walking Distance from Roads: Proximity to roads is important for transportation and connectivity. Areas that are easily accessible by road can facilitate better movement and logistics.

4. Walking Distance from Green Spaces: Access to parks and green spaces contributes to the quality of life. It promotes physical activity and provides recreational opportunities, making areas with nearby green spaces more attractive.

5. Walking Distance from Empty Space: Areas with nearby empty spaces can offer potential for future development or expansion. This criterion allows for the

For this study, we selected five criteria to Determining Waste Bins Locationsa. The average scale method provided the identification of new factors or the use of greater detail of those factors previously used in the large-scale site identification phase. The factors were grouped according to economic or environmental importance and values were assigned to each factor from five to six categories with scores ranging from 0 to 10. A "weight" was then assigned to each factor through a hierarchical analysis that creates a scale of priority within the factors.

The suitability of the area was then evaluated using a simple weighted summation (SAW, simple additive weighting) system. This system is widely used is represented schematically in the diagram below (Figure 3).

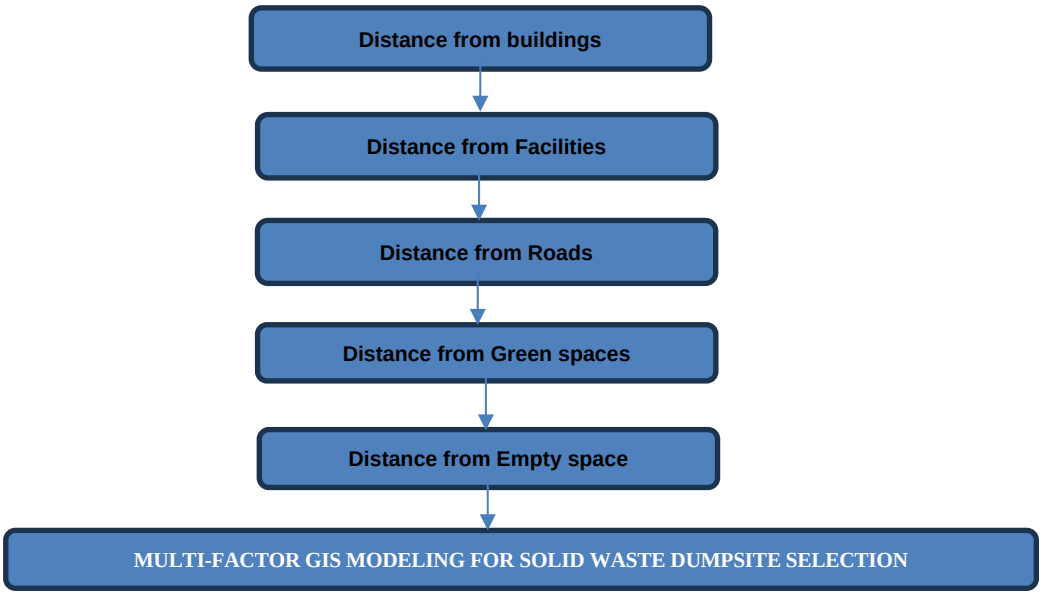

Figure 3. Method modeling for solid waste dumpsite selection

RESULTS AND DISCUSSION

A model was created to perform the spatial analysis tasks by model builder tools, and in it, the working environment was set. Within the model, all operations were performed until the Determining Waste Bins Locations was obtained: Firstly: the datasets were derived based on the previously mentioned criteria as follows:

Building

The Building a raster layer. The distance was derived from buildings by the Euclidean distance tool located in the distance toolset in the spatial analyst tools toolbox, the result is a raster layer. in this raster layer the hue is from Green and light green to red color (changed from the properties to clarify), as, where the preference, according to the criteria followed, returns to the classes with the Green color, followed by the light green color, yellow, orange and the red color respectively (Figure 4).

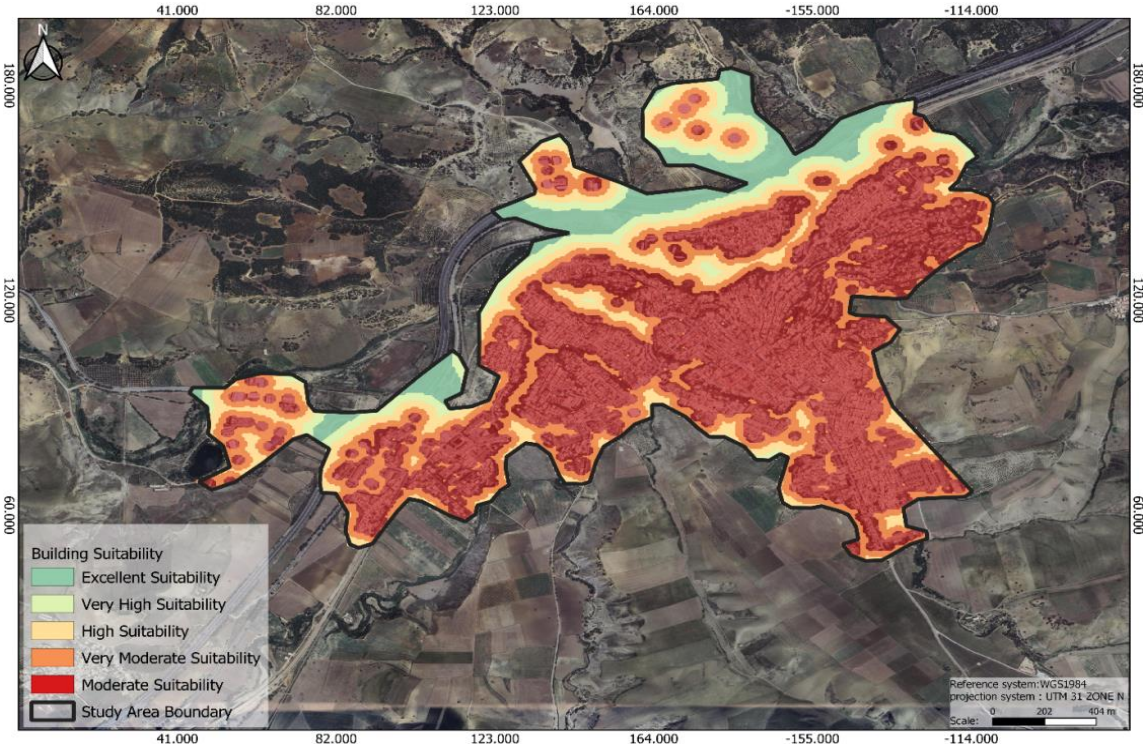

Figure 4. Building criteria map (Source: Authors, 2025)

2. Facilities

The distance was derived from Facilities by the Euclidean distance tool, the result is a raster layer. In this raster layer, the hue is from pink to crepe color (changed from the properties to clarify), as, where the preference, according to the criteria followed, returns to the classes with the pink color, followed by the fuchsia color, purple and the crepe color respectively (Figure 5).

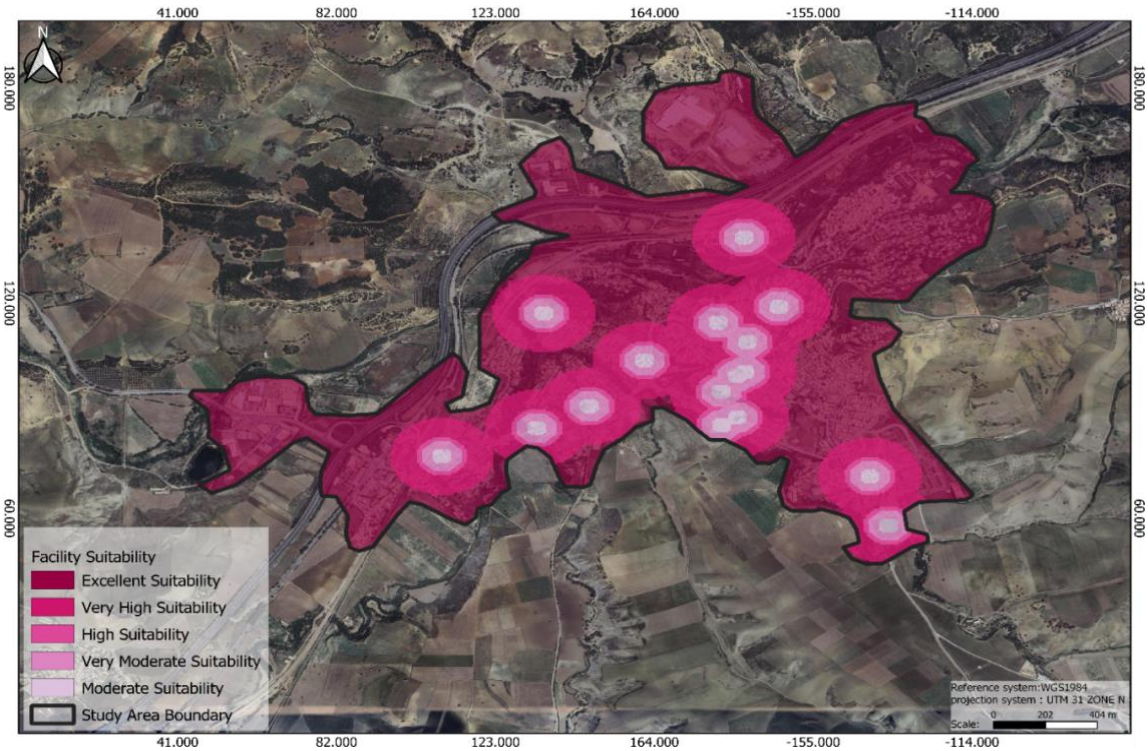

Figure 5. Facilities criteria Map (Source: Benferhat, 2025)

3. Green space sustainability

To evaluate this criterion, we established five buffer zones around all the Green space areas, spaced 150 meters apart. These zones were then converted into a grid map with 20x20-meter cells. A distance-based scoring system was applied, assigning higher scores to areas farther from the rivers. The distance was derived from the Green space areas by the Euclidean distance tool, the result is a raster layer. In this raster layer, the hue is from tawny to yellow color (changed from the properties to clarify),, where the preference, according to the criteria followed, returns to the classes with the tawny color, followed by the copper colour, deep saffron, orange and the yellow color respectively (Figure 6).

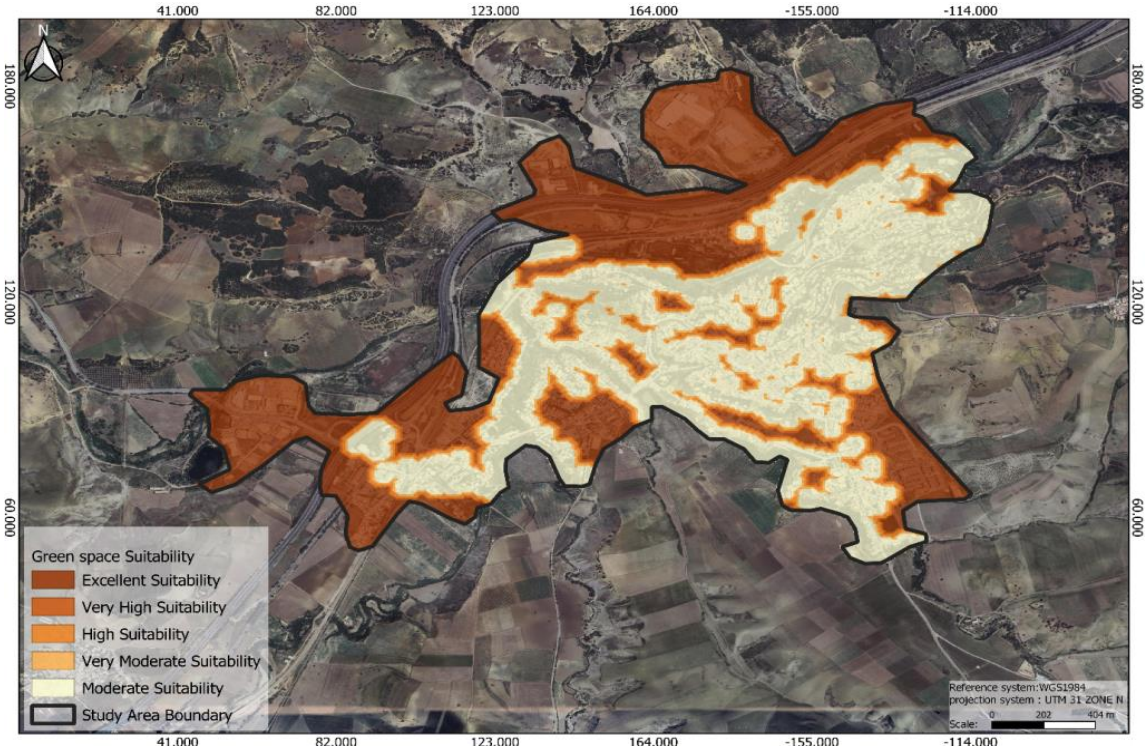

Figure 6. Green space criteria map (Source: Benferhat, 2025)

Figure 7. Roadscriteria Map (Source: Benferhat,2025)

4. Roads

The selection of Waste Bins Locations should consider the criteria of road distance or proximity, as it determines the

site's accessibility. Ideally, Waste Bins should be reachable via alternative routes. However, they should not be located too far from existing road networks to minimize the cost of constructing connecting roads. Additionally, waste transportation should not disrupt regular traffic flow. To assess this factor, we established five buffer zones around major roads (highways, main roads, secondary, and urban roads), each spaced 500 meters apart. These zones were then converted into a 20x20 meter grid map. A scoring system was applied based on road proximity to the Waste Bin, with the highest scores assigned to locations closest to existing roads The distance was derived from roads by the Euclidean distance tool, the result is a raster layer. In this raster layer, the hue is from black to yellow color (changed from the properties to clarify), as, where the preference, according to the criteria followed, returns to the classes with the black color, followed by the purple color, pink, orange and the yellow color respectively (Figure 7).

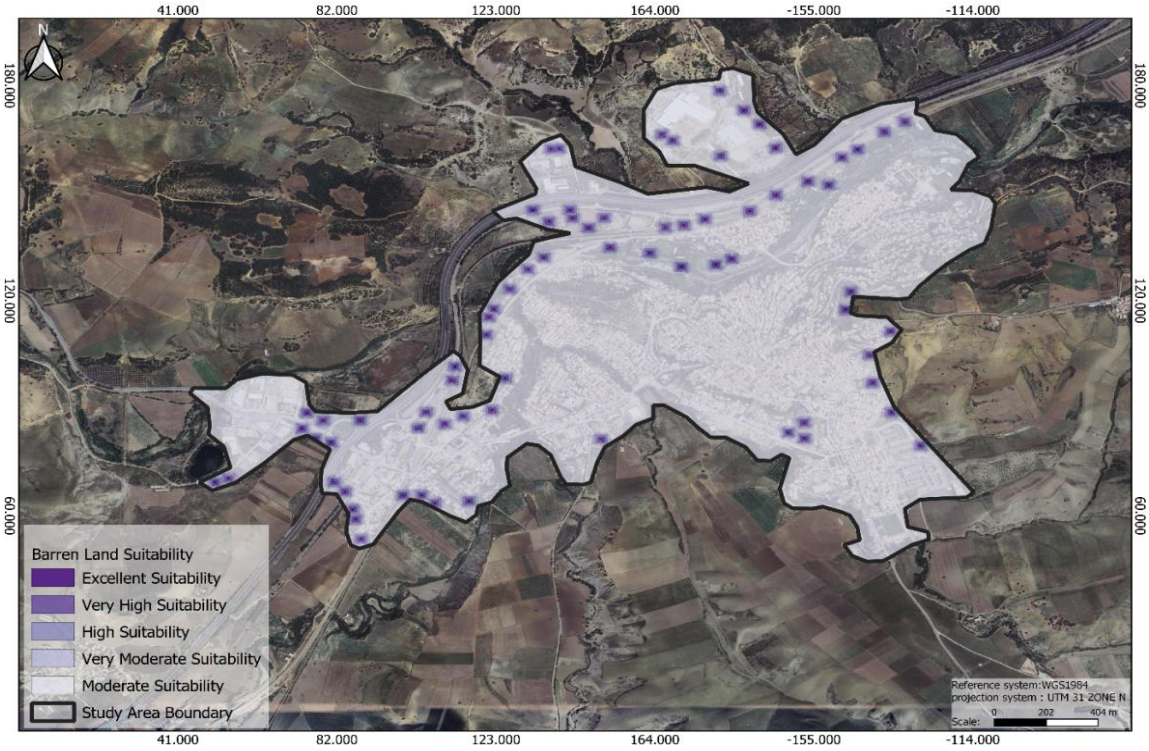

Figure 8. BARREN LAND criteria map (Source: Benferhat, 2025)

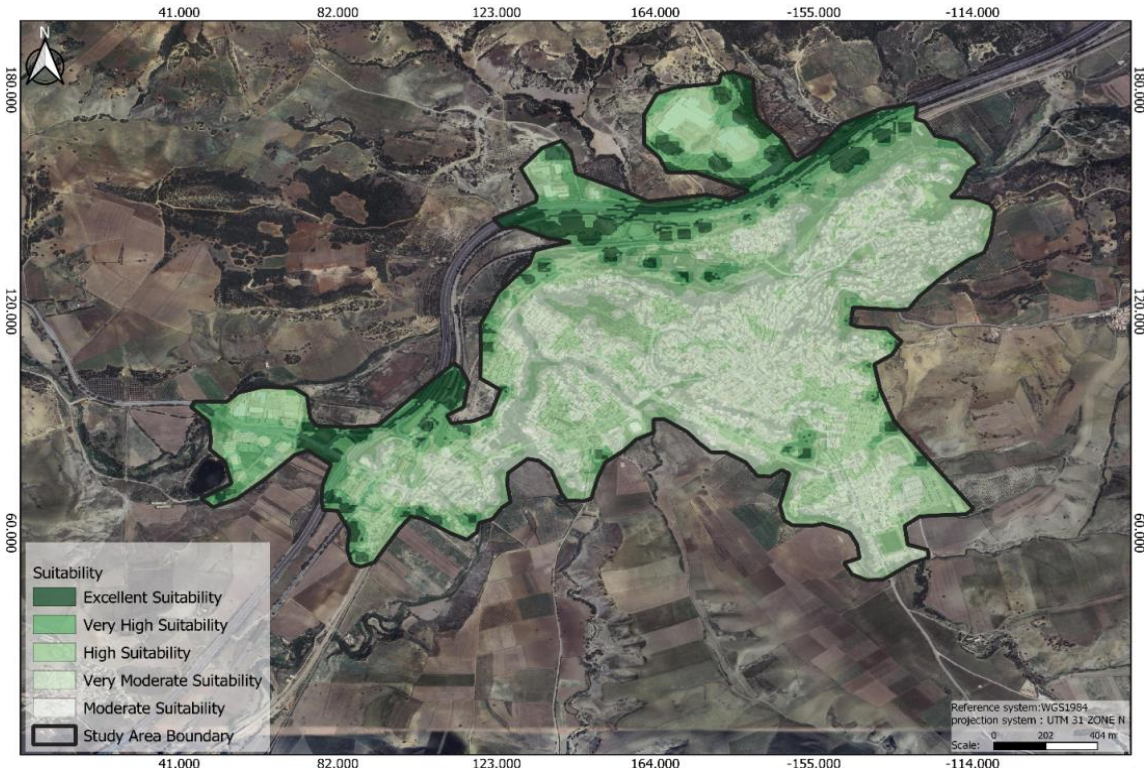

Figure 9. Optimal waste bin locationssource: Benferhat, 2025

5. BARREN LAND

The distance was derived from BARREN LAND by the Euclidean distance tool, the result is a raster layer. in this raster layer the hue is from little princess color to purple color (changed from the properties to clarify), as, where the preference, according to the criteria followed, returns to the classes with the little princess color, followed by the very light purple color, moderate purple, strong purple and the purple color, respectively (Figure 8).

Secondly: the produced datasets were previously reclassified by the objective of the analysis process and the criteria used within 5 weighing ranks so that the value 5 was given to the most appropriate areas and the value 1 to the worst-appropriate areas, and the gradient between them respectively, these suitable sites using the weighted overlay tool located in the overlay toolset from the spatial analyst tools toolbox.

CONCLUSIONS

While this study provides valuable insights into the challenges of solid waste management in Boumedfa, several limitations must be acknowledged to contextualise the findings and guide future

1. Data Availability and Quality: The analysis heavily relied on the availability and accuracy of geographic data related to waste bin placements and population density. Any discrepancies or gaps in this data could lead to misinterpretations of the least suitable locations for waste bins. Future studies should aim to incorporate more comprehensive datasets, including real-time waste generation metrics, to enhance the reliability of the findings.

2. Temporal Constraints: The study was conducted over a specific timeframe, which may not account for seasonal variations in waste generation and disposal patterns. For instance, periods of increased tourism or local events could significantly alter waste production, affecting the effectiveness of waste bin placement. Longitudinal studies that monitor waste management practices over extended periods would provide a more nuanced understanding of these dynamics.

3. Geographic Scope: The focus on Boumedfa may limit the generalizability of the findings to other regions with different demographic, economic, and environmental contexts. While the use of geographic information systems (GIS) allows for localized analysis, the unique characteristics of Boumedfa may not reflect the challenges faced in other municipalities. Comparative studies across diverse settings could yield broader insights into effective waste management strategies.

4. Stakeholder Engagement: The study did not incorporate direct feedback from community stakeholders, including residents and local waste management authorities. Engaging these stakeholders could provide critical qualitative insights into the practical challenges and perceptions surrounding waste bin placement. Future research should consider participatory approaches to gather input from those directly affected by waste management policies.

5. Technological Limitations: While GIS is a powerful tool for spatial analysis, it has inherent limitations in modeling human behavior and decision-making processes related to waste disposal. The study's reliance on GIS may overlook factors such as social norms, cultural attitudes, and individual behaviors that influence waste management practices. Integrating social science methodologies could enrich the analysis and provide a more holistic view of the issues at hand.

6. Focus on Bin Placement: The study primarily concentrated on the placement of waste bins, potentially neglecting other critical aspects of waste management, such as collection frequency, public awareness campaigns, and recycling initiatives. A more comprehensive approach that examines the entire waste management system would be beneficial in identifying interconnected challenges and solutions.

In conclusion, while the findings of this study underscore the need for a strategic reassessment of waste bin distribution in Boumedfa, acknowledging these limitations is essential for framing future research and policy recommendations. Addressing these gaps will be crucial for developing a more effective and sustainable waste management system that meets the community's needs and enhances environmental health (Figure 9).

Author Contributions: Conceptualization, T.B. and S.A; methodology, T.B. and S.A.; software, T.B. and S.A; validation, T.B. and S.A.; formal analysis, T.B. and S.A.; investigation, T.B. and S.A.; data curation, T.B. and S.A.; writing - original draft preparation, T.B. and S.A.; writing - review and editing, T.B. and S.A.; visualization, T.B. and S.A.; supervision, T.B. and S.A.; project administration, T.B. and S.A. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 12.03.2025 Revised: 27.06.2025 Accepted: 15.07.2025 Available online: 06.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1571-1581
DOI 10.30892/gtg.61316-1526

METHODOLOGY FOR ASSESSING THE NATURAL BLOCK OF TOURIST AND RECREATIONAL POTENTIAL OF THE STUDIED TERRITORIES

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Citation: Dmitriyev, P.S., Teslenok, S.A., Fomin, I.A., Ismagulova, S.M., Kitsis, V.M., Kustov, M.V., & Sedelnikov, I.A. (2025). Methodology for assessing the natural block of tourist and recreational potential of the studied territories. *Geojournal of Tourism and Geosites*, 61(3), 1571–1581. https://doi.org/10.30892/gtg.61316-1526

Abstract: The purpose of the study is to create and approbation of the author's methodology for assessing the tourism and recreational potential of components included in the natural block, on the example of the Republic of Mordovia and North Kazakhstan region. Materials and Methods: The results of field research and analysis of available scientific materials, previously conducted studies, cartographic materials, and publications were used in the work. Comparative geographical and historical geographical methods and the method of GIS technologies were used in the analysis. The method of mapping allowed visualising the components of the natural resource potential included in the natural block, including relief, rivers, lakes, and objects with the status of specially protected natural areas. To create a methodology for assessing the natural-resource potential, a four-point scale was used, which included the following indicators: Unfavourable (U), Relatively favourable (RF), Favourable (F), Most favourable (MF), which made it possible to give a qualitative and point assessment of the studied territories. Results and discussions: The potential of natural block resources used in tourism and recreational activities is the sum of the results of an assessment of a number of indicators: relief, climatic conditions, flora and fauna and specially protected natural areas, water resources. The assessment of the tourist and recreational potential of the natural block for the compared administrative territories based on the developed methodology is given in points reflecting the level of attractiveness based on the developed methodology. It was 17 points for the Republic of Mordovia, and 15 points for the North Kazakhstan region. There is no critical difference in the total score of the natural block, which perhaps suggests a sufficiently high and favorable level of potential for both territories. The methodology adapts well and, if necessary, can be modified by changing the evaluation criteria, supplementing, reducing or replacing them. The presented methodology for assessing the tourism and recreational potential of the components of the natural block is developed on the basis of analysing existing methods. The proposed methodology can be used to assess the tourism and recreational potential not only for the studied territories, but also for regions characterised by similar conditions for the development of tourism and recreational activities.

Keywords: natural and recreational potential, tourism and resource potential, natural conditions and resources, biodiversity, tourism resources, sustainable development, tourism industry, natural block, assessment methodology

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INTRODUCTION

The peculiarity of the development of the tourism industry of any region or country is the presence of natural, historical, socio-cultural objects (Minenkova & Potapova, 2021; Bógdał-Brzezińska et al., 2023). The presented objects can be used to show and satisfy cognitive interest, as well as to meet the spiritual needs of tourists. At the same time, all tourist sites and routes should contribute to the recovery and development of spiritual and physical strength. In recent decades, the study of tourism and recreational potential has become of great importance, as this indicator is the basis for the development of the tourism industry. In many countries, tourism has become an integral part of a country's economy, sustainable development (Wendt, 2020; Wendt & Bógdał-Brzezińska, 2024; Berdenov et al., 2024; Brzezińska-Wójcik & Skowronek, 2024; Stojanović et al., 2024). Therefore, scientific research aimed at studying the natural, recreational, tourist potential of a certain territory has become relevant and in demand (Blij & Muller, 2010; Gushchina, 2012; Kicis & Vavilova, 2017).

The formulation of potential received scientific substantiation and began to be used for the assessment of resources and environmental conditions (Garifullina & Safin, 2020). Scientists have been working on the development of methods for assessing tourism and recreational potential since the 70s of the last the century. Despite the rather long period of time of studying methodologies and subsequent changes and transformations of this scientific direction, its theoretical and methodological problems are still poorly developed (Dunets et al., 2011; Teslenok et al., 2021).

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At the same time, the problems of tourism and recreational potential assessment are relevant for scientists (Mamraeva & Tashenova, 2020; Ribeiro & Vareiro, 2012; Baasannamjii et al., 2015; Avila-Robinson & Wakabayashi, 2018; Canteiro et al., 2018; Cutler & Carmichael, 2018; Doran & Hanss, 2019). In this regard, the development and further improvement of the methodology for assessing the tourist and recreational potential of regional territories are still in demand and of great scientific importance. Currently, there are quite a large number of methodologies for assessing the tourism and recreational potential of territories of different levels (Afanasyev, 2016; Dirin et al., 2017; Mahmudov et al., 2020; Surzhikov & Kravchenko, 2022). In addition, to assess the tourist and recreational potential of the territory and visualise the obtained results, spatial analysis of tourist flows, objects of tourist interest, it is necessary to widely involve the capabilities of new information technologies (Dmitriyev et al., 2020; Moskaeva & Teslenok, 2020; Ryzhakova & Folomejkina, 2022). Geographic information system technologies play a particularly important role in these processes (Dirin et al., 2017). Geographic information systems are the basis of modern methodology and techniques aimed at identifying and assessing the state and prospects of the spatial organisation of the tourism industry (Grudtsyn et al., 2024; Zeng et al., 2025).

Despite the diversity of studies and approaches in the study of tourism resources for practical use, researchers combine them into the tourism-resource potential of the territory under study. Tourism and recreational potential of a territory or region is a set of tourist resources and conditions: natural, historical, cultural and socio-economic, including tourist infrastructure. Their condition and perspective variants of their territorial combinations determine the potential and opportunities for the development of certain types of tourism in the territory. They can be used to meet the needs in recreation and leisure of both tourists coming to the region and the local population. At the same time, tourism and recreation potential has a social nature, represented by the human factor. Its main purpose is the development of physical and spiritual development of man. National programmes are aimed at spiritual and physical improvement, for example, the strategy 'Cultural Heritage', which are manifested also in the development of tourism potential and tourism activities. Of particular interest is the authenticity of a country as well as of a particular region (Bancerova et al., 2018; Ismagulova et al., 2020; Wendt, 2020; Ilies et al., 2022). The territory of any region is a unique system represented by unique natural and cultural and historical objects. This is of interest for the study of tourism and recreational potential and can serve as a basis for the development of the tourism industry and economy of the region. Systematic targeted study of natural and recreational potential will help to identify existing problems, preserve the uniqueness and sustainable development of the territory (Hardy & Pearson, 2016; Asmelash & Kumar, 2019; Fomin et al., 2020; Dmitriyev et al., 2021; Berdenov et al., 2024). It is necessary not only to assess and systematise the objects and resources of natural and recreational potential, but also spatial zoning, which is an important part for the development of tourist routes and for the tourism industry in the study area (Nazarova et al., 2019; Dmitriyev et al., 2021; Aliyeva, 2023).

Planning and management of tourism and recreation in the territories of regions cannot be carried out without assessing the tourist and recreational potential of the territory and taking into account the results obtained in this process (Agakishieva & Ismayilova, 2024). For this reason, the territory of a region should be considered as a basis for assessing the prerequisites and prospects of tourism development in it (Dirin et al., 2017; Kicis & Vavilova, 2017; Zhulina et al., 2019; Mahmudov et al., 2020; Surzhikov & Kravchenko, 2022). The assessment of tourism and recreational potential of any territory is an important stage for the subsequent optimisation of the spatial and economic organisation of the region, for determining the significance of individual recreational resources and conditions. In addition, it is necessary for rational and optimal use of tourism and recreational resources and sustainable development of the territory of the region as a whole (Muresan et al., 2016; Pasieka et al., 2021; Grishutkin & Schuryakov, 2023; Topchiyiv et al., 2023; Chau, 2024; Saparov et al., 2024).
Thus, the purpose of the study is to create and approve the methodology for assessing the tourism and recreational potential of the components of the natural block, on the example of the Republic of Mordovia and North-Kazakhstan region (Figure 1).

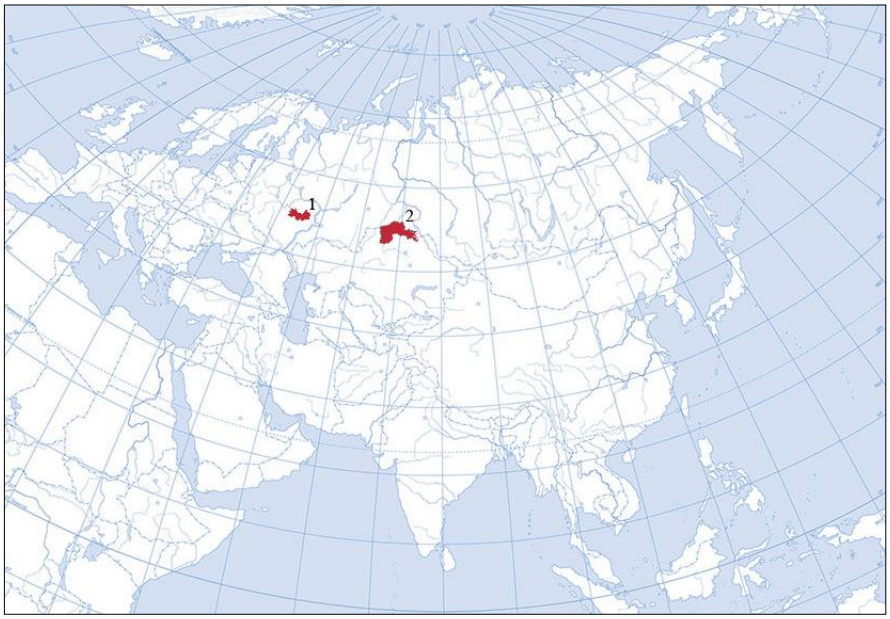

Figure 1. Map of the geographical location of Mordovia and North Kazakhstan region (Source: developed by the authors)

MATERIALS AND METHODS

As it was noted, there is no unified approach for assessing tourism and recreational potential (Sergeeva & Omirzakova, 2020; Minenkova & Potapova, 2021; Tsestsiv, 2021; Kerimbay et al., 2024; Saparov et al., 2024; Omirzakova et al., 2024). Based on the analysis of scientific material and available estimation techniques, the author's methodology was developed. This methodology is based on the study of the available diversity of objects and conditions of different categories that characterise the studied territories. As a result, it is proposed to carry out the assessment according to the criteria, which were united in three blocks: natural, cultural-historic and socio-economic. As noted, the article evaluates the components of the natural block of the studied territories for the possibilities of their use in the tourism industry. The following components are included in the natural block: relief, water, climatic resources, resources of fauna and flora, presence of specially protected natural territories, as well as structures included in the concept and composition of the listed components. The proposed methodology for assessing the natural resource potential of the territory is based on a four-point scale Table 1.

Table 1. Natural resource valuation systems (Source: developed by the authors)

Qualitative assessment	Score
Unfavourable (U)	0
Relatively favourable (RF)	1
Favourable (F)	2
Most favourable (MF)	3

The developed assessment system was proposed for assessment of the territories of the districts of the Republic of Mordovia and the territory of the North Kazakhstan region as one of the administrative parts of the Republic of Kazakhstan. For convenience, the concept of administrative unit is used. It combines the structures of administrative-territorial division of Mordovia, where the concept of municipal district and North Kazakhstan region - administrative district is accepted. The choice of analysis of these territories is not accidental, determined by the author's team, which has many years of scientific ties. The geographical location of the studied territories is characterised by similar latitude coordinates. The regions are close in several physical and geographical characteristics: they have a flat relief, continental climate, a large number of lakes, floristic and faunistic diversity.

The unifying factor is also the presence of forest and steppe zones. The flatness of these territories determines the free movement of air masses, wind activity.One of the main factors in the development of health and recreational tourism is relief. Contrast of changes in the forms of relief of the territory is determined based on the degree of its dissection, according to the indicators of relative height (Table 2).

Table 2. Stages of relief dissection (Source: developed by the authors)

Relative height, metres	Stage
Less than 10	1
10 – 20	2
20 – 50	3
50 – 100	4
100 and more	5

In addition, the values of a number of indicators were used to assess the block under study, for example:

- Lakeiness of the territory or the share of the area of all lakes from the total area of the territory in percent;
- Forest cover or the share of forest area from the total area of the territory in percent;
- The area of specially protected territories from the total area of the studied territory.

The results of field research and analyses of available scientific materials were used in the work. Comparative-geographical and historical and geographical methods were applied in analysing the results of the research. The method of mapping allowed visualising the components of the natural-resource potential included in the natural block. The listed research methods allowed to identify and assess the tourist and recreational potential by the presence of objects and resources included in the natural block. The sequence of methods used has the following structure: 1. analysis of available scientific and cartographic materials; 2. development of an author's assessment methodology using a four-point scale; 3. assessment of the tourist and recreational potential of the compared administrative territories in points; 4. comparative analysis of the results obtained. Thus, an attempt has been made to create a universal methodology for assessing the tourist and recreational potential of the territory, with the possibility of further modification and use for the territories of different regions. The current state of the components of the natural block of the studied territories was assessed and analysed, and the possibilities of using the structures included in them for the development of the tourism industry were revealed. In our opinion, this will serve as an additional basis for the creation of a unified methodology for assessing the tourist and recreational potential. The methodology reflects the opportunities, prospects and problems of its application, which is an important stage for the assessment and development of the tourism industry in the regions.

RESULTS AND DISCUSSION

The assessment of tourism and recreational resources is based on indicators expressed in points. The indicators of the components of the natural block of the studied territories contribute to the development of various types of tourism.

These are balneological, ecological, recreational, sports and recreational, fishing, hunting and other types. To assess the natural block, the results of the assessment of water resources, animal and plant resources, the presence of specially protected natural areas, the peculiarities of climatic conditions, relief and others were used (Kabiyev et al., 2018; Fomin et al., 2020; Azbantayeva et al., 2022; Aliyeva et al., 2024; Franceschinis et al., 2022).

The natural resource potential of the studied territories is of interest for the development of the tourism industry at the interregional and international levels (Ismagulova et al., 2020; Bógdał-Brzezińska & Wendt, 2021; Mikhaylova et al., 2022). The geographical position and relief features serve as a basis for the development of transport routes. This is one of the factors that make it possible to form tourist routes. Mordovia is located on a flat territory. Its central and eastern parts are located on the Volga Upland, the western part lies on the Ox-Don Plain. The average altitude of the surface is about 100 metres above sea level. The most part of the North Kazakhstan Region is located on the West Siberian plain, the surface elevations do not exceed 200 metres above sea level (Figure 2).

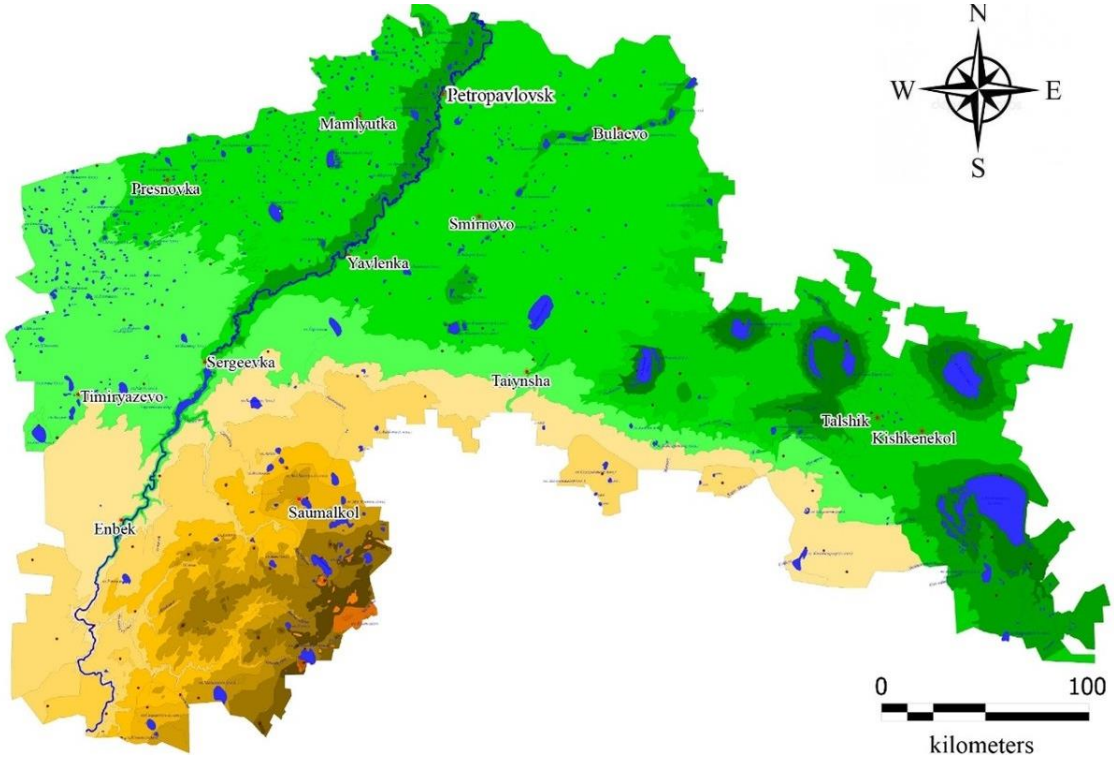

Figure 2. Physical map of North Kazakhstan region (Source: developed by the authors)

The territory is characterised by a weak degree of dissection and undulation. A small part of the study area, which belongs to the northern slopes of the Kokshetau Upland, is located at an elevation above 200 metres above sea level. High hills are rare and are represented by the Syrymbet Mountains. Orlinaya is the northernmost island mountain of the lower tier of relief of the North-Kazakhstan region, its height is 372 metres above sea level. In general, the relief within the entire territory of the Republic of Mordovia (RM) and North Kazakhstan region (NKR) is flat. On this basis, only the first five stages of relative height, which are the most typical for the prevailing flat relief, are presented. Qualitative and point estimation of contrast of different types of plain relief (taking into account the degree of its dissection) is presented in Table 3.

Table 3. Qualitative and point estimation of relief contrast (Source: authors' elaboration)

Relief type	Stages of relief dissection										In total	
	1		2		3		4		5			
	NKR	RM	NKR	RM	NKR	RM	NKR	RM	NKR	RM	NKR	RM
Plain, dissected, elevated	0	2	0	1	1	0	2	0	3	0	6	3
Plain, dissected, low-lying	0	2	0	1	1	0	2	0	3	0	6	3
Plain, slightly dissected, elevated	1	3	0	2	1	1	3	0	3	0	8	6
Plain, slightly dissected, low-lying	0	3	0	2	1	1	3	1	2	0	6	7
Total	1	10	0	6	4	2	10	1	11	0	26	19

The analysis of the relief contrast assessment allowed to compare the studied territories. Considering five stages of relief dissection from 0 to 3 points, four predominant types of relief were obtained. For the Republic of Mordovia, the index was 19, and for the relief of the territory of the North Kazakhstan region - 26, which allows first of all to speak about weak relief dissection and about prevailing heights of flat territories, and in general is a favourable assessment of this component of the natural block. At the same time, the predominantly flat relief of the territories favoured the active

economic development of lands and cultivation of agricultural crops. Plain areas lying at an altitude of about 100-200 metres above sea level are the most favourable for the development of health tourism. Consequently, they can be recommended for tourists who prefer a relaxing holiday and the calming value of the plains. In addition, the high level of agriculture makes it possible to develop rural and gastronomic tourism in the region (Wendt et al., 2021; Kerimbay et al., 2024).

Climatic conditions of the territory for tourism and recreation are the category that determines comfort. The climate of the territory of Mordovia is moderately continental. The average temperature in January is -11°C, in July +19°C. The average annual temperature is about +4.1°C. The average amount of precipitation is 450-500 mm, with the bulk of precipitation falling in the warm season. Unfavourable climatic phenomena include droughts, dry winds and soil freezing.

The specifity of inland position in the zone of temperate latitudes of the Eurasia continent causes climatic conditions of the North Kazakhstan region associated with the prevalence of temperate air masses. Average annual wind speed is 4-5 m/sec, with maximum values of 15 m/sec in April and May and the lowest 3.6-4.3 m/sec in August***.

The average annual precipitation is 317 mm, although in some years precipitation may reach extreme maximum or minimum values. Special atmospheric phenomena of the region are fogs, thunderstorms, dust storms, ice and others. Arctic and tropical air masses also take part in climate formation. The region is characterised by a sharply continental climate, which is expressed in sharp amplitudes of summer and winter temperatures and insufficient moisture.

The average long-term temperature in January is -18.6°C, in July +19.0°C, the average annual temperature is +0.8°C. Winters are quite cold and long, while summers are warm and short. November-January is characterised by maximum cloudiness, with cloudy conditions accounting for about 70%.

At the same time, sunshine per year is about 2000 hours. For comparison, the territories of the Russian Plain at the same latitudes receive less solar radiation than the North Kazakhstan region. Despite the differences in indicators characterising the area and length of the two territories, climatic conditions of the presented administrative units can be characterised as homogeneous, relatively favourable, with relatively similar indicators.

Accordingly, these indicators in the process of assessing the tourism and recreational potential of administrative districts can be excluded from the final assessment. Climatic features determine the opportunities for the development of certain and seasonal types of tourism. Good warming, long daylight hours and the smallest number of cloudy days in the summer period, makes the territory attractive for the development of recreational, ecological, health and wellness and other types of tourism. A good warming of the territory in summer with a high position of the Sun provides favourable conditions for the development of agricultural and gastronomic tourism (Dmitriyev et al., 2023b).

To evaluate and organize tourist activities in the study area, it is important to take into account the presence of surface waters, expressed in the number of reservoirs. The water resources of the districts were estimated by the presence, first of all, of lakes. The lake area indicator is important, which is the proportion of the lake area from the total area of the studied territory. Lakes are places for swimming, fishing, outdoor activities, and more. The possibility of organizing beach and bathing holidays is influenced by many indicators of water bodies and adjacent territories. Lakes, as well as rivers, characterize the possibilities of recreation and tourism. Based on this, it was revealed that Mordovia and the North Kazakhstan region are distinguished by the presence of a large amount of surface water. Two major waterways flow through the territory of Mordovia, these are the Sura and Moksha rivers, which have many tributaries. The North Kazakhstan region is represented by the Yesil River (Ishim), which is the main waterway. Yesil, this is the longest second-order tributary in the world. Both territories are characterized by many rivers and temporary water courses. All rivers have a relatively calm and slow current of about 0.1-0.5 m/s. The number of lakes in Mordovia is about 500, of which 80 are large lakes with a total area of 9 km^2. The North Kazakhstan region has 2,328 lakes (with an area of more than 0.1 km^2). The lake area of the region is 4.6%, which is the highest in Kazakhstan, but despite the large number of lakes in the region, about 80% of them are subject to the process of eutrophication (Nazarova et al., 2021; Dmitriyev et al., 2024b; Dmitriyev et al., 2024b). The lake area of Mordovia is about 1.0%. Nevertheless, among the lakes of the studied territories there are quite large lakes of recreational interest. In addition, the resources of eutrophized lakes can be used as a balneological resource in medical and wellness tourism (Dmitriyev et al., 2023a).

When assessing water resources, it is important to take into account that many reservoirs are located in places that have high landscape attractiveness. The tourist and recreational attractiveness of the region will be higher if there are mineral springs or salt lakes on its territory, which are known for their healing properties (Dmitriyev et al., 2022). The wetlands of the territory and coastal areas also affect the tourist and recreational attractiveness. A high degree of swamp distribution can be considered as an unfavorable factor for the development of recreation and tourism. This is typical for the valleys of the Moksha and Sura rivers, as well as the western part of Mordovia. At the same time, the use of marshes in some cases has a recreational value. In the North Kazakhstan region, there is a natural monument sphagnum swamp "Ryam", which is a relic of the glacial era. It is used as an object for ecological and educational tourism. In Mordovia, a number of marshes also have the status of specially protected areas. In addition, a type of active tourism has appeared in the modern tourism industry – wading. It is gaining popularity among fans of extreme outdoor activities.

The next component that determines the features of the natural landscape are forests. Forests have a beneficial effect on the human body, therefore, in order to organize tourism and recreation, it is important to know the degree of forested area, that is, the ratio of the area covered by forests to the total area of the region (Teslenok et al., 2021; Ozgeldinova et al., 2024). As already noted, the studied territories are characterized by an uneven distribution of forests and relatively high forest cover. For Mordovia, this figure is about 25%, and for the North Kazakhstan region about 8%. Despite the

difference, the majority of forests in the North Kazakhstan region have a pronounced concentration and fall on the northern part of the region. This increases the forest cover in the administrative districts located in this part of the territory.

The diversity of landscapes, the presence of forest and forest-steppe zones, has led to a rich species diversity of fauna and flora of the territories. This factor has determined the creation of specially protected natural areas.

Among other natural zones and subzones, forest and forest-steppe landscapes have a high degree of attractiveness for tourists and recreationists, characterized by the maximum species diversity of berries, medicinal plants, mushrooms, hunting animals and commercial fish (Kustov et al., 2023). Specially protected natural areas also largely determine the tourist and recreational attractiveness of a particular territory (Moskayeva et al., 2020; Teslenok et al., 2021; Kuzina et al., 2022; Ryzhakova & Folomejkina, 2022). Specially protected natural areas are divided into categories: state nature reserves, including biosphere reserves; national parks; natural parks; state nature reserves; natural monuments; arboretum parks and botanical gardens; health-improving areas and resorts (Dmitriyev et al., 2020).

To assess the potential of specially protected natural areas, such indicators as their number and the proportion of their area to the total area of the region were used (Vlasova & Teslenok, 2016; Ryzhakova & Folomejkina, 2022). On the territory of Mordovia, specially protected natural areas are represented by national and regional levels (Figure 3).

Their total number is 109. There are two national parks, «Smolny» National Park and Mordovian State Nature Reserve named after P.G. Smidovich. There are 5 regional reserves: Ardatov Integrated State Reserve, «Lesnoy» State Integrated Hunting Reserve, «Zalesny» State Hunting Reserve, Krasnoslobodsk Integrated State Reserve, Chamza State Hunting Reserve. The rest of the predominant part of specially protected natural territories is represented by nature monuments of regional importance, there are 101*. The total area of specially protected natural territories is 763.44 km^2, which is 2.9% of the area of the republic.

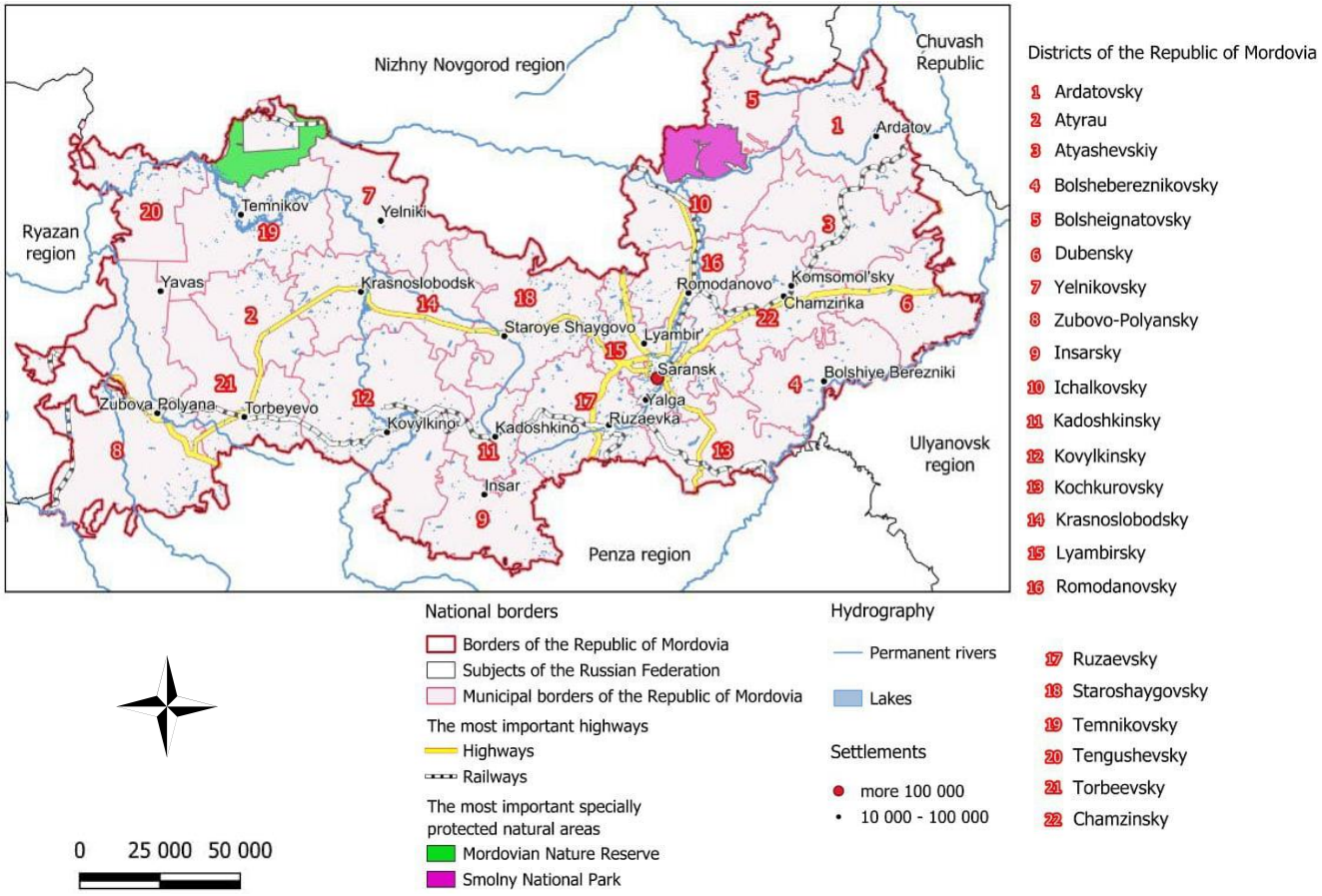

Figure 3. Water bodies, specially protected natural territories, transport routes of the Republic of Mordovia (Source: Developed by the authors)

The total number of specially protected natural territories of the North Kazakhstan region is 18. The region includes the Kokshetau National Park, four state reserves of Sogrovsky, Mamlyutsky, Smirnovsky, Orlinogorsky, two reserves of regional significance - Akzhansky and Aksuatsky (Figure 4). The rest have the status of a natural monument. The total area of specially protected natural areas is about 1306 km^2, which is 1.33% of the total area of the region**.

Specially protected natural territories of the regions are characterized by a variety of animals and plants. Flora and fauna play a very significant role in the organization and development of tourist and recreational activities. To assess the potential of vegetation and wildlife, one can use indicators characterizing the biological resources of the territory of the districts: the degree of diversity of mushrooms and berries; the degree of species diversity of medicinal plants; species diversity of hunting animals and birds; species diversity of commercial fish; forest cover of the territory (Kustov et al., 2023).

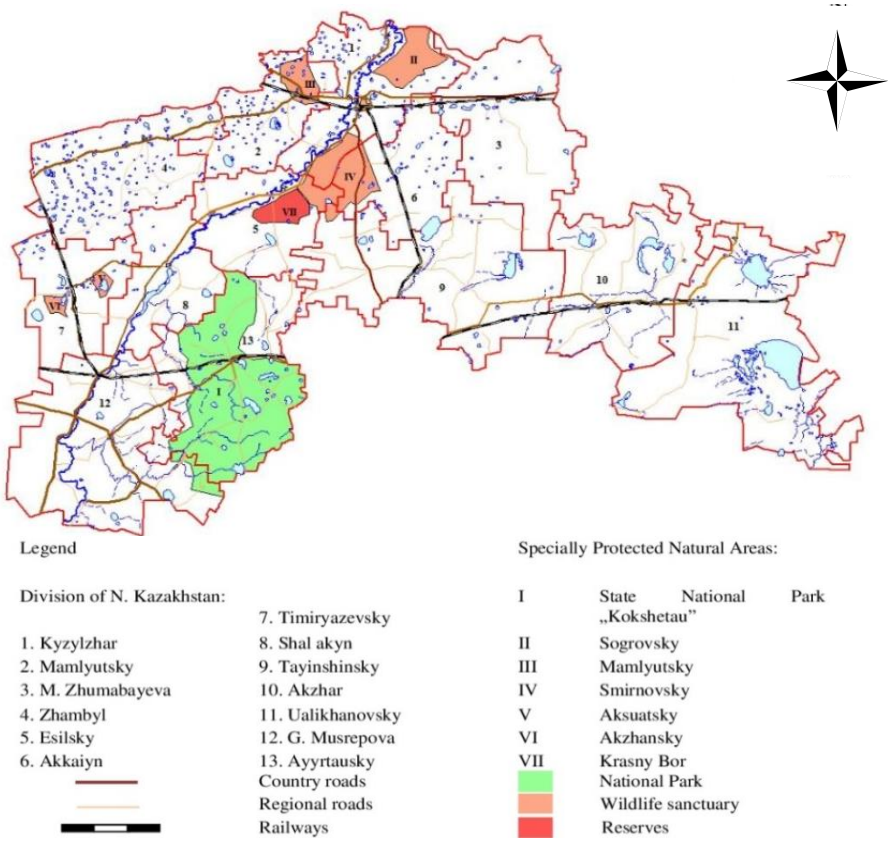

Figure 4. Water bodies, specially protected natural territories, transport routes of the North Kazakhstan Region (Source: Dmitriyev et al., 2021)

Despite the economic development of the territory of Mordovia, there is a wide variety of plant and animal species. The high forest cover of the republic contributes to the diversity of mushrooms and berries. More than a thousand plant species have been identified, of which about 150 are medicinal, and 13 are endangered. There are 247 species of birds, 73 species of mammals, 11 species of amphibians, 7 reptiles, and about 40 species of fish. There are about 20 species of rare and endangered birds and animals, as well as 47 small species*. The flora of the North Kazakhstan region is also diverse, with about 758 species, including 65 species of medicinal plants. Deciduous and mixed forests determine the presence of a variety of mushrooms and berries. An analysis of the research revealed that about 260 species of vertebrates live in the region. Of these, 36 species of mammals, 210 species of birds, 3 species of reptiles, 5 species of amphibians, and more than 30 species of fish. The territory is characterized by many species of birds arriving at nesting grounds, passing birds, entering animals and stray birds (Vilkov, 2010; Zuban et al., 2020). There are permanently living species in the studied territories, for example, moose, roe deer, badger, fox, partridge, house sparrow and dozens of others. This can actively influence the development of ecological, hunting, fishing, ornithological tourism and other areas (Akbar et al., 2020; Liu et al., 2021).

Thus, the analyzed administrative units are characterized by the presence of a number of categories of specially protected natural territories, combining a large number of species of animals and plants. Their presence and diversity highlight the level of environmental protection activities. This is of great importance for tourism activities and is aimed at developing various types of tourism. A system of qualitative and point-based assessment was used to assess the components of the tourist and recreational potential of the studied territories included in the natural block (Table 4).

Table 4. The system of qualitative and point evaluation of the components of the natural block (Source: Developed by the authors)

Evaluation		Evaluation indicators						
Quali-tative	score	Forested area, %	Lake area of the territory, %	Relief contrast	Number of types of berries, medicinal plants, mushrooms, units	Number of commercial species of animals and fish, units	Number of specially protected natural territories, units	The specific weight of the specially protected natural territories in the total area of the district, in %
U	0	less than 5	less than 1	less than 5	less than 5	less than 2	less than 5	less than 2
RF	1	5-10	1-2	5-10	5-10	2-5	5-10	2-5
F	2	10-20	2-5	10-20	10-20	510	10-20	5-10
UF	3	more than 20	more than 5	more than 20	more than 20	more than 10	more than 20	more than 10

Using the developed system, we evaluated a number of indicators of the components of the potential of the studied territories included in the natural block. The assessment of woodlands, lakes, relief, species diversity of flora and fauna, and specially protected natural areas is given. The final comparative assessment of the tourist and recreational potential of the studied components of the territories of the Republic of Mordovia and the North Kazakhstan region is presented in the Table 5.

Table 5. Comparative assessment of the tourism and resource potential of the natural block of the studied territories (Source: developed by the authors)

Comparable territories	Evaluation indicators														Total score
	Forested area, %		Lake area of the territory, %		Relief contrast		Number of types of berries, medicinal plants, mush-rooms, units		Number of commercial species of animals and fish, units		Number of specially protected natural territories, units		The specific weight of the specially protected natural territories in the total area of the district, in %		
	value	score	value	score	value	score	value	score	value	score	value	score	value	score	
Republic of Mordovia	25	3	1.0	1	19	2	>70	3	>40	3	109	3	2.9	2	17
North Kazakhstan region	8	1	4.6	2	26	3	>70	3	>40	3	18	2	1.33	1	15

The assessment of the tourist and recreational potential of the compared administrative territories was determined in points. It was 17 points for the Republic of Mordovia, and 15 points for the North Kazakhstan region. Analyzing the individual components of the natural block, there is a slight difference, which is primarily related to the peculiarities of the physical and geographical location of the regions. It was revealed that the territory of Mordovia, in comparison with the territory of the North Kazakhstan region, has a relatively high score for a number of components.

In terms of forest cover, the number and area of specially protected natural areas. At the same time, the North Kazakhstan region has a high score of lacustrine and weak relief division. But there is no critical difference in the total score of the natural block, which perhaps suggests a fairly high level of potential for both territories. On a qualitative level, the tourism and recreational potential of the natural block can be assessed as favorable for the development of the tourism industry. Thus, a methodology for assessing the potential of natural block resources used in tourism and recreational activities is proposed. It is the sum of the following indicators: relief, climatic conditions, water resources, flora and fauna, and specially protected natural areas. Based on the data analysis, a qualitative and point assessment of the natural resource potential of the territories of the Republic of Mordovia and the North Kazakhstan region was obtained. The final score of the assessment of the studied territories does not have a high difference, it is defined as favorable. The methodology used made it possible to assess the tourist and recreational potential of the natural block, which is a prerequisite for the possibility of developing and managing the tourism industry.

CONCLUSION

Tourism is an actively developing industry, therefore its development is an important part for the economy of any country or individual region. For the formation of a tourist cluster, it becomes important to study and evaluate the tourist and recreational potential of the region. The presented methodology for assessing the tourist and recreational potential of the components of the natural block was developed based on an analysis of existing methods. The natural block for assessing the potential of territories includes: the availability of water, plant and animal resources, the specifics of the relief, the development of a network of specially protected natural areas. The methodology has shown effectiveness in assessing territories of various types of territorial and administrative divisions. The methodology is highly adaptive and, if necessary, can be modified by changing the evaluation criteria, supplementing, reducing or replacing them.

In practical terms, the assessment of territories serves as the basis for optimizing the territorial organization of tourist and recreational systems, for improving activities in the field of recreation and tourism. At the same time, this is an important aspect for developing an effective regional tourism policy, considering the sustainable development of territories, the preservation of the natural environment, as well as cultural and historical heritage. In addition, the definition and assessment of the tourist and recreational potential allows us to identify ways to increase the importance of the incoming components in order to increase domestic and inbound tourist flows. When developing the assessment methodology, the regional natural features of the Republic of Mordovia and the North Kazakhstan region, which do not have well-known and popular tourist sites and routes, were considered. The obtained results of the assessment of the tourist and recreational potential of the components of the natural block of the compared regions show a fairly high level. This is of particular importance for the formation and development of the tourism industry.

The proposed methodology, according to the authors, can be used to assess the tourist and recreational potential not only for the studied territories, but also for regions characterized by similar conditions for the development of tourist and recreational activities. First of all, this concerns territories with the possible development of cross-border, cross-border and international tourism. For example, in the context of the creation and operation of the interregional tourist and recreational cluster "Sarov - Temnikov – Sanaksyr" in Mordovia and the neighboring Nizhny Novgorod region. Or, for example, for the development of tourist routes in the North Kazakhstan region and the Kurgan, Tyumen, and Omsk regions bordering it.

The methodology presented by us for assessing the tourist and recreational potential does not pretend to be complete and exclusive. There are still many unresolved problems and issues of a theoretical and methodological nature that require appropriate additional study. All this highlights the interest for further improvement and practical use of this methodology in assessing the tourist and recreational potential of territories.

Author Contributions: Conceptualization, P.D. and S.T.; methodology, P.D., V.K. and S.T.; software, I.S. and I.F.; validation, S.I. and M.K.; formal analysis, P.D. and S.T.; investigation, P.D. and S.I.; data curation, P.D. and S.T. and

S.I. and I. F.; writing - original draft preparation, P.D. and S.T. and S.I. and I.F.; writing - review and editing, P.D. and S.T. and S.I. and I.F. and V.K.; visualization, P.D. and S.T. and I.S. and I.F.; supervision, P.D. and S.T. and S.I. and I.F. and V.K.; project administration, P.D. and S.T. and S.I. and I.F. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 22.03.2025 Revised: 27.06.2025 Accepted: 16.07.2025 Available online: 06.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1582-1593
DOI 10.30892/gtg.61317-1527

THE IMPACT AND DYNAMICS OF SOCIAL FACTORS ON THE DEVELOPMENT OF HIGHER EDUCATION AND LABOR MARKET INTEGRATION IN KOSOVO

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Citation: Lajçi, D., & Kuqi, B. (2025). The impact and dynamics of social factors on the development of higher education and labor market integration in Kosovo. *Geojournal of Tourism and Geosites*, 61(3), 1582–1593. https://doi.org/10.30892/gtg.61317-1527

Abstract: Education is considered as one of the key areas that directly affect the economic development of a country, as an adequate education system prepares the human capital that meets the needs of the labor market. As of now, when the process of globalization has taken a big leap forward, there is a requirement to have skilled, competent staff in the labor market. The needs of the labor market can only be answered by an adequate and contemporary education system. This paper will elaborate on the relationship between the education system and the labor market, with particular emphasis on the role of education in fulfilling the needs of the labor market, especially from the perspective of Kosovo. How much does Kosovo's education meet the labor market needs, not only in Kosovo, but also beyond. What are the areas in which Kosovo's education system needs to be improved in order to provide skilled employees to the labor market? The methodology used in this study involves conducting structured interviews with two main groups: employers and employees. The interviews were carried out with representatives from various sectors, both private and public, as well as from family businesses and non-profit organizations. The research was conducted in Kosovo, with a particular focus on the Dukagjini region. The main objective of this study is to analyze the phenomenon of early school leaving, the compatibility of qualifications with job positions and the challenges related to unemployment. It will also examine the impact of education and employment policies in addressing these issues, emphasizing the role of education and skills development in increasing employment opportunities. The research aims to provide recommendations for improving the connection between the education system and the needs of the labor market in Kosovo. The findings of this study are expected to shed light on the gaps between the current education system and labor market demands. By identifying these gaps, policymakers and educational institutions can work together to align curricula with market needs. Moreover, fostering partnerships between schools and employers could play a crucial role in bridging this divide. Enhancing vocational training and practical learning opportunities will be key in equipping students with job-ready skills. Ultimately, the study aims to contribute to sustainable economic growth by promoting a more responsive and inclusive education system.

Keywords: education ,economic development, education perspective, human capital, labor market

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INTRODUCTION

Education is considered one of the key areas that directly affects the economic and social development of a country, because thanks to proper education, human capital is prepared to meet the needs of the labor market. When we are talking about human capital, according to Barro (2001), this element consists of health, education and other social aspects. Barro (2001) further explains that human capital is described as a determinant of economic growth only because it includes the very important element of education. The importance of human capital is also emphasized by Ozturk (2001), saying that no country can have sustainable economic growth without continuous investment in human capital. Similar to the views of Barro (2001) and Ozturk (2001) we find a lot in the literature. Many authors who have studied human capital closely link it with education and economic development. Teles & Andrade (2008) emphasize that it is precisely investment in human capital that makes the difference in economic growth between countries. Li & Liang (2010) in their paper mention the great impact of education as an essential part of human capital in the rapid economic development of East Asia, while Azam & Ahmed (2015) reaffirm the irreplaceable role of human capital development in economic growth. From what was said above, we can conclude that at this time, when the globalization process has gained momentum, the demand for skilled, professional and competent personnel in the labor market is imposed and that only a relevant and contemporary education system can respond to the needs of the labor market.

This paper elaborates on the connection that the education system has with the labor market, with special emphasis on discussing the role of education in meeting the needs of the labor market, especially from the perspective of Kosovo and the Western Balkan countries. The Western Balkans during the 1990s faced numerous conflicts that caused significant damage in almost all areas of life, including the education system. The consequences of the damage to education have followed the Western Balkan countries even after the conflicts, which has prevented this field from

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serving the country's development as best as possible. When we talk about Kosovo, education in this country over the last three decades has also faced many challenges. The period of parallel education in the 1990s, the post-war period under UNMIK administration, and the period after Kosovo's declaration of independence represent three stages that have required many reforms and transformations. To what extent have these reforms and transformations in education succeeded in meeting the needs of the labor market in Kosovo? What are the areas in which Kosovo's education needs to advance in order to provide the labor market with prepared personnel? How does Kosovo's education compare to the countries of the Western Balkans when it comes to meeting the needs of the labor market? Reports and publications related to this issue show that the education system in Kosovo and other Western Balkan countries need to take new steps and reforms in order to prepare more professional personnel to meet the needs of the labor market.

The paper is organized as follows: After the introductory part, the literature review is presented, after the literature review, the period of education in Kosovo will be discussed, separately the period of education after Independence will be discussed with a focus on the objectives to meet the needs of the labor market, and finally, conclusions will be given.

LITERATURE REVIEW

As highlighted above, the role of education in meeting the needs of the labor market is an ever-present and very attractive topic for researchers around the world. It was stated above that Barro (2001) sees education as an essential element in human capital due to the fact that human capital is a determinant of economic growth. Effective sustainable development requires clear policies and principles, including sustainable resource use, diversity preservation, strategic planning, local community involvement, stakeholder engagement, and responsible marketing in the industry (Ziari & Mosleh, 2025). Furia et al. (2010) emphasize that education and professional skills acquired throughout life are undoubtedly key factors in achieving satisfactory results in creating a labor market suitable for economic development. The promotion of specific types of territorial attractiveness may prove to be a crucial element in the context of sustainable development planning, programming and project formulation, particularly in rural areas that are currently facing challenges in establishing viable economic activities and social innovation (Happ & Nemes, 2025).

According to Hanushek & Woessmann (2010), there are three mechanisms that make education a determining factor in economic development and one of them is "human capital development". The aforementioned authors emphasize that human capital development increases the labor market and at the same time increases the productivity of the labor force. But the question is which dimensions of education directly affect human capital development? Authors who have studied the relationship between education and the labor market have highlighted the level of education (Khorasgani, 2008), the quality of education (Hanushek & Woessmann 2010) and the education system (Furia et al., 2010) as elements that make the difference. When talking about education and the labor market, importance is also given in the literature to "mismatch".

"Mismatch" represents the case when the labor market and individuals receive wrong "signals" regarding the need for work/employment (Furia et al., 2010). According to Furia et al. (2010) mismatch creates three different situations in the labor market: - overqualification, - underqualification, - migration, and especially with the latter we are now being challenged in Kosovo. The part of the "mismatch" in education and the labor market is a very broad topic, which can be elaborated in other works, while in this paper it will only be mentioned as an important factor in the connection between education and the labor market, while the other elements mentioned above will be elaborated in more detail. Khorasgani (2008) has studied the role of higher education in the economic development of Iran for the years 1959-2000. The author mentions higher education as an extremely important pillar of the country's development, as it prepares the new generations to face the challenges of sustainable development. Socio-economic development policies for ethnic minority areas are measures, programs, and plans implemented by the government to promote economic growth and improve social conditions in ethnic minority areas (Tuan et al., 2024). Strengthening social capital helps improve lives and increase the ability to escape poverty sustainably for ethnic minority communities in rural areas (Pham & Mukhopadhaya, 2022).

Khorasgani (2008) has used the model of Lin (2004), a production function as a function of labor, physical capital and human capital. From the paper we can also see that the author gives importance to the level of education. Khorasgani (2008) emphasizes that one of the reasons that has made the connection between higher education and economic development is that it is precisely higher education that prepares human capital to meet the needs of the labor market. According to the authors, the factors affecting the organization of knowledge training for civil servants include training programs and materials; Lecturers participating in teaching; Students' perception of knowledge improvement; The coordination between relevant agencies in the organization of knowledge training; Infrastructure and information technology applications (Hai et al., 2023). Hanushek & Woessmann (2010) give essential importance to the quality of education. The starting point of their study is the fact that a school year does not produce the same results in each country. The authors emphasize that health, environment, family and teachers also greatly affect these results.

Furthermore, Hanushek & Woessmann (2010) argue that the elements of the quality of education mentioned should not be ignored, because without these elements there cannot be a true picture of the connection between education and economic development. These authors emphasize that economic development directly depends on the skills of workers and that "what people know is of great importance". The authors Hanushek & Woessmann (2010) have concluded that the quality of education has strengthened the effects of economic development. Furia et al. (2010) elaborates on the education system as a very important factor in economic development and meeting the needs of the labor market. As mentioned above, the authors also give importance to the training part as a prerequisite for a good labor market.

The study by Furia et al. (2010) brings into focus the connection between the education system and the labor market in the 27 countries of the European Union. After the tests carried out, the authors have concluded that in the European Union there is a mismatch between the education system and the labor market. According to Furia et al. (2010), countries that

apply higher education standards also have greater employment opportunities. The authors finally suggest that European Union countries should implement an education system similar to Finland, the Netherlands and the Czech Republic in order to meet the demands of the labor market. If we look at the literature related to education and the labor market for the Western Balkan countries, it turns out that many authors and institutions from these countries and the European Union have had a great interest in it. Many scientific papers, reports and various summaries have highlighted the importance of educational development as a key factor in meeting the needs of the labor market and economic development. Uvalic & Cvijanovic (2018) in their paper they emphasize that in the 1990s, the Western Balkan countries faced major cuts in government spending, which mostly affected the health and education sectors. Furthermore, these authors emphasize that this trend of major non-investment in education has continued even after the 1990s, making these countries unable to follow the trends of Europe and developed countries in the field of education and innovation. Uvalic, M., & Cvijanovic, V. (2018) have highlighted the importance of investments in human capital and have argued that the Western Balkan countries (Croatia is excluded) must necessarily prioritize investments in human capital. As a conclusion, these authors recommend that the governments of the Western Balkan countries draft "more efficient industrial policies", which would directly affect the economic development of their countries. Education is also a high-priority area, mentioned in the paper, due to its importance in job creation. Bartlett et al. (2016) under the support of the European Commission have presented a detailed report on the needs of the labor market in the Western Balkans and the impact of higher education on employment. The authors in question emphasize that in the Western Balkans it is much easier to find a job with a university degree than without it, even if you are over-qualified for the given position. It is also noted that in the Western Balkan countries many graduates have an uncertain entry into the labor market and even when they are employed they go a long way until they find a stable employer. On the other hand, the report highlights the dissatisfaction of employers with employees.

According to the statements of the employers presented in this report, it is emphasized that newly graduated workers are not sufficiently prepared for the workplace. The report states that only half of employers think that graduated workers bring more value to the company than workers without a degree. To conclude, Bartlett et al. (2016) emphasize that the Western Balkan countries need to make deep reforms in the higher education system in order to develop human capital, prepare it for the labor market so that there is greater economic development. These reforms, according to the authors in question, include improving study programs, not having facilities for enrollment in universities, developing internship programs so that students have practical knowledge in addition to theoretical knowledge, etc. Bartlett et al. (2016) encourage greater cooperation between educational institutions and businesses in order to harmonize labor market requirements. Another issue that should be reformed in higher education is the reprofiling of the seven public universities in Kosovo. Reprofiling of universities, in addition to having a positive impact on preparing the right staff for the labor market, would also have a positive effect on increasing quality. However, the responsible institutions do not yet seem to have the will to implement it.

The role of the state is to ensure an effective education system, where the skills and competencies acquired by new graduates are in line with demand (Velciu, 2017). Meanwhile, UNESCO defines quality assurance in higher education as a comprehensive term that refers to a continuous, uninterrupted process of assessing (monitoring, guaranteeing, maintaining and improving) the quality of the higher education system, institutions and study programmes (Vlasceanu, et al., 2007). According to the European Network of Quality Assurance Agencies in Higher Education (ENQA), the role of quality assurance is essential to support higher education systems and institutions to respond to these changing needs, ensuring that the qualification achieved by students and their experience during their studies remains the main and primary mission of the institutions (European Association for Quality Assurance in Higher Education, 2015).

The literature review section highlighted the key dimensions of education that affect the fulfillment of labor market needs. These dimensions (level of education, quality of education and education system) are studied in detail and it is precisely the reforms in these dimensions that fulfill the needs of the labor market in a country. Therefore, these reforms in these dimensions have also been recommended by reports for the Western Balkan countries as necessary for an efficient education system. In examining education in Kosovo, we will see that part of the education strategy in Kosovo and part of the reforms are precisely the aforementioned dimensions. One of the main characteristics of the labor market in the Western Balkans is the high long-term unemployment rates. According to Bartlett (2013), and although in 2000 there was a tendency for unemployment rates to decline; still unemployment rates in Kosovo alone remain very high compared to European Union countries. Structural changes in the Kosovo economy have not been accompanied by an adjustment in the skill structure of the workforce and a decline in the unemployment rate in Kosovo. Economic development was insufficient to compensate for job losses in the privatization process and due to the loss of markets for products and services.

This chain situation has led to the deepening of unemployment and poverty in Kosovo year after year. Unemployment and poverty are the biggest concerns of Kosovo citizens (UNDP, 2017).

METHODOLOGY

In this study, the access to education and training is defined in terms of participation and investments. Participation means that an individual has had the opportunity to experience an education or training opportunity. By linking access with participation, this approach allows for the fact that entrance into education can provide individuals with knowledge and skills - and the economic returns associated with them - even when they do not complete their educational/ training programme. Investments refer to expenditure on education, financial aid to students, funding of education. Labour market outcomes are assessed mainly using different employment/ unemployment rates, as well as elements of earnings. In this study, the access to education and training is defined in terms of participation and investments. Participation means that an individual has had the opportunity to experience an education or training opportunity. By linking access with participation, this approach allows for the fact that entrance into education can provide individuals with knowledge and skills - and the

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The research questionnaire developed consists of questions related to the perceptions of employees and employers about the mismatch between the skills of newly employed graduates and the requirements of the workplace. The survey contained a total of 10 questions, mainly closed with multiple choices, from which we have selected those that are of most interest to our research for the results. Data were collected during October, November and December 2024. The research was administered by the authors of the paper, in support of master's level students of the "Haxhi Zeka" University in Peja. Representatives of the enterprises were contacted in advance and after being informed of the purpose of the research and permission was obtained. 150 surveys were conducted directly with representatives of the enterprises as well as with young graduates employed in those enterprises. The selection of employees was done randomly. Each interviewer was previously informed with an instruction letter with necessary explanations of the questionnaire. This careful process aims to ensure that the research findings are reliable and provide a clear overview of the perceptions of different actors about the skills needs and preparation of young people for the labor market. According to theories developed by authors such as Baron et al. (2001) the mismatch between the skills of graduates and the demands of the labor market is a phenomenon that directly affects the quality of organizational performance and the increase in unemployment among young people. This is reflected in the need for an education that is more integrated with the reality of the industry and its demands.

Recent research has also shown that there is an urgent need for a closer connection between higher education and different sectors of industry. Culture mediates action between actors and integrates personality and social systems. Culture throughout the particular ability to be, at least, in part, a component of other systems. Thus, in the social system, culture is embodied in norms, values and in the personality system it becomes an internal part of the actor (Lajçi et al., 2022) to ensure that graduates have the practical skills required by employers. In this context, the questionnaire that was administered aims to analyze whether there is such a perception among employees and employers, as well as to provide valuable data for educational policies and the professional preparation of young people.

Breen (2005) analyzes the impact of social groups and social classes on employment opportunities. He emphasizes that individuals from lower social strata often face significant barriers in the labor market, including mismatches in skills and educational opportunities. Although there are some favorable laws in place to promote gender equality and processes have been formed to achieve gender parity in workplaces and decision-making bodies, Kosovo's institutions and society still face significant obstacles in attaining complete equality. The representation of female employees in governmental and private organizations in Kosovo remains disproportionate to the gender distribution of the population. Despite notable advancements in this domain, the representation of women in decision-making roles remains disproportionately low (Lajçi et al., 2024).

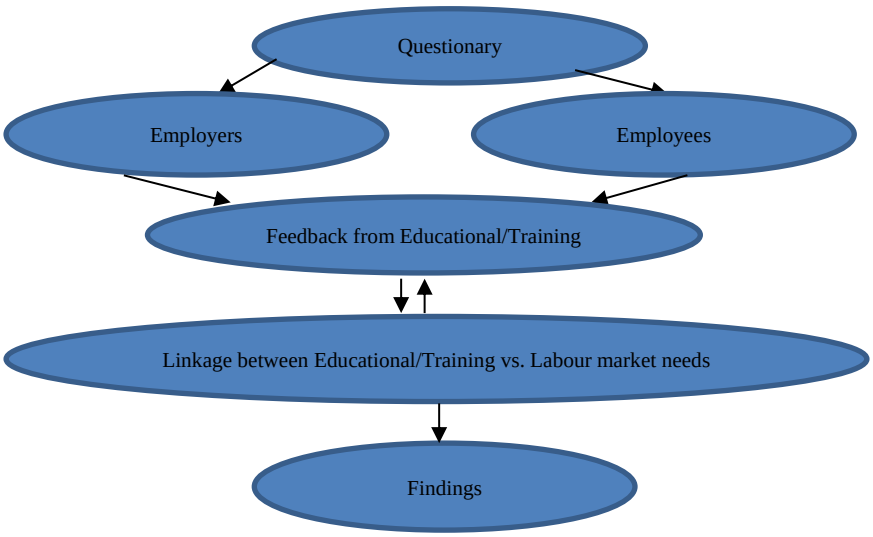

Figure 1. Methodology steps

Education in Kosovo after the Declaration of Independence (after 2008)

With the declaration of Kosovo's Independence, the path of reforms that had begun has only continued (Konxheli & Kadriu, 2018). This path has also continued in the education sector, bringing new strategies and projects funded by national and international institutions. The strategies, reforms and transformations that were already being undertaken had the realization of the most basic goals of the education system "meeting the needs of the labor market and economic development". One of the largest projects, with the aim of linking education with the labor market to improve employment conditions and economic development, is the project "Harmonization of Education with Labor Market Requirements (Kosovo)", supported by the European Union and the Austrian Development Agency with co-financing from the Ministry of Education, Science and Technology (MEST, 2015). This project was signed in 2015 and its focus was based on promoting policies that encourage students to orient themselves in important and strategic areas for the development of the Kosovo economy such as agriculture, engineering and medicine (MEST, 2015). The Ministry of Education, Science and Technology has presented two strategic plans for education in Kosovo in the last decade: the Kosovo Education Strategic Plan 2011-2016 and the Kosovo Education Strategic Plan 2017-2021 (MEST, 2015 & 2017). Both of these strategies have as one of their main objectives the creation of conditions for the development of education in such a way that education meets the needs of the labor market (PSAK 2011-2016 & PESAK 2017-2021). One of the main challenges of higher education, highlighted in the KESP (2017-2021), is the "mismatch of study programs with labor market requirements".

This challenge in this strategy is foreseen to be overcome by conducting a study on the connection of higher education programs with the labor market. This study in the Kosovo Education Strategic Plan (2017-2021) is mentioned as being the basis for the plan and profiling of public universities in Kosovo. Another possibility for overcoming the above-mentioned challenge according to the KESP (2017-2021) is cooperation with businesses, the creation of a system for labor market analysis, etc. The Kosovo Chamber of Commerce (KKC) has also conducted a study on the challenge of meeting the needs of the labor market by education in Kosovo. In 2017, the KCC published the report "Lack of skilled labor – a challenge for businesses", which highlights the lack of qualified staff for Kosovar businesses. In the question "How difficult is it to find qualified workers?" it appears that Kosovar businesses have many difficulties in finding staff. Kosovo Chamber of Commerce (2017) – "Lack of skilled labor – a challenge for businesses". Therefore, coordination between firms or employers and higher education institutions is very important and is one of the main topics often called "University-industry cooperation" (Healy et al., 2012). This finding is worrying, but not unexpected considering the reports of both domestic and international institutions not only for Kosovo, but also for other Western Balkan countries. This report once again confirms the need for deeper reforms in the education system in Kosovo.

It is positive that the Kosovo Chamber of Commerce and the Ministry of Education, Science and Technology share the same recommendations on the issue of the role of education in the labor market. These recommendations are only part of the Education Strategy (2022-2026) accompanied by the insufficient quality of study programs, the deficient academic infrastructure, the limited capacities for quality assurance and professional development of academic staff, the limited number of publications in international journals and the unfavorable academic staff-student ratio, necessarily require increasing the quality of higher education through the review of study programs, the advancement of academic infrastructure, the promotion of excellence in teaching and research and the implementation of high standards of institutional evaluation and study programs. Education in Kosovo has suffered greatly due to the situation of the 90s, but it has also taken concrete steps to provide the most professional cadres to the Kosovo labor market. Kosovo has a concrete strategy to achieve this goal and the application in some areas has already begun.

However, according to the report of the Organization for Economic Cooperation and Development (OECD 2015), but also official statistics show that the quality of education in Kosovo is unsatisfactory at all levels, including the PISA test (Programme for International Student Assessment) which confirms this situation. Meanwhile, according to the European Commission Report 2018, financial support for education and training in Kosovo is only 4.7% of GDP, while for science it has decreased, respectively reaching 0.1% of GDP. Job mismatch is a new concept in the labor market and which manifests the general state of a country's economy. Initially, the concept of job mismatch was understood as a lack of balance between employment and unemployment. Since the 1970s, this concept has been recognized in the literature as "structural mismatch", to explain high unemployment rates, despite the existence of many jobs.

This mismatch has been considered a serious threat to economic growth and development (Bartlett et. al. 2016). Referring to this study, the level of mismatch of the skills of young graduates with the job duties they perform is different. Referring to the data of this study, the direction of Business, Administration and Law has the greatest mismatch. In 2016, there were 9066 graduates in this direction outside the labor market, because there was no demand for such a number. Meanwhile, there was a lack of graduate profiles in natural sciences - Mathematics and Statistics, where the labor market was in a shortage of 3176 cadres of these profiles. These figures speak best of the degree of mismatch and the damage caused to the economy due to the ineffective use of human capital in the Republic of Kosovo.

Relevant laws in the field of higher education and vocational training

Law on Higher Education

The Law on Higher Education in Kosovo forms the comprehensive legal basis for: "regulation, functioning, financing, quality assurance in higher education in accordance with European standards as well as the role of the state and society in the development of higher education in the Republic of Kosovo" (Article 1). The structure of learning

credits that a student must achieve for diplomas of the respective levels is based on the European Credit Transfer System and the European Qualifications Framework. From the relevant institutions for the formation and successful implementation of higher education policies, the law identifies the Ministry of Education as the primary institution for the development of plans, authorization, distribution of funds, etc.; the Accreditation Agency as the body responsible for accreditation, etc. – for which the relevant principles and provisions are also allocated. The law also sets out provisions for licensing private education providers (Assembly of the Republic of Kosovo, 2011).

In Kosovo, the accreditation process is applied, which according to the legislation in force implies formal recognition that a higher education institution and its programs meet internationally accepted quality standards and that its qualifications give their holders, in accordance with the law in force, a number of rights, such as the possibility of access to a further level of education, specific professions and the use of a title (Law on Higher Education in the Republic of Kosovo, no. 04/L-037, September 2011, Article 4). In recent years, the number of students in higher education has been decreasing and this decrease is greater in public higher education institutions in Kosovo. In the academic year 2020/21, 95,335 students (57.4% in the public sector, 42.6% in the private sector) continued their studies in accredited higher education institutions in Kosovo, of which 58.5% were girls/women. Based on the latest data (MEST, 2022) in 2020/21, about 56.3% of students in the age group 18-22 years old, attend higher education in Kosovo. Female participation in higher education is at a satisfactory level. Girls/women make up 59.5% of students in the public sector and 57.1% of students in the private sector. The gender parity index in higher education in Kosovo is 1.41.

Law on Pre-university Education

The Law on Pre-university Education structures levels 0-4 of ISCED (International Standards for the Classification of Education which are approved by UNESCO) in Kosovo. Regarding this period of individual development, pre-university education aims to develop the personality, talent and mental and physical abilities of the student to the full potential of the student; advancing the creation of basic scientific knowledge, communication skills, observation and analytical skills, creativity, independence and related learning skills; respecting human rights in the international framework and according to the Constitution of the Republic of Kosovo, etc. (LAW NO.04/L –032 ON PRE-UNIVERSITY EDUCATION IN THE REPUBLIC OF KOSOVO, Article 1).

Of great importance in relation to the law are the principles and provisions on access to education, where a great focus is given to the inclusion of all groups of the population of Kosovo in pre-university education. The law also divides the competencies and responsibilities of the Ministry of Education, Science and Technology and identifies the competencies of other relevant bodies. Thus, the pre-university system is organized according to the relevant ISCED levels and the main stages of the National Curriculum Framework (Assembly of the Republic of Kosovo, 2011).

Law No. 04/L-138 On Vocational Education and Training

According to Article 1 of the law: "The purpose of this law is to regulate the system of vocational education and training in accordance with the needs of the economic and social development of the Republic of Kosovo, including economic and technological changes, labor market requirements and the needs of individuals towards a market economy, by optimally utilizing financial, human and infrastructure resources" (Assembly of the Republic of Kosovo, 2013, https://gzk.rks-gov.net/ActDetail.aspx?ActID=8676&langid=2). The law also structures the provisions of the relevant institutions, whether public or private institutions qualified for vocational education and training. The structure of institutions and provisions for vocational education and training according to the law reflects the scope towards the development of competencies depending on the career and market needs.

Law on Adult Education and Training in the Republic of Kosovo

This law, according to Article 1, aims to "regulate the entirety of the processes for adult education and training, as an integral part of the education system in Kosovo". The law sets out the basic provisions regarding curricula, accreditation of qualification agencies, testing methods and sets out the roles and competencies of education institutions in Kosovo (Assembly of the Republic of Kosovo, 2013). Law No. 03/L-060 on National Qualifications (https://gzk.rks-gov.net/ActDetail.aspx?ActID= 2606&langid=2). The main purpose of the law is to create a Qualifications System. This system is based on the National Qualifications Framework, which means that it establishes the framework of qualifications at the national level based on criteria and requirements that are consistent with the European Qualifications Framework. The law has the following objectives: "to improve the recognition of qualifications at all levels of formal and non-formal education and training; to ensure that qualifications meet the needs of the labour market, economy and society; to regulate qualifications, assessment and certification, based on quality and standards; to improve access to assessment and recognition of prior learning; to make the qualifications system flexible and transparent; to improve opportunities for improvement and transfer for all" (Assembly of the Republic of Kosovo, 2008).

Law on Education in Municipalities of Kosovo

The law specifies the responsibilities and competencies that the municipalities of Kosovo have in education. According to Article 4: "Municipalities have full and exclusive powers, insofar as they pertain to local interest, while respecting the standards established under applicable legislation regarding the provisions of public preschool, primary and secondary education, including the registration and licensing of educational institutions, the hiring, payment of salaries and training of teachers and administrators". In addition to the powers, the law also regulates the licensing of education and education personnel by municipalities. Summary of challenges in higher education and vocational

education The Strategic Plan for Education in Kosovo 2017-2021 has also identified some of the biggest challenges of the education sector in the country, which are summarized below.

Within the framework of labor market policies, some of them that are implemented in EU member states can be listed: Employment services; Training, Employment incentives, Employment support and rehabilitation, Direct job creation, Incentives to promote start-ups, Social care for the unemployed, Early retirement (Blache, 2011).

Table. 1. Main challenges in education in Kosovo (Source: Ministry of Education, Science and Technology. Strategic Plan for Education in Kosovo 2017-2021, 2016)

Challenges in higher education	Challenges in vocational education
• Failure to respect quality standards in higher education institutions • Failure to adapt study programs to labor market requirements • Insufficient presence of scientific research in higher education institutions • Incomplete legal framework in higher education • Ineffective international cooperation in higher education • Low and unsatisfactory staff/student ratio • Weak administrative capacities and inadequate infrastructure • Lack of a financing plan based on efficiency and accountability	• Mismatch of VET programs with labor market demands • Weak quality assurance mechanisms • Lack of career counseling and guidance • Incomplete framework for occupational standards • Severe funding shortages • Serious deficiencies in practical work and professional practice • Lack of adequate training and background for teaching staff • Difficulty in providing VET teaching materials • Lack of Core Curriculum for VET • Problem of sustainability of competence centers and their further development • Lack of efficient adult education system

Stabilisation and Association Agreement between Kosovo and the European Union Article 107 Education and Training (Council of the European Union, 2015)

The Parties shall cooperate with the aim of raising the level of general education and vocational education and training, as well as youth and youth work policies, as a way of promoting skills development, employment, social inclusion and economic development in Kosovo. One of the priorities for the higher education system is to achieve adequate quality standards of its institutions and programmes in line with the objectives of the Bologna Process and Declaration. The Parties shall also cooperate to ensure that access to all levels of education and training in Kosovo is not subject to discrimination on grounds of gender, racial or ethnic origin, religion or belief, disability, age or sexual orientation. Cooperation shall aim to address the needs of students with disabilities in Kosovo.

Cooperation shall also aim to develop capacities for research and innovation, in particular through joint research and innovation projects involving all stakeholders and ensuring the transfer of expertise. Relevant EU programmes and instruments will contribute to the improvement of educational structures and activities, training, research and innovation in Kosovo. Cooperation shall take into account priority areas related to the EU acquis in this field.

One of the objectives of the European Union is also “Smart Growth”, which should be supported by the “Knowledge Economy” framework. This component is also applied to the Western Balkans through the South East Europe 2020 framework, which aims to significantly increase average labour productivity.

It is considered that such an increase in productivity can only be achieved if supported by an 18% increase in the number of highly qualified workers (Regional Cooperation Council 2015).

Social work and the university curriculum

The curriculum at the university is based on international curricula. In general, the high unemployment rate is a challenge also for the prospective social workers, and the state itself has few social services, but now there is a social center in every municipality (in total there are 33 in Kosovo, in Pristina, for example, there are 3. Social services are often also carried out by NGOs, but in order for NGOs to work, they must be licensed. A social worker in Kosovo earns about 300 euros, a primary school teacher 350 euros, and the average income in Kosovo is about 270 euros.

As already mentioned, there is current social assistance in Kosovo, but it is not easy to get it. Criteria are: you must have no income and no assets, you must have children under 5 years and you must not be able to work (Kostovicova, 2005; Mehmeti & Radeljic, 2017) The curriculum of social work education in Kosovo is similar to the curricula in European countries where university education is applied according to the Bologna Declaration.

The social work education curriculum in Kosovo is focused on several perspectives such as: human behaviour and social environment, social policies, practice and research (Gashi, 2022). The European Commission's 2016 Science, Research & Education Progress Report, respectively the European Union's enlargement policy, concludes that: Kosovo has limited capacities for research and innovation, the research budget is insufficient in relation to GDP. The law on science and scientific activities is in process, limited administrative capacities for science and research, mismatch between study programs and the labor market European Commission (2016). The effects of educational reforms in Europe do not constitute innovation in themselves if they do not affect the consciousness of those who want a more enlightened society. However, this is impossible to happen without a creative approach to educational reforms, which would produce in practice well-being for all. In this context, there are numerous indicators that say that the number of universities in Kosovo has increased, but students are less likely to be employed than their colleagues in the EU.

It is precisely here that the role of universities should be sought in accelerating the creation of a common space, without which decent competition in other wider spaces of knowledge, whether regional or European, would not be possible (Institute of the Spiritual and Cultural Heritage of Albanians, 2020 Website).

RESULTS AND DISCUSSION

Almost everyone who graduates from university has the main goal of finding a job that matches their qualifications and the profession for which they graduated. Everyone has a hope that with their own efforts or with some external help they will achieve their career goals and fulfill the expectations of themselves and their families who have financially supported their education. As the results of this research show, being highly qualified reduces the likelihood of remaining unemployed by almost half compared to less educated groups. In Kosovo, the unemployment rate of young graduates was 19% according to the Kosovo Agency of Statistics (KAS, 2016). The approximate percentage is also in 2024. If past trends continue, a faster growth in the employment of young graduates can be expected in professional, scientific and technical activities, including architecture, engineering, construction, retail and wholesale trade, health care, etc.

According to the data from this study, vertical mismatch is widespread in Kosovo: only 47 percent of higher education graduates are well matched to the job requirements they hold, 53 percent of graduates do not match the skills required in their jobs, of which 42% are overqualified and 11% are underqualified. The survey also shows that 28 percent of graduates by profession are not in line with the requirements of the jobs they hold. Even in the case of research in Kosovo, it has been shown that the level of qualification and the type of skills acquired affect the possibility of finding a well-matched job.

It has also been shown that graduates who had some work experience through an internship or some other form of experience were more likely to end up in a real job compared to others. This highlights the importance of work experience gained through an internship in facilitating the transition of graduates into the labor market. In Kosovo, we also have the phenomenon of dropout, which leads to a low completion rate. Many of those who graduate face long-term unemployment. Of those who find work, many do not match their field of study or level of qualification, then health, welfare and education, perhaps also due to the small number of jobs and the relatively higher number of registered students.

The majority of workers interviewed state that matching their qualifications is one of the most important factors that influenced them to apply for this job. A total of 150 structured interviews were conducted in the study, of which 30 were conducted with employers and 120 with employees. Within the framework of the interviews conducted with employers, 35.5% of the sample consists of private enterprises, 23.3% public institutions, about 10% family businesses, 9.4% public enterprises and 3% non-profit organizations. The total number of interviews conducted is distributed across all regions of Kosovo, with a greater concentration in the Dukagjini region. Most workers (55%) state that the work they do is in line with their qualifications. Nearly 20% of workers interviewed hold a position outside their qualifications due to not being accepted into a job that matches their qualifications. While 12% of workers give up the opportunity to work at their qualification level in exchange for a better salary in another position.

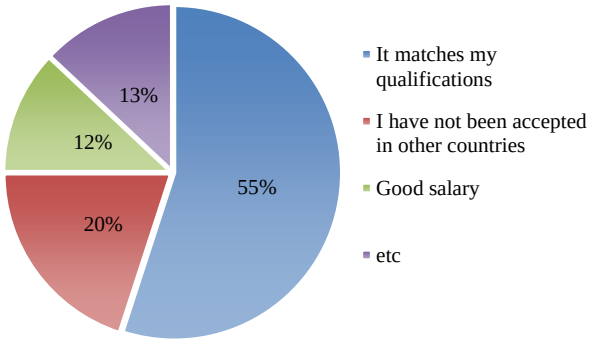

Figure 2. The importance of factors that influenced applying for a job

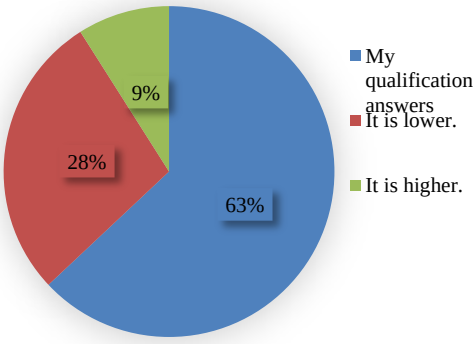

Figure 3. Job matching with qualification

Most workers interviewed appear to be satisfied with their chosen profession, as 63% of them stated that they would not change their profession if they had the opportunity to redefine themselves. For those who stated that they would change their profession if they had the opportunity, the profession with the highest frequency that would be chosen by workers is information technology. Most employers (46%) state that their profession is suitable for the work they do.

In addition, (35%) are close or similar to their profession, which is another very important reason that shows that graduates are mainly employed in fields or jobs that they have knowledge of. Nearly (19%) of employers state that they do not match the work they do and their profession at all. However, this percentage is considered high since it also brings difficulties in implementing the work they do and conflicts with the general framework of respect for local legislation and social inequality in the labor market. The majority (55%) of employers state that graduates face difficulties in employment due to lack of work experience. In addition, another very important reason that graduates face during employment is the mismatch with the field of study. Nearly 13% of employers state that graduates face difficulties in employment due to the mismatch of the level of qualification with the job position.

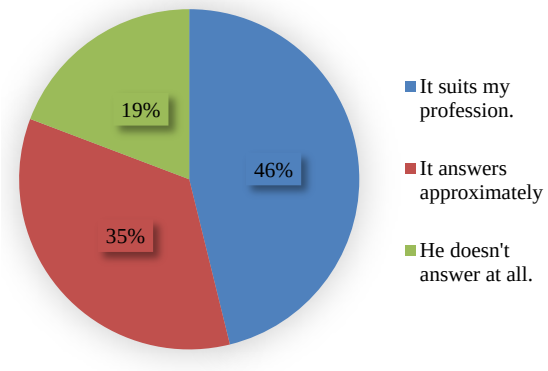

Figure 4. Adaptation of the profession to the workplace

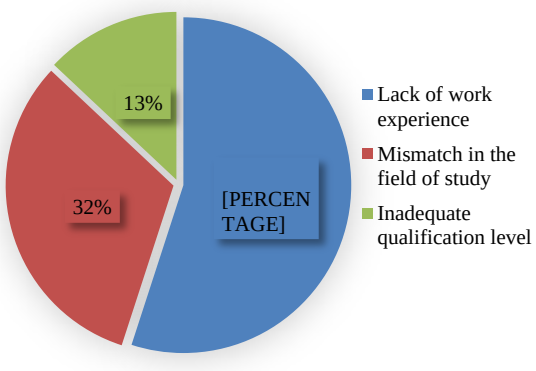

Figure 5. Difficulties faced by graduates in employmen

CONCLUSION

This research elaborated on the role of education in the labor market from the perspective of the state of Kosovo, making comparisons with the countries of the Western Balkans. The education system in the countries of the Western Balkans has undergone many transformations in recent years, especially after the 1990s. When talking about education in Kosovo, it is more than evident that the last three decades have been quite a challenging period, starting from parallel activity for existence to major transformations and reforms in order to meet the needs of the labor market with professional staff. From the research conducted by the Ministry of Education, Science and Technology, the Kosovo Chamber of Commerce and other local and foreign organizations, it emerges that in Kosovo the education system needs additional reforms in order to provide the labor market with the most professional staff.

Similar conclusions are given for other countries of the Western Balkans. In this section, it cannot be said that Kosovo is doing better or worse than neighboring countries, since all of them, without exception, have begun reforms and need deeper reforms to meet the needs of the labor market. Finally, this paper, similar to the Strategic Plan for Education in Kosovo (2017-2021), the report of the Kosovo Chamber of Commerce (2017); Bartlett et al. (2016), reiterates that the key to the development of education in the service of the labor market is the cooperation between businesses and educational institutions, especially higher education.

Kosovo and other countries in the Western Balkans should work hard in this direction to have an educational system in the service of the labor market. Based on the experience of some of the European Union member states in relation to EU programs, the main recommendations for Kosovo institutions are: The Government of Kosovo should analyze and discuss the costs - benefits of participating in European Union programs with academia, universities, higher education institutions (HEIs) as well as civil society; Universities should create partnerships with industry, respectively businesses, in a way that affects the increase in employment, respectively the preparation of personnel for the labor market;

The Government of Kosovo should provide additional funding at the local level in support of applications to EU Programs, especially the Horizon 2020 Program; Kosovo institutions should increase absorption capacities in order to optimally utilize funds, namely European Union programs in the field of education and innovation, considering the fact that in the new Erasmus+ Financial Framework there will be an increase in funding from 14.7 to 30 billion The Stabilisation and Association Agreement (SAA) focuses on respect for key democratic principles and core elements that are at the heart of the EU's single market. The SAA will establish an area that allows for free trade and the application of European standards in other areas such as competition, state aid and intellectual property. It will also help the implementation of reforms designed to achieve the adoption of European standards by Kosovo.

Other provisions cover political dialogue, cooperation in a wide variety of sectors ranging from education and employment to energy, the environment and justice and home affairs (Council of the European Union, 2015). Vocational schools, whether public or private, should increase their efforts to register their programs with the relevant accreditation authorities, so that the titles obtained through these programs have validity at the international level.

This would not only increase the value of vocational education in the country, but would also make the programs offered significantly more attractive to potential followers. Institutions should develop post-secondary and tertiary vocational education programs, so that participants in vocational education are given opportunities for continuous development throughout their careers. The lack of alternatives after completing secondary vocational schools can be a discouraging factor for students to pursue vocational education.

Occupational standards should serve as a guarantor of the qualifications of individuals in different fields. Occupational standards, which should be created in harmony with the European Qualifications Framework, aim to prove that a person who has obtained that occupational standard is fully competent to perform the assigned work. The process of developing these standards should be accelerated in the future. Education and the Labor Market in Kosovo and the European Union American Chamber of Commerce in Kosovo.

For employees, university preparation and work experience are considered the two most important and determining factors for employment. There is a significant mismatch in terms of qualification with the position they hold (vertical mismatch), the mismatch is also high in the horizontal one. Developing the skills of graduates through the modernization of teaching methods is considered important in providing the opportunity for graduates to be employed.

Graduates with work experience are more likely to find a job. Additional training outside the enterprise is considered very important in providing the opportunity for graduates to be employed. Employers consider it very important to hire a recent graduate if the monthly salary for a period of time is financed or co-financed by a donor. Labor legislation should be amended in order to promote the creation of a dynamic labor market that promotes competitiveness and productivity of the workforce. Also, potential obstacles, whether stemming from this legislation or from any other legal act, that in one way or another affect informality and discriminatory practices in the workplace, should be eliminated.

In this regard, it has already been evidenced that maternity leave is such a source of discrimination and informality. Urgent steps should be taken to address structural problems in employment, and in particular in indicators related to the activity rate of the working-age workforce. Kosovo in this regard is extremely poor, both in comparison to the European Union average and in a regional perspective. Kosovo should take rapid steps towards strengthening social dialogue, as a crucial link to guarantee the harmonization of education and labor policies with demand and need in the private sector.

The Economic and Social Council should be more inclusive, and as such should provide input towards addressing the many challenges in this sector in the country. The Danish model of "flexicurity" best demonstrates the many positive results with genuine dialogue between social partners.

Recommendations

The perspective of education and the labor market in Kosovo is the need to pay greater attention to vocational education, which has occupied an increased space in the public discourse, the situation in this sector still leaves much to be desired. In order to prioritize vocational education and training and create a dynamic labor market, the government must undertake a series of targeted reforms, which will help in the recovery of this sector: The budget dedicated to vocational education and training should be significantly increased so that this area is truly prioritized.

Vocational schools have numerous difficulties both in terms of working conditions and equipment needed for laboratories and school facilities, as well as in terms of qualified staff who can provide knowledge to program participants. Therefore, a key step in this regard is the greater allocation of the budget for vocational schools.

Another recommendation that also takes up space in UNESCO's work is the need to encourage and create the prerequisites for diversifying the way vocational schools are financed by creating opportunities for investment from the private sector. This is not currently practiced in vocational education in Kosovo, but the creation of incentive policies that would enable and encourage the private sector could create new financing opportunities.

The government should develop policies to encourage companies to be involved in dual education programs. Such policies are also implemented in the most developed countries in Europe where there is a better tradition of vocational education, through the provision of fiscal incentives for participation in dual education programs.

For example, such a policy would be for companies to be exempt from personal income tax for those workers who are engaged during the period when they attend a vocational school. Vocational education should be promoted as a career option among young people in Kosovo, considering the tendency to prioritize higher education at the expense of vocational education. Such promotion should be addressed to ninth grade students and their parents, as it is the first step when making a career-orienting decision according to the educational system scheme explained above. Such initiatives are already being implemented by various donor projects, but a more structured approach is needed to raise awareness of the importance of vocational education and the employment opportunities that this sector brings to the new generations.

Institutions should encourage greater participation of the private sector in the development of educational programs and curricula, in order to create the preconditions where the programs offered are a real reflection of the needs of the private sector for the labor market. So far, educational institutions have not succeeded in encouraging the participation of businesses in industrial boards to a satisfactory extent, where they would have the opportunity to provide their contribution on the necessary profiles. Certainly, part of the responsibility in this regard falls on businesses themselves, which should have a more proactive approach in building lines of cooperation with educational institutions.

Limitations

From the limitations of this study, we can emphasize the lack of prior research in this field in Kosovo which would help us to have a greater clarity of the development context of education and social work. From a methodological point of view, the lack of a primary research that would provide us with empirical data on the basic issues addressed in this paper can be emphasized as a limitation. Limited access to archives as a result of the lack of hardcopy materials on this topic can be considered as another limitation.

Author Contributions: Conceptualization, D.L. and B.K.; methodology, D.L. and B.K.; software, D.L. and B.K.; validation, D.L. and B.K. and B.A.; formal analysis, D.L. and B.K investigation, D.L. and B.K..; data curation, D.L. and B.K.; writing - original draft preparation, D.L. and B.K.; writing - review and editing, D.L. and B.K; visualization, D.L. and B.K.; supervision, D.L. and B.K.; project administration, D.L. and B.K. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable. ALL CHANGES SHOULD BE MARKED IN RED

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 23.03.2025 Revised: 27.06.2025 Accepted: 17.07.2025 Available online: 06.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1594-1603
DOI 10.30892/gtg.61318-1528

THE ROLE OF ENVIRONMENTAL INFRASTRUCTURE IN ENHANCING PLACE AFFECTION AND QUALITY OF LIFE: EVIDENCE FROM A MOUNTAINOUS TOURISM DESTINATION IN LENGER TOWN OF KAZAKHSTAN

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Citation: Mamirkulova, G., Akbar, I., Tazhekova, A., Myrzaliyeva, Z., Pazylkhaiyr, B., Mominov, S., Abaisi, D., & Ussenova, A. (2025). The role of environmental infrastructure in enhancing place affection and quality of life: Evidence from a mountainous tourism destination in Lenger town of Kazakhstan. *Geojournal of Tourism and Geosites*, 61(3), 1594–1603. https://doi.org/10.30892/gtg.61318-1528

Abstract: This study examines the role of environmental infrastructure in enhancing place affection and residents' quality of life (QOL) in Lenger, a mountainous tourism destination in southern Kazakhstan. Rooted in Social Exchange Theory, the research investigates how eco-friendly infrastructure, such as green spaces, parks, and sustainable waste management, shapes emotional connections to place and promotes physical and mental well-being, aligning with Sustainable Development Goal 3 (Good Health and Well-being). A structured survey involving 417 residents was conducted, and Structural Equation Modeling (SEM) was employed to analyze the direct and indirect relationships among environmental infrastructure, place affection, and QOL. The findings reveal that environmental infrastructure positively influences both QOL and place affection, with place affection acting as a partial mediator in this relationship. This indicates that infrastructure investments not only improve physical conditions but also foster emotional attachment, which in turn enhances overall well-being. The study emphasizes that emotionally resonant infrastructure is essential for sustainable tourism planning and public health promotion. By focusing on the case of Lenger, the research contributes to a growing body of literature highlighting the psychosocial dimensions of tourism development. It offers practical recommendations for policymakers and urban planners to incorporate community-oriented and ecologically sensitive infrastructure in tourism regions. The findings suggest that infrastructure designed to engage residents emotionally and support their environmental values can lead to stronger community bonds, healthier lifestyles, and more sustainable tourism outcomes. By highlighting the psychosocial pathways linking infrastructure development and community well-being, this research offers valuable insights for policymakers, urban planners, and tourism developers aiming to balance ecological sustainability with socio-emotional needs in emerging tourist destinations like Lenger.

Keywords: environmental infrastructure, place affection, quality of life, sustainable tourism, good health and Well-being, Lenger town, Kazakhstan

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INTRODUCTION

Modern society is increasingly focused on achieving a sustainable future through initiatives such as the United Nations' Sustainable Development Goals (SDGs). Each country is striving toward these objectives to meet the needs of its citizens and improve their overall living conditions (Sakhatbekovna et al., 2024). According to the UNWTO, the 17 SDGs present a global framework to eliminate inequality and injustice, reduce poverty, improve health and well-being, and combat climate change by 2030. Tourism has been identified as a key driver capable of supporting the achievement of many of these goals. The 2030 Agenda emphasizes sustainable tourism, recognizing its capacity to generate employment, tax revenues, and income. Achieving these goals requires investments in infrastructure, innovation, technology, and human capital, along with a clear implementation strategy and sufficient funding. In this context, the multi-sectoral Belt and Road Initiative (BRI) is seen as a potential catalyst in advancing the 2030 Agenda (Li & Zhu, 2019).

As a continuation of the historic Silk Road, the BRI in Kazakhstan primarily focuses on tourism infrastructure, encompassing transportation, social, and environmental components (Abbas et al., 2024; Mamirkulova et al., 2020). The tourism departments of countries along the Silk Roads can collaborate to enhance tourism infrastructure to meet the expectations of increasingly discerning travelers (Akbar et al., 2024). This study employs Social Exchange Theory (SET) to

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examine the effects of environmental infrastructure, an essential yet often overlooked dimension of tourism infrastructure. The research aims to offer valuable insights for policymakers to address the persistent challenges associated with the expansion of both international and domestic tourism (Daye et al., 2020). Multi-sectoral infrastructural development, particularly through tourism initiatives, plays a pivotal role in socio-economic advancement. It contributes to improvements in healthcare systems, transportation networks, trade, commerce, and employment generation (Abbas et al., 2024). However, such development often comes at a significant ecological cost, placing pressure on natural resources and leading to environmental degradation (Nazneen et al., 2021). For instance, Nazneen et al. (2021) highlight that while infrastructure development has helped reduce poverty, it has also exacerbated ecological pollution, underscoring the imbalance that can arise when one pillar of sustainable development, such as ecology or economy, becomes unstable.

Contradictory findings also exist in the literature. Kanwal et al. (2020) report strong community support for infrastructure due to perceived benefits, and they did not observe significant environmental drawbacks. They speculated that these results might be influenced by the developmental stage, time, and the emergence of positive outcomes such as the establishment of modern national parks and wildlife conservation efforts. However, these assumptions were not empirically tested. Other studies (e.g., Abbas et al., 2024; Mamirkulova et al., 2020) have demonstrated that mega-infrastructure projects, when aligned with sustainable development goals, can significantly enhance quality of life (QOL). Despite increasing recognition of the importance of environmental infrastructure, its influence on fostering residents' emotional bonds with place and its implications for health outcomes remain underexplored (Sun et al., 2018).

Environmental infrastructure improvements, such as expanding green spaces, promoting sustainable transportation, enhancing waste management systems, and controlling pollution, are critical to ecological sustainability and public well-being (Mamirkulova et al., 2020; Nathanson, 2019, March 20). Clean air and water, along with the preservation of natural ecosystems, are among the top concerns of local communities.

According to Social Exchange Theory, place attachment refers to the emotional bonds individuals form with natural environments, which in turn contribute to mental health and positive attitudes toward tourism development (Kang & Lee, 2018; Ramkissoon & Mavondo, 2015). Place attachment has been widely used to understand residents' perceptions and attitudes; however, one of its key dimensions—place affection—has often been overlooked in the context of environmental infrastructure (Kang & Lee, 2018).

Place affection represents the emotional and cognitive connections individuals develop with specific places, and it is crucial to investigate its mediating role between perceived impacts of environmental infrastructure and the achievement of Sustainable Development Goal 3 (Good Health and Well-being), especially in mountainous tourism regions.

This study addresses a significant gap in the literature by pursuing the following objectives: (1) to empirically examine how environmental infrastructure influences residents' perceptions of place attachment and SDG 3 outcomes, and (2) to test the mediating role of place affection in this relationship. The present research offers a novel contribution to tourism studies by being among the first to explore the connections between environmental infrastructure development, place-based emotional responses, and health-related outcomes. Through the lens of SET, this study also introduces a unique mediating factor - place affection - to better understand the psychosocial dynamics underlying tourism infrastructure and sustainable well-being.

Environmental Infrastructure and Tourism Destination

The primary purpose of environmental infrastructure is to enhance urban and rural environments through the development of green and open spaces, the promotion of electric vehicles and sustainable transportation systems, and the provision of essential services such as water supply, energy, waste management, and pollution control (Nathanson, 2019). This infrastructure also fosters environmental responsibility within local communities, ensuring environmental protection, improved public health, and a higher quality of life (Mamirkulova et al., 2020). Despite its importance, environmental infrastructure has received limited attention in tourism literature. However, its role in shaping residents' living environments and experiences is critical. Residents, like foreign visitors, also act as domestic tourists. Infrastructure projects such as the development of national parks, water parks, recreational areas, conservation of natural and cultural heritage sites, and eco-friendly housing developments can encourage local tourism by attracting residents to explore their regions (JovanoviĆ & IliĆ, 2016; Mamirkulova et al., 2020). Therefore, tourism-related environmental infrastructure represents a key opportunity to support both cultural and environmentally sustainable activities, while simultaneously contributing to the broader development of the tourism industry.

Environmental Infrastructure and SDG 3

The growing urgency of climate change has intensified focus on the role of green policies within communities, prompting a shift toward more efficient and sustainable tourism planning. Innovative approaches and strategies in tourism development are increasingly seen as vital not only for environmental sustainability but also for addressing significant mental and physical health concerns. Scholars advocate for the integration of more blue and green spaces into urban and rural planning, while medical experts highlight their benefits for residents' overall health and well-being (Barnhill & Smardon, 2012; Majeed & Ramkissoon, 2020).

Ramkissoon (2021) emphasizes that green infrastructure in neighborhoods significantly contributes to residents' positive mood, daily physical activity, recreational engagement, emotional stability, and happiness. Similarly, through a study of tourist perceptions in Tokyo, Chen et al. (2020) found that the development of diverse green gardens enhances tourist preferences and supports the sustainable development of natural environments.

In recent years, eco-tourism—tourism centered on natural environments—has garnered increasing attention as an effective means of improving quality of life and strengthening social bonds, while also ensuring a minimal environmental footprint (Minikhanova et al., 2024). Viewed as a strategy for both sustainable development and environmental preservation, the ongoing growth of eco-tourism has become a priority (Akbar et al., 2022). Within this context, tourism, as a component of environmental infrastructure, plays a key role. The integration of well-designed green spaces, pollution control measures, and effective waste treatment systems fosters healthier societies and enhances residents' well-being and happiness. Proper treatment of sewage, waste disposal, and air purification reduces environmental degradation and improves public health. Kim et al. (2013) also demonstrate that tourism development can positively impact environmental health through improved water quality, increased tree planting, and nature conservation. Accordingly, we hypothesize the following:

H1: Environmental infrastructure is likely to positively influence SDG 3 (Figure 1).

Infrastructure Development and Place Affect

Place affect refers to individuals' emotional connections with environmental settings and their social experiences, which contribute to mental restoration and mood enhancement (Ramkissoon et al., 2013; Townsend et al., 2018). Over the past decade, various academic fields, including environmental management, business, environmental psychology, sociology, and economics, have increasingly examined the role of place attachment. Likewise, tourism research has begun to investigate how tourists, as well as residents, develop affective relationships with destinations (Isa et al., 2020). From the perspective of residents, place affect is often conceptualized as one dimension of place attachment, alongside place identity and place dependence (Lv et al., 2019). Methodologically, studies have assessed residents' involvement in tourism-related economic activities (Lv & Xie, 2017) as predictors of place affect and identity. However, relatively few empirical studies have explored the place effect as a mediating variable in the relationship between environmental infrastructure and residents' perceptions.

This study seeks to address that gap by analyzing how environmental infrastructure influences residents' place attachment. It posits that the quality and availability of environmental infrastructure significantly affect the emotional bonds residents form with their surroundings. As Walker & Ryan (2008) suggested, both residential development and conservation initiatives can strengthen emotional and psychological ties between individuals and their landscapes.

In this context, residents' emotional connections to their neighborhoods may be shaped by their participation in leisure, recreational, and physical activities facilitated by well-developed environmental infrastructure. A destination can only achieve long-term sustainability if residents, who are central stakeholders, are satisfied with tourism development and actively participate in planning processes (Akbar & Yang, 2022). The perceived benefits and quality of infrastructure, such as recreational spaces, natural landscapes, and social cohesion, enhance residents' experiences and contribute to stronger place affect (Lv & Xie, 2017). These positive experiences foster emotional attachment and identification with place (Arnberger & Eder, 2012). Residents' preference for accessible, well-maintained green spaces, such as parks and gardens, aligns with this notion. In essence, when environmental infrastructure, such as clean water facilities, air quality, electric transportation, and recreational amenities, is both attractive and accessible, place attachment is likely to increase (Gross & Brown, 2008). Nonetheless, some studies caution that merely expanding green space or improving access does not necessarily enhance community connectedness (Kimpton et al., 2014).

A more comprehensive approach, considering both the physical and visual attributes of environmental infrastructure, is necessary to foster frequent, meaningful interactions with nature. These elements allow residents to engage more regularly with their surroundings and deepen their experiential connection to place. Infrastructure coherence, such as road quality, connectivity, safety, and spatial clarity, facilitates accessibility and supports orientation (Ali et al., 2017).

Features such as waymarks, well-designed pathways, and visible routes to green areas enable residents to easily access tourism and recreational opportunities. The presence of natural features like water and lush vegetation further enhances engagement with the environment. Visually and physically appealing surroundings create positive atmospheres, evoke memorable experiences, and promote place identification, all of which enhance comfort, enjoyment, and well-being. In sum, residents' connection with nature, facilitated by accessible and high-quality environmental infrastructure, can improve emotional stability and promote healthier lifestyles.

Thus, the development of environmental infrastructure can enhance place value, deepen emotional bonds between residents and their environments, and strengthen place affect. This emotional satisfaction, in turn, has positive implications for public health and well-being (Abbas et al., 2024). Based on this reasoning, the study hypothesizes that:

H2: Environmental infrastructure is likely to positively influence place attachment (Figure 1).

Place Affect and SDG 3

From childhood homes to favorite vacation destinations, individuals' attachment to places can have a profound influence on their well-being and sense of identity. This raises compelling questions about how such emotional bonds are formed in the brain and how they shape human behavior and decision-making.

Ramkissoon (2020) argues that place affection, along with the physical attributes of environments (Mansor et al., 2009) and emotional connections to place (Lv & Xie, 2017) can significantly enhance quality of life (QOL). Supporting this view, van Vliet & Hammond (2021) suggest that individuals' self-perception and sense of progress can be revitalized through the use of well-designed green infrastructure, which can evoke feelings of being advanced, active, and connected to their surroundings. According to Mansor et al. (2009) exposure to clean lake and river corridors, as well as green park environments, contributes to cognitive well-being and fosters positive emotions such as comfort, serenity, happiness,

relaxation, and satisfaction. Even though many individuals may not reside near designated recreational or tourism areas, emotional bonds with one's home, community, and natural surroundings, enhanced by accessible infrastructure, can foster strong place affection. Research shows that such affection toward nearby parks and natural areas can play a role in psychological rehabilitation (Ramkissoon et al., 2018). Furthermore, place affection has been associated with reduced stress, improved mental health (Grahn & Stigsdotter, 2010), and overall improvements in quality of life (Ramkissoon, 2020).These findings highlight the importance of designing infrastructure that not only meets physical needs but also nurtures emotional and psychological connections to place, thereby promoting holistic well-being.

One of the key advantages of environmental infrastructure is its ability to facilitate meaningful interactions between local communities, tourists, and the natural environment. Inhabitants who lead more traditional, home-centered lifestyles often engage, either directly or indirectly, in agro-tourism and eco-tourism activities such as farming, gardening, and planting. With improved access to modern environmental infrastructure, residents may develop a stronger sense of place attachment, particularly about green spaces, national parks, and public gardens. Connecting with nature has well-documented benefits for both physical and mental health (Mansor et al., 2009).

Health professionals, including those in integrative medicine and behavioral health, often recommend spending time outdoors, as it promotes physical activity and positive emotional states (Ramkissoon, 2020). In line with this, contemporary infrastructure has been shown to strengthen socio-environmental ties, resulting in greater happiness and improved well-being (Ali et al., 2021; Mamirkulova et al., 2020). Supporting this argument, Abbas & Mamirkulova (2024) found that infrastructure development enhances quality of life, but primarily through the mediating role of sustainable practices. Based on these insights, this study proposes the following hypothesis:

H3: Place of affection is likely to positively influence SDG 3 (Figure 1).

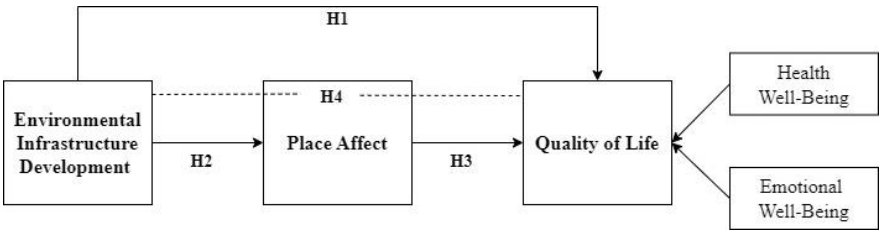

Figure 1. Conceptual model

In our study area, Lenger town, recent infrastructure modernization efforts have introduced new green parks, sanitary zones, and pedestrian-friendly spaces, particularly around the national park and medical tourism zones. These improvements are increasingly used by residents not only for recreational purposes but also for health and wellness. Such spaces support physical health and enhance emotional well-being by fostering deeper connections to nature.

Local engagement in environmental conservation, such as tree planting and neighborhood clean-up initiatives, has also increased, suggesting a heightened sense of environmental ownership and place affection. However, the benefits of tourism-related infrastructure are not perceived equally by all (Mamirkulova et al., 2020). While some residents associate the changes with civic pride and progress, others view them as top-down government initiatives that overlook local needs (Akbar et al., 2021). These divergent perceptions underscore the complexity of infrastructure impacts, making this region an ideal case study for exploring how emotional bonds to place influence well-being. Thus, we propose a fourth hypothesis:

H4: Place affection mediates the relationship between environmental infrastructure and SDG 3 (Figure 1).

MATERIALS AND METHODS

Study context

The study was conducted in the Turkistan region of Kazakhstan, an area known for its rich historical heritage. Turkistan is one of the oldest settlements in the country, with centuries of cultural and historical significance. Owing to its strategic location along the ancient Great Silk Road, the region has become an increasingly popular destination for both domestic and international tourists (Issakov et al., 2023).

The Great Silk Road, as a historical and cultural corridor, fosters mutual understanding and peace among nations, promotes cultural exchange, and stimulates the growth of tourism, trade, and commerce (Moldagaliyeva et al., 2024). Within this broader region, the researchers selected Lenger town, a mountainous locality situated near Sairam-Ugam National Nature Park (Figure 2). Sairam-Ugam is a striking yet relatively underexplored national park in southern Kazakhstan, offering unique ecological and recreational value. The Lenger was chosen for its proximity to the park and its strategic function as the primary gateway for tourists visiting the area.

The town supports the most tourism-related activities and infrastructure in the region. As the nearest urbanized settlement, Lenger plays a pivotal role in facilitating the interaction between the natural environment and tourism development. Its environmental infrastructure, including road networks, sanitation systems, lodging, and recreational amenities, has a direct impact on both the quality of the tourist experience and the sustainability of park usage.

Additionally, the local population serves as key stakeholders in this tourism ecosystem. They provide essential services, help manage visitor flows, and experience both the economic opportunities and social pressures associated with tourism growth. Furthermore, the region is witnessing rapid growth in domestic eco-tourism, driven by increasing interest from

families and small groups in nature-based and medical tourism. This trend underscores the importance of studying the role of environmental infrastructure in shaping sustainable tourism and community well-being in Lenger and similar mountainous destinations. The study employed snowball sampling, a cost-effective and flexible referral method, to address low survey participation rates in Kazakhstan and effectively gather responses from residents of Lenger Town.

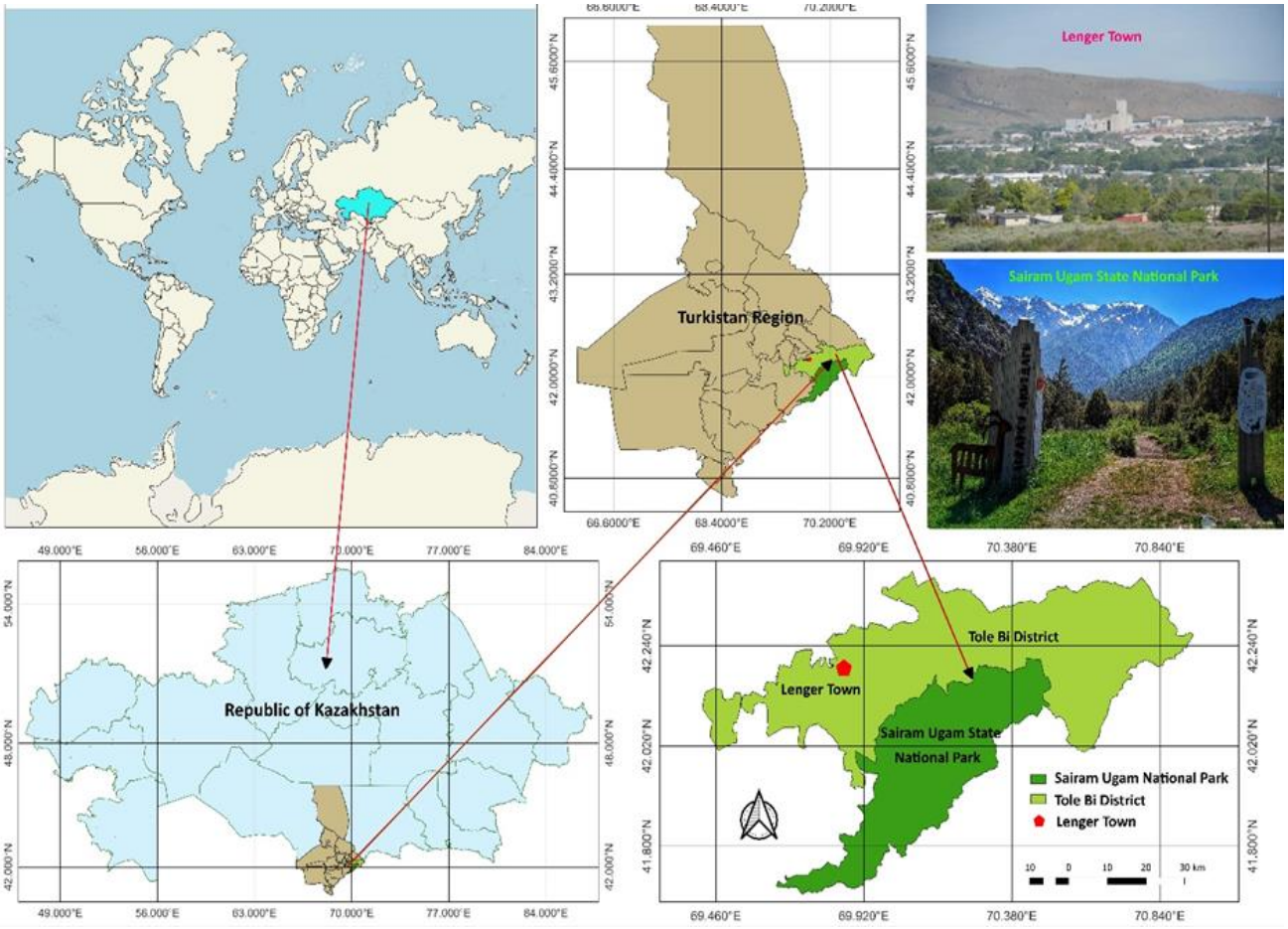

Figure 2. Geographical location map of the research area

To minimize sampling bias, local town leaders were enlisted to help by providing contact information for a diverse group of participants. Additionally, the study followed the sample size determination criteria outlined by Krejcie & Morgan (1970) to ensure statistical validity and representativeness. This method offers a widely accepted formula for selecting a sample size based on a defined confidence level and margin of error. Given Lenger Town's population of 24,302, the required minimum sample size was 379 to achieve a 95% confidence level with a ±5% margin of error. To ensure the sample's representativeness, the authors distributed approximately 600 survey links to Lenger Town residents via personal contact.

Instrument Development and Data Collection Process

A four-part self-administered questionnaire was developed using a quantitative research method as the primary data collection tool. The first section focused on the respondents' demographic factors, such as gender, age, and occupation. The second section assessed environmental infrastructure development, considering the unique characteristics of Lenger Town. A 5-item scale was created to evaluate both tourism-related and general environmental infrastructure development (Abbas et al., 2024; Mamirkulova et al., 2020). The third section measured place attachment, using a 4-item scale adopted from (Lv et al., 2019). The fourth section assessed the quality of life (QOL) concerning SDG3, using a 4-item scale from (Kim et al., 2013). Following the pre-test, we tested the reliability of the scales.

All variables were rated on a five-point Likert scale. The research was conducted between May and July 2022. Out of 600 questionnaires distributed, 470 responses were received. After cleaning the raw data in SPSS, 417 valid surveys were retained. Descriptive statistics were then calculated for each item to determine the mean and standard deviation, reflecting the central tendency and variability of respondents' perceptions.

Data Analysis Approaches

The study employed the statistical platforms SPSS and AMOS (version 23.00) to conduct all data analyses, including testing for convergent and discriminant validity. SPSS 23.0 was used for processing the questionnaires, performing descriptive statistical analysis, and assessing reliability using Cronbach's alpha, which involved mean comparison.

Finally, confirmatory factor analysis (CFA) and structural equation modeling (SEM) were applied to evaluate the significance of the proposed model relationships (Figure 3).

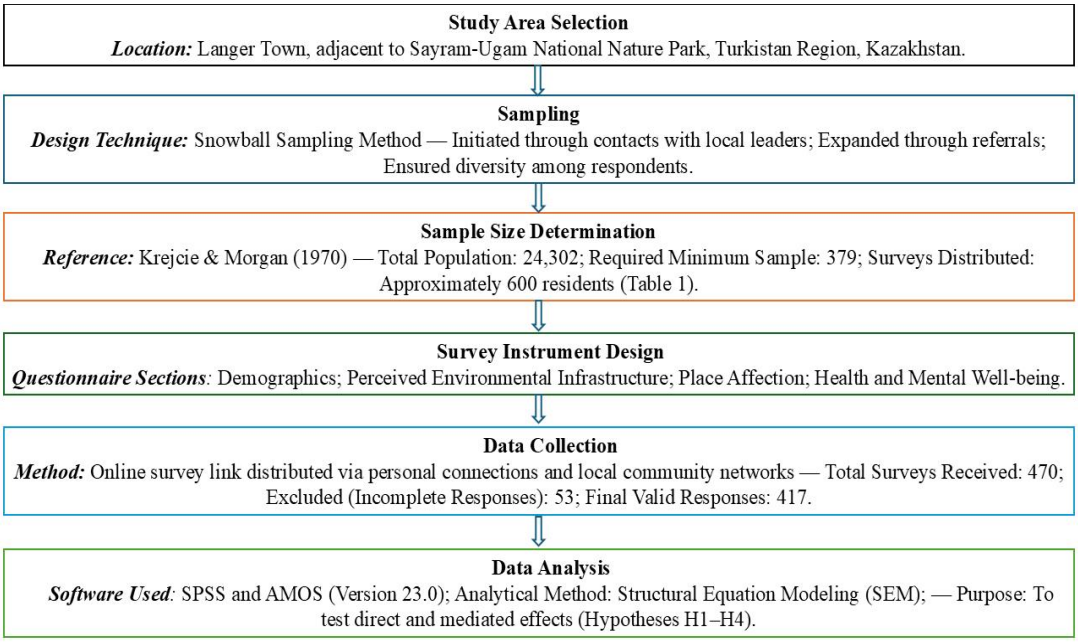

Figure 3. A flowchart of the study methodology steps

Sample Characteristics

As shown in Table 1, 54.90% of participants were female and 45.10% were male. Of the surveyed participants, 24.00% were aged between 18–30, 29.50% were between 31–45, 26.10% were between 46–59, and 20.40% were over 60. Additionally, 29.70% of respondents worked in government institutions, 30.50% in non-governmental institutions, 15.10% were self-employed or engaged in business, animal husbandry, and farming, 20.40% were retired, 2.60% were students, and 1.70% were homemakers (Table 1).

Table 1. Demographic Profile of the respondents (compiled by the authors based on the questionnaire survey)

Variables	Dimensions	Number	Percentage
Gender	Female	229	54.90%
	Male	188	45.10%
Age	18-30 years	100	24.00%
	31-45 years	123	29.50%
	46-59 years	109	26.10%
	60 years and Above	85	20.40%
Current Occupation	Government job	124	29.70%
	Non-government job	127	30.50%
	Self-employment	63	15.1%
	Retired	85	20.40%
	Students	11	2.60%
	Housewife	7	1.7%

RESULTS AND DISCUSSION

Measurement Model

To validate the constructions, Environmental Infrastructure, Place Attachment, and Quality of Life, we conducted a Confirmatory Factor Analysis (CFA) using AMOS. The key metrics resulting from this process are presented in Table 2.

Standardized Factor Loadings (SFL) indicate the strength of the relationship between each item and its underlying construction. Average Variance Extracted (AVE) assesses the amount of variance captured by a construct relative to the measurement error. Composite Reliability (CR) and Cronbach's Alpha (CA) measure the internal consistency of the constructs. As shown in Table 2, the Cronbach's alpha coefficients for all constructs range from 0.83 to 0.94, exceeding the threshold value of 0.70. Furthermore, all measurement items were found to be statistically significant, with standardized factor loadings above 0.70, indicating strong loadings on their respective constructs (Table 2).

The AVE for all constructions was greater than the proposed threshold of 0.50, further confirming construct validity. According to the criteria proposed by Bagozzi et al. (1991), the CFA results demonstrated that the proposed model's goodness of fit was excellent, with the following fit indices: $\chi^2/df = 1.164$, SRMR = 0.053, GFI = 0.942, AGFI = 0.931, NFI = 0.947, RFI = 0.941, IFI = 0.992, TLI = 0.991, CFI = 0.992, and RMSEA = 0.030.

Table 2. Measurement model results (n = 417)

	Constructs and Indicators:	Mean	St. dev.	CSL (L)	AVE	CR	CA
	Environment Infrastructure				**.595**	**0.946**	**0.946**
1	Preserve and restore wildlife habitats with modern methods	3.82	1.249	.793			
2	Attract locals to participate in ecology conservation initiatives	3.93	1.278	.789			
3	Connecting people to nature through outdoor recreation and outdoor sports activity opportunities	3.83	1.238	.800			
4	Create a new source of community identity through an environmental and recreational resource connected to adjacent development	3.72	1.255	.793			
5	Creates green spaces, parks, and green corridors for places of solace and respite.	3.79	1.200	.714			
	Place affect				**0.553**	**0.906**	**0.843**
1	I feel Lenger is a part of me	3.57	1.339	.705			
2	I am highly attached to Lenger	3.77	1.249	.787			
3	I feel a strong sense of belonging to Lenger	3.71	1.175	.761			
4	Visiting Lenger says a lot about who I am	3.65	1.186	.712			
	Quality of life				**0.547**	**0.881**	**0.908**
1	Your overall health status is good.	3.50	1.339	.757			
2	You enjoy better psychological status	4.01	1.285	.725			
3	There are more opportunities to enjoy the happiness of life	3.62	1.334	.729			
4	Your daily life has been filled with things that interest you.	3.68	1.340	.716			

Hypothesis Testing and the SEM Model

The SEM analysis confirmed the relationships among the constructs and indicators (Figure 4). The goodness of fit measures indicated an excellent model fit, with the following values: $\chi^2/df = 1.175$ (Chi-square values), SRMR = 0.052 (root mean square residual), GFI = 0.942 (goodness-of-fit index), AGFI = 0.930 (adjusted goodness-of-fit index), NFI = 0.949 (normed fit index), RFI = 0.943 (relative fit index), IFI = 0.992 (incremental fit index), TLI = 0.991 (Tucker-Lewis index), CFI = 0.992 (comparative fit index), and RMSEA = 0.031 (root mean square error of approximation).

These measures demonstrate a strong overall model fit. The SEM results revealed that environmental infrastructure directly impacts Quality of Life (QOL), confirming H1 (ß = 0.28, p < 0.001). The total effect (ß = 0.323) suggests additional influence through indirect pathways. Similarly, the direct effect of environmental infrastructure on place attachment was supported (H2: ß = 0.220, p < 0.001), with a total effect of 0.262.

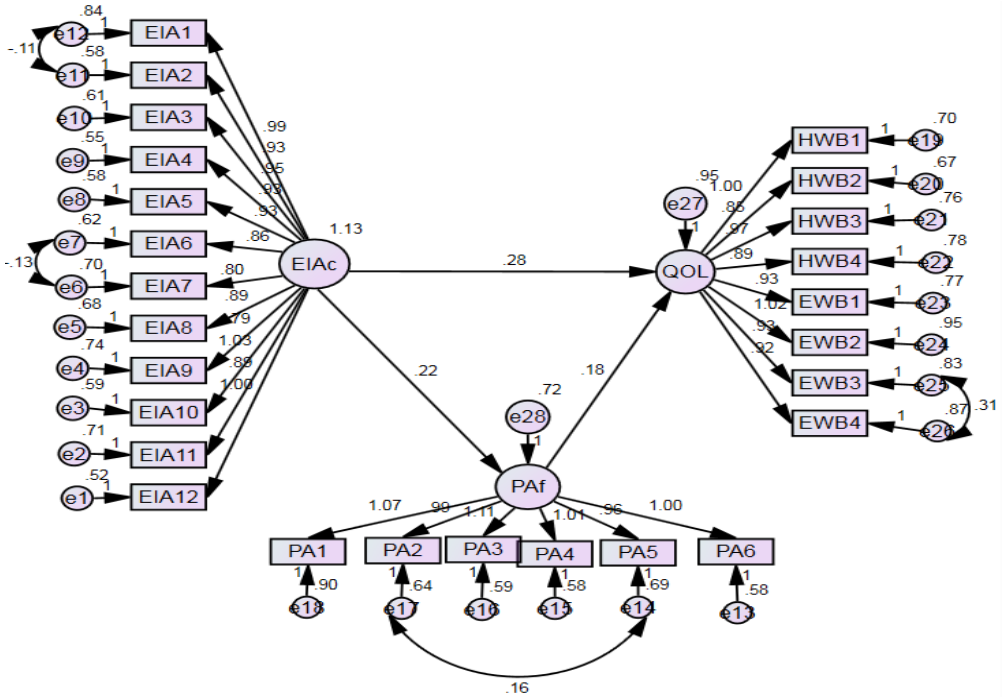

Figure 4. SEM model tests

Furthermore, place attachment significantly influenced QOL (H3: ß = 0.180, p < 0.01), although the total effect was slightly lower (ß = 0.156), indicating complex dynamics between perception and impact (Table 3).

Tourism infrastructure encompasses transportation, social, and environmental infrastructure. This study specifically focused on environmental infrastructure as part of tourism infrastructure development, emphasizing destination development and creating a better living environment for residents. The location and design of innovative environmental infrastructure are crucial. Hypothesis 1 is supported by the findings, which suggest that environmental infrastructure

development in tourism neighborhoods can enhance residents' health and emotional well-being. This improvement is due to the creation of better recreational green spaces, more parks and gardens, and the preservation of natural heritage. These results align with the findings of Mamirkulova et al. (2020), who demonstrated that large-scale infrastructure development can improve quality of life (QOL), indicating a positive relationship between environmental infrastructure and QOL.

Table 3. Results of the model test

We hypothesized path coefficients.	**Stand. estimates**	**t value**	**SE values**	**95% biased corrected confidence interval**		**Test Results**
				Lower bounds	Upper bounds	
H1: EI-> QOL	0.28***	5.224	0.058	0.152	0.391	Supported
H2: EI -> PA	0.22***	4.851	0.060	0.148	0.375	Supported
H3: PA -> QOL	0.18**	2.841	0.063	0.037	0.278	Supported

Hypothesis 2 focused on testing the direct impact of environmental infrastructure on place attachment within the model. The findings showed that environmental infrastructure development significantly predicted residents' place attachment, thus supporting H2. This suggests that environmental infrastructure development enhances residents' emotional connections to a place. In other words, the positive effects of tourism infrastructure development make residents proud of the uniqueness and distinctiveness of their community (Daye et al., 2020), thereby increasing their sense of place attachment. Although no prior research directly examined the impact of environmental infrastructure on residents' place attachment, earlier studies suggest that individual affective connections to places develop over time through environmental and social experiences (Lv & Xie, 2017; Lv et al., 2019). Therefore, fostering a strong sense of place attachment can aid in economic revitalization and recovery, providing valuable insights for government officials in developing strategies to build a more resilient domestic and international tourism industry.

Furthermore, Hypothesis 3, which proposed a positive relationship between place attachment and quality of life (QOL) in terms of health and emotional well-being, was also supported by the data analysis. Residents' emotional attachment to their area was strengthened by the perception that their community is both a tourist attraction and a safe environment. The opportunity to spend time in local parks and gardens contributed to improved emotional and physical well-being.

Hypothesis 4 suggests that the relationship between environmental infrastructure development and quality of life (QOL) in terms of emotional and health well-being is partially mediated by place attachment (Table 4). Therefore, H4 is supported. The findings indicate that enhancing residents' place attachment is a key mechanism linking environmental infrastructure development to improvements in emotional and health-related QOL.

Table 4. Results of the bootstrapping method for mediation

Path	Coefficient			95% biased corrected confidence interval	
	Total effect	Direct effect	Indirect effect	LLCI	ULCI
EI on QOL	.323	.282	-	0.1955	0.3727
EI on PA	.262	.262	-	0.1529	0.3000
PA on QOL	.156	.156	-	0.0936	0.3165
EI impacts QOL via PA	-	-	0.41	BootLLCI: 0.0176	BootULCI: 0.0862

In other words, as residents form stronger bonds and emotional connections to their community, the development of environmental infrastructure leads to enhanced QOL. This study aligns with the work of Ramkissoon (2020), who proposes that place attachment can serve as a link between social tourism development and QOL.

CONCLUSION

This study examined how residents in a mountainous tourism area perceive the impacts of environmental infrastructure and how these perceptions influence their emotional connection to the place (place attachment) and their sense of health and well-being, aligned with SDG 3 (Good Health and Well-being). The SEM model analysis revealed that perceived environmental infrastructure significantly enhances place attachment, which, in turn, strongly predicts residents' well-being. Notably, place attachment partially mediates the relationship between environmental infrastructure and well-being, highlighting the psychological mechanisms through which infrastructure investments can influence community health outcomes. These findings provide empirical support for incorporating emotional and cognitive responses into sustainable tourism planning, particularly in ecologically sensitive and culturally rich regions like Lenger Town in the Turkistan region of Kazakhstan. From a policy and planning perspective, the results suggest that infrastructure improvements should address not only physical needs (such as roads, waste management systems, and green spaces) but also foster residents' emotional connection to their surroundings.

Such investments can contribute meaningfully to broader development goals, including environmental sustainability, community support for tourism, and public health promotion. Furthermore, researchers recommend policies that promote green tourism and eco-adventure tours, which can generate local jobs, increase incomes, and support biodiversity protection. Our study demonstrates that investing in protected areas, such as the Sairam-Ugam National Nature Park, not only promotes sustainable tourism but also serves as an effective strategy for economic recovery.

In conclusion, environmental infrastructure development in Kazakhstan's tourism sector must be strategically managed and planned, incorporating natural parks, wildlife reserves, greenways, recreational areas, and lands with

preservation value. Developers should focus on preserving native species of flora and fauna and supporting natural ecological processes that sustain air, water, and mineral resources—factors that significantly impact the health and quality of life (QOL) of communities and individuals in Kazakhstan.

Theoretical Contributions and Limitations

This research is among the first to explore tourism's environmental infrastructure as a precursor to place attachment, health, and emotional well-being. It also emphasizes the importance of multi-sectoral initiatives, such as the Belt and Road Initiative (BRI), in supporting the 2030 Sustainable Development Agenda.

However, like any research, this study has certain limitations that should be considered when interpreting the findings. The data for this study were collected from a survey of residents in Lenger Town, located near the Sairam-Ugam National Nature Park. To gain a broader perspective, it would be beneficial to explore the impact of environmental infrastructure development on locals' quality of life (QOL) in other national parks with varying economic and health conditions. Additionally, future studies could examine the connection between residents' place attachment in different contexts.

Author Contributions: Conceptualization, G.M. and I.A.; methodology, G.M. and I.A.; software, B.P. and D.A.; validation, G.M. and I.A. and A.T. and Z.M.; formal analysis, G.M. and I.A.; investigation, G.M. and I.A. and A.T. and Z.M. and B.P. and D.A. and A.U.; ; data curation, G.M. and I.A. and B.P.; writing - original draft preparation, G.M.; writing - review and editing, G.M. and I.A.; visualization, G.M. and I.A. and A.T. and Z.M. and B.P. and D.A. and D.A. and A.U.; supervision, G.M. and I.A.; project administration, G.M. and I.A. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The author(s) received no financial support for the research, authorship, and/or publication of this article. We are grateful to our institutions. Also, many thanks to the anonymous reviewers for their helpful comments and guidance. Lastly, thank you to the survey participants who provided valuable insights.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 28.03.2025 Revised: 30.06.2025 Accepted: 22.07.2025 Available online: 12.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1604-1614
DOI 10.30892/gtg.61319-1529

EVALUATING TOURIST PERCEPTIONS THROUGH SENTIMENT ANALYSIS: INSIGHTS FROM CHACHAPOYAS, PERU

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Citation: Ruiz-Miranda.V.P., Sanchez-Cobarrubias.V.A., Palomino-Ludeña.M.H., Esparza–Huamanchumo, R.M., & Miranda-Guerra, M.D.P. (2025). Evaluating tourist perceptions through sentiment analysis: Insights from Chachapoyas, Peru. *Geojournal of Tourism and Geosites*, 61(3), 1604–1614. https://doi.org/10.30892/gtg.61319-1529

Abstract: In the context of rapid digitalization and the post-pandemic recovery of the tourism sector, user-generated content (UGC) on digital platforms such as TripAdvisor has emerged as a critical source of information for understanding tourist behavior, satisfaction, and destination image formation. As tourists increasingly rely on peer reviews to plan their trips, analyzing this content offers valuable insights into how destinations are perceived globally. Chachapoyas, located in the Amazon region of northern Peru, represents an emerging tourist destination with notable cultural, archaeological, and natural attractions. Despite its growing visibility in national and international tourism circuits, empirical studies analyzing tourist perceptions of Chachapoyas through online content remain limited. This study aims to evaluate the destination image of Chachapoyas by examining the main attributes emphasized by tourists in their reviews posted on TripAdvisor. A total of 644 reviews published between 2018 and 2023 were systematically collected and analyzed using text mining and sentiment analysis techniques. The reviews were categorized into thematic dimensions such as lodging, restaurant services, transportation, major attractions, and overall visitor experience. The analysis focused on the frequency of key terms, the polarity of sentiments expressed, and the narrative structures used by tourists to describe their stay. The findings reveal that the most positively valued categories include "infrastructure", "atmosphere of the place", and especially "culture, history, and art". Tourists consistently expressed positive sentiments regarding the preservation of cultural heritage, the authenticity of local traditions, and the welcoming attitude of residents. Conversely, negative comments were largely related to service inconsistencies, transportation challenges, and infrastructure limitations. The results emphasize the centrality of cultural heritage in shaping the visitor experience in Chachapoyas and highlight the increasing influence of online reviews in constructing and disseminating destination image. This research contributes methodologically by applying advanced content analysis tools and offers practical insights for tourism stakeholders in emerging destinations.

Keywords: tourist perceptions, sentiment analysis, destination image, cultural heritage, text mining analysis, Chachapoyas

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INTRODUCTION

Since the onset of the pandemic, the relevance of social media and review platforms has increased significantly in travelers' decision-making. In the tourism sector, this trend has been consolidated, as tourists create and use information from these platforms during the different stages of their trips (Marchiori & Cantoni, 2015). Platforms such as TripAdvisor not only allow tourists to share their experiences and ratings but also play a crucial role in shaping the destination image (Jiang et al., 2023). Constant interaction on these platforms generates a vast amount of user-generated content (UGC) that significantly influences travel decisions (Reza et al., 2012). The rise of social networks in recent years has led to a massive increase in user-generated data on the Internet. According to a recent study by Statista, it is estimated that there are approximately 4.2 billion active users of social networks globally, with an average daily usage of 2.42 hours per day (Sultan, 2023). This large volume of information has a significant impact on the creation of the image of tourist destinations and, therefore, on travelers' decisions. The image of a destination is a key factor in the travel decision, as the globalization of the tourism industry and the growth of competition increase the supply of tourism products, influencing the perception of tourists through the media (Vila-Lopez & Kuster-Boluda, 2024).

People tend to believe that the images perceived in the media reflect the reality of the destination, motivating them to travel, although the real offer is not always as attractive as the image projected.

TripAdvisor stands out as the world's leading platform for traveler reviews and opinions, present in 49 countries and considered the largest community of travelers in the world (TripAdvisor, 2024). TripAdvisor has revolutionized the travel

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industry by ranking and sorting hotels, restaurants, and destinations based on user reviews. This platform allows tourists to consult the experiences of other travelers, which has become a determining factor in the choice of tourist destinations (Balagué et al., 2016). In addition, the active participation of users in the generation of content and interaction on the platform highlights its importance in the sector (Alaimo et al., 2020). For these reasons, this research uses reviews on TripAdvisor, since it is the most widely used specialized tourism website, with more than 455 million visits each month (TripAdvisor, 2024). According to Barreda & Bilgihan (2013), it is important to take into account the opinions of users, as these have become increasingly relevant, and a good or bad rating can have a significant influence on the image projected of a tourist destination. Previous studies have shown a close relationship between the image of a destination, the attitude of travelers, and their intention to visit it (Reza et al., 2012).

In Peru, tourism is a sector that has shown a remarkable recovery after the pandemic. According to the 2023 report of the Directorate General of Research and Studies on Tourism and Handicrafts, domestic tourism is projected to reach 34 million trips, representing a 25% growth from the 27 million registered in 2022 (MINCETUR, 2024). In addition, in 2023, 2,524,658 international tourists were registered, surpassing initial projections with an inter-annual growth of 25.7% (MINCETUR, 2024). 59% of Peruvian vacationers searched for information on social networks before making their trip, with platforms such as Facebook, Instagram, and TikTok standing out (Promperu, 2022). In 2023, these trends continued, with 54% of vacationers relying on the recommendations of acquaintances and 49% using social networks as their primary source of information (Promperu, 2023; Nastase et al., 2014). In this context, platforms such as TripAdvisor play a crucial role in the recovery and promotion of Peruvian tourist destinations.

In the Amazon region of Peru, tourism has shown signs of recovery and growth. In 2023, the Kuelap Archaeological Complex was the most visited attraction, with 46,007 visitors, an increase of 15.2% compared to 2022 (Zavaleta et al., 2024). Other notable destinations include the Gocta Waterfalls and the Leymebamba Museum, which continue to attract both domestic and foreign tourists (MINCETUR, 2023). Likewise, the Karajía archaeological complex is considered one of the most important tourist resources in the Amazon region after Kuelap and Gocta (Zavaleta et al., 2023). Additionally, in the case of Chachapoyas, the information generated by tourists on platforms such as TripAdvisor is essential to understand how the destination is perceived and to plan its future promotion. The present research analyzed user-generated content on TripAdvisor to understand tourists' perceptions of the destination image of Chachapoyas, Peru. In particular, the study focused on three key elements: the lodging service, the restaurant service, and the main tourist attractions, in order to provide strategic inputs for tourism marketing, development, and promotion plans.

LITERATURE REVIEW AND THEORETICAL DISCUSSION

Destination Image (DI)

Destination image (DI) is a key concept in tourism studies, essential to understand how tourists perceive and select their destinations. This concept has been the subject of multiple studies and theorizations since its inception (Kutlu & Ayyıldız, 2021). Based on Phelps (1986), destination image is commonly categorized as primary and secondary. The primary image is built after direct experience at the location, influenced by personal experiences. The secondary image is formed before the trip, from organic sources, such as the experiences of others, or induced sources, such as advertising campaigns, and shapes tourists' expectations (Saqib & Jan, 2021; Bigi et al., 2022). The interplay between these images' influences tourist satisfaction and behavioral intentions, such as returning or recommending the destination (Van-Dunem et al., 2021).

Echtner & Ritchie's (1993) conceptual framework remains influential, describing destination image through three continua: attribute–holistic, functional–psychological, and common–unique (Wang & Lin, 2024; Jiang et al., 2023). This model integrates objective features, emotional perceptions, global impressions, and distinctive characteristics of destinations. In addition, Gartner's (1994) tripartite model widely adopted in recent studies (Baber & Baber, 2023; Zarkada et al., 2025; Hussain & Rather, 2023) conceptualizes destination image through cognitive (knowledge and beliefs), affective (emotional responses), and conative (behavioral intentions) dimensions, offering a comprehensive perspective on tourist perceptions and reactions. Finally, destination image is assessed through nine interrelated categories: culture, history and art; leisure and recreation; tourism infrastructure; natural environment; general infrastructure; social environment; political and economic factors; place atmosphere; and natural resources. These elements reflect the multidimensional nature of tourism perception and contribute to a holistic evaluation of a destination (Guo et al., 2023; Marchi & Raschi, 2022).

Destination image plays a crucial role in tourism decision-making and destination marketing and significantly influences the choice of a vacation destination (Liu et al., 2021). Likewise (Hussain & Rather, 2023) consider DI as one of the key factors in successful destination marketing (Ghosh et al., 2025). In addition, it has been widely recognized that the image of a destination significantly affects the travel decision of most tourists and that a destination with a relatively positive image is more likely to attract international tourists (Vila-Lopez & Kuster-Boluda, 2024). The online destination image ("online DI") can be defined as the representation of the set of beliefs, knowledge, ideas, feelings and general impressions of a destination; and the product of the interaction and communication between supply (travel agencies and other tourism intermediaries) and demand (tourists in general) (Liu et al., 2021). The formation of DI is deeply dependent on user-generated content fostered by tourists using new technologies. Social networks provide a wealth of information that allows you to form a first impression of a destination (Vila-Lopez & Kuster-Boluda, 2024). Although there are multiple methods for investigating destination images, there is no universally accepted definitive measurement (Guzman-Parra et al., 2021). DI is therefore a multidimensional global impression, but there is no consensus on the dimensions that make up this holistic impression (Bigne et al., 2019; Guzman-Parra et al., 2021). In summary, destination image is a multidimensional and

complex concept that significantly influences travel decisions and destination marketing. Understanding its components and how it is formed is crucial to developing effective strategies in the tourism sector (Freire & Curvelo, 2021).

Tourist-generated content (TGC)

Tourist-generated content (TGC) plays a key role in the contemporary tourism landscape, as it encompasses various forms of user-generated content (UGC) shared by travelers. Various authors systematically classify TGC into four categories; the consumer-to-consumer (C2C) category is particularly relevant, as it includes the sharing of tourism experiences, communication with family and friends, and the creation of electronic word-of-mouth (Liu et al., 2021; Volo, 2010). Compared to traditional information channels, TGC offers advantages such as better information storage, greater dissemination and search efficiency, which collectively shape an online destination image (DI) (Liu et al., 2021).

Tourist-generated content (TGC), also known as tourist-generated content (TGC), plays a key role in today's tourism, significantly influencing destination image and visitor intentions. One of its main strengths is its authenticity, perceived as more credible than official information (Nantakat & Vorachart, 2021). This type of content, especially when it conveys positive emotions, generates greater connection with potential visitors. Its impact is particularly strong on audiences such as Generation Z, who value genuine experiences (Aboalganam et al., 2025; Yamagishi et al., 2024). Marketers frequently use UGC to enhance their presence in social networks and other marketing channels, recognizing its value in accurately assessing customer needs and developing products (Liu et al., 2021; Rasool & Pathania, 2021). In addition, companies leverage text mining tools to analyze TGC, identifying frequent words and themes to better understand customer feedback, thus more effectively managing customer relationships and satisfaction (Jia, 2018; Rasool & Pathania, 2021).

According to Liu et al., 2021, the influence of TGC on tourists' perceptions and decision-making processes is considerable. Tourists not only consume information but also contribute to it, building a DI that significantly influences the choice of the destination (Rasool & Pathania, 2021). In their research conducted in India (Chen et al., 2019), they identified that online reviews and ratings on platforms such as TripAdvisor impact the purchase intentions of potential customers, demonstrating a clear link between TGC and consumer behavior. The motivations behind the generation of TGC range from personal enjoyment to economic incentives, further highlighting their role in shaping consumer perceptions and actions (Romero-Rodriguez & Arbara, 2023). The evolution of TGC is closely linked to advances in digital communication technologies. The shift from monologic communication to an interactive process has fostered the creation of UGC, allowing consumers to express themselves and interact on various digital platforms (Dahl et al., 2019). Web 2.0 technologies have facilitated the emergence of social commerce, allowing consumers to share their satisfaction or dissatisfaction with products and services online, thereby influencing a wide audience (Park & Lee, 2024; Rasool & Pathania, 2021). In the hospitality industry, in particular, TGC is crucial, as online consumer reviews are critical to selling experiences, making it an integral part of destination marketing strategies (Navarro et al., 2025).

Chachapoyas as a tourist destination

According to the World Tourism Organization (UNWTO), "the tourist destination is the place visited that is fundamental to the decision to travel". From a geographical perspective, it is emphasized that a tourist destination not only encompasses natural and cultural resources, but also the infrastructure, services, and facilities that, together with the local community and public and private stakeholders, form an interdependent system (Barnerjee et al., 2023). Furthermore, it is recognized that a tourist destination has an intangible dimension, represented by the image and perception that tourists have of the place. This perception is built from lived experiences, interaction with the local community, and the quality of the services offered, which directly influences visitor satisfaction and loyalty to the destination (Králiková et al., 2020; Marine-Roig, 2021). In this context, tourist destination management must consider both tangible and intangible elements, promoting a harmonious integration of available resources and encouraging the active participation of all stakeholders. Only through strategic and collaborative planning can the sustainable and competitive development of tourist destinations in the global market be guaranteed (MacEachern et al., 2024).

The city of Chachapoyas is located in the Peruvian jungle, in the province of the same name belonging to the Amazon region and was officially created on September 5, 1538, being the sixth oldest city created by the Spaniards in Peru (Alvarado, 2022). The name "Chachapoya" may be a corruption of the Inca (Quechua) name for the province called Chachapoyas (Hagen, 2002); which is derived from the words Sacha (“tree") and Puyu ("cloud"). Combined, these terms could be translated as "cloud forest." A description particularly fitting for the Chachapoya territory, characterized by tropical wet forests. In 2017, Chachapoyas was in a moment of great tourist development since the first cable car system in Peru was created which allowed to take a large number of tourists to the monument of Kuelap, also known as "The Machu Picchu of the North"; this was accompanied with a renovation of the airport of Chachapoyas which will allow to increase on a large scale the flow of tourists to this region (Church & Guengerich, 2017). This study aims to evaluate tourist perceptions of Chachapoyas by leveraging sentiment analysis techniques on TripAdvisor reviews. By analyzing user-generated content, the research provides valuable insights into the factors influencing the destination image and tourist satisfaction. The findings will serve as a basis for informed decision-making in tourism planning, marketing, and development, contributing to the sustainable growth of Chachapoyas as a competitive destination in the Amazon region of Peru.

MATERIALS AND METHODS

The objective of this research was to understand tourists' perceptions of the destination image (DI) of Chachapoyas, Peru, by analyzing reviews of lodging, restaurants and tourist attractions posted by users on TripAdvisor. For this purpose,

the comments and ratings of national and international tourists on the TripAdvisor platform were analyzed. The data were collected through textual opinions and analyzed in such a way that their characteristics are recognizable, therefore, it is a qualitative study (Todd et al., 2004). The research focused on identifying the key categories and attributes associated with the destination image, limiting itself to collecting relevant information only within the predefined categories (Sampieri et al., 2014). For this purpose, unstructured text mining was used, a cutting-edge technique that is gaining popularity among tourism professionals (Godnov & Redek, 2016). This technique allows taking advantage of the abundance of textual content available online, transforming large volumes of data into valuable and understandable information by analyzing patterns and trends (Li et al., 2018; Yang & Stienmetz, 2018).

Four key stages were defined for the application of data mining: selecting the sample, recording the characteristics of the initial data, applying the appropriate procedural criteria, and interpreting the data (Vallejo Ballesteros et al., 2018). It is important to note that not all travelers speak the same language, which may affect the data mining process due to variations in translations (Berezina et al., 2015). To mitigate this impact, it is recommended to use a single translation engine for all comments, which helps to standardize content and improve data consistency (Hofmann & Chisholm, 2016). In the case of TripAdvisor, SDL Language Cloud was used, a tool that not only homogenizes content but also improves its accuracy by incorporating artificial intelligence and machine learning. This platform accepts corrections from users and works in conjunction with Google Translate, which optimizes the quality of translations over time (Li et al., 2014). For sentiment classification, the Text2Data program was used to ensure a clear and consistent categorization of perceptions expressed in the reviews. This approach enabled a detailed analysis of the positive and negative aspects influencing the image of Chachapoyas as a tourist destination. The sentiment score thresholds were based on the tool's default settings and aligned with established practices in the sentiment analysis literature, ensuring both methodological rigor and comparability with previous studies.

Data collection

We collected 644 TripAdvisor reviews published between January 2018 and December 2023, using a Python web scraping script that extracted the comments in CSV format from the platform. The collection process took place between April and May 2024. In addition, they were contextualized based on the time and place where they took place and the interactions between the various agents (Jung, 2019). The comments obtained were about lodging, restaurants and tourist attractions in Chachapoyas, in order to understand tourists' perceptions of the destination image (DI). To ensure data integrity and homogeneity, all reviews were obtained in their original language and then translated into English using SDL Language Cloud, a translation tool that incorporates artificial intelligence and machine learning, improving the accuracy of the translations. To guarantee the accuracy and quality of the analysis, Grammarly was used for grammatical and spelling correction of the translated texts, adjusting contextual errors and ensuring that the reviews were interpreted correctly (Alshayban, 2024). All content was filtered to exclude non-relevant information, strictly aligned with the research objectives and ensuring a rigorous and representative analysis of tourists' perceptions.

Data analysis

Data analysis was performed using text mining, an advanced technique for transforming large volumes of data into understandable and actionable information. For this purpose, tools such as R Studio and WordCloud were used to generate visual representations of the frequency of key terms associated with the destination image, their usefulness lies in their efficiency in summarizing large amounts of data (Ballestar et al., 2020). In addition, the Text2Data tool was used for sentiment analysis, classifying comments into three categories: positive (values greater than +0.25), negative (values less than -0.25), and neutral (values between -0.25 and +0.25). This classification made it possible to identify patterns and trends in tourists' perceptions, minimizing possible biases.

The categories of the destination image used in this study are based on the proposals of (Beerli & Martín, 2004) which have been specifically adapted to the context of the Chachapoyas tourist destination to reflect its particularities and distinctive characteristics. Table 1 presents the categories and their associated attributes.

Table 1. Categories and Attributes of the destination image applied in research (Source: Authors' own creation)

Categories	Authors	Attributes according to the destination's reality
Natural resources	(Liu et al., 2021); (Beerli & Martín, 2004); (Dwivedi, 2009);	Weather; Sunshine hours Rainfall; Temperature
General Infrastructure	(Hussain & Rather, 2023); (Liu et al., 2021); (Beerli & Martín, 2004); (Dwivedi, 2009);	Development of commercial infrastructures; Extension of building development; Public and private transport
Tourism Infrastructure	(Hussain & Rather, 2023); (Liu et al., 2021); (Beerli & Martín, 2004); (Dwivedi, 2009);	Hotel accommodation and self-service; Tourist centers; Excursions at destination; Ease of access to the destination; Tourist information network; Restaurants; Hotel quality
Culture, History and Art	(Liu et al., 2021); (Beerli & Martín, 2004) ; Dwivedi, 2009);	Customs and lifestyles; Gastronomy; Museums, historical buildings, monuments, etc.
Political and Economic Factors	(Hussain & Rather, 2023); (Liu et al., 2021); (Beerli & Martín, 2004); (Dwivedi, 2009);	Prices
Natural Environment	(Hussain & Rather, 2023); (Liu et al., 2021); (Beerli & Martín, 2004); (Dwivedi, 2009);	Attractiveness of cities and towns; Beauty of the landscape
Atmosphere of the Place	(Liu et al., 2021); (Beerli & Martín, 2004); (Dwivedi, 2009);	Pleasant; Attractive or interesting; Fun, enjoyable; Exotic; Mystic; Relaxing

RESULTS

The image of a tourist destination should be thoroughly investigated before attempting to position the product (Ahmed, 1991) this study focuses on analyzing the destination of Chachapoyas, one of the seven provinces of the Amazon region, located in Peru, considered one of the tourist destinations of excellence (Zavaleta et al., 2023), highlighting the architecturally beautiful squares and cathedrals of yesteryear, it is a link between the other localities to reach other destinations in the region. The data analysis resulted in the identification of 1,719 keywords distributed in 7 categories and 26 attributes of the destination image based on the model applied in the research, which had nine categories and sixty-five attributes. The categories with the highest number of keywords were "Tourist Infrastructure" (671 keywords) and "Atmosphere of the Place" (526 keywords), which highlights the importance of these aspects in the tourists' perception of the destination image of Chachapoyas. On the other hand, "Political and Economic Factors" and "Natural Resources" had *a lower number of keywords, suggesting a more limited focus on these aspects by tourists* (Table 2).

Table 2. Keyword frequency by Categories and Attributes of the Destination Image (Source: Authors' own creation)

Category	Attribute	Keywords
Natural Environment	Attractiveness of cities and towns	6
126	Beauty of the landscape	120
Atmosphere of the Place 526	Pleasant	88
	Attractive or interesting	395
	Fun, enjoyable	12
	Exotic	3
	Mystic	8
	Relaxing	20
Culture, History and Art 178	Customs and lifestyles	8
	Gastronomy	102
	Museums, historical buildings, monuments, etc.	68
Political and Economic Factors 19	Prices	19
General Infrastructure 192	Development of commercial infrastructures	112
	Extension of building development	54
	Public and private transportation	26
Tourism Infrastructure 671	Hotel accommodation and self-service	199
	Tourist centers	6
	Excursions at destination	19
	Ease of access to the destination	52
	Tourist information network	4
	Restaurants	225
	Hotel quality	166
Natural resources 7	Weather	1
	Sunshine hours	3
	Rainfall	1
	Temperature	2
Total		**1719**

As for the sentimental analysis, as shown in Figure 1, of the total of 150 records, 63% had a positive sentimental evaluation, 16% negative, and 21% neutral. Therefore, it is observed that comments about the destination image of Chachapoyas are given in a positive or neutral context most of the time; with an average sentimental value of 0.3667.

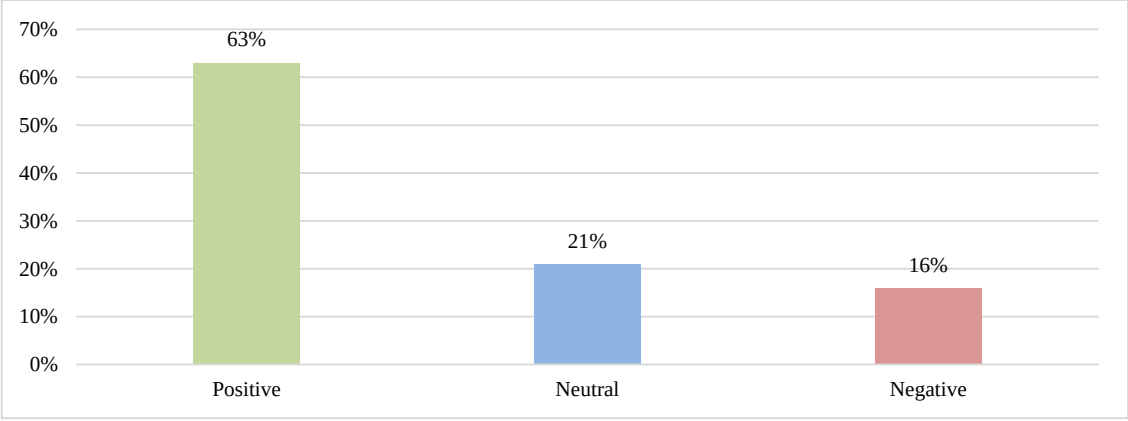

Figure 1. Relative frequency of records by sentiment value
(Source: Own elaboration based on the analysis of TripAdvisor comments)

Word clouds were used to identify the most frequently used terms in TripAdvisor comments. With the results, it was identified that out of the total of 1719 keywords, 98% carry a positive or neutral sentiment (89% and 8% respectively), while only 2% of the keywords represent negative sentiments related to the destination image. The generated word clouds reveal the most recurrent keywords in the comments with positive (Figure 2a) and negative (Figure 2b) sentiments, where the size of the words is proportional to their frequency and colors are used only to facilitate visualization. In the positive comments, terms such as "excellent", "good" and "beautiful" appear frequently, being associated with favorable reviews of tourist attractions. Words such as "delicious" for restaurants, and "clean", "comfortable" and "pleasant" for hotels reflect a positive perception. On the other hand, in the negative comments, "basic" and "slow" (related to the service in restaurants), "expensive" (related to the price of food) and "disappointing" (related to the lack of hot water in hotels) stand out. In the specific case of tourist attractions, words such as "cheap" (related to the quality of the souvenirs), "inaccessible" and "challenging" (referring to the difficulty of access and the state of the trails) stand out".

(a) **(b)**

Figure 2. Word cloud on the most frequently used keywords in (a) positive and (b) negative sentiment TripAdvisor comments (Source: Own elaboration based on the analysis of TripAdvisor comments)

Figure 3 presents the keywords with the highest sentiment score extracted from TripAdvisor comments, organized in (a) positive and (b) negative sentiment TripAdvisor comments. In general, in the positive comments, terms such as “tremendous” (related to the hosts' treatment), “perfect” (referring to the facilities and views) and “genuine” (related to the commitment to the protection of nature) in lodgings; “best” (regarding the taste of the dishes) and “great” (related to the portions, coffee and location) in restaurants; and “monumental” (related to the landscape and historical aspect) and “entertaining” (referring to the excursions) in tourist attractions stand out in the positive comments. On the other hand, negative comments include “unfriendly” (referring to the treatment of the reception staff) and “disorganized” (related to service) in lodging; “limited” (regarding the diversity of the menu) and “uncomfortable” (referring to the furniture) in restaurants; and “disappointing” (referring to the lack of information on the inaccessibility of Kuelap) and “impossible” (referring to the fact that the circuits are not adapted for tourists in wheelchairs) in tourist attractions. This analysis highlights how travelers perceive different aspects of the destination based on their experience in each service category.

Hotels		Restaurants		Touristic Attractions	
Keyword	Sentiment Score	Keyword	Sentiment Score	Keyword	Sentiment Score
tremendous	0,99	best	0,99	monumental	1,00
perfect	0,99	great	0,99	entertaining	1,00
genuine	0,99	exquisite	0,99	excellent	1,00
excellent	0,88	favorite	0,96	charming	1,00
disappointing	-0,99	limited	-0,74	disappointing	-0,99
unfriendly	-0,75	uncomfortable	-0,74	impossible	-0,99
disorganized	-0,75	slow	-0,73	challenging	-0,74
deteriorated	-0,74	expensive	-0,72	inaccessible	-0,74

Figure 3. Highest sentiment score keywords in TripAdvisor comments
(Source: Own elaboration based on the analysis of TripAdvisor comments)

Figure 4 presents the destination image categories and their sentimental values for each of the three key elements (lodging services, restaurant service and tourist attractions). In the case of lodging, the keywords were concentrated in two categories of destination image, both with predominantly positive sentimental value. The analysis of the restaurants revealed keywords related to five destination image categories, of which four showed positive values.

However, the category of political and economic factors registered a negative average sentimental value, especially in the attribute related to price. As for tourist attractions, the keywords were distributed in six categories of destination image. Five of these categories exhibited positive values; especially in the attributes of customs and lifestyles; and historical monuments. The tourism infrastructure category, however, presented a negative value, mainly in the attributes of ease of access to the destination and the tourism information network.

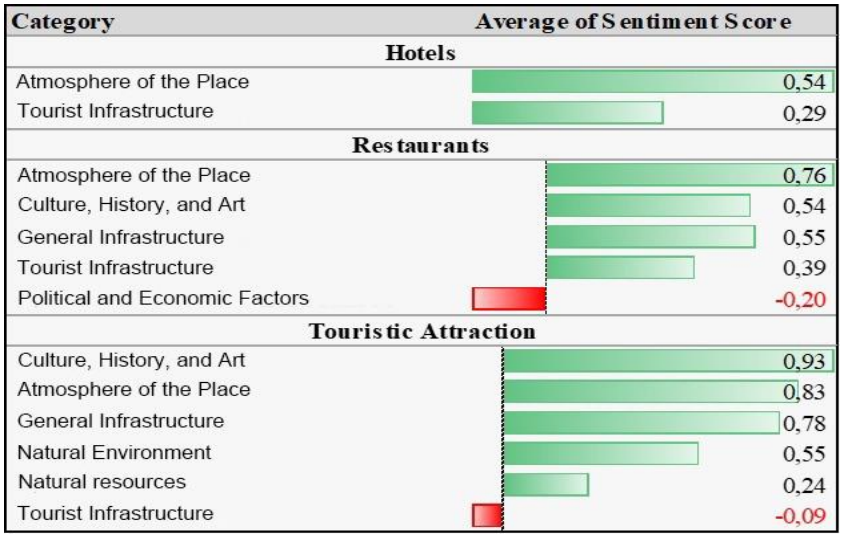

Figure 4. Average sentiment score per category classified by hotels, restaurants and touristic attraction (Source: Own elaboration based on the analysis of TripAdvisor comments)

DISCUSSION

The image of a tourist destination should be thoroughly investigated before attempting to position the product (Ahmed, 1991) this study focuses on analyzing the destination of Chachapoyas, one of the seven provinces of the Amazon region, located in Peru, considered one of the tourist destinations of excellence (Zavaleta et al., 2023), highlighting the architecturally beautiful squares and cathedrals of yesteryear, it is a link between the other localities to reach other destinations in the region. In this study, the categories that registered the highest number of mentions were: "tourist infrastructure", "atmosphere of the place" and "infrastructure in general". These findings contrast with the results obtained in a similar study conducted in Macau, where the main categories were "culture, history and art", "leisure and tourist recreation" and "natural environment" (Liu et al., 2021).

Likewise, Guo et al., 2022 in their study identified the categories "culture, history and art", "atmosphere of the place" and "leisure and recreation for tourists" registering (59.4%) of mentions by Chinese tourists visiting Finland. This indicates that the dimensions of the destination image can vary significantly depending on the context, as suggested by (Bigne et al., 2019; Guzman-Parra et al., 2021), who argue that destination image is a global impression with multiple dimensions that may differ between destinations. Therefore, destination image and perceived value are two important antecedents of tourist satisfaction that influence destination choice (Sun et al., 2013).

Sentiment analysis of the reviews of tourists who visited Chachapoyas shows a predominantly positive rating, with a score of 0.37. For (Assaker, 2014) the destination image includes the visitor's perceptions of the destination they have decided to visit, their thoughts and expectations, as well as the feelings associated with it. It is clear that tourists not only decide to visit the place for what it offers but also for the image that the destination projects (Chi & Phuong, 2022).

This result is consistent with the trend of sustained recovery of tourism in the region, reflected in an increase in visits to the attractions, as highlighted in an analysis of the economic impact in Chachapoyas (Zavaleta et al., 2024). According to Guo et al., 2022 the image of a tourism destination changes over time as the conditions of the destination evolve. The sentimental value is not static but varies according to improvements in infrastructure and tourism services, which is aligned with the recovery of the Chachapoyas destination.

The most frequent words on the TripAdvisor platform, segmented by sentiment in relation to the destination image of Chachapoyas, are mainly associated with accommodations, restaurants and tourist attractions. According to (Zavaleta et al., 2024), tourists' perceptions of key elements of the tourism package, such as hotels, restaurants and attractions, are closely linked to general infrastructure, cultural authenticity, customer service, safety and other factors. (Kourkouridis et al., 2023) also highlight that the quality of the experience plays a fundamental role in tourist satisfaction. Furthermore, (Esparza-Huamanchumo et al., 2023) indicate that, in the satisfaction of a visit to a destination, beyond the natural, cultural and artistic resources, the tourist experience generates significant expectations. In a study about Hong Kong's destination image, it is mentioned that different platforms can project different images of the same destination (Leung et al., 2011).

As for the analysis of comments with positive sentimental value, terms such as "clean", "comfortable" and "pleasant" stand out for hotels; "delicious" for restaurants; and "excellent", "good" and "beautiful" for tourist attractions. This is in line with studies that highlight the importance of positive attributes in the overall perception of the destination (Li & Du, 2020; Sanz-Blas & Buzova, 2016). In the case of hotels, interaction with staff is a factor that affects the destination image. Tourists value the quality of service provided by hotel staff and relate it to a pleasant experience. (Barreda & Bilgihan, 2013). According to Li & Du, 2020, local gastronomy has a significant impact on tourists' experience and reinforces their intention to recommend the destination. Sanz-Blas & Buzova, 2016 analyze the comments of tourists who took excursions in the main Mediterranean ports; the authors conclude that tourists experience positive feelings when they take part in guided tours. On the other hand, the analysis of comments with negative sentimental value revealed terms associated with

less favorable perceptions of service in hotels, such as "disappointing"; in restaurants, terms such as "basic", "slow" and "expensive"; and in tourist attractions, qualifiers such as "inaccessible" and "challenging".

These negative perceptions are in line with studies that relate the competitiveness of the tourism destination and its businesses to the visitor experience (Zavaleta et al., 2024). As for the "culture, history and art" category, this study found a higher average sentimental value (0.60), which is consistent with previous research highlighting the importance of these factors in the formation of a positive destination image. Li & Du, 2020 indicate that tourists tend to seek destinations that offer rich cultural experiences and historical significance, which reinforces their emotional connection to the place. This category has a significant role in creating a positive image of the destination; where cultural factors are a basis on which other attributes can enhance the attractiveness of the destination (Guo et al., 2022). Those responsible for tourism promotion in Chachapoyas can focus on the attributes of this category to improve the experience and satisfaction of visitors to the Chachapoyas destination, which can contribute to a more favorable destination image.

In contrast, "political and economic factors" and their related attributes showed a negative average sentimental value. This finding suggests that challenges in these areas can negatively influence the perception of the destination, which is consistent with studies that highlight the influence of external factors on tourism image. When tourists express dissatisfaction with the price level of tourist attractions, with failures in transport services due to unfavorable economic or political conditions, and poor service quality related to underpaid or under-trained workers, a negative image of the destination is generated, associated with fatigue and frustration (Li & Du, 2020). According to Guo et al., 2022, other aspects related to this category, such as political instability or economic crises, can overshadow the positive aspects of the destination and deteriorate the overall image. It is, therefore crucial that these factors are carefully managed, as their impact can be profound and long-lasting on the overall perception of tourists. When grouping TripAdvisor reviews into clusters corresponding to accommodations, the category "atmosphere of the place" presents a high or positive sentimental value. The main attributes associated with this rating include "pleasant" and "relaxing". On the other hand, the "tourism infrastructure" category obtained a lower sentimental value (although still positive), especially in attributes such as "quality of hotels". (Barreda & Bilgihan, 2013), highlight that tourists tend to leave positive reviews when lodgings are well located, close to tourist attractions, and meet the expectations of cleanliness. In contrast, tourists tend to leave negative reviews when the quality of the lodging establishment or the service is below their expectations, these negative opinions can discourage future guests and cause reputational damage to the destination image (Navarro-Mendoza et al., 2025).

When analyzing restaurant reviews, the categories "atmosphere of the place" and "culture, history and art" with attributes such as "customs and lifestyles" and "gastronomy" have high or positive ratings. While the categories “political and economic factors” in “price” attributes resulted in low or negative sentimental value. This shows that tourists value not only the quality of the food but also the relationship of the destination's gastronomy with culture and immersive experiences. According to (Leung et al., 2011) in the case of destinations such as Hong Kong, the environment, atmosphere and authenticity of local restaurants affect the overall perception of tourists. On the other hand, when they do not perceive a relationship between prices and quality, a negative perception is generated, as was observed in the ratings of restaurant service in Chachapoyas.

In the case of tourist attractions, the category "tourist infrastructure" consistently presents a low or negative average sentimental value. The main attributes associated with this rating include "ease of access to the destination" and "tourist information network". This reflects the need to improve these aspects to enhance the destination image, in line with studies that highlight infrastructure as a critical component of the tourist experience. Improving key infrastructures (such as accessibility and tourism services) helps to increase satisfaction and encourage tourists to return to the visited destination (Sanz-Blas & Buzova, 2016; Sánchez-Franco & Rey-Tienda, 2024). Optimizing tourism infrastructure not only improves the perception of the destination but can also positively influence the destination's long-term competitiveness.

The findings of this study on the destination image of Chachapoyas highlight both the positive aspects and the areas for improvement identified. Negative perceptions linked to accessibility and value for money in tourism services underscore the need to optimize these key aspects to improve the visitor experience and the competitiveness of the destination.

CONCLUSION

This study contributes to the literature on destination image (DI) by focusing its analysis on Chachapoyas, an under-researched destination despite its remarkable cultural richness. The DI plays a crucial role in the decision-making process of tourists. In the case of Chachapoyas, the attributes related to "infrastructure" and "atmosphere of the place" coincide with the results obtained in studies carried out in other regions. However, the emphasis on "culture, history and art" highlights a distinctive aspect of the perception of this destination, underlining the relevance of local tourism heritage in the formation of DI. Sentiment analysis applied to user-generated content (UGC) allows for a more detailed understanding of DI and provides a more enriched perspective compared to traditional qualitative and quantitative methods.

The results of this study have significant practical applications for the authorities and tourism stakeholders in Chachapoyas. The findings suggest that factors such as infrastructure, transport, access to tourist attractions, and quality of accommodation are critical and should be prioritized to improve the visitor experience. Likewise, tourism stakeholders can leverage data analytics from platforms such as TripAdvisor to effectively manage their online reputation, encouraging satisfied tourists to leave positive reviews that influence the decision of other potential visitors. The implementation of the results and recommendations of this research will allow tourism stakeholders to make informed decisions to improve the attractiveness and competitiveness of Chachapoyas, thus contributing to the sustainable development of the region.

The present research is exclusively based on TripAdvisor reviews, which introduce possible demographic biases. International tourists, individuals with greater digital access, and those who are more inclined to share their experiences online are the primary demographics of users of this platform. This restriction may limit the representativeness of the findings regarding other tourist profiles that use different platforms or do not post reviews. Moreover, the self-selection characteristic of individuals who engage in reviewing may amplify opinions of an extreme nature, both positive and negative, thereby biasing the overall destination perception analysis.

Machine translation has the capacity to influence the preservation of cultural and emotional nuance in multilingual reviews. Furthermore, the emphasis on attributes such as accommodations, restaurants, and major attractions fails to encompass crucial aspects such as transportation, safety, and local interaction. These limitations stress the necessity for tourism digital marketing strategies to incorporate more inclusive and sophisticated monitoring of multiple sources and attributes, as well as critical interpretation of results derived from automated analysis.

The study's findings, which indicate which aspects of the destination elicit the most favorable and unfavorable opinions from travelers, provide useful information for digital tourism marketing strategies. By using sentiment analysis on user-generated content, tourism agents can customize promotional campaigns, improve the destination's online reputation and rectify service deficiencies. This data-driven strategy facilitates the implementation of more targeted, adaptable and effective digital marketing campaigns in Chachapoyas and similar emerging destinations.

Author Contributions: Conceptualization, V.P.R.M. and V.A.S.C. and M.H.P.L.; methodology, V.P.R.M and M.H.P.L.; software, V.A.S.C.; and M.H.P.L.; validation, R.M.E.H. and M.P.M.G; formal analysis, V.P.R.M. and V.A.S.C. and M.H.P.L.; investigation, M.H.P.L.; and R.M.E.H. and M.P.M.G; data curation, M.H.P.L.; and R.M.E.H.; writing - original draft preparation, M.H.P.L.; and R.M.E.H.; writing - review and editing, V.P.R.M. and V.A.S.C. and M.H.P.L; and R.M.E.H. and M.P.M.G; visualization, R.M.E.H., supervisionM.H.P.L.; and R.M.E.H.; project administration, R.M.E.H. and M.P.M.G. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 28.03.2025 Revised: 30.06.2025 Accepted: 22.07.2025 Available online: 12.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1615-1625
DOI 10.30892/gtg.61320-1530

ANALYSIS OF THE VULNERABILITY OF RECREATIONAL LANDSCAPES IN THE RIVER BASIN TO LANDSLIDES, CONSIDERING THE GEOMORPHOLOGICAL FACTOR (KAZAKHSTAN)

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Citation: Kerimbay, B.S., Baimyrzaev, K.M., Kerimbay, N.N., Ospan, G.T. Abdullina, A.G., Bakhyt, M.B. (2025). Analysis of the vulnerability of recreational landscapes in the river basin to landslides, considering the geomorphological factor (Kazakhstan). *Geojournal of Tourism and Geosites*, 61(3), 1615–1625. https://doi.org/10.30892/gtg.61320-1530

Abstract: This study analyzes the vulnerability of recreational landscapes in the Sharyn River basin (Almaty Region, Kazakhstan) to landslides. The area, known for its tourism potential and geomorphological diversity, faces increasing threats due to slope instability. The aim of the research is to assess geomorphological and hydrological factors contributing to landslide risk and develop a comprehensive spatial model. Using GIS and remote sensing tools, a Digital Elevation Model (DEM) was created. The basin was divided into altitude zones, and slope gradient and exposure were analyzed. A landslide risk map was produced, classifying areas into low, medium, and high-risk zones. Slope stability was assessed using the Factor of Safety (FS), integrating soil type, moisture, and slope conditions. To enhance risk evaluation, the Analytic Hierarchy Process (AHP) was used to combine multiple spatial and environmental criteria. The Normalized Difference Water Index (NDWI) was derived from satellite imagery to map surface moisture and assess spatio-temporal humidity dynamics. NDWI helped refine FS results and indicated that high-risk areas were associated with steep slopes, north-facing exposures, and high soil moisture. Lower-altitude areas showed seasonal variability in humidity, influencing instability. The integration of NDWI and AHP improved the accuracy of landslide susceptibility mapping and the prioritization of vulnerable zones. The results confirm that geomorphological structure and hydrological factors jointly control landslide processes. This integrated approach supports early warning, spatial planning, and risk reduction in mountainous recreational regions. The findings are essential for sustainable tourism development and regional safety strategies. The methodology can be adapted for other vulnerable landscapes with similar natural and socioeconomic characteristics.

Keywords: tourism safety, high-altitude zones, landscape vulnerability, landslides, risk analysis, relief, factor of safety

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INTRODUCTION

The recreational landscapes of the river basin of the mountainous region represent a unique system of the natural environment. The Sharyn River is the largest left - bank tributary of the Ile River and belongs to the basin of Lake Balkhash, located in the semi-desert zone of the temperate climate zone. The basin area is 12,693 km2, with absolute heights ranging from 3,957 m at the source to 540 m at the mouth. The geographical coordinates of the basin are 42°40'-44°00' north latitude and 78°30'-80°35' east longitude. According to the hypsometric structure and macrorelief, the landscapes of the region belong to the class of flat and mountainous territories, the uniqueness of which opens up significant opportunities for the development of various forms of ecological tourism. Due to its physical and geographical location, geological and geomorphological features, and landscape diversity, the south-east of Kazakhstan, as noted by Nigmatova and co-authors, has sufficient natural resource potential for the development of recreation and such types of tourism as ecotourism and "green" tourism (agrotourism), water tourism and other types (Nigmatova et al., 2021). A physico-geographical mountainous region is a part of a continent that is characterized by the geomorphological unity of the territory, similar macroclimatic conditions, types of landscape diversity, and high-altitude zonation of landscapes. The relief is the main component of the this environment, which contributes to the development of the tourist potential of

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mountainous areas, which can be represented as tourist sites or resources that generate tourism. Tourism activities in mountainous areas bring many positive results, such as economic development, popularization of natural attractions and improvement of the standard of living of local communities (Dunets et al., 2019; Dunets, 2011; Ufimtsev, 2010).

However, the use of landforms for tourism purposes also has a number of disadvantages, including the threat of degradation of natural sites. In addition, mountainous areas are susceptible to various natural disasters, such as landslides, which requires special attention to ensure the safety of tourism activities and minimize environmental damage.

According to Sümeyra, giving conservation status to relief forms used for tourism is a key element of their sustainable use. This status contributes to the preservation of natural sites and the prevention of negative consequences associated with the exploitation of the territory for tourist purposes (Sümeyra, 2015). In mountainous regions, landslides represent one of the most severe natural hazards. Due to natural conditions or man-made actions, landslides have produced considerable human and economic losses. Individual slope failures are generally not so spectacular or so close as earthquakes or some other natural catastrophes. However, they are more widespread, and over the years, they may cause more damage to properties than any other geological hazards. The effects of these events have significant consequences for local communities, ecosystems, and infrastructure. With climate change and increased human activity, assessing the vulnerability of these areas has become a critical task (Van Westen & Castellanos, 2007; Kusainov, 2012; Baryshnikov, 2012).

The altitude and climate gradients in mountainous areas make geomorphic processes and relief evolution especially active. Slope movements are one of the main factors contributing to erosion and relief evolution. Landslides are catastrophic geological events that occur worldwide. Research on assessing their risk has only recently gained widespread attention among scientists (Redondo et al., 2005; Ovreiu et al., 2018; Castellanos & Van Westen, 2007).

Landslides in mountainous areas have a significant impact on the safety of tourism activities and the sustainable development of territories. Petley analyzes global trends in landslide losses, including their impact on tourism infrastructure and local communities (Petley, 2012). The study emphasizes the need to integrate risk assessment into tourism planning in order to minimize potential risks and ensure the safety of tourists and local residents. In the work of Media et al., data on mountain collapses and landslide in the Kungei Alatau, Terskei Alatau, and other ranges in southeastern Kazakhstan are presented. As a result of their research, more than 60 large seismogenic landslides were identified, with the volume of 25 ranging from 10 to 100 mln m^3, and the volume of the four largest landslides exceeding 100 mln m^3. In the mid-mountain and high-mountain zones of Zhetysu Alatau, Ile Alatau and Kungei Alatau, the density of seismogenic landslides ranges from 1/100 to 1/50 $км^2$, and the proportion of landslide-prone areas ranges from 1% to 1.5% (Medeu et al., 2018).

The geomorphological features of mountainous regions are an important factor in the formation of landscapes, their sustainability, and the development of tourism potential (Dunets, 2011). Many studies emphasize the role of geological structure and relief formation processes in creating attractive tourist resources, as well as the emergence of natural threats. In the work of Tserkashova et al., the influence of tectonic activity on the formation of complex reliefs and related geohazards is considered, and climatic factors play a significant role in the vulnerability of mountainous areas (Tserkashova et al., 2020). Changes in temperature conditions and precipitation can significantly increase the likelihood of landslides, especially in areas with high moisture content and intense erosion (Kalinin et al., 2019).

An important aspect is the study of the anthropogenic impact on mountain landscapes. In particular, urbanization, road construction, and mining activities can significantly increase the vulnerability of mountainous areas to landslides, as shown in studies. In addition, the sustainable development of mountainous areas requires taking into account natural threats, such as landslides, when developing tourist routes and infrastructure (Yakovleva et al., 2021; Froude & Petley, 2018).

For local communities located in areas with a high risk of landslides, the consequences can be catastrophic. Landslides threaten not only human lives, but also the destruction of infrastructure and agriculture. The assessment of the significance of the risks in this study showed that areas with high risks of landslides should receive special attention from local authorities. It is especially important to consider the impact of climate change, which can cause more frequent and severe precipitation, worsening the condition of slopes. The purpose of this work is to identify areas with a high risk of landslides based on an analysis of the terrain of the Sharyn River basin in the Almaty region, Republic of Kazakhstan.

This study is relevant due to the development of ecological tourism in this region, where natural hazards pose a serious threat to tourist routes and infrastructure sustainability. To achieve this goal, the following tasks were solved: creation of a DEM, analysis of slope maps to identify critical areas and areas at high risk of landslides, considering the geomorphological characteristics of the territory; use of satellite data to calculate NDWI to assess soil moisture; assessment of slope stability using FS calculation method and AHP multicriteria analysis, taking into consideration soil type and moisture content. The practical significance of identifying risk zones in terms of their impact on sustainable development and the safety of tourists is based on an integrated approach using GIS. This approach combines the protection of natural landscapes and infrastructure development to ensure the safety of visitors and the sustainability of the area.

GIS also allows for creating interactive educational programs that help raise environmental awareness among tourists and encourage them to interact with the environment more deeply (Seidualin et al., 2024; Krotova, 2003).

The results of the work have practical importance for planning sustainable development in the region, ensuring the safety of tourist routes, and minimizing damage from landslides. The findings of the study can be used as a basis for strategies to manage natural risks and promote environmentally sound tourism.

MATERIALS AND METHODS

The methodology of the work is based on the following steps, as shown in Figure 1. Firstly, using GIS and remote sensing technology to create a DEM and perform slope analysis. The DEM is created using topographic survey data and satellite

imagery, and the ArcGIS PRO software is used to build the model. This allows us to determine key characteristics of slopes, such as height, slope, and exposure. The process includes collecting initial relief data, processing it, interpolating elevation points, creating slope maps, and exposures for further analysis (Kerimbay & Kerimbay, 2022; Zhensikbayeva et al., 2024).

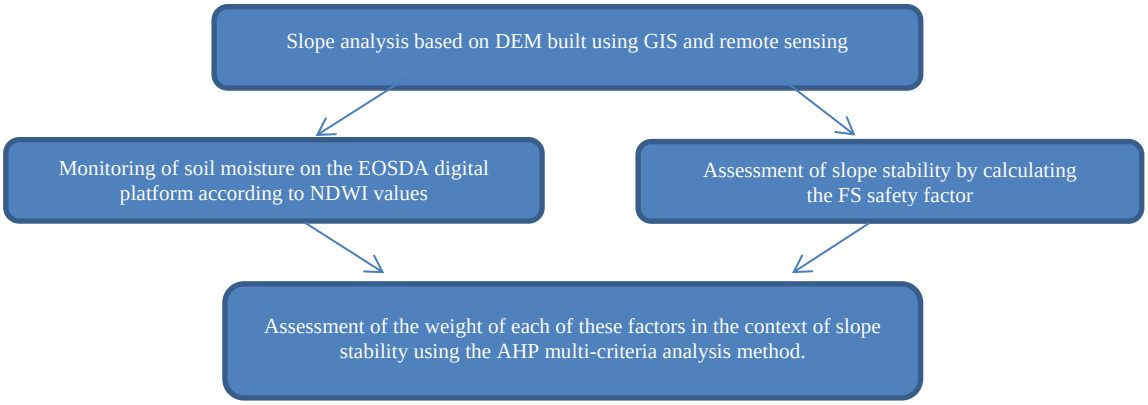


Figure 1. Methodology steps of our scientific research

Secondly, to increase the accuracy of assessing the vulnerability of territories to landslides, factors such as soil type and soil moisture were taken into account. These parameters play a key role in the formation of slope instability, which is confirmed by research (Fredlund & Rahardjo, 1993). The analysis included high, mid-mountain (3000-2200 m), and low-mountain (2200-1600 m) as well as the desert-steppe territories (below 1600m). Different types of soils in these zones have unique physical properties that affect slope stability: clay soils are prone to loss of stability in high humidity, while sandy and rocky soils are more stable. Soil moisture, which depends on climatic conditions (heavy precipitation and snowmelt), directly affects its density and particle cohesion. This, in turn, increases or reduces the risk of landslides.

The digital platform Earth Observing System Data Analytics (EOSDA, web service "Analytics-Time series") was used to monitor soil moisture in the Sharyn River basin (EOSDA, 2024). The method is based on the use of satellite data, where the green spectrum and the near-infrared zone make it possible to detect spatio-temporal changes in soil moisture and vegetation. NDWI values provide important information for classifying territories according to the degree of drought, humidity, and risk of landslide (Gao, 1996; Gu et al., 2007; Jackson et al., 2004). The integration of cartographic techniques and remote sensing data in a GIS environment forms the foundation for cartographic and remote monitoring of natural processes and events, which is essential at the regional scale (Sharapkhanova et al., 2024).

Thirdly, to assess the stability of slopes in mountainous areas, a safety factor calculation method was applied to FS, which makes it possible to identify landslide risk zones. Due to its versatility, this method is actively used in geotechnical and geomorphological analysis. Using the FS method, we obtained accurate data on potential threat areas and developed recommendations for minimizing them (Fell et al., 2005). Fourth, in order to assess the weight of each of these factors in the context of slope stability, the AHP method was applied, which provides a systematic approach to selecting and weighing multiple criteria, making it an ideal tool for geotechnical assessment. AHP is a method that allows you to make decisions when several criteria need to be taken into account (for example, soil type, soil moisture, relief, etc.). During the analysis, a hierarchy of factors is established, and then the weight of each one of them is determined using paired comparisons. The AHP in combination with GIS is widely used for spatial analysis and decision-making in various fields, such as risk management, sustainability assessment, environmental research and project management (Saaty, 1980; Malczewski, 1999; Saaty & Vargas,2001).

Geomorphologically, the Sharyn River basin is characterized by a high diversity of relief, including high-mountain, medium-mountain and low-mountain relief as well as desert-steppe plain territory. The mountain ranges bordering the basin have steep slopes and are heavily indented by deep river valleys. The watershed lines of the Ketmen Range and the Karatau Mountains run at an altitude of 2500-3000 meters, although some peaks reach absolute elevations of 3600-4200 m.

Similarly, in the northern spurs of the Central Tien-Shan and on the Kungei-Alatau ridge, the maximum heights are 3200-2100 m. The relief gradually decreases towards the mouth of the Karkara River, and the heights in the middle part of the basin do not exceed 1,800. The mountainous area is characterized by frequent rock outcrops, making this area particularly susceptible to landslide processes (Kerimbay, 2008; Kerimbay et al., 2024). The DEM analysis showed that more than 80% of the total basin area is mountainous (above 1,600 m). The rest falls on flat areas and counter (Figure 2). Based on this analysis, the territory of the Sharyn River basin was divided into high-altitude zones, which allowed us to characterize the slopes and their stability in detail (Table 1).

Table 1. High-altitude zones of the Sharyn River basin (Source: Authors' data processing)

№	Elevation Range (m)	Area (km²)	Percentage of Total Area (%)
1	up to 1000 m	724	8,7
2	1000-1600	979	11,8
3	1600-2500	4211	50,4
4	over 2500	2435	29,1

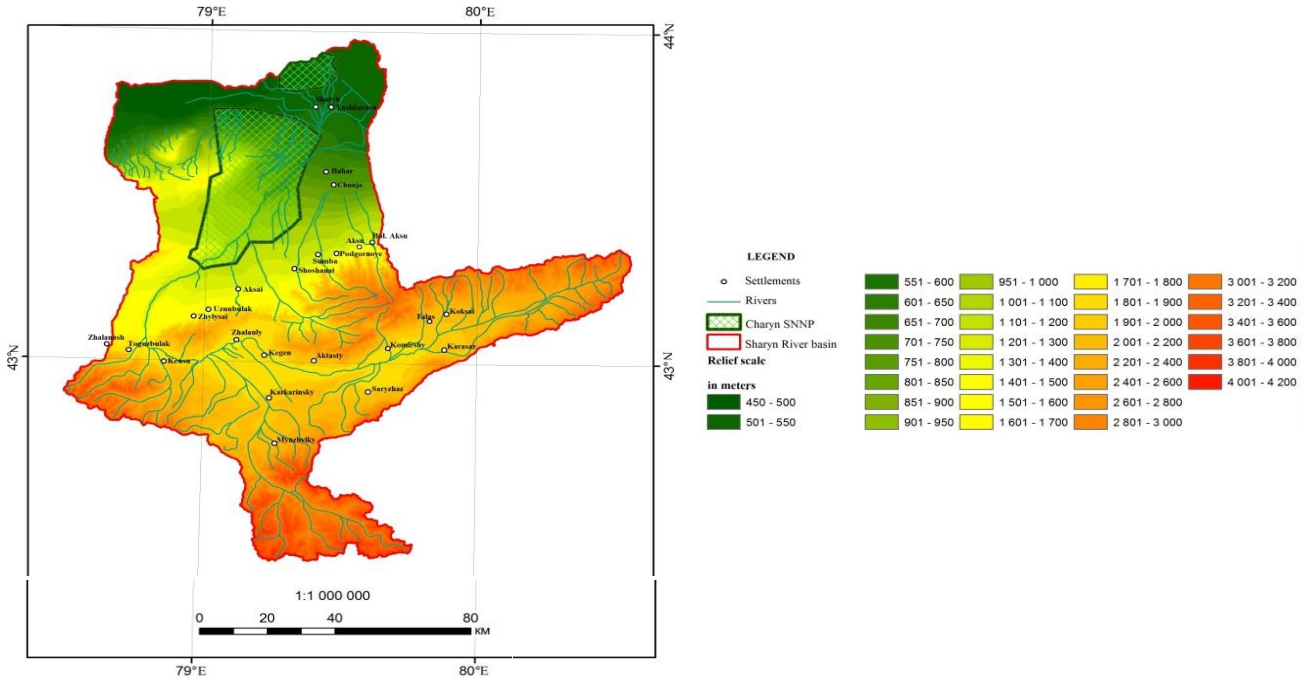


Figure 2. Digital Relief Model of the Sharyn River Basin (Source: compiled by the authors)

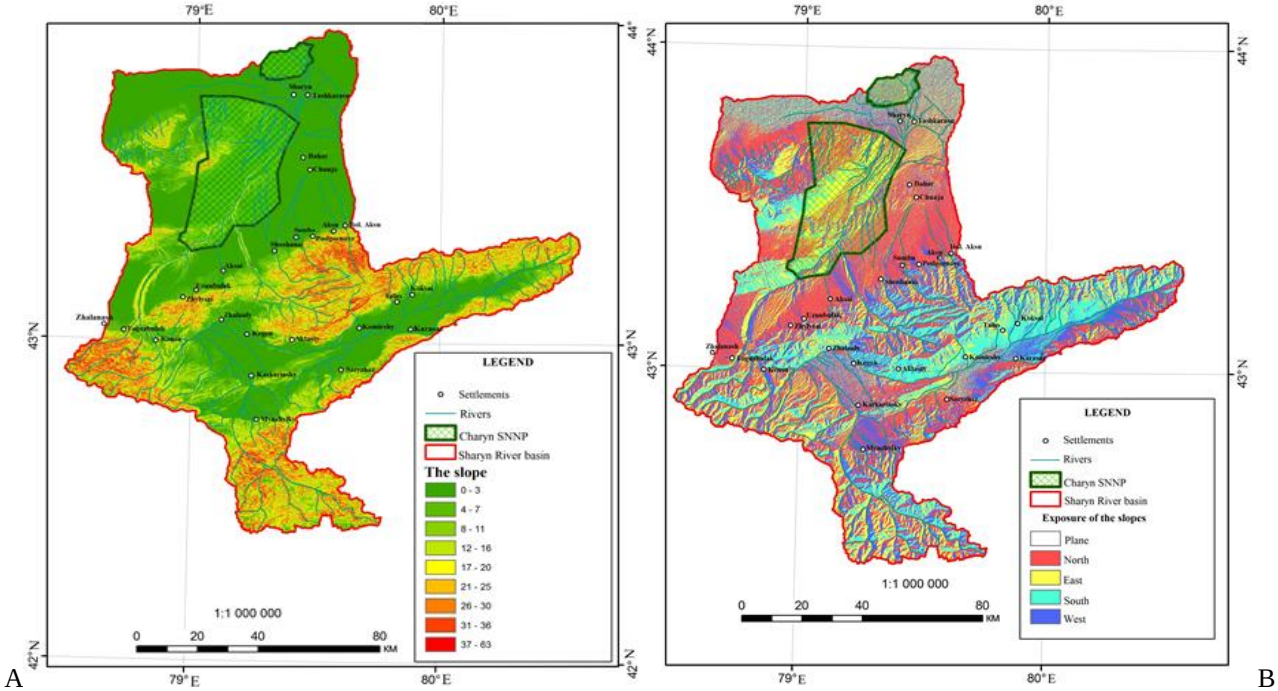
The main risk zones were identified based on an analysis of the geometry of slopes, their steepness and characteristics, as well as soil moisture data. This approach has made it possible to identify areas with a high potential for landslide processes, which require additional measures to minimize risks.

The territory of the Sharyn river basin is characterized by a latitudinal alternation of mountain ranges and large intermountain depressions, which is typical of the northern slopes of the Tian-Shan. Among the identified areas are the Terskei-Alatau and Kungei-Alatay highlands, the Shalkudusu-Kegen, Kuluktau-Temirlik and Ketmen mountains, the Turaigur lowlands, Zhalanash valley, as well as Aksay-Sogety foothills and lower delta of Sharyn. These areas reflect the significant diversity of the region's topography, which has an impact on landslide resistance. The main processes involved in the formation of the relief include glacial, tectonic, erosion-denudation, and accumulative types (Kerimbay et al., 2020).

RESULTS AND DISCUSSION

1. Analysis of the digital relief model to assess the slope resistance to landslides according to FS calculation

To determine the risk zone for landslides, it was necessary to perform an analysis of slopes and exposures from the original digital DEM file in tif (GeoTIFF) format (Figure 3).



A B

Figure 3. DEM of the Sharyn River basin: (A) map of slopes; (B) map of exposures (Source: compiled by the authors)

Steep slopes with a high risk exceeding the slope threshold of more than 30 degrees have been identified. The slope directions relative to cardinal directions have been analyzed and key areas with high risk of landslides have been identified based on overlap of slope data and exposure data.

To assess the stability of slopes, FS was calculated. The main results include:

- Areas with FS < 1 indicate steep slopes, unstable soil and high groundwater levels. This indicates a high probability of landslides.
- Areas where FS = 1 are in a state of borderline stability. Any slight changes in conditions could lead to landslides.
- Zones with FS > 1: are represented by more stable areas where the probability of landslides is significantly lower. To analyze the territories of landslide risk zones, based on data on slopes and exposure, a spatial assessment of risk zones has been performed (Figure 4).

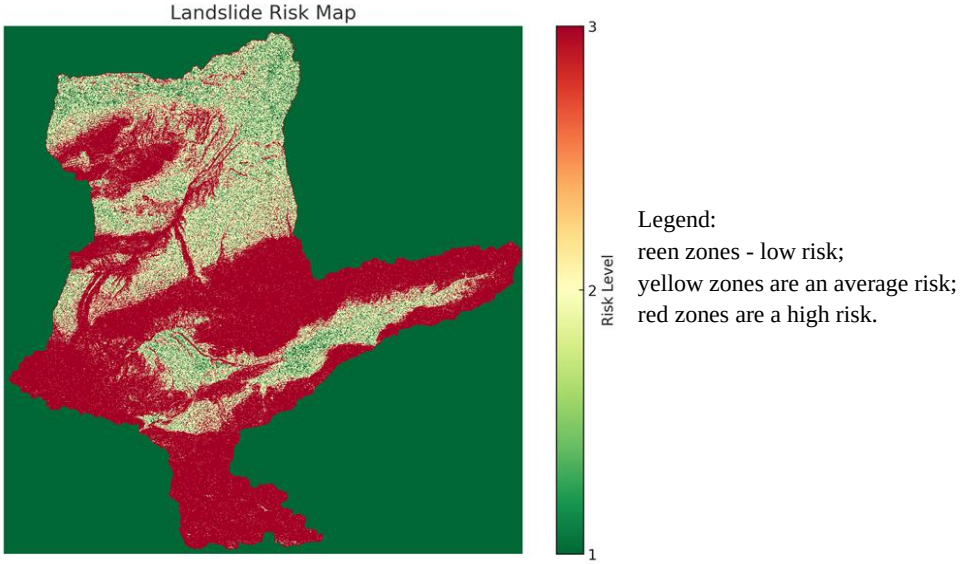


Figure 4. Landslide risk zones of the Sharyn River basin (Source: Authors' data processing based on calculations by FS)

Spatial assessment of the risk areas of landslides in the Sharyn River basin: green areas - low risk corresponding to gentle slopes; yellow areas - medium risk determined by transitional slope characteristics; red areas - high risk associated with steep slopes and unfavourable soil conditions. Summary of risk areas:

- Low risk covers approximately 2,835,159 cells (19.256 km²).
- Average risk is about 557,930 cells (3.789 km²).
- High risk is approximately 1.110.277 cells (7.541 km²). Each pixel of the map has a size of 82.41 mx 82.41m, which gives an area of about 6.793m^2 per pixel. This was used to calculate the total area of risk zones (Table 2).

The main results of the slope stability analysis performed using the FS method include: Zones with FS < 1 indicate a high probability of landslides. These zones are characterized by steep slopes and unstable soils, and have high groundwater levels. They are therefore the most dangerous areas. The high risk of landslides is concentrated on steep slopes, especially in highland areas such as the Terskei-Alatau and Kungei-Alataus. Zones with FS = 1: belong to border-stable territories. The slightest change in conditions (for example, heavy precipitation) can lead to the activation of landslides. The average risk is typical for foothills and mid-mountain areas with moderate slopes, such as Ketmen and Kuluktau-Temirlik. Zones with FS > 1 represent the most stable areas with a low risk of landslides, and a low risk was noted in the low-mountain and lowland areas including the Delta Sharyn. These results highlight the importance of taking into account geomorphological factors, such as slope steepness and exposure, when planning hiking trails and implementing conservation measures.

Table 2. Total area of landslide risk zones in the Sharyn River basin (Source: Authors' data processing based on calculations by FS)

№	The level of risk	The spatial assessment	Total area of risk zones (km)
1	Low risk	corresponds to gentle slopes with stable soils, with slopes of less than 15°. The lower reaches of the Sharyn River basin	19,256
2	Average risk	corresponds to the transitional characteristics of slopes with mixed exposures, ranging from 15 degrees to 30 degrees. It includes foothills and mid-mountains	3,789
3	High risk	corresponds to the steep slopes of the north-eastern exposure with unstable soils, slopes of more than 30° and watersheds in mountainous areas	7,541

2. Results based on AHP (Analytical Hierarchy Process) with additional factors: soil type and soil moisture NDWI

For more comprehensive and accurate results, we use additional factors such as soil type and soil moisture, based on the AHP, which is used to solve complex problems when it is necessary to take into account several factors or criteria that have varying degrees of importance (Hwang & Yoon, 1981).

So, the factors for assessing the resistance of slopes in the Sharyn River basin to landslides are:

Factor 1: Terrain - data on the digital terrain model, slopes, and exposures, as well as calculation of FS.

Factor 2: Soil Type - data on soil types, their properties, and resistance to landslides.

Factor 3: Moisture - data on moisture content.

Different types of soil in the Sharyn River basin have unique physical properties that determine their resistance to landslides. Clay soils are particularly susceptible to landslides during periods of high humidity, as their structure becomes less stable under the influence of water. At the same time, sandy and rocky soils demonstrate greater stability due to their drainage properties and mechanical strength. The diversity of soils in the Shari River basin is closely related to the altitude zone and the nature of geomorphological processes in the region. The high-altitude region (over 3000 m) is covered by modern glaciers. At lower elevations, there are deposits of gravel and loam formed on dark chestnut-colored mountain soils. Also, there are fragments of alpine meadows, typical of mountain meadow soils.

- The mid-mountain belt (3000–2200 m) is characterized by Alpine and subalpine meadows developed on dark mountain meadow soils. The peculiarity of this zone is the strong dissection of the relief and intense erosion processes. High moisture content and large hypsometric levels of soil create conditions for planar flushing development.
- Low-mountain (2200–1600m) includes temporary watercourse territories. The soils are represented by black mountain earth and chestnuts.

Desert-steppe plain (below 1600) covers foothills with drainless ecosystems. Gray-brown soils dominate in runoff dispersion zones. The NDWI space-time series, which was constructed for analysis between 2016 and 2024, includes high-altitude, medium-altitude (3000 - 2200m), low-altitude territories (2200 -1600 m) as well as desert-steppe plain territories (below 1600 m) (Tables 3-8). The results showed that NDWI values in high-altitude areas ranged from moderate drought (-0.6 to -0.3) to flooding (0 to 0.2). However, the area of flooded territory remained at all times. The average NDWI value indicated a trend towards moderate humidity between 2016 and 2024.

Table 3. NDWI values for the highland and mid-mountain belts (3000-2200 meters), 2016-2024 (Source: on materials EOS Data Analytics, authors' data processing)

NDWI	Humidity type	Area, km^2				
		2016	2018	2020	2022	2024
0.2-0.1	The surface of the water	0.00	0.00	0.00	0.00	0.00
0-0.2	Flooding, humidity,	0.34	0.015	0.00	00.82	0.00
-0.3-0	Moderate aridity, non-water surfaces	117.57	141.68	150.1	152.33	132.60
-0.6-0.3	Aridity	19.96	14.34	0.00	7.20	19.74
-1-0.6	Drought	12.57	14.10	0.00	0.78	17.80

Table 4. Minimum, maximum, and average NDWI values for high-altitude and mid-mountain zones (3,000–2,200 m), 2016-2024 (Source: on materials EOS Data Analytics, authors' data processing)

Years	NDWI mean	min	max
2016	-0.49	-0.74	0.16
2017	-0.39	-075	0.28
2018	-0.04	-0.08	0.03
2019	-0.09	-0.66	0.10
2020	-0.50	-0.74	0.04

Table 5. NDWI values for the low-mountain belt (2,200 - 1,600 m), 2016–2024 (Source: on materials EOS Data Analytics, authors' data processing)

NDWI	Humidity type	Area, km^2				
		2016	2018	2020	2022	2024
0.2-0.1	The surface of the water	0.015	0.010	0.066	0.066	1.29
0-0.2	Flooding, humidity,	0.43	0.40	0.51	0.27	0.70
-0.3-0	Moderate aridity, non-water surfaces	35.18	33.79	6.45	2.34	33.68
-0.6-0.3	Aridity	141.27	130.23	139.35	80.08	85.02
-1-0.6	Drought	19.25	17.09	5.15	68.78	32.10

Table 6. Minimum, maximum, and average NDWI values of the low mountain belt (2,200-1,600 m), 2016-24 (Source on materials EOS Data Analytics, authors' data processing)

Years	NDWI mean	min	max
2017	-0.49	-0.85	0.37
2018	-0.44	-0.75	0.30
2019	-0.47	-0.76	0.35
2020	-0.49	-0.85	0.36

The monitoring results showed that the territory with severe drought indicators (-1 to -0.6) significantly increased in 2022 and then decreased by 2024. At the same time, there was an increase in the area with a humidity index (0.2-0.1), indicating possible climatic or hydrological changes in 2024. The monitoring results showed that the territory with moderate aridity (from -0.3 to 0) demonstrated relative stability, occupying most of the region during the study period. No significant changes in the indicators (from -1 to -0.6) indicate the zone's resistance to extreme events.

At the same time, there was an increase in the area of wetlands (0-0.2), which may be due to local seasonal or climatic changes affecting the hydrological conditions in the region. The observed trends are related to the peculiarities of high-altitude zone. The observed trends are related to the peculiarities of high-altitude zones. Highlands with northeastern exposures and midlands with transitional slope characteristics and mixed exposures show a more balanced moisture level, which is related to their climatic characteristics. Low mountains and foothills with transitional slopes and mixed exposures are more susceptible to drought and arid conditions. The desert-steppe plain with stable soils has a moderate drought, but small changes in humidity indicate the influence of local climate factors or seasonality in some years. The areas of temporary watercourses have an increase in moistened areas in some years, while the territories of permanent watercourses remain unchanged

Table 7. NDWI values for the desert-steppe plain (below 1,600 m), 2016-2024 (Source: on materials EOS Data Analytics, authors' data processing)

NDWI	Humidity type	Area, km^2				
		2016	2018	2020	2022	2024
0.2-0.1	The surface of the water	0.00	0.00	0.00	0.00	0.001
0-0.2	Flooding, humidity,	0.076	0.013	0.016	0.00	0.217
-0.3-0	Moderate aridity, non-water surfaces	141.34	141.61	141.61	141.44	141.38
-0.6-0.3	Aridity	0.049	0.006	0.00	0.19	0.026
-1-0.6	Drought	0.00	0.00	0.00	0.00	0.00

Table 8. Minimum, maximum and average NDVI values for the desert-steppe plain (below 1,600 m), 2016-2024 (Source: on materials EOS Data Analytics, authors' data processing)

Years	NDWI mean	min	max
2016	-0.17	-0.53	0.21
2017	-0.15	-0.40	0.13
2018	-0.09	-0.25	0.09
2019	-0.16	-0.56	0.12
2020	-0.13	-0.32	0.35

.Thus, soil types and soil moisture in the Sharyn River basin not only reflect the diversity of natural conditions, but also have a significant impact on slope stability. This is especially important when planning the use of these territories, as the moisture level in the soil directly affects its density and stability. Heavy rains or snowmelt can increase the water content, leading to a decrease in adhesion forces between soil particles and increasing the risk of landslides.To identify the relative importance of each factor, paired comparisons were made. For this purpose, a scale from 1 to 9 was used to indicate the importance of factors, with 1 being equal importance and 9 indicating that one factor is significantly more important than another. Based on the importance ratings, a matrix of pairwise comparisons was created (Table 9).

Table 9. Matrix of paired comparisons based on importance ratings (Source: on materials of the method Analytic Hierarchy Process)

№	Factor	Relief (1)	Soil (2)	Humidity (3)
1	Relief (1)	1	7	7
2	Soil (2)	1/7	1	5
3	Humidity (3)	1/7	1/5	1

The importance of slope stability factors can be assessed as follows:

- Relief (Factor 1): Relief plays a significant role in determining the stability of slopes. Steep slopes and exposed areas have a greater impact on the risk of landslides, so they will receive the highest weight. The terrain is more important than the type of soil and humidity (we will estimate the importance of the terrain compared to other factors on a scale of 1-10). Soil type and humidity also have an effect, although it is smaller than that of the terrain.
- Soil Type (Factor 2): The type of soil is important for slope stability, especially for clay soils, which are more susceptible to erosion and landslides. The importance of soil is greater than that of humidity, and the importance of terrain is also significant (let's assign a value of 5 for soil compared to humidity and a value of 3 for terrain).
- Soil moisture (Factor 3): While soil moisture can affect slope stability, its effect is likely to be less significant compared to the terrain and soil types. Humidity is considered less important than the soil and terrain factors, so its significance will be estimated at 1/3 of the importance of the soil factor and 1/7 of the terrain factor.

To obtain the weights for each factor, the values in the matrix are normalized (Table 10). This is done by dividing each value in a row by the total sum of all values in that row (Figure 5and Figure 6). According to the matrix of paired comparisons, relief has been identified as a significant factor, with a higher weight than other factors, as its value in the normalized table is greater. The type of soil and soil moisture are of medium importance. This may suggest that the terrain plays a more significant role in determining vulnerability to landslides in the study area.

Table 10. Normalized values of relief, soil, and humidity in the matrix (Source: on materials from the analysis of AHP calculations)

№	Factor	Relief	Soil	Humidity
1	Relief	0.067	0.453	0.453
2	Soil	0.140	0.162	0.815
3	Humidity	0.140	0.032	0.641

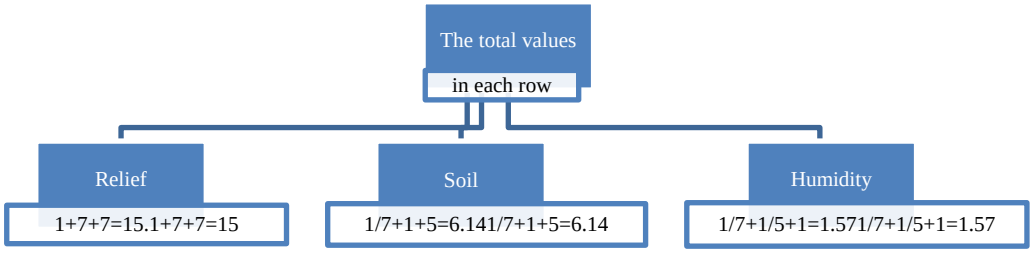


Figure 5. The total of the values in each row the matrix: Authors data processing

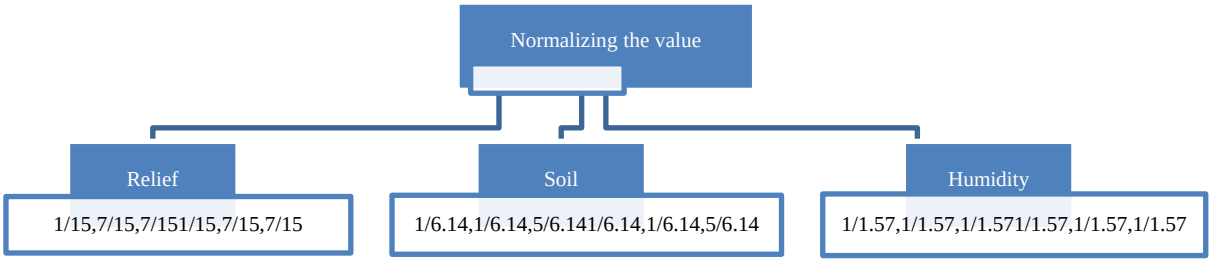


Figure 6. Normalizing the value: Authors data processing

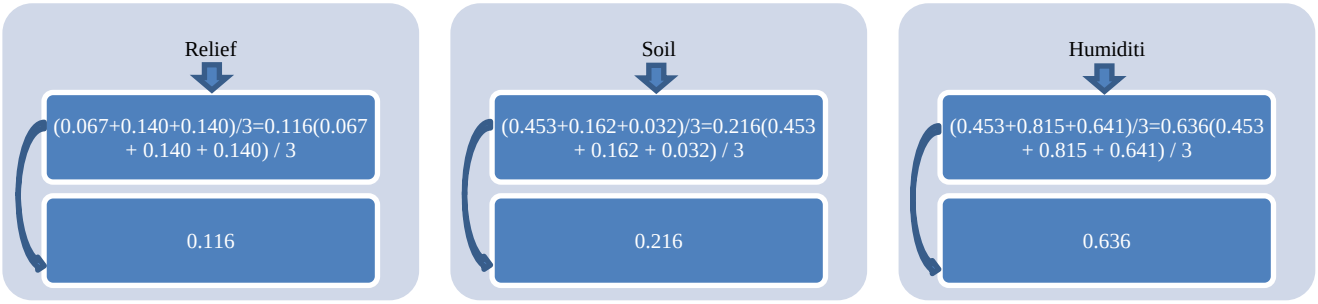


Figure 7. Calculation of weights and average values for each factor (Source: Authors data processing based on calculations by AHP)

The normalized values show the relative importance of each factor. For example, in the case of relief 7/15, a value of ≈ 0.467 indicates that relief contributes approximately 46.7%, when compared to other factors. Calculation of the final weights for the factors and the average values for each factor (Figure 7).

Thus, the results indicate that, although slope steepness remains an important factor in assessing the stability of slopes in the Sharyn River basin, soil moisture has a significant impact on the risk of landslides. Additionally, soil type also plays a role in determining the stability of the slopes. Therefore, it is essential to take into account both moisture and soil type when assessing the stability of a slope. These results emphasize the importance of considering the relief as the primary factor when planning sustainable hiking routes in mountainous areas. The relief has the greatest impact on landslide activity, making it a crucial consideration. While soil and humidity are also significant, their effects are likely to be secondary. Humidity may become more significant in the context of seasonal climate changes, for example.

3. Results of the analysis of the vulnerability of recreational areas in the Sharyn River basin to landslides

The results of the landslide resistance analysis, considering the geomorphological factors, soil type, and soil moisture, indicate that there is a wide variety of slopes with varying levels of stability within the Sharyn River basin. These areas with a higher risk of landslides tend to be concentrated in regions with steep slopes and unstable soil, as confirmed by the FS calculations, with values below 1 indicating a high probability of landslides. Special attention should be given to areas with high levels of soil moisture, as this significantly reduces the stability of slopes. Additionally, floods and heavy spring precipitation associated with snowmelt can increase the likelihood of ground movement. The most prone areas to landslides in the Sharyn River basin are located in the following geographical regions:

In the Terskei-Alatau, Kungei-Alatau, Shalkudysu-Kegen, Kuluktau-Temirlik, and Ketmen highlands and midlands, the constant effects of erosion processes and melting glaciers make the slopes extremely vulnerable to landslides. This is especially evident in the context of climate change, which increases glacial degradation and increases the intensity of surface erosion. Unstable soils formed on glacial deposits create a high potential for destructive processes. High erosion activity caused by slope and tectonic processes make the stability of landscapes extremely low, especially during periods of intense rain. The accumulation of loose material and changes in moisture regime increases the likelihood of landslides, especially in steep and actively collapsing areas (Kerimbay, 2008; Kerimbay et al., 2020).

Erosion processes that actively erode the slopes in the Turaigyr low-mountain erosion-denudation region contribute to the accumulation of sedimentary material in the lowlands. The slopes in this area are prone to landslides, especially during periods of heavy rainfall. Intensive processes of weathering and erosion in the Zhalagash and Aksai-Sogeti foothills form bedlands with weakened slope stability, which increases the likelihood of mass collapses due to the accumulation of loose material. Deposits of boulder-pebble strata and loess cover contribute to the formation of accumulative relief forms. These

characteristics create dangerous conditions for landslides, especially in areas with insufficient soil consolidation. In the lower Sharyn desert-steppe plain zone, accumulative landforms formed by sedimentary material are vulnerable to soil displacement, especially under conditions of high humidity and sudden floods (Kerimbay, 2008; Kerimbay et al., 2020).

High-altitude zones, based on GIS analysis, open up opportunities for the localization of high-risk areas. GIS and remote sensing techniques make it possible to integrate data on soil types and moisture, providing a more comprehensive approach to slope stability analysis (Khromykh & Khromykh, 2007). The analysis of GIS data has allowed us to identify areas in the Sharyn River basin with different levels of vulnerability to landslides, which has been an important step in assessing and managing natural risks. Slope maps have proven to be especially useful in identifying areas with high slopes, which are a predisposing factor for landslide processes. Steep slopes, for example, have less soil stability, especially when exposed to moisture. This is confirmed by the results of our FS calculations. Additionally, the combination of slope maps and a slope exposure map has allowed us to establish a relationship between the orientation of slopes and their stability. Slopes facing the dominant sources of moisture are the most susceptible to landslides. In our work, it was important to develop measures to reduce the risk of landslides and increase safety in the region. Therefore, the use of GIS and remote sensing geotechnology became the main tool for assessing the vulnerability of slopes in the Sharyn River basin to landslides.

The use of the AHP method has made it possible not only to assess the importance of each factor, but also to integrate them into a comprehensive model that can be used to predict risks under various conditions. In particular, AHP helps identify those areas where each factor (for example, soil type or humidity) has the strongest impact on slope stability. This allows for more accurate targeting of efforts in areas with the highest risk. The study of the impact of landslides in the Sharyn River basin has shown the need for effective environmental and infrastructure measures. These measures include strengthening slopes, installing drainage systems, and improving monitoring. Additionally, it is important to create awareness programs for local residents about the risks and precautions associated with landslides. The study emphasizes the importance of having evacuation plans in place and strategies for quick response in case of emergency. This will help reduce damage and casualties in the event of a landslide. Despite the careful approach taken in this study, there are some limitations that need to be considered. Firstly, the data used for calculating the FS (factor of safety) is based on digital terrain models, which may contain some errors, particularly in areas with sudden elevation changes or complex geological structures. To improve accuracy, it may be beneficial to use higher-resolution data as information about groundwater levels and the geological characteristics of the area. Secondly, the FS method does not take into account all dynamic processes that can affect slope stability, such as earthquakes or changes in groundwater levels. In order to provide more accurate predictions of slope stability in the future, it would be helpful to develop more complex models that include these variables.

In addition, climate change and natural disasters, such as heavy rainfall and floods, can alter projected risks. This makes it necessary to regularly update data and use more sophisticated models to predict slope stability. Therefore, periodic monitoring and updating of data are important aspects of accurate forecasting of landslide risks.

CONCLUSION

The findings from the DEM analysis and FS and AHP calculations indicate that high- and mid-mountain areas with steep slopes and specific soil moisture conditions are the most susceptible to landslides. This information forms the basis for developing effective risk mitigation strategies, such as the construction of protective structures and water flow management, as well as the selection of safer routes for tourists. Additionally, the practical significance of these identified risk zones was considered in terms of its impact on the long-term sustainability of the region and tourist safety.

High risks of landslides in areas with steep slopes, such as the Terskei-Alatau Geomorphological Region, can lead to damage to infrastructure and increased restoration costs. This emphasizes the need for a sustainable approach to the construction and operation of tourism infrastructure. Sustainable development requires consideration of natural processes, such as slope stabilization and prevention of soil degradation, especially in areas with active tourism. Minimizing the risks of landslides helps attract tourists, create new jobs, and promote socio-economic growth in local communities. We have examined the impact of risk zones on tourist safety and developed measures to ensure tourist safety in risk zones (Table 11).

Table 11. Measures to ensure the safety of tourists in high-risk areas (Source: compiled by the authors)

№	Measures	Description
1	Identification of dangerous routes	Provides important information to adjust routes and strengthen safety measures
2	Warning and evacuation systems	In high-risk areas it is important to implement early warning systems and well-thought-out evacuation plans
3	Education and awareness	It is important to raise awareness among tourists and locals about natural hazards and necessary precautions through educational initiatives

The analysis has led to the development of an integrated approach that combines the planning of safe ecotourism routes, protection of the natural landscape, and ensuring the safety of tourists. This approach also ensures the sustainable development of infrastructure. This balance between environmental sustainability and the economic benefit of the region is reflected in Table 12. The results of the DEM and NDWI analyses, FS and HP calculations showed that high- and mid-mountain areas with steep slopes and unfavourable soil moisture conditions are most vulnerable to landslides. These data form the basis for developing effective measures aimed at minimising risks and ensuring the sustainable development of the region. We have devised risk minimisation measures:

1. Slope reinforcement and drainage system construction: The use of engineering solutions such as slope terracing, soil reinforcement with vegetation, and drainage system design helps reduce the risk of landslides.

2. Monitoring of terrain changes using GIS: Regular monitoring of changes in terrain and analysis of risky areas using GIS and satellite imagery allows you to quickly identify unstable areas.

3. Informing the public about possible risks: educational programs and alerts for local residents and tourists increase awareness of natural risks and recommend safety measures.

Table 12. Practical significance of recreational landscapes of the Sharyn River basin for the sustainable development of tourism (Source: compiled by the authors)

№	Recreational landscapes	Practical significance for the sustainable development of tourism
1	Landscapes Terskei-Alatau and Kungei - Alatau highlands	- Steep slopes and melting glaciers increase the risk of landslides, requiring constant monitoring of these areas to ensure the safety of tourists and local residents. - While the attractiveness of the region for mountain tourism, it is important to mark safe routes and install warning systems in potentially hazardous areas. - Monitoring the effect of climate change on glaciers and preventing their deterioration is essential for preserving the region's ecosystem.
2	Landscapes Ketmen Highlands	- Wide flat-topped ridges provide opportunities for the construction of tourist bases, but it is important to take into account possible erosion and take protective measures. - The creation of ecologically safe routes will minimize the load on the soil and preserve the natural heritage of the region.
3	Landscapes Shalkudysu-Kegen middle mountains	- Alluvial plains are convenient for tourist infrastructure, but lake plains with loose sediments require careful approach due to the risk of erosion. - Opportunities for organizing eco-routes that emphasize the uniqueness of ancient alluvial and lake forms. - Heavy precipitation can activate the processes of erosion and shifting of soils, which requires preventive measures.
4	Landscapes Kuluktau-Temirlik middle mountains	- Relief with hilly surfaces and relict denudation surfaces require consideration of their fragility when planning tourist routes. - Prolonged erosion processes can pose a threat to the stability of the landscape, especially with an intense tourist load. - The area can be used to organize easy routes with minimal risk, which makes it accessible for family tourism.
5	Landscapes The Toraigyr lowlands	- Low-mountain areas are favorable for the creation of recreation centers, given their moderate height and relative stability of the slopes. - Exposure to denudation increases the risk of erosion, so it is important to maintain natural balance and minimize human impact. Opportunities to get acquainted with the unique denudational forms of relief that can become a part of educational tourism.
6	Landscapes Zhalagash foothills	- Rolling terrain and badlands create interesting hiking routes. - Gully systems need special attention to avoid active soil erosion. - Accessibility of the area makes it suitable for recreation areas with minimal risk.
7	Landscapes Aksai-Sogeti foothills	- Terraced foothills with loose sediments need to be protected from destruction as tourist flow increases. - River valleys deeply embedded require the installation of warning signs and safe viewing platforms creation. - The promotion of ecological routes will help preserve natural characteristics of area.
8	landscapes lower Sharyn plain	- The flat terrain of the delta is favorable for the development of tent camps and recreational areas. - Areas that are prone to seasonal flooding may require monitoring and assessment of hydrological risks. - Preserving ancient alluvial deposits and maintaining the ecosystem of the region is important to sustainable development.

The identified risk areas and proposed measures emphasize the importance of an integrated approach to sustainable development. These combined measures can significantly reduce the risk of landslides, minimize damage and ensure the safety of the local population and tourists, here protection of natural landscapes and security are combined with economic and social growth. This will help preserve the natural beauty of the region and create safe conditions for tourism and employment.

Author Contributions: Conceptualization, methodology, software, B.S.K. and N.N.K.; validation, N.N.K.; formal analysis, G.T.O. and A.G.A. and M.B.B.; investigation, data curation, B.S.K. and N.N.K.; writing - original draft preparation, B.S.K.; writing - review and editing, N.N.K.; visualization, N.N.K. and G.T.O. and M.B.B.; supervision, B.S.K.; project administration, K.M.B.; All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: This study was conducted for participation in grant funding of scientists for scientific and (or) scientific and technical projects for 2025-2027 by the Ministry of Science and Higher Education of the Republic of Kazakhstan (IRN No. AP26197657), entitled “To develop a natural-scientific justification for optimizing the geosystems of the mountainous territories”.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 31.03.2025 Revised: 30.06.2025 Accepted: 23.07.2025 Available online: 12.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1626-1637
DOI 10.30892/gtg.61321-1531

BEYOND THE TOMB: HAN DYNASTY AESTHETICS IN PUBLIC ART, WOODBLOCK NEW YEAR PAINTINGS, AND URBAN SPACES IN CONTEMPORARY CHINA

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Citation: Gao, S., Jaafar, J.B.M., Suhaily, S.S., Gao, F., Hadi, H.B.A., & Ismail, I.B. (2025). Beyond the tomb: Han Dynasty aesthetics in public art, woodblock new year paintings, and urban spaces in contemporary China. *Geojournal of Tourism and Geosites*, 61(3), 1626–1637. https://doi.org/10.30892/gtg.61321-1531

Abstract: Purpose: This study aims to explore the continuity of Han Dynasty aesthetics in modern Chinese art and its influence on contemporary urban landscapes. Han Dynasty, being the foundation of China history, was founded by Emperor Gaozu, whom also stabiized and unified the land of China, similar to modern territory. By investigating the historical achievements and artistic legacy of the Han Dynasty, the study seeks to identify key aesthetic principles, motifs, and techniques that continue to shape modern Chinese art and urban design. Moreover, the research aims to understand the role of Confucianism and Daoism in shaping Han Dynasty aesthetics and their enduring impact on cultural practices and urban development in China. Method: This qualitative study conducted 17 semi-structured interviews with stakeholders, including urban planners, artists, policymakers, and cultural practitioners in China. The interviews were analyzed using thematic analysis, focusing on identifying patterns, themes, and relationships related to Han Dynasty aesthetics, contemporary public art characteristics, cultural continuity, urban development factors, and urban aesthetics. Findings: The findings of this study highlight the enduring influence of Han Dynasty aesthetics on contemporary Chinese art and urban landscapes. Key themes include the integration of traditional motifs and techniques into modern artistic expressions, the role of cultural continuity in shaping urban aesthetics, and the moderating influence of urban development factors on the preservation and integration of Han Dynasty aesthetics within contemporary urban environments. Implications/Originality: This research contributes to theoretical frameworks in art history, cultural studies, and urban studies by providing new insights into the continuity of Han Dynasty aesthetics and its implications for modern Chinese culture and society. Moreover, the findings have practical implications for policymakers, urban planners, artists, and cultural practitioners involved in the development and management of urban environments in China. Overall, this study shows the far-reaching impacts of Han Dynasty, spanning across time to affect the current society in the form of urban asthetics, cultures, and even to the policymakers ; while adds to the understanding of the dynamic relationship between tradition and innovation in Chinese art and culture and its significance for contemporary urban landscapes.

Keywords: Han Dynasty aesthetics, Contemporary Chinese art, urban landscapes, cultural continuity, urban development factors

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INTRODUCTION

The Han Dynasty, from 206 BCE to 220 CE, shaped Chinese history with its cultural achievements and lasting impact. After the brief Qin Dynasty, Emperor Gaozu founded the Han Dynasty in 206 BCE (Magli, 2018). It helped stabilize and unify China after a difficult period. The Han Dynasty has two main periods: Eastern Han (25–220 CE) and Western Han (206–9 CE). These times saw exceptional political, social, and cultural advances (Hinsch, 2011). During the Han Dynasty, Confucianism became China's preeminent philosophical philosophy, settling moral and ethical issues for millennia (Xu, 2022). Confucian principles like filial piety, righteousness, and compassion influenced regulations, education, and social structure, according to (Wei et al., 2023a). Confucian values helped develop a bureaucratic state with a meritocratic civil service structure, known as the "civilization of Confucianism" (Louie, 2024).

Literature, philosophy, science, the arts, and governance and institutions advanced throughout the Han Dynasty. Philosophical schools like Legalism, Confucianism, and Daoism gave Chinese philosophy intellectual richness and plenty. The watermill, silk manufacturing, and papermaking were scientific and technological advancements (De Meyer, 2020). Chinese architecture, craftsmanship, and art were influenced by Han Dynasty art. Han Dynasty art is known for its naturalism, simplicity, and beauty, showcasing harmonious groupings and perfect workmanship (Jiang et al., 2024). Similar to the insights from the study of the artistic style of Pingyang woodblock New Year paintings, woodblock New Year paintings reflect a unique understanding of nature and harmony within traditional artistic styles.

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Han artists excelled in silk weaving, jade carving, bronze casting, and pottery. They made beautiful art that mirrored the culture and aesthetics of the time. Despite scholarly interest, little is known about Han Dynasty aesthetics in contemporary Chinese art. Although the Han Dynasty is famous for its cultural and creative achievements, its aesthetic values' influence on modern art is unclear (Liu et al., 2022). The inability to fully appreciate the ongoing impact of Han Dynasty aesthetics on modern Chinese art and culture is a major study challenge (Sen, 2025).

Analyzing the link between modern urban landscapes in China and traditional aesthetics is crucial. Globalization and urbanization may replace traditional art and culture as the nation urbanizes (Li et al., 2022a). Historical aesthetics must be preserved and blended into new urban environments to preserve China's rich artistic past. Thus, the continuity of Han Dynasty aesthetics in modern Chinese art and urban environments and its cultural identity and urban aesthetics consequences must be assessed (WANG et al., 2021b). Many reasons make it important to not understand Han Dynasty aesthetics in current Chinese art. This squandered chance hides the richness and majesty of Chinese creative traditions and their influence on modern society. Scholars and professionals who overlook Han Dynasty aesthetics may miss China's cultural heritage and creative identity (Yang et al., 2023). Urbanization and cultural globalization make cultural sustainability and heritage protection difficult without understanding. Political, urban, and cultural leaders may lose opportunities to incorporate Han Dynasty aesthetics into metropolitan settings. Metropolitan China may lose local identities and cultural diversity (Cheng et al., 2022). Our lack of understanding of historical aesthetics and urban environments inhibits our ability to rejuvenate urban areas and encourage community development with art and aesthetics. Studying Han Dynasty aesthetics in modern urban development and public art projects may help scholars and specialists increase urban cultural vibrancy and livability (Zhang, 2022). Studying Han Dynasty aesthetics can show how art and aesthetics shape cultural identity and provide stability in constantly changing urban situations (Lee, 2019). Learning this notion is crucial for cultural sustainability, civic pride, and social cohesiveness in modern Chinese cities.

This study explores the complex relationship between Han Dynasty aesthetics and modern Chinese urban settings. This study examines Han Dynasty aesthetics in modern Chinese art and urban design to explain how Chinese cities' visual and cultural identities are formed. The Han Dynasty's historical achievements and artistic heritage are examined to determine the aesthetic principles, issues, and techniques that shape modern cultural expressions and urban aesthetics. The research also seeks to understand how Confucianism and Daoism shaped Han Dynasty aesthetics, urban development, and Chinese cultural practices over time. This study analyzes historical and contemporary perspectives to examine the complex relationship between innovation and tradition in Chinese art and culture. We can better understand China's complex interplay between ancient aesthetics and present urban landscapes thanks to the study.

The study examines how Han Dynasty aesthetics influenced modern Chinese art and urban design. It advances art history, cultural studies, and urban studies. Policymakers, urban planners, artists, and cultural practitioners involved in Chinese city development and management can benefit from the study's findings. The study suggests ways to promote cultural sustainability, historical preservation, and community involvement in Chinese cities. Modern urban design and public art should incorporate Han Dynasty aesthetics. This research improves public understanding of China's creative and cultural heritage, which has major social impacts. The project intends to encourage artistic innovation, improve respect for China's rich cultural legacy, and educate locals and tourists by highlighting Han Dynasty aesthetics in modern urban environments and Chinese art. This strategy could influence Chinese and international academic research, urban planning, and cultural policies. This research uses interdisciplinary collaboration and stakeholder engagement to increase urban cultural diversity, inclusivity, and liveliness in China and other locations.

LITERATURE REVIEW

Beyond academic domains, academic research has examined the relationship between modern art and historical aesthetics. So (2019) have examined how old artistic traditions continue to influence modern creativity, emphasizing how historical aesthetics foster artistic innovation and the development of cultural identity.

Art history, anthropology, and cultural studies researchers have studied the continuing impact and perception of modern artistic representations from ancient civilizations like the Han Dynasty in China (Yin & Qian, 2020).

Aesthetic traditions survive because academics study complicated processes like cultural transmission, adaptation, and reinterpretation through specific examples and comparative assessments. The study of modern public art in cities has grown alongside its historical counterparts in recent decades and Zhu & Lo (2022) examined how public art shapes urban landscapes, including civic participation and social and political processes. Murals, sculptures, and interactive digital displays are crucial to urban landscapes. They improve the area's culture, society, and aesthetics.

Han Dynasty Aesthetics

China's rich cultural heritage includes Han Dynasty aesthetics and innovation. The artistic sensibility of this period intrigued academics and historians from ancient times to 220 CE—respect for nature shaped Han Dynasty aesthetics (WANG et al., 2021). Birds, flowers, and landscapes are common in art. Han artists used exact art and attention to detail to depict nature's grandeur and equilibrium in pottery, sculpture, and painting. The Han dynasty's creative works emphasized symmetry and equilibrium, reflecting a philosophical conviction in the universe's harmony (Ma, 2022). The Han Dynasty aesthetics combined indigenous Chinese traditions with external influences, mainly from Central Asian nomadic civilizations and the Qin Dynasty (Yang et al., 2018). The vivid depictions of animals and humans in Han ceramics and sculpture showed how this merging of cultures combined realism with idealism. Numerous tomb decorations and funerary art show the close relationship between Han Dynasty aesthetics and religious and spiritual beliefs (Lu et al., 2021).

The Han Dynasty's artistic ingenuity and love of the supernatural are reflected in Emperor Qin Shi Huang's massive terracotta troops. Jade, a rare stone with symbolic value, emphasizes Han's creative expression's spirituality (Geng, 2025). The Han carved and refined jade objects with great skill. These items symbolized longevity, divinity, and prosperity, reflecting their culture and goals (Wang et al., 2023). Beyond art, Han Dynasty aesthetics influenced city planning, architectural development, and governance. Huge palaces, temples, and city walls showed the Han Dynasty monarchs' political authority and commitment to cultural unification and social cohesiveness (Wang & Hein, 2022). The Han Dynasty's elegant gates, precisely constructed roof tiles, and magnificent canopies showed its emphasis on both beauty and function. Urban hubs like Chang'an (now Xi'an) hosted poets, craftspeople, and philosophers to promote Han culture (Zhang et al., 2020). Infiltrating all parts of Chinese culture, Han Dynasty aesthetics shaped the physical environment and common imagination.

Contemporary Public Art Characteristics

Contemporary Chinese public art is now a complex depiction of cultural identity, urban renewal, and social involvement. Urban areas have a variety of current public art styles, subjects, and mediums. These art installations show the complexity of Chinese society and its goals (Yu, 2022). Public art, from interactive digital media to enormous sculptures, has revitalized plazas, parks, and streets, making them cultural hubs. Modern public art emphasizes creation and experimentation, as artists use new technology, materials, and presentation methods (Chen et al., 2024). Modern public art often addresses current cultural, social, and political themes, encouraging conversation and reflection. Artists explore social justice, environmental sustainability, and globalization, raising audience understanding (Chen et al., 2022).

Modern public art artists debate identity and heritage, gaining inspiration from many historical legacies and cultural traditions. Public art can effectively represent Chinese identity in a fast-changing global world by honoring native traditions, commemorating historic events, or condemning consumer society (Wang et al., 2021a). Contemporary public art includes painting, sculpture, performance art, sound installations, and multimedia displays. Many mediums allow artists to interact with their audiences in new ways and explore new artistic expressions. Interactive artworks blur the artist-viewer relationship and establish a sense of ownership over public spaces (Jia et al., 2023). Digital technology also allows artists to create immersive experiences that invite spectators to explore virtual landscapes and engage with artworks in new and engaging ways (Makris et al., 2021). Contemporary Chinese public art also addresses urbanization and the clash between modernity and tradition. Public art helps cities flourish rapidly by creating metropolitan identities and fostering a sense of belonging (Abe & Fukushima, 2021). Public art initiatives range from major metropolis undertakings to tiny enhancements in everyday areas. Their main goal is to promote cultural exchange and urban humanization. By reclaiming public spaces for artistic expression and highlighting the unique cultural past of Chinese cities, contemporary public art combats the homogenizing impacts of urban development. Urban landscapes and citizens' daily lives are improved by public art.

Cultural Continuity

Cultural continuity is the impact of previous customs, values, and beliefs on modern culture. Chinese art shows cultural continuity since long-standing themes and aesthetics shape modern art (Benslimane & Biara, 2019). Cultural continuity emphasizes how historical legacies impact modern cultural identities and artistic developments (Aswita et al., 2018).

Transmission, adaptation, and reinterpretation have preserved and evolved old Chinese cultural elements like Han Dynasty aesthetics (Gibbon et al., 2016). This shows the relevance of tradition now. Reusing ancient motifs and symbols in public art initiatives helps modern Chinese art maintain cultural continuity. Research on the artistic style of woodblock New Year paintings provides further insight into how these traditional art forms continue to influence and inspire modern creativity (Allen et al., 2025). Artists use mythology, historical relics, and ancient literature to connect with modern sensibilities (Walsh, 2020). Public art featuring lotus blossoms, dragons, and phoenixes emphasizes their continued importance in Chinese culture as symbols of longevity, prosperity, and rejuvenation (Chen et al., 2020). Artists combine old and new by incorporating these components into their work. Contemporary artists' use of traditional techniques and skills proves cultural longevity. Calligraphy, ink painting, and pottery give craftsmen's works historical continuity (Zhao, 2023). Underglaze painting and celadon glazing can encourage modern ceramicists to honor China's ceramic legacy (Sun et al., 2023). Modern materials and traditional brushwork allow ink painters to create works that merge historical and current styles (Hatch, 2020).

Modern China values classical art and culture, showing cultural continuity. Even as cities grow, classical Chinese arts like opera, calligraphy, and martial arts remain important (Lo et al., 2019). These artistic manifestations retain cultural values and historical knowledge and adapt to new contexts. Modern artists may combine calligraphy with graphic design or use new Chinese opera techniques to revive cultural traditions (Kruppa et al., 2023). Cultural continuity is crucial to modern Chinese art because it links the past and present and gives the cultural environment historical significance and resonance. Contemporary Chinese painters acknowledge its growth. To connect with their culture, they use classical aesthetics, subjects, and methods. Keeping culture alive requires reinterpreting and inventing the past.

Urban Development Factors

urban dynamics, economic growth, and fast urbanization affect city creativity. Urban planning and government policies affect public art and urban growth (Wei et al., 2023). Government land use restrictions, zoning rules, and development incentives affect the built environment (Senghor et al., 2023). Urban planners employ public art to beautify, attract tourists, and build community pride. City public art programs may require or finance public art commissions in new buildings. Urban development projects are using public art to create lively, culturally varied cities that attract investment and promote sustainable growth (Pérez-Hernández et al., 2020). Economic variables including sponsorship, funding, and market demand

affect metropolitan public art development and distribution (Pia & Bezboruah, 2025; Smith et al., 2025). Chinese state art programs, like many others, draw private and public funding. Government subsidies, business sponsorships, and private donations demonstrate this. Cash flow, ROI, and income output affect artist, artwork, and installation site choices. Economic and consumer preferences may affect public art commissions (Shi et al., 2022). Many towns favor large, identifiable monuments or tourist attractions. Economic issues affect metropolitan public art's form, substance, and accessibility. Social variables such as public participation, cultural diversity, and community engagement impact urban development and public art (De Guimarães et al., 2020). Community participation, social cohesiveness, and urban cultural diversity are typical of public art. Cooperative murals, interactive exhibits, and community-driven art initiatives can include communities in public art development and interpretation. Public art can also empower disenfranchised groups to voice their opinions and challenge cultural norms through shared recall, advocacy, and societal critique (Yoon et al., 2020).

Public art blends many experiences and perspectives to make cities more vibrant, democratic, and inclusive. Technology and digital advancements are rapidly affecting urban public art creation and delivery. Augmented reality, interactive installations, light installations, and digital projections are possible with technology. Social media and digital platforms provide artists with new ways to promote their work, expand their audience, and receive public feedback.

Urban Aesthetics

Urban aesthetics includes sensory, spatial, and visual characteristics that define cities' personalities and atmospheres. Contemporary Chinese urban aesthetics affect tourists' and residents' identities, sense of belonging, and quality of life (Wu et al., 2023). Urban aesthetics refers to the process of creating and constructing urban landscapes such as waterfronts, plazas, and streetscapes. Urban landscapes with architectural symbols, lush planting, public art, and pedestrian-friendly infrastructure are beautiful and functional (Moosavi et al., 2023). Urban planners and designers improve aesthetics and practicality to encourage social interaction, exercise, and a sense of place. Architecture shapes urban aesthetics since buildings are cultural icons and prominent characteristics (Huang et al., 2022). Chinese architects and developers must balance economics, cultural preservation, and modern design in rapidly rising cities. Many major cities have monuments, modernist buildings, and Chinese architecture (Kan & Baoqing, 2023). Adaptive reuse of industrial areas and old structures is also growing. Architects must adapt former factories, warehouses, and cultural institutions into lively mixed-use complexes while preserving the city's history (Wang et al., 2020). Public art enriches urban aesthetics by enhancing the visual environment and fostering cultural identity. Public art includes interactive installations, transitory exhibitions, monumental sculptures, and murals, allowing people to communicate, express themselves, and share ideas (Eltokhy et al., 2023). Art in urban contexts encourages resident and tourist interaction and dialogue, increasing the city's visual experience. Public art may revitalize cities by turning abandoned or neglected places into vibrant cultural hubs that attract investors and tourists (Krieger, 2023). Lighting and signs also affect urban aesthetics by affecting safety, accessibility, and visual appeal. Efficiency lighting improves architecture, highlights public art, and creates pleasant nighttime environments.

Urban signage improves readability and navigation by providing cultural landmarks, navigational cues, and orientation indicators (Schimkowsky, 2022). By carefully designing lighting and signs, communities can improve the visual harmony and functionality of their urban environment, improving residents' and visitors' quality of life. Urban aesthetics includes several factors that affect visual, spatial, and sensory perception (Li et al., 2022b). Cities use public art, lighting, urban design, and architecture to define their appearance. Municipalities may create more habitable, environmentally friendly, and culturally lively neighborhoods that improve inhabitants' well-being and society's by stressing aesthetics in urban planning and design.

METHODOLOGY

Purposive sampling was utilized to choose participants for this qualitative study to ensure relevant knowledge and experiences. Participants were selected for their broad Chinese art, culture, urban development, and public art backgrounds. The initiative hired visual arts, art history, public administration, urban planning, and cultural studies professionals. Students, government employees, non-profit leaders, and artists were admitted. We enrolled people who could illuminate the research subject with minimal exclusion criteria. No one without Chinese art, urban development, or cultural experience could attend. Participation was recruited through academic, professional, and community organizations. Participants were notified of the study's goals, procedures, and ethics by email or phone. Volunteers and informed consent were used to recruit research participants. This qualitative study used semi-structured interviews with 17 sample members.

The interviews collected qualitative data on participants' perceptions, interactions, and understandings of the Han Dynasty's visual appeal and modern Chinese public art. Before the interviews, participants gave informed consent after being told the study's goals, methods, and ethics. Participant preferences and logistics dictated whether to interview remotely or in person. Tape interviews lasted 45–60 minutes with consent. The interviews covered several topics using open-ended inquiries. The Han Dynasty's aesthetics, public art's urban development impact, and modern Chinese art's creativity and tradition were explored. Experts employed active listening and probing questions to encourage deep and meaningful talks, allowing subjects to freely express their opinions. Field notes were gathered during interviews to record contextual information and observations. Data gathering continued until saturation, indicated by the absence of fresh interview themes or insights. As expected by the theoretical framework, this result indicates maximal data collection.

The Braun & Clarke (2006) thematic analysis criteria were used to evaluate this qualitative study's data in three stages. The study sought consistent themes, concepts, and patterns in semi-structured interview qualitative data. Analysis began with data familiarization. Researchers reviewed verbatim transcriptions of interview audio recordings to fully grasp the data. We noted initial observations and patterns and identified key concepts and ideas. Coded texts included Han Dynasty

aesthetics, modern public art, urban development, and cultural continuity. Thematic analysis coded crucial transcript parts inductively. Step three, theme development, organized the transcribed material into research objectives-based subject clusters. The study team debated themes iteratively to find data correlations, discrepancies, and recurring events.

To reinforce themes and provide context, transcript fragments were used. Analyses were done carefully to assure data interpretation accuracy. Member verification, peer debriefing, and reflexivity supported the findings. Data was well-founded and accurately reflected participant viewpoints and experiences using these approaches.

RESULTS

The study's findings section investigates the complicated relationships between current public art, modern Chinese urban aesthetics, cultural continuity, urban development variables, and Han Dynasty aesthetics. The study shows how numerous elements affect metropolitan environments' aesthetic and cultural qualities. A broad sample of semi-structured interviews is analyzed qualitatively. The firsthand accounts of public administration, cultural studies, urban planning, and art history specialists may explain Chinese urban aesthetics. The findings highlight Han Dynasty aesthetics' influence on modern art and public art's role in cultural continuity and community involvement. These results illuminate the social, cultural, economic, and political factors that determine urban aesthetic development in China today.

Policymakers, urban planners, artists, and cultural practitioners can learn how to promote cultural preservation, heritage conservation, and aesthetic enhancement in urban areas by carefully analyzing the study's topic correlations.

Han Dynasty aesthetics influence urban aesthetics

The study found that Han Dynasty aesthetics influenced modern Chinese urban aesthetics (Figure 1). Participants noted the lasting impact of Han Dynasty creativity and themes on city aesthetics. P008, however, claimed that Han Dynasty aesthetics still shape Chinese urban aesthetics. The current architectural architecture and public art installations show harmony, balance, and a strong regard for nature. Participant P014 said Han Dynasty aesthetics provide Chinese towns with a sense of cultural heritage and continuity. Participants also stressed the need for public art in urban settings to maintain and replicate Han Dynasty aesthetics. The statement claims that public art often draws influence from traditional Chinese symbols and ideas, commemorating the Han Dynasty while expressing current creative sensibilities. Han Dynasty aesthetics in public art projects boost urban China's cultural identity, fostering pride and connection, according to P011. Previous research supports these conclusions. (Ma, 2022) states that Han Dynasty creative practices have influenced current Chinese urban building and public art. Li et al. (2022a) state that Chinese urban landscapes must conserve and modify ancient aesthetics to define their visual character. As Han Dynasty aesthetics encountered modern urban development factors, participants stressed their changing nature. P012 claimed Han Dynasty aesthetics may be reinterpreted and adapted to changing social, economic, and environmental conditions for urban design. P017 stated that Han Dynasty aesthetics and current urban development show China's shifting cultural milieu, where tradition and innovation coexist. Urban landscapes, architectural landmarks, and public art installations show how Han Dynasty aesthetics influenced modern Chinese urban architecture. Han Dynasty aesthetics improve urban environments by maintaining and reinventing historical artistic concepts and themes. This research examines how historical events affect urban landscapes and how traditional and modern Chinese art and culture interact.

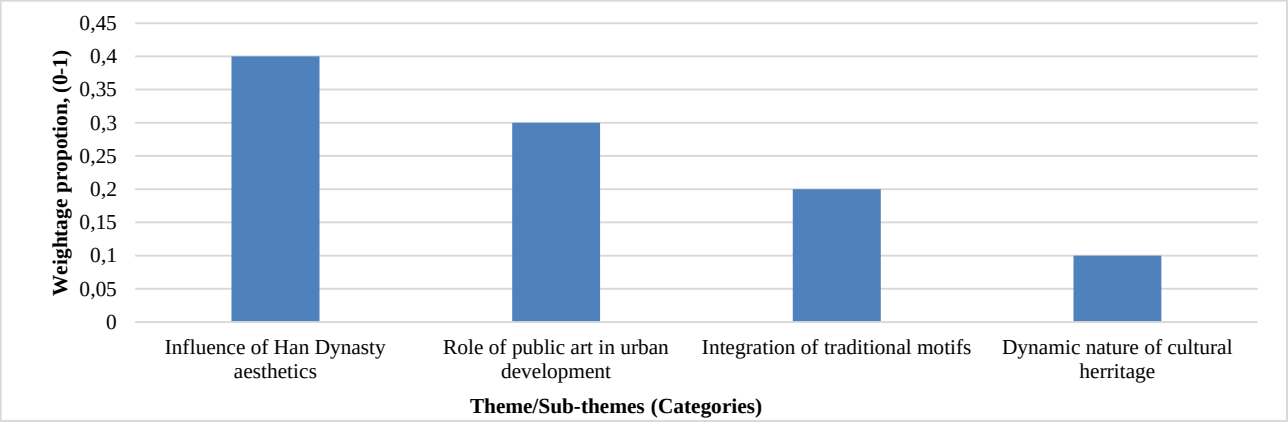

Figure 1. Influence of Han Dynasty Aesthetics on Urban Themes (Source: Author's analysis based on interviews, 2025)

Contemporary public art characteristics influence urban aesthetics

The study shows that modern public art influences Chinese urban aesthetics (Figure 2). Public art enhances metropolitan aesthetics and culture, according to participants. Modern public art installations are key hubs in cities, boosting vitality and life. "The diverse and international nature of urban China is evident in the wide range of styles, themes, and mediums used in modern public art," P015 stated. Participants also stressed the relevance of public art in urban areas for social cohesion and community participation. Public art projects often involve artists, community members, and local stakeholders, giving urban communities a sense of ownership and fulfillment, according to P004. Participant P013 stated public art initiatives foster community and cultural awareness by encouraging local debate and involvement. Current research confirms these findings. Modern public art may alter cities by fostering collective memory, cultural expression, and public interaction,

according to (Etro & Stepanova, 2021). Fan et al. (2023) also suggest that public art shapes city identity and community through its visual character. Modern public art initiatives in metropolitan China reflect and respond to regional socioeconomic dynamics, the panelists said. P002 noted that public art initiatives often address current social and cultural issues, providing a platform for artistic expression and social critique. P010 also noted that current public art's utilization of technology and multimedia shows how digital culture and globalization affect urban aesthetics. Due to its socio-cultural significance, diversified visual aspects, and community engagement, modern public art enhances the visual appeal of Chinese cities. Modern public art adds visual appeal and cultural life to cities with innovative styles, subjects, and materials. This study emphasizes public art's strength and influence on modern Chinese cities' social and aesthetic structures.

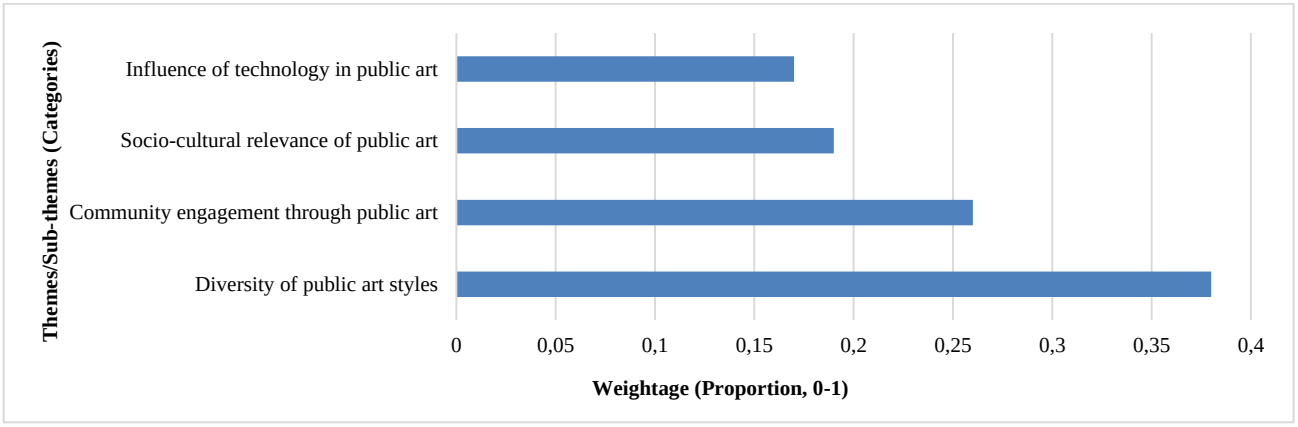

Figure 2. Contemporary Public Art Characteristics and Their Impact on Urban Aesthetics: Interview-Based Insights (Source: Author's interview data analysis, 2025)

Cultural continuity mediates the relationship between Han Dynasty aesthetics and urban aesthetics

The study found that cultural continuity linked Han Dynasty aesthetics to urban Chinese aesthetics (Figure 3). Respondents stressed the relevance of cultural heritage in modern art and urban design. Cultural continuity connects the past and present, helping interpret and adapt Han Dynasty aesthetics in current public art and urban design, the participant said. Participant P016 said preserving and reinterpreting traditional cultural traditions makes Chinese cities more authentic and distinctive. Participants also discussed how cultural continuity impacts urban perceptions of Han Dynasty aesthetics.

Cultural continuity helps explain the symbolic meanings and cultural significance of Han Dynasty motifs and symbols in public art, according to P003. P011 said incorporating traditional culture into urban buildings shows a commitment to preserving China's rich cultural heritage. Current research supports these findings. Cultural continuity mediates historical aesthetics and current urban development in China, according to Chen et al., 2023. Reinterpreting traditional cultural symbols and practices strengthens urban communities' cultural resilience and identities, according to Maureen et al. (2022).

Participants also stressed the dynamic aspect of cultural continuity in modernization and globalization. Participant P017 said cultural continuity gives a sense of rootedness and tradition and allows innovation and flexibility to change social norms and values. P010 claimed that ancient cultural elements with new creative ways show Chinese culture's dynamic and expanding nature in the 21st century. Cultural continuity connects Han Dynasty art to present Chinese urban life. It impacts how urban areas receive, use, and understand previous innovative ideas. By preserving and reinterpreting the cultural past, urban landscapes in China reflect the problems faced by modernity and globalization as well as historical continuity and cultural identity. This study stresses cultural continuity's role in developing urban China's visual and cultural settings.

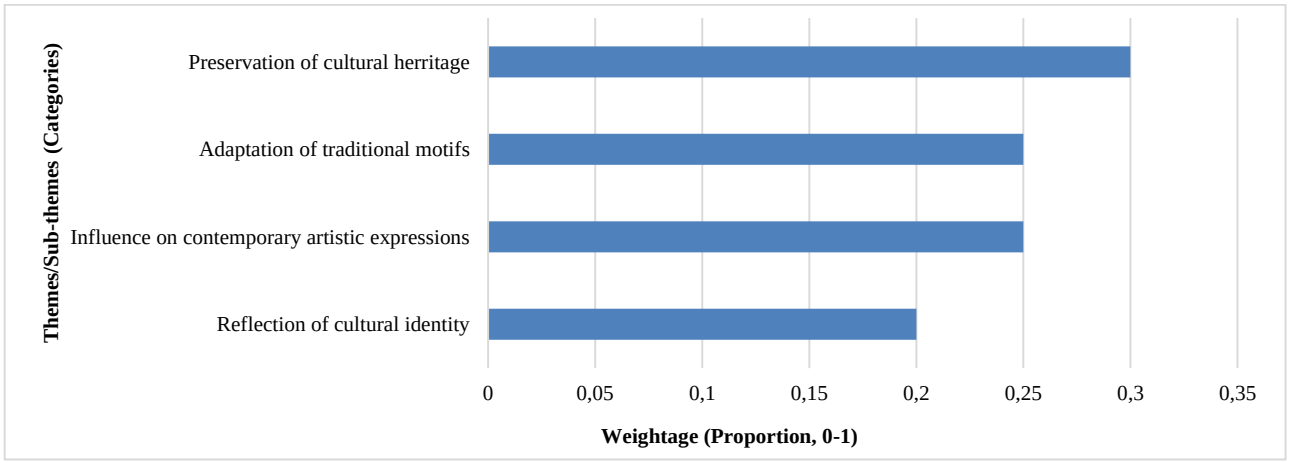

Figure 3. Cultural Continuity as a Mediator Between Han Dynasty and Urban Aesthetics: Interview Insights (Source: Author's interview data analysis, 2025)

Cultural continuity mediates the relationship between contemporary public art characteristics and urban aesthetics

The study stressed the relevance of cultural continuity in integrating current public art with Chinese urban aesthetics (Figure 4). The judges noted how modern public art reflects and reinterprets historical cultural themes and practices, boosting urban visual and cultural life. P009 claims that modern public art often draws influence from old Chinese themes and symbols, showing a constant cultural expression over time. Participant P015 said cultural components in public art projects enhance metropolitan location and culture. Participants also stressed the importance of cultural continuity and urban aesthetics in current public art. P004 stressed the importance of cultural continuity in comprehending and situating modern public art in Chinese culture. P012 said public artworks that incorporate traditional cultural themes and techniques show how urban aesthetics blends tradition and modernity. Current research supports these findings. Smith et al. (2017) state that modern public art preserves and reinterprets urban cultural heritage through cultural communication and expression. According to Bleibleh & Awad (2020), incorporating culture into public art enhances urban authenticity and culture. Cultural continuity fosters social cohesion and community involvement in cities, participants said. P007 noted that public art projects often involve artists, community people, and local stakeholders, which fosters a sense of ownership and happiness in cities. P013 said that public art programs encourage residents to talk and connect, establishing a sense of community and cultural appreciation. Cultural continuity links modern public art to urban aesthetics in China, affecting how creative expressions are accepted, altered, and understood in urban settings. By combining traditional cultural themes and practices, contemporary public art revitalizes and enhances urban landscapes. This strengthens local ties and communities. This study stresses cultural continuity's role in developing urban China's visual and cultural settings.

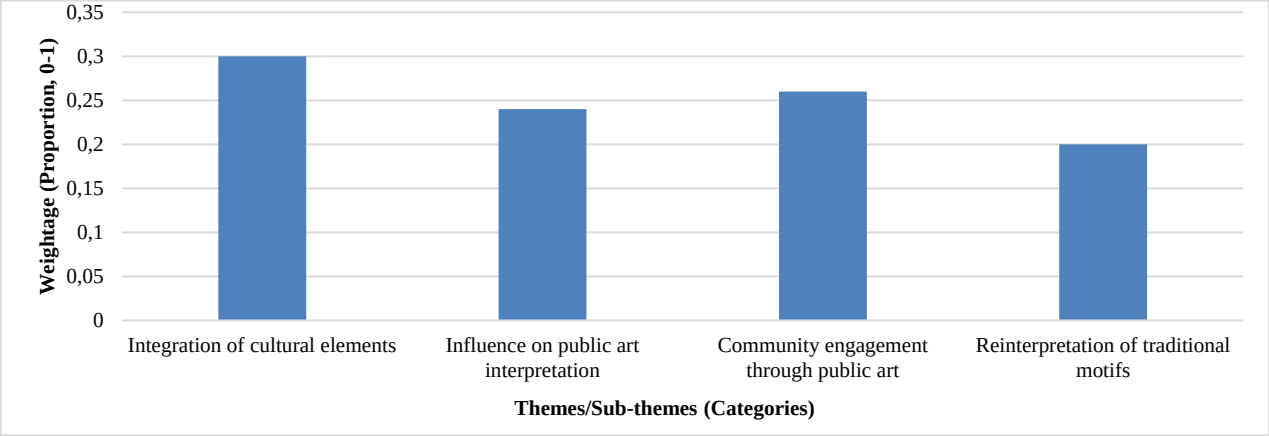

Figure 4. Cultural Continuity mediates the relationship between Contemporary Public Art Characteristics and Urban Aesthetics (Source: Author's analysis based on interviews, 2025)

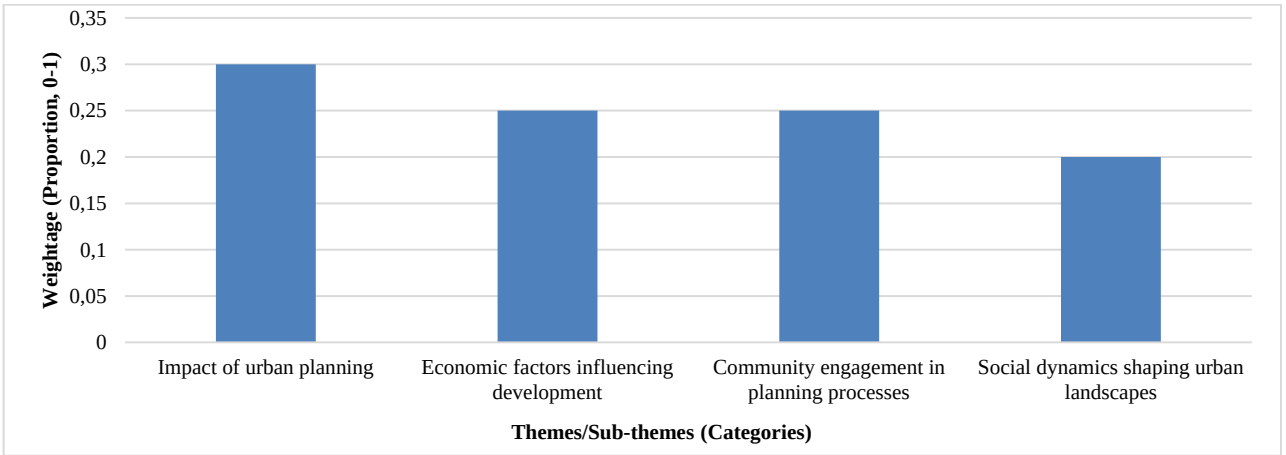

Figure 5. Urban Development Factors moderate the relationship between Cultural Continuity and Urban Aesthetics (Source: Author's analysis based on interviews, 2025)

Urban development factors moderate the relationship between cultural continuity and urban aesthetics

The study found that urban development factors reduce cultural continuity's effect on Chinese urban aesthetics (Figure 5). Participants stressed the relevance of social dynamics, urban planning, architecture, and economic factors in understanding and protecting urban cultural assets. The speaker said urban development factors affect city infrastructure and constructed environments, altering cultural elements and public art. "The execution of urban development projects and policies can either support or hinder efforts to maintain and advance cultural continuity in urban landscapes," said P011. Urban development factors also affected the relationship between city aesthetics and cultural preservation. P005 noted that urban planning and public art are based on cultural continuity. Urban development factors like zoning and land use

restrictions can affect cultural heritage assets and artistic expressions' visibility and accessibility. P014 said that urban development projects' economic viability often affects cultural preservation and inclusion. Current research supports these findings. Hartog & González Martínez (2022) believe that urban development affects city culture. Gentrification and commercialization are factors that affect cultural heritage authenticity and conservation. Li et al. (2022a) address how urban planning policies and initiatives affect cultural continuity and heritage preservation in urban regions. P010 proposes that community involvement in urban planning and design may guarantee that cultural assets and public art reflect local values. Participants also stressed the need for community involvement and participatory planning in urban development.

P017 suggested that collaborative urban development initiatives may foster a sense of ownership and responsibility among residents, creating more sustainable and culturally diverse cities. Chinese urban growth influences aesthetics, cultural continuity, and cultural asset maintenance, interpretation, and integration. Collaborative planning and policy can promote community engagement and cultural preservation in cities. They reflect residents' histories and identities. Urban development considerations maintain cultural assets and ensure cultural continuity in urban zones, according to this study.

DISCUSSION

The Han Dynasty aesthetics vs. present Chinese urban aesthetics debate involves historical legacies and urban environments. This study reveals how Han Dynasty art affected Chinese cities. Han Dynasty aesthetics like symmetry, proportion, and nature still affect urban China's aesthetics, respondents indicated. This supports previous studies on how creative practices shape urban design and public art (Bleibleh & Awad, 2020).

Han Dynasty aesthetics—symmetry, balance, and appreciation of nature—still inspire Chinese art. This complements earlier studies on how past creative practices shape urban architecture and public art (Li et al., 2022a). Han Dynasty aesthetics are used in new urban environments to honor China's cultural history. Urban planning, public art, and architecture use Han Dynasty symbols to show cultural continuity. Chinese towns' Han Dynasty aesthetics reveal how historical legacies shaped urban identities (Jiang et al., 2024). Blending Han Dynasty themes with modern urban settings permits a conflict between innovation and legacy, expressing Chinese art and culture's ongoing growth. Han Dynasty aesthetics provide a stable framework for artistic expression, yet they can be adapted to changing social ideals (Xu, 2022). Old creative traditions inspired urban aesthetics, as Han Dynasty aesthetics influenced modern art.

This research shows the many ways public art affects metropolitan visual and cultural environments. Modern public art installations' many materials, subject matter, and creative methods represent Chinese cities' global and cosmopolitan nature, according to respondents. Diverse aspects improve urban aesthetics and foster cultural vitality. Modern public art allows artists to explore and exchange ideas on pressing social and cultural issues. Public art displays address critical social concerns, inspire serious thought, and spark public conversation, enriching urban culture. This supports earlier studies that show public art promotes urban social cohesion, cultural awareness, and community participation (Hoop et al., 2022). Public art also affects Chinese urban aesthetics due to its sociological significance. Respondents said public art often draws influence from local histories, traditions, and identities, reflecting their communities' cultures. Public art that incorporates cultural motifs can resonate with metropolitan inhabitants and foster a sense of belonging and connection. Implementing community preferences and the local environment during public art project development ensures that they authentically reflect urban culture. Cultural relevance emphasizes the importance of considering these factors. Technology in modern public art complicates urban aesthetics by blending physical and digital domains. Participants recognized that public art shows using interactive technology, digital art, and multimedia increased urban accessibility and sensory experience. Technology and art combine to make metropolitan landscapes vibrant and creative, demonstrating modern art's forward-thinking nature.

Cultural continuity helps urban areas preserve and rethink ancient creative ideas and patterns. The study emphasizes the need to incorporate Han Dynasty aesthetics into public art and urban planning to preserve cultural heritage. The answers said current urban architecture and culture reflect Han Dynasty aesthetics of symmetry, stability, and love for nature. Urban landscapes look better and foster cultural continuity and identity by preserving historical artifacts. Cultural continuity permits the Han Dynasty's aesthetics to be updated to reflect evolving values and practices. Traditional creative notions can be updated and modernized to support artistic expression. Cultural continuity allows Han Dynasty aesthetics to adapt to present tastes and needs, according to respondents. Cultural continuity shows Chinese art and culture's continual progress by balancing novelty and legacy. Participants emphasized conserving ethnic traditions while embracing new art.

Liu et al. (2023) found that cultural flexibility and resilience shape urban landscapes' visual and cultural aspects. Maintaining cultural continuity in modern communities links the Han Dynasty's visual style to community affiliation and values. Respondents believe that integrating traditional cultural aspects into public art boosts local pride and social cohesiveness. Urban citizens' role in cultural preservation and recognition emphasizes continuity (Akbar et al., 2020).

Modern public art preserves and adapts historic patterns and motifs, according to the study. Public art projects generally combine traditional Chinese culture, exhibiting city cultural preservation, respondents said. Maintaining cultural continuity makes cities more appealing and promotes cultural identity. Cultural continuity lets modern society investigate past events and reimagine old customs. Creative expression can incorporate modern culture while using historic elements. Cultural continuity enables expressions to suit current audiences, say participants. City public art preserves culture and unites communities. Many public art projects involve artists, community members, and local stakeholders, enhancing urban pride and ownership, respondents stated. This cultural continuity component encourages local urban culture preservation and acknowledgment. Such activities boost urban culture and social connections. Cultural continuity influences modern public art and metropolitan identity. Traditional cultural elements in public art projects promote urban culture and social cohesion by including communities, according to survey participants. Cultural continuity helps urbanites' cultural preservation and acknowledgment.

Urban development elements affect cultural continuity perception, adaptation, and integration into city visual and cultural traits, according to this study. Urban planning and regulation affect cultural asset protection and integration in urban landscapes. Participants said urban growth affects cultural heritage assets and creative expression exposure, accessibility, and preservation. Zoning, land use, and development incentives affect metropolitan landscapes' aesthetics and cultural continuity. Economic issues impact urban culture and aesthetics. People believed urban growth must be economically sustainable to preserve and integrate culture. Funding, market demand, and ROI affect public art and cultural preservation resource distribution. These views impact metropolitan culture and authenticity.

Social interactions affect culture's worth and urban people's participation and contribution, affecting cultural preservation and urban visual attractiveness. Integrating the community into urban planning and architecture ensures cultural assets and public art reflect local values, respondents say. Community engagement, diversity, and demographic changes affect metropolitan regions' cohesiveness and cultural character, which affects how cultural traditions are received and understood. Collective urban development may also instill responsibility and ownership, creating culturally dynamic and environmentally sustainable cities. Community participation and participatory planning are essential to connecting urban development with local values, respondents said. This promotes urban cultural heritage preservation and celebration.

CONCLUSION

In conclusion, this study studied the complex interaction between historical aesthetics, public art, cultural continuity, urban development variables, and urban aesthetics in China. The study's qualitative research showed how these influences shape urban visual and cultural landscapes. The findings showed Han Dynasty aesthetics still affect Chinese urban aesthetics. Urban landscapes show symmetry, harmony, and respect for nature, indicating a long history. Han Dynasty aesthetics in public art and urban planning demonstrate cultural continuity in modern cities.

The study of Pingyang woodblock New Year painting artistic styles further illustrates how woodblock New Year paintings, as important traditional art forms, continue to shape modern artistic styles and urban aesthetics. The study also highlighted how modern public art might alter metropolitan aesthetics. Public art installations in cities foster community, social cohesiveness, and cultural appreciation. Multiculturalism and cosmopolitanism make modern Chinese cities active and energetic, with a variety of styles, themes, and mediums. Cultural continuity connected historical aesthetics, current creativity, and urban aesthetics. Preservation, adaptation, and reinterpretation of traditional cultural themes and behaviors in urban settings produce a rich cultural identity and continuity. Cultural continuity also fosters community engagement, social cohesion, and a sense of belonging in urban places, strengthening urban culture. Urban development factors mitigate the relationship between urban aesthetics and cultural continuity. Cultural preservation and absorption into urban landscapes are affected by zoning, economics, and society. Inclusive, vibrant, and culturally rich communities require collaborative urban design that promotes cultural preservation, community engagement, and sustainable development.

Implications

This research illuminates the intersection of historical aesthetics, contemporary public art, cultural permanence, urban progress, and urban aesthetics, among other theoretical implications. The research first improves urban studies theory by stressing the long-term effects of historical legacies on urban landscapes. By examining how the Han Dynasty aesthetics influenced the development of modern urban aesthetics, this research helps us better understand the complicated relationship between innovation and tradition in public art and urban architecture. This study also examines how cultural continuity affects historical aesthetics, present public art, and urban aesthetics. It also advances cultural continuity theory.

As shown by the qualitative analysis in this study, cultural continuity connects the past and the present, guiding the conservation, adjustment, and reinterpretation of traditional cultural characteristics in urban settings. This helps us understand how cultural legacy shapes urban identities and manifestations. This study also emphasizes how urban development factors influence the relationship between urban aesthetics and cultural continuity, adding to urban development theory. Urban design, economic factors, and social dynamics affect cultural conservation and assimilation in urban contexts. This helps explain urban development processes and their effects on cultural sustainability.

This study affects Chinese politicians, urban planners, artists, and community groups involved in city development and maintenance. The research emphasizes the importance of cultural heritage preservation and historical aesthetics in urban planning and development. Policymakers and planners may integrate cultural integration and conservation in urban development initiatives by acknowledging the influence of historical legacies on present urban identities. The report also stresses the importance of community participation in urban development and public art initiatives. Municipalities can ensure that urban environments reflect residents' diverse identities, values, and preferences by actively engaging community stakeholders, artists, and local citizens in the planning, design, and implementation of public art exhibitions and cultural preservation initiatives. This increases urban culture and cohesiveness by fostering ownership, fulfillment, and responsibility. The research also stresses the importance of inclusive, sustainable urban development plans that conserve cultural assets, engage communities, and promote cultural activities. Sustainable development, inclusive design, collaborative planning, and honoring urban populations' histories and identities can produce welcoming, diverse, culturally rich, and livable communities.

Metropolitan areas benefit from cultural diversity, creativity, and innovation while living standards rise. This study offers theoretical insights into China's complex urban dynamics and practical consequences for policymakers, urban planners, artists, and community groups involved in urban growth and cultural preservation. Urban areas may generate culturally dynamic, inclusive, and varied environments that reflect inhabitants' numerous identities and experiences. Recognizing historical aesthetics, maintaining cultural continuity, and valuing community engagement and sustainability can achieve this.

Limitations and Future Direction

This study sheds light on the link between historical aesthetics, current public art, cultural continuity, urban development factors, and urban aesthetics in China, although it has certain limitations. The first research concentrated on urban China, limiting its application to other cultures. Future research may examine similar difficulties in different cultures to better understand the worldwide link between historical and urban aesthetics. The study's qualitative nature limits quantitative analysis and statistical generalization. While qualitative methods can describe complex events, future research should apply quantitative tools to evaluate statistical correlations between variables and use bigger sample sizes.

Understanding the many factors that determine urban aesthetics and cultural coherence may help. The study employed self-reported data, which was biased and misinterpreted. A rigorous data analysis ensured data quality and reliability, although mixed-methods research may help confirm findings from many sources and perspectives. This may improve study accuracy, credibility, and comprehension of the phenomenon. The study favored urban inhabitants, artists, and lawmakers above urban developers, cultural heritage specialists, and the poor. Future research may involve more participants, especially those directly affected by cultural preservation and urban growth. This may help us understand the difficulties of urban aesthetics and cultural continuity in varied cities. The study did not examine how public art and urban growth affected cultural continuity and aesthetics. The chronological development of urban landscapes, cultural practices, and community identities may be studied longitudinally. This might illuminate cultural continuity's resilience and adaptability to fast urban change. It may also reveal better ways to protect cultural treasures in the face of urbanization and globalization.

Many prospective study paths require further research. Longitudinal studies might examine how public art and urban development initiatives affect cultural continuity, community identity, and urban aesthetics. This study may reveal how cultural legacy may resist urbanization and provide better ways to preserve cultural identity in rapidly changing cities. Comparative studies may also compare cultural continuity and urban aesthetics across cultures and regions. Researchers can better understand universal and context-specific factors that affect urban aesthetics and cultural identity by studying how historical aesthetics and cultural practices are perceived and modified in different urban contexts. Sociology, anthropology, urban planning, and cultural studies can also help explain cultural continuity and urban aesthetics' complicated dynamics. Using environmental, social, cultural, and economic perspectives can help researchers understand urban development and cultural preservation. Participatory research allows local communities, artists, legislators, and others to construct urban regions and cultural activities. Academics may empower, collaborate, and include urban populations by incorporating diverse perspectives into research. This might make urban development more sustainable.

Author Contributions: Conceptualization, S.G. and F.G.; methodology, S.G and F.G.; software, J.B.M.F. and S.S.S.; validation, H.B.A.H. and I.B.I.; formal analysis, J.B.M.F. and S.S.S.; investigation, S.G. and F.G.; data curation, J.B.M.F. and S.S.S.; writing - original draft preparation, S.G. and F.G.; writing - review and editing, J.B.M.F. and S.S.S.; visualization, H.B.A.H. and I.B.I.; supervision, J.B.M.F.; project administration, J.B.M.F. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 20.02.2025 Revised: 31.06.2025 Accepted: 28.07.2025 Available online: 18.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1638-1648
DOI 10.30892/gtg.61322-1532

THE FUTURE OF OPERA: ENHANCING INTANGIBLE CULTURAL HERITAGE THROUGH MULTIMEDIA COMMUNICATION TECHNIQUES

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Citation: Ding, J., & Haris, F.M.H. (2025). The future of opera: Enhancing intangible cultural heritage through multimedia communication techniques. *Geojournal of Tourism and Geosites*, 61(3), 1638–1648. https://doi.org/10.30892/gtg.61322-1532

Abstract: Opera is an important part of China's intangible cultural heritage (ICH). However, it faces increasing challenges in the digital age. Changes in how people consume culture, gaps between generations, and limited access are major issues. This study looks at how multimedia communication techniques (MCT), information technology (IT), digital skills (DC), and government support (GS) help preserve and improve opera in today's society. Using a framework that combines communication theory and cultural preservation, the study examines the relationships between these factors and their impact on opera. A quantitative research design was used, with a structured survey given to 290 university students from three major Chinese institutions. The researchers analyzed the data using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method through SmartPLS 4.0. The results show that multimedia communication techniques and information technology strongly promote opera. Furthermore, digital skills greatly improve the effectiveness of multimedia strategies, especially when people's cultural awareness is high. Cultural awareness emerged as a key factor that strengthens the connection between MCT, digital marketing, and opera engagement. Government support also plays an important role, boosting the impact of digital tools when there is institutional backing. Additionally, combining MCT and digital marketing has a greater effect on promoting opera than using them separately. This finding highlights the important synergies between communication strategies and technological platforms. The study provides valuable evidence for a comprehensive framework that highlights the importance of technology, education, and institutional support in preserving traditional cultural expressions. It offers practical recommendations for cultural policymakers, educators, and media professionals. These include increasing investment in digital infrastructure, providing targeted funding for projects that digitize opera, and integrating cultural education with digital literacy training. Overall, the research offers important insights into how traditional art forms like opera can be preserved, updated, and promoted through digital change. It emphasizes the need for collaboration among government, academia, and creative industries to support the survival and growth of cultural heritage in a rapidly changing media environment.

Keywords: intangible cultural heritage, multimedia communication, opera, digital competences, government support, information technologies

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INTRODUCTION

The conservation and protection of ICH are steadily becoming something deserving of consideration as the world turns digital. Opera, a significant component of intangible cultural resources, reflects the definite culture and its values and practices that define the cultural members of society and align them with their history (Lercari et al., 2022). Data, social, and visual media communication techniques have slightly affected the flow whereby the desire to maintain Opera as an intangible cultural heritage has been well enhanced. These techniques provide some form of a new approach to arresting cultural practices through documentation, sharing, and advocating for them. Social media platforms, in particular, potentially increase opera interest and availability among the public through presented performance records and artifacts (Pasca et al., 2021). Technologies applied to information, such as VR and AR, have prospects of increasing the degree of presence with cultural heritage (Boboc et al., 2022). Nevertheless, they are yet to be interrogated regarding the extent to which they enabled the continuation of Opera as a cultural practice. Promoting these technologies requires digital competencies, implying that better digital skills can enhance the management and promotion of opera heritage (Yende, 2023). Financial support from the government is crucial to applying these tools in promoting and undertaking the conservation and management of these heritage components. Government regulations that encourage multimedia communication and information technologies and policies supporting financial and infrastructural development can enhance the intensification of multimedia communication and information technologies (El-belkasy & Shehata, 2024).

However, thanks to the opportunities for multimedia communication and information technologies, there is a growing possibility of improving the functioning and dissemination of such heritage. Since engagement with web 2.0 applications is still relatively new, the interaction with and contribution of these technologies to opera heritage and the significance of digital

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skills and governmental aids have not been adequately examined yet. Taking cues from these perspectives, this paper seeks to find out how all these factors influence opera heritage preservation. The present research is intended to fill this gap by examining the role of multimedia communication technologies and information technologies in supporting and maintaining Opera as an element of the cultural heritage. For these reasons, we assert that heritage preservation can be significantly boosted with adequate digital competencies, support from the government, and the innovative use of the mentioned digital tools. In particular, six hypotheses regarding the impact of these factors on opera heritage and their interactions are considered.

The research is limited to the opera subdomain of intangible cultural heritage. In particular, it focuses on the effects multimedia communication forms, IT, and competencies have on the conservation and promotion of the opera. This study also aimed to establish the moderating function of government support on these linkages. The study locates itself in China to understand how university students – the younger generation – envisage opera heritage and engage with it in the digital sphere.

Of course, works that address the contribution of digital technologies to cultural heritage have been of great interest in the past, but very few works focus on how these digital technologies influence the preservation of opera, an intangible cultural heritage. Furthermore, there appears to be a lack of studies on the moderating impact of government support and the involvement of digital competencies in this regard. Indeed, this research aims to fill these research gaps by offering actual data regarding multimedia communication techniques, information technologies, digital competencies, and government support to improve opera heritage. In this study, the author adds to the existing knowledge by investigating how digital tools and government support for Opera intertwine with digital competencies.

The study gives practical recommendations to policymakers and cultural stakeholders, including cultural institutions and educators, on utilizing these tools to protect cultural heritage.

LITERATURE REVIEW

Modern Communication Technologies in Opera and the Promotion of Intangible Cultural Heritage

Traditional operas are incorporating modern communication technologies to promote and retain cultural transmission. The use of technologies such as VR and meta-media has transformed the opera into something immersive and relatable for younger audiences (Jiang et al., 2024; Wu, 2024). For instance, VR could provide realistic and experiential depictions that are consistent with modern sensibilities and enrich Chinese opera (Jiang et al., 2024). In addition, interactive media blurs the distinction between traditional and modern aesthetics by creating a participatory cultural environment (Zhai, 2024). These tools lead to the expression of creativity and help manage large audiences, but have their difficulties in ensuring cultural integrity together with technological advancements (Boh & Adoka, 2023). However, the combination of analog performance with digital tools helps teach generational values (Jiang et al., 2024; Xiaoyu, 2024). Furthermore, Zhang (2024) stresses that digital archives of, and online platforms for, traditional opera ensure its accessibility and thereby allow it to be preserved beyond the stage.

Hypothesis 1: The integration of modern communication technologies in opera has a positive impact on the promotion of intangible cultural heritage.

1. Digital Marketing and the Promotion of Opera as a Medium for Intangible Cultural Heritage

Digital marketing has revolutionized cultural heritage promotion by reaching and being relevant to a wider audience. Social media, influencer campaigns, and short-form videos (TikTok) have attracted younger audiences to Chinese opera (Gagliano, 2020; Hammou et al., 2020). TikTok platforms amplify the cultural visibility through the 'algorithmic content distribution' by engaging audiences who have no prior exposure and have little or no interest in opera (Sudiantini et al., 2024; Zhou, 2024). These tools allow the creation of accessible, entertaining content that would resonate with users while breaking the traditional norms of cultural dissemination (Todorova-Ekmekci, 2021). However, the echo chamber and content ethics remain concerns (Sandra et al., 2024; Zhou, 2024). However, digital platforms can be a strong tool to support cultural revival and promotion (Gan et al., 2023) as long as they can be used responsibly.

Hypothesis 2: Digital marketing significantly enhances the promotion of opera as a medium for intangible cultural heritage.

2. Cultural Awareness of Opera and the Promotion of Intangible Cultural Heritage

Assuming younger generations are more culturally aware, they will continue growing traditional art forms through digital means. Social media marketing, short-form video, and other such technologies allowed cultural institutions to create targeted campaigns that could attract a wider audience (Golovach, 2023; Trach, 2024). According to Cham et al. (2022), digital analytics and media optimization have made it simpler for opera to personalize content, thereby making the opera more relevant in its modern cultural context. However, many institutions have yet to fully adopt digital tools (Nataliya Golovach). Unlike many tools like TikTok, which introduce new users to culture through short videos (Liu, 2024; Zhou, 2024), museums foster interactive engagement and actively involve communities (Li & Yu, 2024). Branding techniques in media improve market presence and cultural appreciation, while community media practices promote intercultural exchange (Li & Tay, 2024; Zhu & Mustaffa, 2024). All of these trends indicate that opera can become more of a cultural phenomenon, which may help to increase the interest in it, provided that there is a real interest in it and also that it is supported with robust promotional strategies (Peters et al., 2017).

Hypothesis 3: Cultural awareness of opera positively influences the promotion of intangible cultural heritage.

3. Combined Use of Modern Communication Technologies and Digital Marketing in Opera

With cultural engagement to come in the linear use of communication technologies and digital marketing, it will amplify it globally. Li & Yu (2024), Montanari et al. (2024), Zhu & Mustaffa (2024), Zou et al. (2024) make use of tools like 3D

modeling, multimedia presentation, and visual narrative in expanding cultural documentation and audience outreach. However, concerns also exist regarding data privacy and commercialization (Lee et al., 2024; Zou et al., 2024) and curation is now being augmented by immersive, interactive artificial intelligence. VR and semantic-driven digital scenography have become strategically used for redefining audience engagement and pushing the appeal of traditional opera beyond (Jiang et al., 2024; Liang et al., 2022). Moreover, digital twin technology fosters sustainable global communication of cultural assets (Prasad et al., 2022; Zou et al., 2024). The combination and the convergence of modern tech and marketing delivered these approaches, highlighting the revitalizing and deepening of the cultural resonance of traditional opera.

Hypothesis 4: The combined use of modern communication technologies and digital marketing in opera has a greater impact on the promotion of intangible cultural heritage than either method used alone.

4. Cultural Awareness of Opera as a Mediator between Modern Communication Technologies and the Promotion of Intangible Cultural Heritage

Communication tools shape heritage engagement through cultural awareness. According to Kozulin (2023), cultural mediation determines the way technology affects self-awareness. Likewise, Liu (2024) points out that even advanced technologies, without cultural grounding, will not preserve heritage completely. Cultural communication is an important source to maintain authenticity and produce the visitor's deep experience in tourism (Kinderknekht & Kolada, 2022). Regarding translation, mediation is equally important to enable cross-cultural understanding. Therefore, these findings assume that cultural sensitivity at the core of their use achieves the potential of preserving communication technologies (Abdelfattah, 2019).

Hypothesis 5: Cultural awareness of opera mediates the relationship between modern communication technologies and the promotion of intangible cultural heritage through opera.

5. Cultural Awareness of Opera as a Mediator between Digital Marketing and the Promotion of Intangible Cultural Heritage

Digital marketing for intangible heritage is effective only when culture is central to it. In line with what Prasad et al. (2022) mention, marketing should not just use digital tools to exploit them but to elevate cultural understanding. Rich and informative content about the opera helps to market it and also makes it more relevant in the culture (Zhu & Mustaffa, 2024). Digital tools save and disseminate culture but also integrate it into contemporary life. Nonetheless, there are still commercialization risks and ethical issues remaining that need to be addressed strategically while keeping in mind that the culture of the recipient country/region has to be respected (Yatsunami, 2024). Digital marketing serves as a valuable instrument in maintaining and enhancing cultural traditions. Hypothesis 6: Cultural awareness of opera mediates the relationship between digital marketing and the promotion of intangible cultural heritage through opera. Multimedia communication techniques (MCT), information technologies (IT), and digital competencies (DC) can thus be used to develop valuable intangible cultural heritage (ICH) through opera (Figure 1). These components modernize opera and make it more obtainable, rewarding, and well-connected to the present crowd. All three of these components are crucially enabled by government support. This provides institutional backing and infrastructural support for the effective digital transformation and preservation of opera. Based on these constructs, the framework proposes that when used together, they create a sustainable cultural ecosystem supporting the presence of opera as a living tradition for the modern digital age, particularly within the Chinese context.

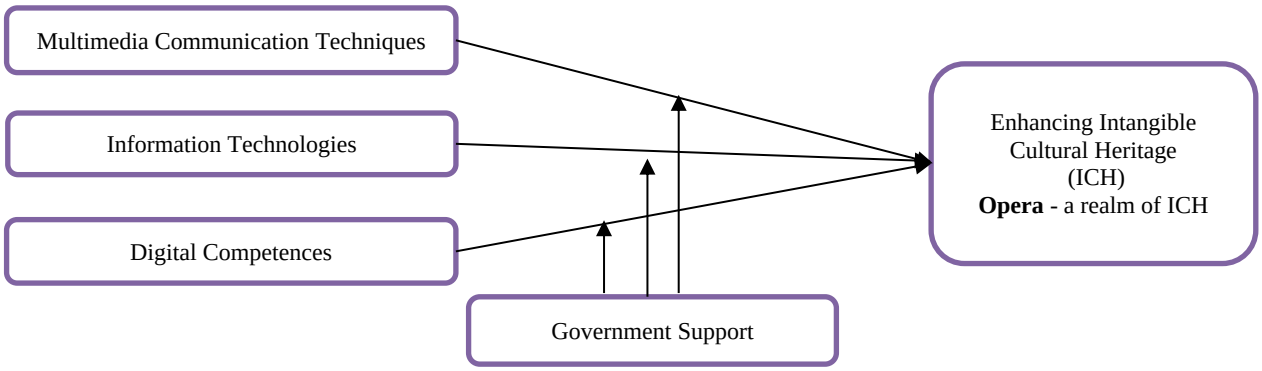

Figure 1. Conceptual Framework, Adapted Constructs, and the Items

METHODS

This study uses a quantitative research design to explore how multimedia communication techniques (MCT), information technology (IT), digital competence (DC), and government support (GS) impact opera as a form of intangible cultural heritage (EICH). The formulated research model was based on established related constructs, while the measurement items were adapted from previous validated studies to guarantee conceptual validity and reliability (Table 1). Multimedia Communication Techniques (MCT) is a construct with 6 items related to the multimedia tools application for opera promotion: increasing the audience's interest, using interactive content, live streaming, and virtual and augmented reality in cultural education (Stieglitz et al., 2014). Six items are linked to digital archiving, using databases, tools for digitizing content, having opera available online, educational platforms, and IT in opera production (Alavi & Leidner, 2001). Digital competencies (DC) measure five skills useful for promoting opera using digital platforms: video editing, content creation, social media proficiency, digital marketing, and platform usage (Kannan & Li, 2017). Five items in the

Government Support (GS) construct look at the involvement of the public sector in funding, policy formulation, grant provision, infrastructure development, and awareness campaigns toward opera digitization (Trimarchi, 2016). Finally, the Enhancing Intangible Cultural Heritage (EICH) construct is measured from four items reflecting the impact of multimedia on the preservation of opera, the cultural value of digitization, the level of public engagement of digital initiatives, and the long-term preservation of heritage through a digital approach (Timothy & Boyd, 2006).

Table 1. Constructs with Corresponding Items Focusing on Enhancing Opera as Intangible Cultural Heritage

Construct	Items	Adapted from
Multimedia Communication Techniques (MCT)	MCT1: Employment of multimedia in the promotion of Opera.	(Stieglitz et al., 2014)
	MCT2: The use of multimedia to increase audience interest.	
	MCT3: Integration of the use of interactive content.	
	MCT4: Making live opera performances available online.	
	MCT5: Application of virtual and augmented reality into Opera.	
	MCT6: Multimedia as a tool for cultural education.	
Information Technologies (IT)	IT1: Optical recording of opera productions.	(Alavi & Leidner, 2001)
	IT2: Databases are used to manage opera content.	
	IT3: Technological tools for digitizing Opera.	
	IT4: Accessibility of Opera through IT.	
	IT5: Online platforms for opera education.	
	IT6: Information systems supporting opera production.	
Digital Competences (DC)	DC1: Skill in using digital marketing for Opera.	(Kannan & Li, 2017)
	DC2: Proficiency in video editing for opera content.	
	DC3: Knowledge of social media for promoting Opera.	
	DC4: Ability to create digital content for Opera.	
	DC5: Competence in using online platforms for opera promotion.	
Government Support (GS)	GS1: Funding for multimedia opera projects.	(Trimarchi, 2016)
	GS2: Policy support for digital opera initiatives.	
	GS3: Grants for opera digitization.	
	GS4: Public campaigns supporting Opera.	
	GS5: Infrastructure development for cultural heritage.	
Enhancing Intangible Cultural Heritage (EICH)	EICH1: Impact of multimedia on preserving Opera.	(Timothy & Boyd, 2006)
	EICH2: Public participation in digital opera initiatives.	
	EICH3: Cultural value of digitized Opera.	
	EICH4: Long-term preservation of Opera through digital means.	

Table 2. Convergent validity

Constructs	Items	Loadings	Alpha	CR	AVE
Multimedia Communication Techniques	MCT1	0.853	0.903	0.925	0.674
	MCT2	0.81			
	MCT3	0.808			
	MCT4	0.784			
	MCT5	0.858			
	MCT6	0.809			
Information Technologies	IT1	0.748	0.88	0.888	0.57
	IT2	0.832			
	IT3	0.814			
	IT4	0.744			
	IT5	0.628			
	IT6	0.747			
Digital Competences	DC1	0.802	0.852	0.892	0.624
	DC2	0.796			
	DC3	0.754			
	DC4	0.79			
	DC5	0.806			
Government Support	GS1	0.859	0.922	0.941	0.761
	GS2	0.871			
	GS3	0.879			
	GS4	0.866			
	GS5	0.888			
Enhancing Intangible Cultural Heritage	EICH1	0.82	0.841	0.893	0.676
	EICH2	0.837			
	EICH3	0.804			
	EICH4	0.826			

A structured questionnaire was developed using a 5-point Likert scale (1—strongly disagree to 5 — strongly agree) and pretested for clarity and reliability. A purposive sample of 290 university students from China who had been exposed to cultural and digital education environments was sampled to administer the questionnaire. The sample size of the data meets the minimum requirements to be used for PLS-SEM analysis (Hair, Risher, et al., 2019; Hair, Sarstedt, et al., 2019; Sarstedt

et al., 2019), and it also enables robust structure modeling. The Institutional Ethics Committee also approved this study, adhering to the research ethics that govern research involving human participants. Before the data collection, all the participants gave their consent and assurance of anonymity, confidentiality, and voluntary participation.

RESULTS

The analysis of the data based on the relationships between the multimedia communication techniques, information technologies, digital competencies, government support, and the improvement of opera as an intangible cultural heritage is presented in this section (Table 2). The measurement model and structural model were both evaluated using SmartPLS 4.0. The reliability and validity of the constructs were checked with confirmatory factor analysis, and then the hypothesis was tested using path coefficients, t values, and significance levels obtained from bootstrap. The results provide empirical evidence of how digital tools and institutional support matter for sustaining cultural heritage for opera.

Multimedia communication techniques (MCT) consist of six items labeled as MCT1 to MCT6. The factor loadings for these items range from 0.784 to 0.858. The overall reliability of the scale is 0.903, and the composite reliability is 0.925. The average value (AVE) is 0. A coefficient of 0.674 indicates that the detected construct would account for a substantial portion of the observed variation. This construct focuses on promoting Opera through multimedia communication techniques, aiming to enrich Opera as a cultural form. Regarding these elements, a higher loading suggests that in order to engage with modern audiences and sustain the Opera, digital approaches such as virtual performances, interactive content, and streaming platforms are crucial. For the second construct - Information Technologies (IT) - the items (IT1 to IT6) have loadings ranging from 0.628 to 0.832, indicating strong reliability. The scale's overall reliability is measured by Alpha, 0.88, and composite reliability (CR) is 0.888. The average value of 0.570 implies an adequate amount of variability being captured. Information technologies play a vital role in preserving Opera by utilizing them for archiving performances, managing operational data, and implementing technological improvements to collect and distribute historical performances to global audiences. As for the methods of introduction, the emphasis is placed on the importance of these technologies for the preservation and further evolution of Opera as a lively image of the culture.

Digital competences (DC) include the items from DC1 to DC5. Their loadings vary from 0. 754 to 0. 806 and have a good measure of reliability with the Alpha value of 0. 852, and the composite reliability (CR) was 0.892. The average value of AVE was 0. In predicting the construct's validity, 624 indicates that the construct is responsible for much of the variance. Digital competencies are the best practices and expertise to apply advanced technologies in advocating for Opera. Such an emphasis strengthens the need and ways of using social networks, video editing software, marketing platforms, and other means to interact with the audience and introduce Opera as a culture. Concerning the loadings for this government support (GS) construct, they lie within the range of 0.859 to 0.888, Alpha coefficient of reliability of 0.922, and a composite reliability of 0.941. The AVE of 0.761 shows that this construct indexes much variation. Fundamentally, government intervention is usually fundamental in offering the right resources, financing, and framework to facilitate Opera's being a component of intangible cultural heritage. The high loadings of these elements show that the attempts to preserve Opera will be significantly improved if government aid to multimedia projects is granted.

Enhancing intangible cultural heritage (EICH) refers to improving and preserving intangible cultural practices. In this context, items EICH1 to EICH4 have loadings that vary from 0, suggesting that they are the primary means of transferring information in organizations. The Alpha reliability was 0.841, and the composite reliability was 0.893.

The average (AVE) of 0.676 indicates a significant level of representation of the construct. This construct encompasses all the actions taken to enhance Opera as a cultural heritage asset. Similarly, the influence of several elements indicates that multimedia communication techniques supported by information technology, digital skills, and government promotion and support are crucial for marketing and sustaining Opera in the digital realm.

Table 3. Fornell Larcker

	DC	EICH	GS	IT	MCT
DC	**0.790**				
EICH	-0.180	**0.822**			
GS	-0.114	0.399	**0.873**		
IT	-0.131	0.411	0.648	**0.755**	
MCT	-0.071	0.512	0.431	0.460	**0.821**

The Fornell-Larcker criterion is part of the validity assessment in structural equation modeling and is used to evaluate discriminant validity. Discriminant validity ensures that a construct is distinct from others by not correlating too highly. Each construct is critical to promoting and preserving Opera using modern tools and support structures.

The diagonal values (bolded) are the square roots of the Average Variance Extracted (AVE) for each construct (Table 3). They reflect the degree to which the construct explains the variance of its indicators.

These values should be higher than the corresponding inter-construct correlations (off-diagonal values) for the constructs to have adequate discriminant validity. This means each construct is more closely related to its indicators than others. Off-diagonal values represent the correlations between constructs. For instance, the correlation between DC and EICH is -0.180. The correlation between GS and MCT is 0.431. With a high AVE (0.790), digital competencies, such as skills in using digital marketing, are critical for effectively promoting Opera in the digital era. The low negative correlation with EICH (-0.180) suggests that while digital competencies are crucial, they may not directly translate into immediate enhancements in intangible cultural heritage without the support of other factors like IT and government support. The construct EICH (enhancing intangible cultural heritage) has a strong AVE (0.822), underscoring its importance in

preserving and promoting Opera as a cultural heritage. The correlations with MCT (0.512) and IT (0.411) suggest that these technologies significantly enhance the cultural value and long-term preservation of Opera. With an AVE of 0.873, government support emerges as a key enabler for other constructs like MCT (0.431) and IT (0.648). This implies that governmental policies and funding significantly influence the effectiveness of multimedia and IT in preserving opera. The construct information technologies (IT) has a moderate AVE (0.755), indicating its role in converting and preserving Opera digitally. Its strong correlation with GS (0.648) highlights that government initiatives are essential in enhancing the impact of information technologies. Multimedia communication techniques (MCT) show a strong AVE (0.821), reflecting its effectiveness in engaging modern audiences through digital means like streaming and virtual reality. The positive correlations with EICH (0.512) and IT (0.460) indicate that multimedia techniques are vital for promoting and preserving Opera. The findings of the Fornell-Larcker criterion indicate that although each construct is separate, they are connected in significant ways, especially in how government support can strengthen the influence of digital competencies, IT, and multimedia techniques in improving the intangible cultural heritage of Opera. This interaction highlights the importance of using various methods that combine technology, talents, and support systems to secure the future of Opera in the digital era.

Table 4. Cross-loadings

	DC	**EICH**	**GS**	**IT**	**MCT**
DC1	**0.802**	-0.112	-0.083	-0.108	-0.052
DC2	**0.796**	-0.148	-0.128	-0.147	-0.070
DC3	**0.754**	-0.103	-0.047	-0.036	-0.005
DC4	**0.790**	-0.149	-0.048	-0.097	-0.067
DC5	**0.806**	-0.175	-0.124	-0.109	-0.070
EICH1	-0.152	**0.820**	0.315	0.378	0.430
EICH2	-0.153	**0.837**	0.336	0.324	0.401
EICH3	-0.161	**0.804**	0.360	0.389	0.463
EICH4	-0.120	**0.826**	0.291	0.237	0.375
GS1	-0.094	0.333	**0.859**	0.537	0.325
GS2	-0.096	0.351	**0.871**	0.590	0.387
GS3	-0.108	0.326	**0.879**	0.536	0.361
GS4	-0.098	0.387	**0.866**	0.571	0.409
GS5	-0.102	0.335	**0.888**	0.587	0.391
IT1	-0.102	0.177	0.673	**0.748**	0.251
IT2	-0.123	0.425	0.399	**0.832**	0.437
IT3	-0.103	0.444	0.360	**0.814**	0.434
IT4	-0.097	0.182	0.672	**0.744**	0.251
IT5	-0.046	0.162	0.621	**0.628**	0.279
IT6	-0.100	0.175	0.664	**0.747**	0.259
MCT1	-0.105	0.488	0.358	0.396	**0.853**
MCT2	-0.010	0.435	0.355	0.420	**0.810**
MCT3	-0.022	0.405	0.348	0.393	**0.808**
MCT4	-0.107	0.423	0.331	0.366	**0.784**
MCT5	-0.031	0.419	0.377	0.332	**0.858**
MCT6	-0.073	0.314	0.355	0.349	**0.809**

Table 4 provides insight into how well the items (DC1, EICH1, etc.) represent their respective constructs (Digital Competences, Enhancing Intangible Cultural Heritage, Government Support, Information Technologies, and Multimedia Communication Techniques). Cross-loadings are used in structural equation modeling to assess the discriminant validity of the constructs by ensuring that each indicator (item) loads more strongly on its associated construct than on other constructs. This provides credibility that the items are good indices of the different constructs.

Regarding the DC construct, each item has a significant amount of loading, with loadings ranging from 0.754 to 0.806. The fact that this is the case suggests that these items are adequate indicators of digital capabilities. The fact that the items had significantly lower loadings on other constructs (EICH, GS, IT, and MCT) proves that these pieces of information are separate from DC. As an illustration, DC1 has a loading of 0.802 on DC. However, it has significantly lower values in EICH (-0.112), GS (-0.083), IT (-0.108), and MCT (-0.052). Hence, this implies that digital competencies are well-defined and distinct from the other constructs, reflecting the importance of specific skills in using digital tools to promote Opera.

The items load strongly on EICH, ranging from 0.804 to 0.837. This suggests that these items effectively capture the essence of enhancing intangible cultural heritage. As a result of the decreased cross-loadings on other constructs, it can be established that these characteristics are distinct from EICH. One example is that EICH1 loads 0.820 on EICH, significantly higher than 0.315 on GS and 0.430 on MCT. The things included in this construct bring to light the significance of various tactics and practices aimed at maintaining and promoting Opera as an intangible cultural resource.

The items also have good loadings on GS, ranging from 0. 859 to 0. 888, clearly showing that the two are good predictors of government support. While some moderate cross-loading on IT, such as GS2 with 0. 590, the primary loading on GS is much higher, thus supporting the assessment of government support as a different construct. Through cross-loading analysis, the result shows that government support is the significant predictor of using digital and multimedia tools in improving Opera, and the items adequately reflect this construct. This means that the loadings on IT vary between 0. 628 to 0. 832, indicating that these items are pretty effective in measuring the extent of information technologies' role. The cross-loadings are as follows: Some moderate with GS (e.g., IT2 = 0. 590), but the loadings on IT are still the highest,

supporting the uniqueness of this construct. Based on the analysis, it can be noted that the said items adequately reflect the contribution of information technologies in the protection and development of Opera, signifying a strong value of IT in contemporary culture conservation. The items from MCT1 to MCT6 reveal high factor loading of multimedia communication technique (MCT) with loading 0. 784 to 0. 858, which helps to state their effectiveness as the number of multimedia communication techniques. The items have a relatively low cross-loading on other constructs; however, the highest loading is on EICH, for instance, MCT1= 0. 488; nonetheless, the loading values on MCT are considerably higher.

Multimedia communication techniques appear necessary for attracting modern audiences to Opera, and this construct seems to be adequately captured by the respective items. As indicated by the cross loads in Table 3, everything has loaded more on the construct it should be a part of, affirming good discriminant validity. This means the identified constructs have captured various perspectives on improving multimedia communication techniques for the ICH of Opera. The relative dissimilarity of these constructs can be viewed as evidence for the stability of the model as a means of illustrating the diversity of tasks undertaken by contemporary technologies and assistance systems to maintain and foster the development of Opera.

In Structural equation modeling, Heterotrait-Monotrait Ratio (HTMT) is an index used for Discriminant validity assessment. It assesses whether the constructs in a model are unique. In general, HTMT< 0.85 or 0.90 (based on the source) indicates adequate discriminant validity in this study, indicating that the constructs examined are unique.

Table 4 helps to evaluate the degree of uniqueness of the key constructs that you have defined, including Digital Competences (DC), Enhancing Intangible Cultural Heritage (EICH), Government Support (GS), Information Technologies (IT), and Multimedia Communication Techniques (MCT). All the HTMT values of DC are significantly lower than the other constructs, with the cut-off value of < 0.85 (Henseler et al., 2015), which corroborates that discriminant validity is also satisfactory. This implies that digital competencies, skills, and abilities required for using digital tools differ from factors such as media richness in enhancing cultural heritage and multimedia communication techniques.

The fact that opera companies are distinct amplifies the need for targeted and appropriate digital competencies in the contemporary promotion of Opera. Overall, the HTMT values between EICH and the other constructs are higher than those of the other constructs. However, all the values are below the cut of 0.70, which shows adequate discriminant validity. This means that, even as several facets of intangible cultural heritage assets can be promoted through various factors, such as government support and multimedia techniques, the construct of enhancing intangible cultural heritage is still discrete. This obvious but essential distinction helps to emphasize the measures and approaches required to propagate Opera as a historical and artistic phenomenon in its own right, devoid of other contingents.

It can be seen then that the HTMT values of GS and IT are 0.792, and of GS and MCT, they are 0.471, which indicates a moderate level of shared variance but reveals that these constructs are different. The fact that the HTMT value between GS and IT is relatively higher than that between GS and IT shows that while the two objects are interconnected, they are not identical. This shows how policy support for IT influences the conservation of culture.

In our case, the HTMT value between IT and MCT is equal to 0.451, which shows that these constructs are different and, at the same time, related. This makes sense in the context of your research, as information technologies are often used as platforms for multimedia communication techniques. However, the distinction between these constructs is essential to ensure each is recognized for its unique contribution to promoting Opera. The HTMT values involving MCT and other constructs are below the threshold, confirming that multimedia communication techniques are distinct. This highlights the importance of specific methods like virtual reality, streaming, and digital marketing in engaging modern audiences with Opera.

The HTMT analysis in Table 5 demonstrates that the constructs in your study (DC, EICH, GS, IT, MCT) exhibit good discriminant validity, meaning they are sufficiently distinct. This supports the robustness of your model, where each construct uniquely enhances the intangible cultural heritage of Opera through modern techniques and support structures. The discriminant validity analysis findings show interconnections between digital competencies, government support, and multimedia techniques. Each plays a distinct role in the preservation and promotion of Opera. The discriminant validity confirmed by the HTMT analysis ensures that the constructs are well-defined and contribute uniquely to the overall model.

Table 5. Heterotrait Monotrait ratio

	DC	**EICH**	**GS**	**IT**	**MCT**
DC					
EICH	0.203				
GS	0.123	0.447			
IT	0.137	0.376	0.792		
MCT	0.086	0.573	0.471	0.451	

Figure 2 presents a path model, which visually represents the relationships between the study's constructs (latent variables). Each construct is depicted as a blue circle, with the associated indicators (observed variables) as yellow boxes. The arrows indicate the direction and strength of the relationships between these constructs. The loadings for the indicators on the DC construct range from 0.754 to 0.806, suggesting that these items are strong measures of digital competencies. The diagram shows DC's direct paths to GS (Government Support) and MCT (Multimedia Communication Techniques), suggesting that digital competencies influence both constructs in promoting Opera. The GS indicators' loadings vary from 0.859 to 0.888. However, from this index, we can conclude that government support is actively reinforced. GS has links to give access to IT (Information Technologies) and EICH (Enhancing Intangible Cultural Heritage). The intensity of the paths indicates that the government's support positively influences the practicality of I&T and the improvement of ICH. The loadings for the IT indicators are from 0.628 to 0.832. Also, according to Table 3, the current health promotion IT measures

range from moderate to vigorous. This construct avails input from GS, and it, in turn, affects EICH. This suggests that information technologies act as a buffer between government support and ICH (intangible cultural heritage) improvement. The loadings vary in the case of the MCT indicators, with a minimum loading of 0. 784 to 0. 858, which such authors consider to be a substantial measure of multimedia communication techniques. MCTs are a condition sine qua non promoted through digital competencies, and government support has become the primary tool for successfully popularizing Opera as ICH.

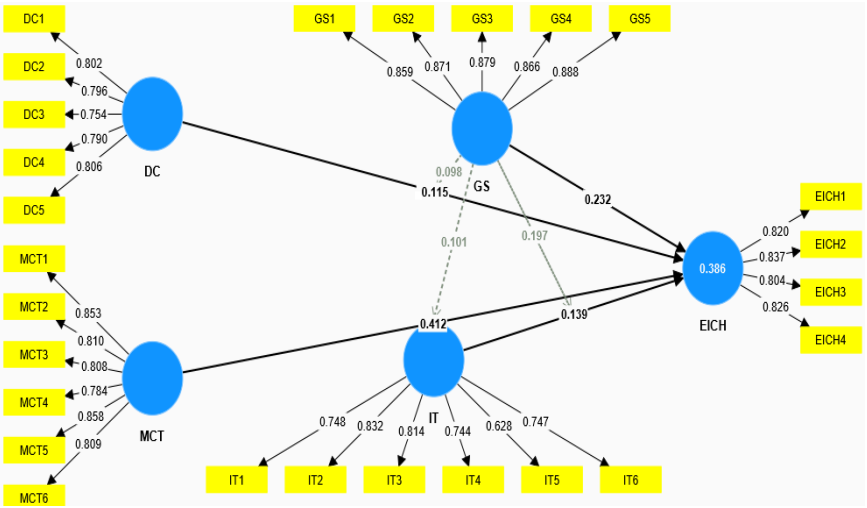

Figure 2. Measurement assessment model

The loadings for EICH indicators can be as low as 0.804 to 0.837, which is regarded as a strong index in this construct. The findings indicated that each factor, MCT, IT, and GS, affected EICH positively. This implies that the improvement of Opera as an intangible cultural heritage combines the listed factors. The model concludes that the result is improving intangible cultural heritage, Opera in particular, using multimedia technologies as a result of effectiveness criteria with the support of information technologies and government, based on the priorities of digital competencies.

Table 6. Path analysis

Relationships	Beta	Standard deviation	T statistics	P values
DC -> EICH	0.115	0.043	2.692	0.008
GS -> EICH	0.232	0.077	3.004	0.003
IT -> EICH	0.139	0.068	2.033	0.045
MCT -> EICH	0.412	0.054	7.646	0.000
GS x IT -> EICH	0.197	0.060	3.263	0.002
GS x DC -> EICH	0.098	0.043	2.277	0.025
GS x MCT -> EICH	0.101	0.046	2.215	0.029

Table 6 presents the results of the structural model, showing the relationships between various constructs (digital competencies, government support, information technologies, multimedia communication techniques, and their interactions) and the outcome variable, enhancing intangible cultural heritage (EICH). The relationships are evaluated through Beta coefficients, standard deviations, T statistics, and P values. For digital competencies, the positive and significant beta value (0.115) indicates that digital competencies positively impact the enhancement of intangible cultural heritage. The T statistic (2.692) and P value (0.008) confirm this relationship is statistically significant. This suggests that individuals or organizations with higher digital competencies are more effective in utilizing digital tools and techniques to preserve and promote Opera as a cultural heritage. For government support, the beta coefficient of 0.232 indicates a strong positive impact of government support on the enhancement of intangible cultural heritage. The T statistic (3.004) and P value (0.003) show this relationship is highly significant. This highlights the crucial role of government policies, funding, and other forms in promoting and preserving Opera. The positive beta value (0.139) of the construct information technologies indicates that information technologies significantly enhance intangible cultural heritage. The T statistic (2.033) and P value (0.045) suggest that this effect is statistically significant, though relatively modest. This means that the effective use of IT, such as digital archives, streaming, and other technologies, contributes positively to promoting Opera. The beta coefficient of 0.412 indicates a powerful positive impact of multimedia communication techniques on enhancing intangible cultural heritage.

This relationship is highly significant, with a T statistic of 7.646 and a P value 0.000. This underscores the pivotal role of multimedia tools, such as virtual reality, social media, and digital marketing, in engaging modern audiences and promoting Opera as an important cultural asset. The interaction effect of government support and information technologies on enhancing intangible cultural heritage is positive and significant (beta = 0.197). The T statistic (3.263) and P value (0.002) indicate that this interaction significantly strengthens the impact of IT on the promotion of Opera when supported by government initiatives. This suggests that government support enhances the effectiveness of IT in cultural heritage projects. The interaction between government support and digital competencies has a significant positive effect on enhancing intangible cultural heritage (beta = 0.098). The T statistic (2.277) and P value (0.025) confirm this relationship. This

suggests that combining digital competencies with government support enhances their impact on promoting Opera as a cultural heritage. The positive and significant interaction effect (Beta = 0.101) indicates that government support enhances the effectiveness of multimedia communication techniques in promoting Opera as an intangible cultural heritage. The T statistic (2.215) and P value (0.029) support the significance of this interaction, emphasizing the synergistic effect of these two factors.

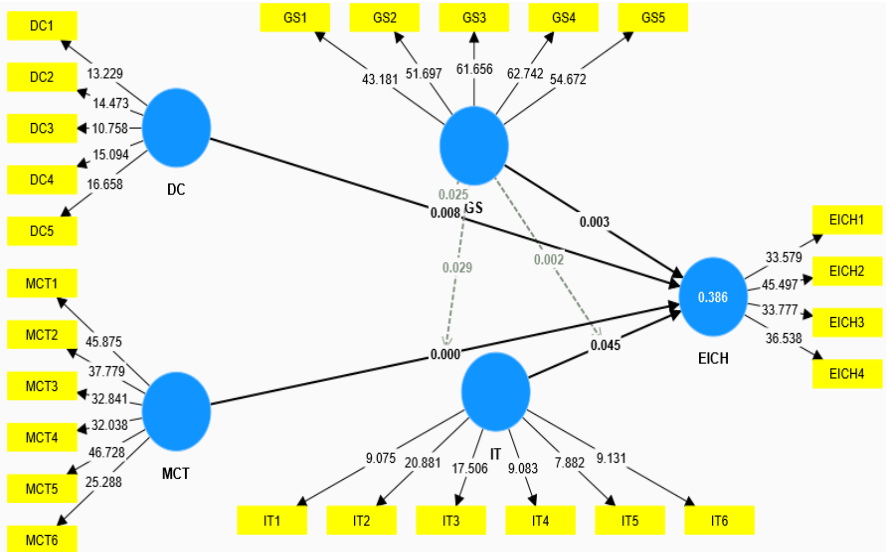

Figure 3. Structural assessment model

Figure 3 showcases the relationships between different constructs (latent variables) and their observed variables (items). The arrows pointing from DC to its items (DC1 to DC5) show that these items are the observed variables that measure the latent construct of Digital competencies. The numbers next to the arrows represent factor loadings, indicating the strength of each item when measuring the construct. The arrows from MCT to its items (MCT1 to MCT6) indicate that these items are used to measure Multimedia Communication Techniques. The arrows from IT to its items (IT1 to IT6) indicate how they measure Information Technologies. Government Support (GS) is measured by items GS1 to GS5, as indicated by the arrows from GS to these items. Enhancing Intangible Cultural Heritage (EICH) is measured by EICH1 to EICH4, showing the role of these items in capturing the latent construct. The numbers on the arrows connecting the latent constructs (e.g., DC → EICH) represent the path coefficients, which show the strength and direction of the relationship between constructs. For instance, the path from DC to EICH has a coefficient of 0.386, indicating a positive and moderately strong relationship. Likewise, the path from GS to EICH has a coefficient of 0.045, suggesting a weaker positive relationship. Again, the path from IT to EICH is also positive, with a coefficient of 0.003, which is relatively small, indicating a minimal direct effect.

GS mediates the relationship between DC, IT, and EICH as indicated by the indirect paths through GS (e.g., DC → GS → EICH). These are weaker relationships, as shown by the smaller coefficients. The diagram suggests that Digital Competences (DC), Multimedia Communication Techniques (MCT), Information Technologies (IT), and Government Support (GS) all contribute to Enhancing Intangible Cultural Heritage (EICH). However, their contributions vary in strength, with Digital Competences (DC) having the most significant direct impact on EICH. Government Support (GS) also plays a role but with a smaller direct effect, potentially mediating the effects of DC and IT on EICH.

DISCUSSION

It provides empirical evidence that modern communication technology and digital strategies may be instrumental in protecting and fostering opera as an expression of ICH. This conclusion is not different from the findings of Jiang et al. (2024) and Wu (2024), who indicate that virtual and augmented reality have a huge impact on creating more immersive scenes aimed at interacting with modern audiences as they see it. This discourse is extended further with the support of the current study, which solidifies the fact that, aside from making opera more accessible, such technologies are also active participants in the preservation of cultural narratives in digital forms so that they are effectively transmitted from one generation to the next. Finally, the results validate the significance of information technologies (IT) in heritage promotion (H2), reinforced by the past findings that point out that digitization, archival systems, and educational platforms are paramount for cultural sustainability (Alavi & Leidner, 2001; Zhang, 2024). The novelty of this study is to demonstrate that performance records in IT tools are not only about preserving records; they can also facilitate knowledge management and digital education beyond document archiving. The role of digital competencies (H3) is likely to corroborate that technology-based heritage promotion requires users to be competent with digital tools to navigate and maximize the available tools. Trach (2024) and Cham et al. (2022) assert that social media, content creation, and digital marketing skills play a crucial role in drawing in younger audiences.

The findings highlighted mutually reinforcing linkages between cultural heritage institutions' digital capacity and building up the public's digital literacy as key strategic levers for conservation. Most importantly, the interaction effects between institutional support and the main predictors (MCT, IT, DC) show that institutional backing facilitates the effectiveness of digital interventions (H4, H5, H6). This finding is in accordance with Trimarchi (2016) and Maietti (2023), who emphasized the need for policy frameworks, funding mechanisms, and infrastructure development to incorporate digital technologies into

heritage management systems. The support of the government legitimates and funds digital initiatives, impacts public perception and participation, and provides a valuable foundation for sustained cultural engagement. In addition, this study examines the mediating effect of cultural awareness by linking communication strategies with the outcomes of the ICH. Kinderknekht & Kolada (2022) argue that the enhancement of the cultural meaning of digital content and meaningful interaction are realized through cultural understanding. The concept agrees with Kozulin (2023), who considers cultural mediation indispensable for the adequate possession of technology in the cultural transmission.

This analysis shows that to ensure desired outcomes, technological tools must be built on cultural literacy. In brief, this study confirms and expands the theoretical foundations of digital heritage promotion and recommends practical approaches for policymakers, cultural educators, and media strategists. This implies digital, inclusive, and institutionalized heritage promotion in the 21st century, where the juxtaposition of traditional art with future technologies is advocated.

CONCLUSION AND POLICY IMPLICATIONS

Based on the findings of this research, it is clear that multimedia communication techniques and information technologies were vital in promoting Opera as a cultural asset that is not tangible. These results highlight the role of digital competencies and government intervention in enhancing the utility of knowledge in question. Based on the findings of this study, the following policy implications have been made for the sustainable conservation of Opera and other intangible cultural heritage domains: First, governments must subsidize appropriate technology used in documenting and marketing cultural heritage. Secondly, creating detailed curricula may improve digital literacy among heritage professionals and practitioners. Thirdly, the study recommends that there should be political motivation towards policies that will support the financial and infrastructural support towards promoting digital solutions to preserve cultural heritage. Prospective, through the approaches above, stakeholders stand to harness the purported strategies and hence afford the operationalization of Opera and other forms of DOI to enhance the sustainability of intangible cultural heritage. The current study also offers direction for future research. Further studies should investigate whether multimedia communication techniques and information technologies have a strong positive or negative impact on documenting the opera heritage.

Comparative analysis may also be used to compare the benefits of diverse kinds of intangible cultural heritage from digital instruments and governmental aids in different cultural communities. Evaluation of different training interventions in developing digital skills for the effective management of heritage sites may also give more insight into how digital and governmental measures can enhance the sponsorship of intangible cultural heritage.

Author Contributions: Conceptualization, J.D.; methodology, J.D.; software, J.D.; validation, J.D. and M.F.M.H.; formal analysis, J.D. and M.F.M.H.; investigation, J.D.; data curation, J.D. and M.F.M.H.; writing - original draft preparation, J.D.; writing - review and editing, J.D. and M.F.M.H.; visualization, J.D. and M.F.M.H.; supervision, M.F.M.H.; project administration, M.F.M.H. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 14.03.2025 Revised: 31.06.2025 Accepted: 29.07.2025 Available online: 18.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1649-1655
DOI 10.30892/gtg.61323-1533

EXAMINATION OF THE PRACTICE OF TOURISM TAX LEVYING BY HUNGARIAN MUNICIPALITIES IN THE EARLY OF 2020`S

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Citation: Kozma, G. (2025). Examination of the practice of tourism tax levying by Hungarian municipalities in the decade of 2020`s. *Geojournal of Tourism and Geosites*, 61(3), 1649–1655. https://doi.org/10.30892/gtg.61323-1533

Abstract: The aim of this study is to examine the activities of local governments in Hungary in relation to tourism taxes in the post-COVID-19 era. The research is significant in two respects: on the one hand, local taxes, and one type of these, tourism tax, are a very important source of financial independence for Hungarian municipalities. On the other hand, during the coronavirus pandemic, Hungarian municipalities were unable to introduce this type of tax or increase its rate. Within this framework, the research basically seeks to answer three questions: how local governments have approached the tourism tax in recent decades and especially in the first half 2020s, what role does tourism tax play in the local government tax system and what factors influence local governments in deciding whether to levy the tourism tax and, if so, what tax rate they apply. The primary data sources for the research were data from the Hungarian State Treasury and the Central Statistical Office on the subject, and relevant legislation was also used. The research analysed data on the application of different types of local taxes introduced by municipalities (whether this type of tax has been introduced or not). In addition, the index developed by the author made it possible to compare tax rates (tourist tax – other types of local taxes, tax rates applied by different types of local governments). Using the above methods, the following main findings can be highlighted as the results of research. Firstly, Hungarian local governments relied more than average on the tourism tax, which is essentially linked to the nature of the tax (it is not a tax on the local population, and therefore leaders of settlements need not fear a decline in popularity among local voters). On the other hand, the activity of local authorities in the field of tourism tax is largely influenced by the size of the settlements (larger settlements employ tourist tax at a higher rate and introduce higher tax rates) and their tourism classification (local governments in settlements located in tourist regions designated by the central government introduce this type of tax more frequently, and in their case the tax rate is also higher).

Keywords: tourism tax, Hungary, population, local government, tourist areas

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INTRODUCTION

The growth in tourism across the world in recent decades (Assylkhanova et al., 2024; Boros & Korcsmáros, 2024; Pénzes, 2024) has been significantly disrupted by the coronavirus epidemic (Tömöri & Staniscia, 2023; Bader et al., 2024; Cehan & Iațu, 2024; Darabos et al., 2024; Dzurov Vargova et al., 2024), which has affected localities in several ways. On the one hand, the significant drop in the number of tourists has led to a reduction in the amount of taxes they pay, and on the other, to a significant reduction in the revenue from the sectors that serve the sector (e.g. catering, accommodation). This problem is also very acute in Hungary, where local taxes are one of the last vestiges of the financial sovereignty of municipalities, which is nowadays increasingly in decline, and which, in addition to financing community functions, play a very important role in financing all or part of various investments, often for tourism purposes. One such local tax is the tourism tax, which, although its share of total municipal budget revenue is not significant (less than 1% - Table 1), plays an important role in the operation and management of certain municipalities.

Table 1. The role of tourism tax in the finances of Hungarian local governments between 2015 and 2023 (Source: https://statinfo.ksh.hu/Statinfo/QueryServlet?ha=TA2021_W)

	2015	2016	2017	2018	2019	2020	2021	2022	2023
Tourism tax revenue (billion HUF)	10.48	11.68	13.60	14.86	16.25	3.95	6.82	16.60	21.39
Share of tourism tax in total budget revenue (%)	0.35	0.45	0.44	0,48	0.51	0.13	0.20	0.43	0.47

Consequently, the outbreak of the coronavirus in March 2020 caused a significant problem in the financial situation of the Hungarian municipalities concerned, through the loss of revenue (Tables 1). On the one hand, the restrictions imposed and the general decline in travel have led to a sharp fall in the number of nights spent by visitors, which is the basis for the tourist tax. On the other hand, Government Decree 141/2020 (21 April 2020), which suspended the obligation to pay tourist

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tax until the end of the year, proved particularly tragic for municipalities with an interest in tourism. Thirdly, the regulation that came into force at the end of 2020 (Government Decree 535/2020 (1.12.20)) prohibited municipalities from introducing new types of local taxes and from increasing the rates of existing local taxes.

Due to the decline of the coronavirus epidemic, this restriction was lifted in 2022, leaving the municipalities free to decide in this area in subsequent years (this fact, together with the resurgence of tourism, explains the 2023 value - Table 1).

In this spirit, the study primarily seeks answers to the following questions (I have not included the capital, Budapest and the districts of Budapest in the study):

- how much the municipal leaders made use of the freedom they were given after 2022;
- what factors influence the tourism taxation activities of local authorities. One of the novel features of the study is that I used an index I developed for the analyses that allowed for multiple comparisons

LITERATURE REVIEW

In the review of the literature, I focused on two main areas. On the one hand, I summarized the most important findings of the scientific works published in the literature on tourism tax, and on the other hand, I reviewed the changes in the Hungarian legislation on tourism tax, with special attention to the tax rate. In literature, the term tourism tax is interpreted very broadly to include all types of taxes that are levied directly or indirectly on tourists during their travels. In this sense, based on a WTO study (1998), a total of 45 types of taxes (e.g. VAT, car rental charges, airport taxes, tolls) are identified in 12 sectors (e.g. air transport, gambling, hotels, catering), some of which are paid by consumers (30) and others by businesses (15) (of which only one or two are identical to the Hungarian tourism tax).

Studies on tourism taxation cover a wide range of areas (Teiusan, 2023). On the one hand, researchers have examined the objectives of introducing the tax, which include increasing local and central revenues (e.g. Pole & Grizane, 2021), promoting economic development by generating the necessary resources for it (e.g. Carrascal Incera and Fernandez, 2015) (although some studies, e.g. Bakhat & Rosselló, 2013; Seetaram et al., 2014, have proposed their abolition precisely because of their negative economic impact), to achieve social goals (e.g. reducing income disparities - e.g. Surugiu & Surugiu, 2017; Gooroochurn & Sinclair, 2005, Demeter et al., 2024) and to promote the so-called "social inclusion" of the poor (e.g. by reducing the number of children in the labour market) or "overtourism" (e.g. Bertocchi &Camatti, 2022; Cárdenas-García et al., 2022; Saidi et al., 2024).

Secondly researches have addressed the specificities of the revenue from the tourism tax. These studies have shown that in the Northern Hungarian region very few municipalities make use of this possibility, and there is a close relationship between tax revenue and tourism development (Bujdosó et al., 2007; Gróf, 2020, Gyurkó et al., 2024). In addition, it has been shown that there are also significant differences in the use of the revenue generated from the tax: smaller municipalities tend to use it for public services, while only larger municipalities use it for tourism (Kozma, 2002; Kozma, 2008).

The other major body of research has analysed the impact of tourism-related taxes on tourism, and in this respect the results have not been consistent. Some studies have shown that these taxes have a negative effect on tourism (e.g. Forsyth et al., 2014; Maila & Czimre, 2024), while others have not (Song et al., 2019). However, research has also shown that different reactions are observed for different groups of tourists. An analysis on the Maldives (Adedoyin et al., 2023) found that tax increases or the introduction of new taxes caused a decline for the largest sending countries, while for the others this was not observed, for example a study in Spain (Biagi et al., 2017) found a similar discrepancy between domestic and international tourism (a decline in domestic tourism). In addition, a study analysing the travel of British tourists to Spain and France (Heffer-Flaata et al., 2021) also highlighted the importance of travel timing: the impact of taxes on tourism (in this case the so-called accommodation tax) is mainly felt during the peak summer season.

In contrast to the above, it is regrettable that very few studies have so far been carried out on spatial differences in application of tourism tax and in tourism tax rates. Researchers on this topic have, among other things, highlighted the very high activity of Hungarian spa towns in this field: tax rates far were above the national average (Gróf, 2019). Besides they pointed out the inequalities in application of tourism tax and in tax rates and in this context, they have highlighted the importance of the size of the municipality, its tourism history and its leaders (Barna & Papp, 2017, Alfano et al., 2022).

Act C of 1990, which introduced local taxes, distinguished between two types: the tourist tax on the guest nights and the tourist tax on the holiday home. For the former, the maximum taxable amount was HUF 100 per night and for the latter HUF 300/m^2, but the law emphasised that municipalities could apply a lower rate (which is still the case today). The first major changes took place in the first half of the 1990s: firstly, from 1992 (Act LXXVI of 1992), the maximum amount of tourist tax that could be levied on a stay was increased from the number of nights to the accommodation rate (the maximum rate was then 4%), and maximum rate was raised to HUF 300 per night or HUF 900/m^2 by Act IIC of 1995.

In order to avoid continuous changes in the law due to inflation (i.e. continuous increases in the maximum tax rate), Act CI of 2004 was enacted, which introduced the indexation method. Accordingly, from 2005 onwards, the maximum tax that can be levied in a given year is the value obtained by multiplying the value stated in the law by the product of the changes in consumer price levels in the years 2003 and the second year preceding the tax year (this figure was 1.99 in 2023, 2.28 in 2024 and 2.68 in 2025). The last major change occurred in 2010 (Act XC of 2010), when the tourist tax on holiday homes was abolished, and therefore that type of tax has not been examined in detail.

MATERIALS AND METHODS

Three main sources of information were used in the research. Firstly, the 8th-9th (July) 1997 issue of the financial government's journal, entitled ADÓ published the rates of local taxes introduced in 1997, and secondly, the website of

the Hungarian State Treasury (https://hakka.allamkincstar.gov.hu/Letoltes.aspx) contains the tax rates applied by municipalities as of 2018. Thirdly, data on the population (permanent population at the beginning of the year) were downloaded from the website of the Deputy State Secretariat for the for Registers' Management of the Ministry of Interior (https://nyilvantarto.hu/hu/statisztikak?stat=kozerdeku). I used three methods to process the data.

Firstly, I examined the proportion of municipalities within the municipalities analysed that levied a tourist tax (the main question here was whether the municipality applied the tourist tax). Secondly, I created my own index to determine the average rate of tourist tax applied in municipalities belonging to the same categories (e.g. municipalities with less than 500 inhabitants, municipalities belonging to tourist areas) (in this case, of course, I only analysed those municipalities where tourist tax was applied). In order to calculate this index, I have established four categories (maximum or close to maximum taxable amount[1], between 66.7% and 100% of maximum taxable amount, between 33.4% and 66.6% of maximum taxable amount, less than 33.3% of maximum taxable amount) and then applied the weighting method (5, 4, 3, 2). The arithmetic average calculation was then used to obtain a value that showed the size of the tax burden in each category, thus making it possible to compare the tax rates for different types of tax. Thirdly, I calculated the arithmetic average of the tax rates applied in 2020 and 2024 for each category by the municipalities belonging to it.

In the analysis, I compared the situation of the tourism tax with other types of local taxes, and I tried to identify the territorial differences in the tourism tax and the reasons for them. As I mentioned earlier, for a long time there were two types of tourism tax, but since the tourist tax on holiday homes was abolished in 2010, I have only included the tourist tax on guest nights. In the research I focused only on rural municipalities and did not pay attention to the individual districts of Budapest, which was due to their difficult classification (e.g. whether each district can be considered a municipality).

RESULTS AND DISCUSSION

Due to governmental measures that made the financial situation of local governments more difficult, the number of local governments levying different types of local taxes and their share in the total number of municipalities has been steadily increasing in Hungary since the mid-1990s (Figure 1). This trend was even stronger than average for tourism taxes, as illustrated by two facts. Firstly, in 2020, almost 30% of municipalities introduced a tourism tax on guest nights, and this figure is higher than the sixth highest in 1992 with regards to implementation. In 2020, it ranked fourth among the various types of local taxes (the two types of local business taxes were popular because they were levied on local businesses rather than on the population, while the high share of municipal tax on individuals can be explained by their ease of levying).

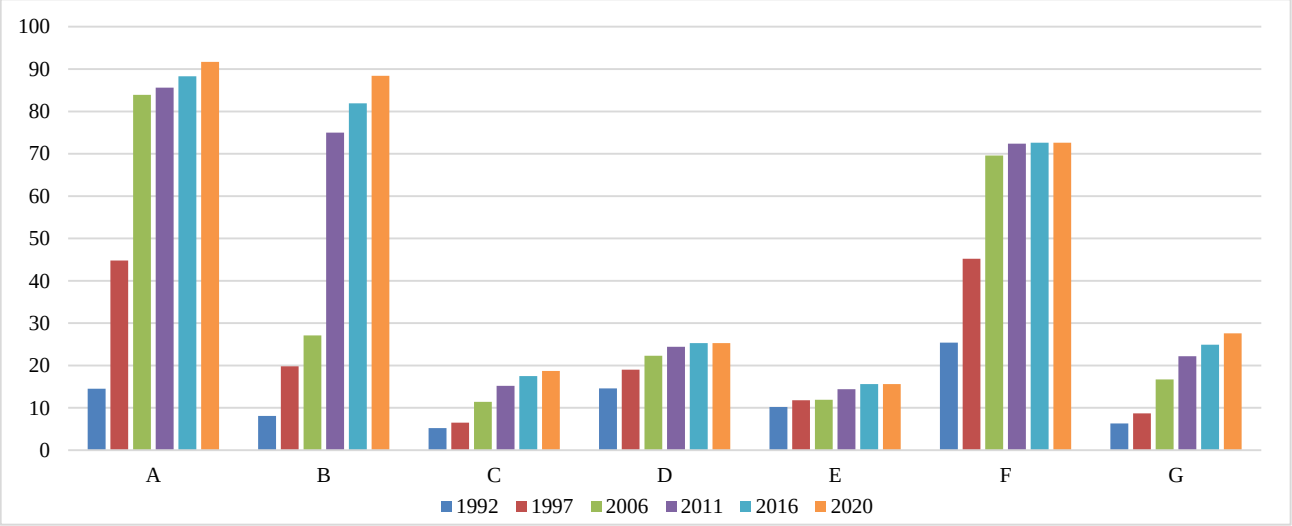

Figure 1. Proportion of municipalities applying the main types of local taxes in the total municipalities (%) Between 1992 and 2020 (Source: Local taxes introduced, 1997; ado.hu, https://hakka.allamkincstar.gov.hu/Letoltes.aspx)

A - local business tax paid on regular activities (taxable amount: net turnover), B - local business tax paid on non-regular activities (taxable amount: the activity itself), C - building tax paid on residential buildings (taxable amount: the floor area of the property), D – building tax on non-residential buildings (e.g. shops, offices) (taxable amount: the floor area of the property), E - land tax (taxable amount: the floor area of the property), F - municipal tax on individuals (taxable amount: the dwelling as a property), G - tourist tax on guest nights (taxable amount: the number of nights spent in the dwelling).

As tourism tax has been extended to a wider range of municipalities, there has also been a steady increase in the local tax rate (Table 2). In this respect, the tourism tax was already the top tax among local governments in the second half of the 1990s and has maintained this position until 2020. This was mainly due to the fact (and in some ways explained the relatively high prevalence) that this type of tax was paid by tourists visiting the municipality rather than by local residents, so that its introduction and the increase in the tax rate did not cause major dissatisfaction among the population.

[1] Municipalities can hardly be expected to adjust the tax rate to the inflation-adjusted maximum each year. As a result, municipalities that applied the maximum tax rate two years earlier were also considered to use the maximum in a given tax year. Thus, the maximum/100% band readable/findable in the text and figures includes them.

Table 2. Rates of local taxes levied by municipalities in 1997 and 2020 based on the index I have developed (Legend: see Table 3) (Source: no author, 1997; ado.hu, https://hakka.allamkincstar.gov.hu/Letoltes.aspx)

	A	B	C	D	E	F	G
1997	3.70	2.16	2.28	2.28	2.15	2.13	2.78
2020	4.43	3.78	2.42	2.47	2,.7	2.39	3.16

As I mentioned earlier, the ban on imposing new types of local taxes or increasing the tax rate was lifted in 2022. Consequently, a significant number of local governments have taken advantage of this option. On the one hand, the number and the share of municipalities introducing one type of local tax in the total number of municipalities has increased (Table 3). Looking at the tourism tax from this point of view, it can be seen that local authorities have been particularly active in this area, introducing this type of local tax more frequently than any other type of local tax once the opportunities opened up.

Table 3. Percentage of municipalities applying the main types of local taxes in 2020, 2023, 2024 and 2025 (%) A - local business tax on regular activity, B - building tax on residential buildings, C - building tax on non-residential buildings, D - land tax, E - municipal tax on individuals, F - tourist tax (Source: https://hakka.allamkincstar.gov.hu/Letoltes.aspx)

	A	B	C	D	E	F
2020	91.7	18.7	25.3	15.6	72.6	27.6
2023	94.5	19.2	26.1	16.3	72.8	29.8
2024	95.1	19.7	26.6	16.6	72.8	30.7
2025	96,0	19.9	27.0	17.3	72.5	31.9
2023/2020	103.1	102.7	103.2	104.5	100.3	108.0
2025/2023	101.6	103.6	103.4	106.1	99.6	107.0

Table 4. Rates of local taxes levied by municipalities in 2020, 2023, 2024 and 2025; A - local business tax on regular activity, B - building tax on residential buildings, C - building tax on non-residential buildings, D - land tax, E - municipal tax on individuals, F - tourist tax guest nights (Source : https://hakka.allamkincstar.gov.hu/Letoltes.aspx)

	the value of the index I have constructed						arithmetic mean value					
	A	B	C	D	E	F	A	B	C	D	E	F
2020	4.43	2.42	2.47	2.27	2.39	3.16	1.751	596	615	74	8,070	286
2023	4.43	2.42	2.47	2.29	2.30	3.23	1.755	658	684	85	8,618	316
2024	4.45	2.33	2.38	2.25	2.20	2.97	1.763	672	702	88	8,777	332
2025	4.45	2.28	2.36	2.25	2.16	2.91	1.765	718	770	95	9,464	360
2023/2020	100.0	100.0	100.0	100.9	96.2	102.2	100.2	110.4	111.2	114.9	106.8	110.5
2025/2023	100.5	94.2	95.5	98.3	93.9	90.1	100.6	109.1	112.6	111.8	109.8	113.9

On the other hand, local governments have also increased the rate of local taxes (Table 4). The constructed index falls between 2023 and 2025, but this is mainly due to high inflation in those years. The situation of the tourism tax is not so clear-cut in this respect: according to my index, it is the one where the tax rate increased the most after the lifting of the restrictions (i.e. between 2020 and 2023), but it also decreased the most between 2023 and 2025.

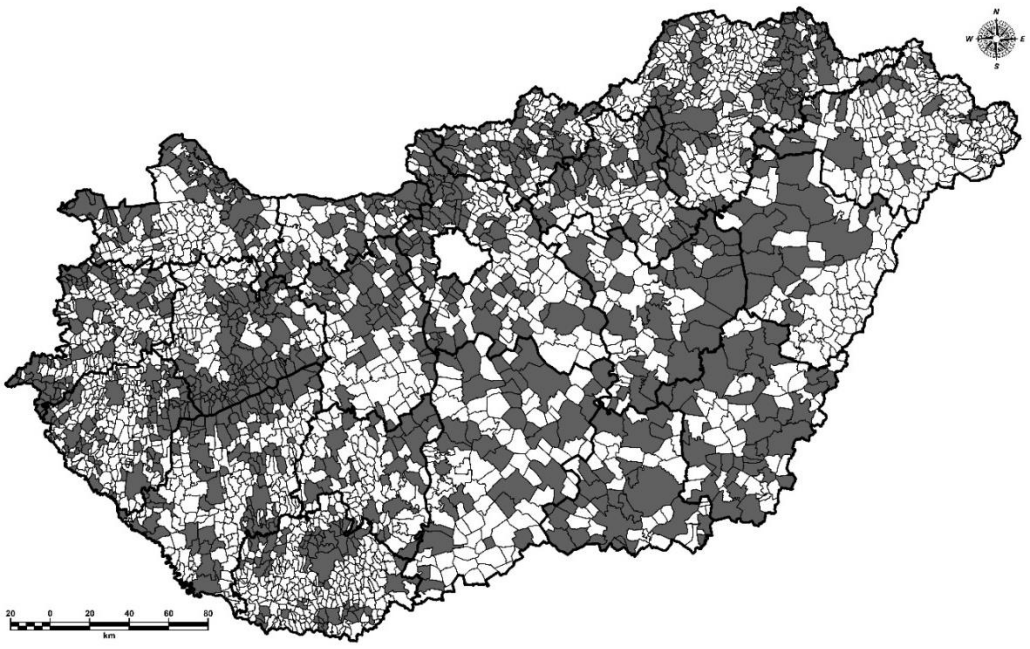

Figure 2. Municipalities introducing tourism tax in 2025 (marked in dark colour) (Source: own work relying on https://hakka.allamkincstar.gov.hu/Letoltes.aspx)

However, the arithmetic average of the size of the tax is the reverse: the increase between 2020 and 2023 is only the third largest, while it has been the first largest in the last two years. In terms of the activity of local governments in relation to tourism tax in Hungary in 2025, a very mixed picture could be observed. In terms of the introduction of the tax (Figure 2), there was a higher spatial concentration mainly in the municipalities around Lake Balaton, in the Danube Bend, along the western border and in the North Central Mountains (e.g. Bükk, Mátra, Börzsöny and Zemplén Mountains) and in parts of the Central Danube Region (Bakony and Visegrádi Mountains).

When looking at the size of the applied tax rate (Figure 3), higher values were mainly observed in the settlements along Lake Balaton, in the Danube Bend and in the larger mountain ranges, while a lower tax rate is observed accross a large part of the country. Two potential explanatory factors were examined: the size of the settlements and their tourism classification (and therefore their importance). In terms of the population of the municipalities (Table 5), there is a very clear relationship: with the increase in population, the proportion of municipalities applying a tourist tax increases, with one or two minor exceptions, as does the value of the indicator reflecting the tax rate. In my opinion, this phenomenon is due to the fact that larger municipalities have more tourist attractions and appeal, attract more tourists, and the municipalities concerned would like to take advantage of the resulting revenue growth potential.

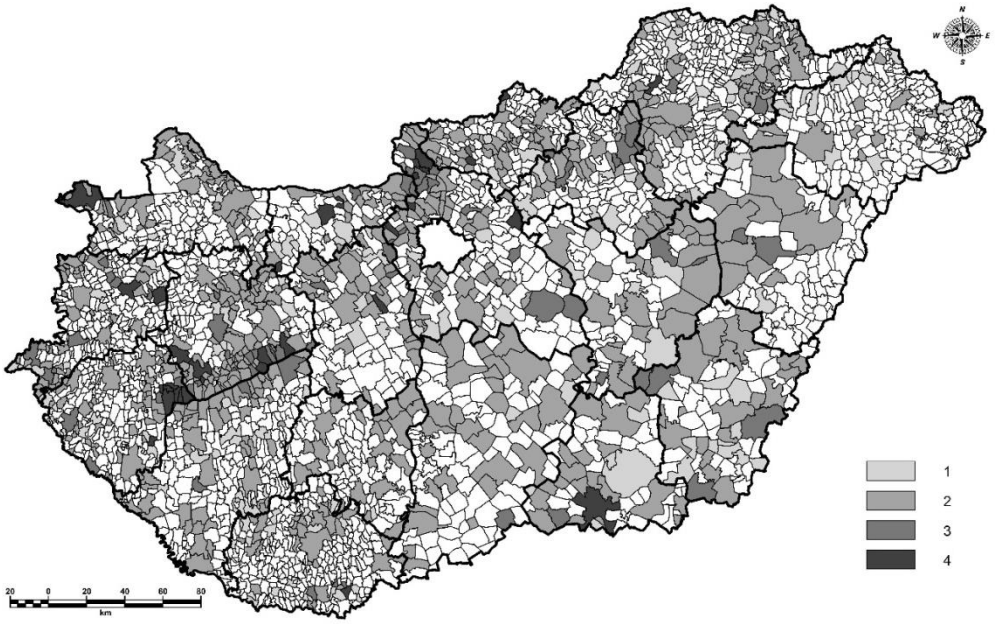

Figure 3. The maximum rate of tourism tax levied by local authorities in 2020 compared to the maximum (1: 1%-33,3%; 2: 33,4%-66,6%; 3: 66,7%-99,9%; 4: 100,0%) (Source: own work relying on https://hakka.allamkincstar.gov.hu/Letoltes.aspx)

The second factor included in the study is the role of municipalities in tourism, analysing how the existence of tourist areas defined in Government Decree 429/2020 (IX. 14.) influences the attitude towards tourism tax. The relevant legislation designates a total of 11 tourist areas in Hungary, including 577 municipalities.

Table 5. Prevalence of tourism tax and tax burden in municipalities of different sizes in 2025 (Source : https://hakka.allamkincstar.gov.hu/Letoltes.aspx, https://nyilvantarto.hu/hu/statisztikak?stat=kozerdeku)

number of population	percentage of municipalities applying a tourism tax (%)	arithmetic average of the tourist tax rate (HUF)
less than 250 inhabitants	23.2	312.9
251-500 inhabitants	24.8	334.9
501-1,000 inhabitants	22.3	352.5
1,001-2,500 inhabitants	34.0	354.8
2,501-5,000 inhabitants	41.4	409.0
5,001-10,000 inhabitants	57.3	395.5
10,001-25,000 inhabitants	70.0	421.0
more than 25,000 inhabitants	95.5	441.9

The data (Table 6) show a very strong link between the two factors: in 2025, more than two-thirds of the municipalities in tourist areas levied a tourism tax (more than three times the rate of municipalities outside tourist areas) and the municipalities concerned were also characterised by a higher tax burden. In the light of the above, it may be asked whether this is not due to the different population composition of the two types of 'area'. The data do not show such a correlation: municipalities in the tourist area have higher values in all population categories. In my opinion, this phenomenon is due to the fact that, as mentioned above in the case of the size of settlements, the tourist area has more attractions, which means more visitors and more nights spent. At the same time, the municipalities located in this area are also trying to take advantage of this favourable situation and, in this spirit, are using the means of levying a tourist tax and setting a higher rate.

Table 6. Prevalence of tourism tax and size of tax burden in municipalities of different sizes situated in the tourist and outside tourist areas in 2025 (permanent population) A - municipalities in the tourist area, B - municipalities outside the tourist area (Source: https://hakka.allamkincstar.gov.hu/Letoltes.aspx, https://nyilvantarto.hu/hu/statisztikak?stat=kozerdeku)

	percentage of municipalities applying a tourism tax (%)		arithmetic average of the tourist tax rate (HUF)	
	A	B	A	B
less than 250 inhabitants	60.3	18.0	343.4	298.4
251-500 inhabitants	65.8	18.6	391.0	305.0
501-1,000 inhabitants	60.0	15.0	370.5	338.6
1,001-2,500 inhabitants	72.5	24.1	411.7	305.4
2,501-5,000 inhabitants	75.0	30.1	442.5	381.0
5.001-10,000 inhabitants	86.1	48.6	451.7	322.8
10.001-25,000 inhabitants	82.1	62.3	442.2	384.8
more than 25,000 inhabitants	100.0	90.9	481.4	398.5
all of the settlements	70.8	23.0	409.9	328.2

CONCLUSION

The main findings of the study can be summarised as follows. Since the mid-1990s, the number of local authorities levying a tourism tax and the tax burden has steadily increased and is now the third most common type of local tax, and the second most popular in terms of the rate applied. After the lifting of the restriction on local taxes during the coronavirus epidemic, municipal leaders were very active on the tourism tax. The main reason for this was that this type of tax is not levied on the local population, so that local authorities were able to act without risking a loss of popularity, to introduce this type of local tax and to increase the rate applied.

Looking at the differences between municipalities, two factors can be highlighted. On the one hand, municipalities with a larger population and, on the other hand, those located in tourist areas tended to take advantage of the introduction of the tourist tax and to apply a higher than average tax rate. Further research on this topic could aim in particular to analyse the relationship between the tourism tax rate and the revenue generated from this source.

Author Contributions: Conceptualization, G.K.; methodology, G.K.; software, G.K.; validation, G.K.; formal analysis, G.K.; investigation, G.K.; data curation, G.K.; writing - original draft preparation, G.K.; writing - review and editing, G.K.; visualization, G.K.; supervision, G.K.; project administration, G.K. The author has read and agreed to the published version of the manuscript.

Funding: Supported by the University of Debrecen Program for Scientific Publication

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the scientific involvement of the author concerned.

Conflicts of Interest: The author declare no conflict of interest.

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Article history: Received: 09.04.2025 Revised: 31.06.2025 Accepted: 30.07.2025 Available online: 18.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1656-1667
DOI 10.30892/gtg.61324-1534

CULTURAL HERITAGE AND EXPERIENTIAL TOURISM: OPPORTUNITIES AND CHALLENGES IN GREECE-ALBANIA CROSS-BORDER AREA (BERAT, GJIROKASTRA AND IOANNINA)

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Citation: Pazari, F., Avdia, B., & Mamoci, E. (2025). Cultural heritage and experiential tourism: Opportunities and challenges in Greece-Albania cross-border area (Berat, Gjirokastra and Ioannina). *Geojournal of Tourism and Geosites*, 61(3), 1656–1667. https://doi.org/10.30892/gtg.61324-1534

Abstract: The study aims to analyze the cross-border tourism potential, identify the challenges and opportunities for its development and the impact it has on the social and economic development of the local community. Based on the current situation, the study also proposes concrete strategic measures that need to be undertaken to position it in the competitive regional market. A mixed methods approach was used to conduct the study, including: a review of the literature and similar cases of cross-border experiential tourism development at the international level, qualitative and quantitative interviews with the local community, actors operating in the tourism sector, and institutional stakeholders. The use of analytical tools, such as GIS analysis, helped in interpreting the data, in function of the development of experiential tourism. The Albania-Greece cross-border region presents a high potential for the development of experiential tourism. The results of the surveys and study analyses show a high interest of local communities and a positive impact on the local economy, the preservation of cultural heritage and the development of ecotourism as a form of sustainable tourism. The main challenges are related to the lack of institutional support between the two countries, the road infrastructure and the fragmented marketing strategies for promoting the region. The region is promising for the development of experiential tourism as a long-term sustainable tourism activity that generates employment, protects heritage and improves the life of the local community. Community involvement, infrastructure investments and the integration of technological innovation in the service of tourists are important factors for the transformation into a competitive destination. However, there are limitations to the long-term sustainable development of the sector and methodological limitations that should be addressed by research for future studies in this field. The findings emphasize the need for cross-border cooperation frameworks that ensure continuity and coordination in tourism planning. Capacity-building programs for local tourism actors are essential to enhance service quality and innovation. Additionally, environmental protection must be prioritized to maintain the ecological balance of the region. Finally, the study highlights the importance of joint branding initiatives to position the region as a unified tourism destination.

Keywords: experiential tourism, cross-border cooperation, cultural heritage, sustainable tourism, destination development

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INTRODUCTION

Experiential tourism is the current trend in international tourism. Tourists are increasingly seeking to acquire authentic experiences and experiences of the destinations they visit during their tourist trips. This type of tourism is focused on creating authentic, personalized and emotionally impactful experiences that will remain in the visitors' memories for a long time. The Balkan countries (which include Greece and Albania) have considerable potential for the development of experiential tourism by integrating the cultural and natural heritage of this territory.In the cross border area between Greece and Albania, the cultural heritage, both tangible and intangible, together with the unique natural landscapes (UNESCO sites), constitutes a strong foundation for offering differentiated, attractive, and sustainable tourist experiences to international visitors. At a time when global demand for authentic and personalized experiences is constantly increasing, this region has significant potential to become an internationally recognized destination.

The study aims to analyze the importance and potential for the development of experiential tourism in the cross-border region of Greece-Albania, identifying the challenges and opportunities for its development and its return to a major destination in the region. The main objectives include examining existing barriers, exploring opportunities for sustainable and inclusive development, and assessing the economic and social impact of this tourism segment on local communities. Based on the principles of sustainable tourism, the study seeks to provide an in-depth analysis of the opportunities for strategically positioning the region as a major destination for experiential tourism.

The study uses a mixed-methods approach, including a review of existing literature to create a theoretical basis on the concept and importance of experiential tourism; the development of a structured questionnaire for decision-makers, tourism operators and local communities to identify perceptions of this tourism model; and the application of

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cartographic techniques (GIS) to process and interpret the collected data, ensuring an evidence-based approach. Through analysis and concrete recommendations, this study aims to contribute to the development of innovative strategies and best practices for the promotion of experiential tourism in the Albania-Greece cross-border region.

The study followed a mixed methods approach, including a literature review to develop a theoretical background on the concept and development of experiential tourism in countries with similar potential as the study area; the design of a structured questionnaire for the local community involved in tourism services, decision-making institutions and stakeholders in order to assess perceptions of this tourism model; and the use of cartographic methods (GIS) to process and interpret the collected data, ensuring an evidence-based approach and analysis. The discussions and conclusions drawn from the study aim to support the development of new strategies and best practices in the development of experiential tourism in the Albania-Greece cross-border region. Its conclusions are expected to support not only the economic empowerment of the area and increased opportunities for local communities but also the promotion and international recognition of the region's cultural and natural heritage as an added value to the tourism industry.

LITERATURE REVIEW

Literature research is an essential component to understand the importance of developing experiential tourism and to identify best practices and international trends. Scientific articles, international reports, strategic documents and publications from international organizations such as the World Tourism Organization (UNWTO) and the World Travel and Tourism Council (WTTC) served as the main sources for building the theoretical basis of this study.

Carli et al. (2020) in their study, define the elements of experiential tourism as inclusive experience, cultural interaction, short stays and sustainability. According to the OsservatorioTuristico Valle d'Aosta (2018), experiential tourism trips last an average of 5.2 days, with variations between urban and rural environments. International practices show its positive impact on territorial promotion and stakeholder cooperation.In the study "Future of Travel and Tourism: Embracing Sustainable and Inclusive Growth" (World Economic Forum, 2025), emphasis is placed on the fact that `tourism experiences should be designed to meet different needs, to give something back to host communities and to create authentic experiences that promote cultural exchange and respect for local traditions. The experiences experienced by tourists are carried in their memories and experiences for a long time, also transmitting them to their friends.

In the study conducted by Raymundo et al. (2024), the contribution of the development of experiential tourism to the preservation of local identity and the active involvement of communities in the sustainable development of rural destinations is emphasized, through the direct interaction of visitors with nature and local traditions. Recent studies (Martínez de Carnero Calzada, 2025; Dimitrova, 2023) emphasize the role of digital technology in the design of personalized itineraries, deepening the experience of authentic local experiences by tourists and the engagement of local communities, especially in rural and cross-border contexts. These developments are in line with post-COVID orientations towards more sustainable practices, authentic experiences and the active involvement of local communities in the process of creating tourism offers. Economically, experiential tourism supports local incomes, jobs and entrepreneurship (Moreschi, 2017; Esau & Senese, 2022). Successful models include Rajasthan (India), Costa Rica and Tuscany (Italy) (Esau & Senese, 2022).

Case studies such as Tuscan cooking courses, Irish folk experiences or ecotourism in the Albanian Alps create lasting connections for visitors (Carli et al., 2020). The Iso-Polifonia Labe in Gjirokastër, Xhubleta and K'cimiiTropojes (UNESCO sites) further enrich Albania's cultural attractiveness (UNESCO, 2023). Berat, Gjirokastra and Ioannina illustrate its role in heritage preservation and economic growth. Cross-border experiential tourism has been expanded through EU and Council of Europe initiatives, with cultural routes such as the Camino de Santiago, Viking Route, Amber Road and Balkan Heritage Route (Prokkola, 2008; Council of Europe, 2021). Projects such as "Danube Limes" and "Via Dinarica" foster regional cooperation, while "Smart Travel on Cultural Route" (Interreg, 2023) increases cross-border tourism in Greece-Albania. Similar approaches to cross-border cooperation have also been explored in Central Asia.

For example, Turaev et al. (2023) analyze the potential of cross-border pilgrimage tourism in the Lower-Tisa Valley, highlighting how cultural and religious heritage can foster sustainable regional tourism networks. Although the context is different, the study offers useful parallels for the Albania–Greece region in terms of identifying common heritage assets and building coordinated tourism strategies. Also, the study on the reintegration of Albanian returned migrants (Xhaho et al., 2024) emphasizes the importance of social and human capital in the development of new ventures, including those in the experiential tourism sector. Finally, recent advances in technological development such as the use of artificial intelligence, augmented reality, digital storytelling, have a significant impact on tourism development models. These developments are in line with global tourism trends that emphasize the growing importance of personalization, technology-driven experiences, and sustainability as pillars of future tourism models (Chinekeokwu, 2025). As an example, citizen science initiatives such as those implemented around Lake Pamvotis in Ioannina demonstrate how experiential tourism can integrate digital tools and environmental education to strengthen visitors' connection to nature (Potsikas et al., 2023).

Experiential tourism is one of the tourism models that is being affected by these developments for the enjoyment of personalized experiences, which are combined with the direct engagement of local communities and the principles of sustainability. This collaboration aims to strengthen cultural identity and promote local development. Models such as "slow tourism" and "green experiential centers" are increasingly being implemented in various countries in Europe and Asia, being considered as effective tools for social and economic impact (WTTC, 2024; UNWTO, 2025).

However, the scientific literature on experiential tourism still remains limited for countries like Albania, especially for cross-border cases. In this context, this study aims to analyze the potentials and challenges of cooperation between Albania and Greece, with a focus on sustainability and building an inclusive and experience-oriented tourism model.

MATERIALS AND METHODS

The study is based on a combination of quantitative and qualitative research methods, with the application of primary and secondary data sources in analyzing the potential and problems of the development of experiential tourism in the cross-border regions of Albania and Greece. Primary data were obtained through surveys and in-depth interviews with the community, public institutions, tourism enterprises, etc. The questionnaire analyzed the contribution that experiential tourism brings to the economic and social development of the community, while interviews with experts addressed strategies for strengthening cross-border cooperation. The analysis of secondary data included literature reviews, reports of national and international tourism institutions, as well as Albanian and Greek statistical data to assess current tourism trends and economic contribution. The study is based on the hypothesis that experiential tourism affects the growth of economic income, increases cross-border cooperation, increases tourism diversification and extends the tourist season. The study aims to answer the following questions:

- Does the region have sufficient cultural and natural potential for experiential tourism?
- What benefits and challenges does the local community face?
- Are there effective policies to promote cross-border cooperation?

By integrating primary and secondary data, the study provides a comprehensive analysis and recommendations for the sustainable development of experiential tourism in the region.

The questions were open-ended and included key issues related to the tourism industry and the impact this industry brings to the region. Participants answered open-ended questions on the development of experiential tourism, the social, economic and cultural impacts as well as the opportunities and challenges of the development of experiential tourism.The specific open-ended questions addressed to both public and private sector actors are summarized in Table 2, which reflects the differentiated yet complementary perspectives that each group brings to the experiential tourism development process in the region.

1. Data collection

1.1. Survey and interview

Surveys and questionnaires were used in the study as the main sources of primary data, with the aim of identifying the perceptions and expectations of stakeholders in the local community regarding the development of experiential tourism in the Albania-Greece cross-border region. Meetings and interviews were conducted with 26 representatives of interest groups, which were classified into two main categories, as shown in Table 1:

1. Representatives from the public sector (institutional actors involved in the design and management of tourism policies at local, regional and national levels).
2. Representatives from the private sector (tour operators, tourist guides, accommodation providers, travel agencies, restaurants/gastronomy and other tourism-related entities).

Table 1. Number of potentially relevant stakeholders per category (Source: Authors' elaboration based on stakeholder mapping and interviews with public and private actors in the Albania–Greece cross-border area (2024)

Category of target group	Number of subjects
Public Sector/Organizations	6 (Municipality of Berat, Gjirokaster and Ionniana, Regional Agency, Tourism and Cultural Heritage Agency of Gjirokastra and Berat, National Tourism Agency, etc)
Private Companies	15 private subjects; 4 from accommodation sector; 4 from Experience activities/ventures; 3 from tourist office; 5 from thematic tours; 4 restaurants/gastronomy
Total	**26**

Tables 2. Research questions by target group (Source: Authors' elaboration based on semi-structured questionnaires developed for public institutions and private tourism operators in the Albania–Greece cross-border region (2024)

Open questions for the Public Sector/Organization	Open questions for the Private Section
What policies and strategies have been followed for the development of experiential tourism in your area?	How do you incorporate elements of culture and tradition into the services you offer to tourists?
How do you think we can integrate cultural and natural heritage into the development of experiential tourism in the cross-border region?	What do you offer specifically to tourists that differentiates your offer from other offers and mass tourism?
What are the biggest challenges you see in the sustainability of the development of experiential tourism?	How do you think visitors are interested in authentic experiences and collaboration with the local community?
Have you had any cross-border cooperation with a neighboring country to increase the promotion and sustainable development of experiential tourism?	What are the most common challenges you face in providing tourist services? Have you tried to design a joint itinerary between the two countries for experiential tourism?
How do you assess the involvement and engagement of the local community in experiential tourism initiatives?	What is your perspective on the role of cooperation between the public and private sectors in the development of experiential tourism?

Questionnaire structure and general data of respondents

To provide a detailed analysis of perceptions and impact of experiential tourism, the questionnaire was structured into 6 sections: I) General information; II) The impact of cultural heritage on experiential tourism; III) Opportunities and benefits of experiential tourism; IV) Challenges for cultural heritage and experiential tourism; V) Suggestions for improving cultural heritage and experiential tourism; VI) Additional Information. The survey was conducted with target groups involved in the provision of tourism services as well as tour operators and the local community. 150 participants responded to the survey, of which 66.7% belonged to the young age group 18-30 years old and 68% were women, highlighting the role that these two

elements play in employment and the provision of tourism services. Also, 62.8% of respondents worked in tourism and 59.2% had lived in the area for more than 10 years, reflecting their strong connection to the local heritage and authenticity of the area.

1.2. GIS and mapping of tourism resources in the region

The use of Geographic Information Systems (GIS) has been essential in the identification, analysis and visualization of cultural and natural attractions of the Albania-Greece cross-border region, providing a structured approach to planning experiential tourism. GIS not only provides accurate spatial localization of attractions, but also facilitates spatial analysis to find the most effective and cost-effective solutions for successful strategic tourism management. The thematic maps created within the framework of this study provide important digital information on the region's tourist attractions as well as cultural routes that can be described during a several-day tour, locating the attractions of the authentic values of the area. The use of GIS as an analytical method highlighted the importance of data-driven planning, creating a structured platform for the design of long-term strategies in experiential tourism. Furthermore, geospatial visualization of the region helps identify infrastructure challenges, as well as needs for improvement in access and tourism services.

2. Data analysis

The study applied thematic analysis and the Potential Assessment Matrix. The thematic analysis identified the main tourist trends, which emerged as a result of the analysis of questionnaires with stakeholders and experts in the field and helps to identify the main factors for the sustainable development of experiential tourism in the Greece-Albania cross-border area. that affect this type of tourism and its role in the sustainable development of the cross-border region. The analysis also highlighted best practices and innovative approaches for strengthening experiential tourism, while preserving cultural and natural heritage. The Potential Assessment Matrix was used as a standardized instrument to measure the region's capacity to develop experiential tourism, analyzing five key indicators: (i) quality and diversity of tourism resources, (ii) suitability for experiential activities, (iii) institutional and political support, (iv) level of existing infrastructure, and (v) suitability for marketing strategies. Adapted from Crouch & Ritchie (1999), this method used empirical data from interviews, surveys, and secondary data sources. GIS was applied to visualize the spatial distribution of tourism resources and to create thematic maps that aid in the design of tourism development strategies. The combined approach of these methods presents a comprehensive framework for identifying the region's strengths and weaknesses, setting priorities, and recommending sustainable strategies for the growth of experiential tourism.

RESULTS AND DISCUSSION

1. Description of the study area and tourism potential for experiential tourism

The cross-border region between Albania and Greece presents a significant potential for the development of experiential tourism, thanks to the combination of cultural wealth, natural landscapes and interconnected history of the two countries. Figure 1 presents the geographical position of the study area, highlighting the cross-border connection between the regions of Ioannina (Greece), Gjirokastër and Berat (Albania), which serve as the main focal points of the research. Albania, with a population of 2.77 million inhabitants (Worldometer, 2025), and Greece, with 9.93 million inhabitants (Worldometer, 2025), have a strong demographic base for the development of a sustainable tourism, where local communities play a key role in providing authentic experiences for visitors. While tourism contributes €45.8 billion to the Greek economy (WTTC, 2024), Albania is experiencing continuous growth, with tourism contributing $565 million to GDP in 2023 (WTTC, 2024), reflecting efforts to improve infrastructure and diversify the tourism offer.

Figure 1. Geographical position of the study area: Cross-border area Greece-Albania

(Source: Authors' processing based on data from the Albanian National Geoportal and Google Maps (2024)

In 2023, Greece hosted 36.08 million international tourists, while Albania recorded 10.1 million visitors (Statista, 2023), indicating a positive trend for tourism development. The region has a rich range of historical and cultural attractions, including UNESCO monuments, traditional festivals and gastronomic heritage, positioning this area as an ideal destination for experiential tourism. Improving infrastructure and facilitating movement through border crossings such as Kakavija and Kapshtica are key factors in exploiting this potential and creating an integrated tourism ecosystem between the two countries.

Ioannina – The cultural heart of Epirus – UNESCO site

Ioannina, the capital of Epirus in Greece, is rich in history and culture, with a blend of Ottoman, Greek and Balkan influences. It offers the potential for diverse tourist experiences, such as historic forts, Orthodox monasteries and Lake Pamvotis. Figure 2 illustrates the touristic potential of the Ioannina region, emphasizing the variety of cultural and natural attractions that support the development of experiential tourism. Known for its goldsmithing, tourists can participate in the process of making handmade jewelry. The region also offers nature-based experiences such as boat trips, hiking and exploring nature in Lake Pamvotis and the Pindus Mountains.

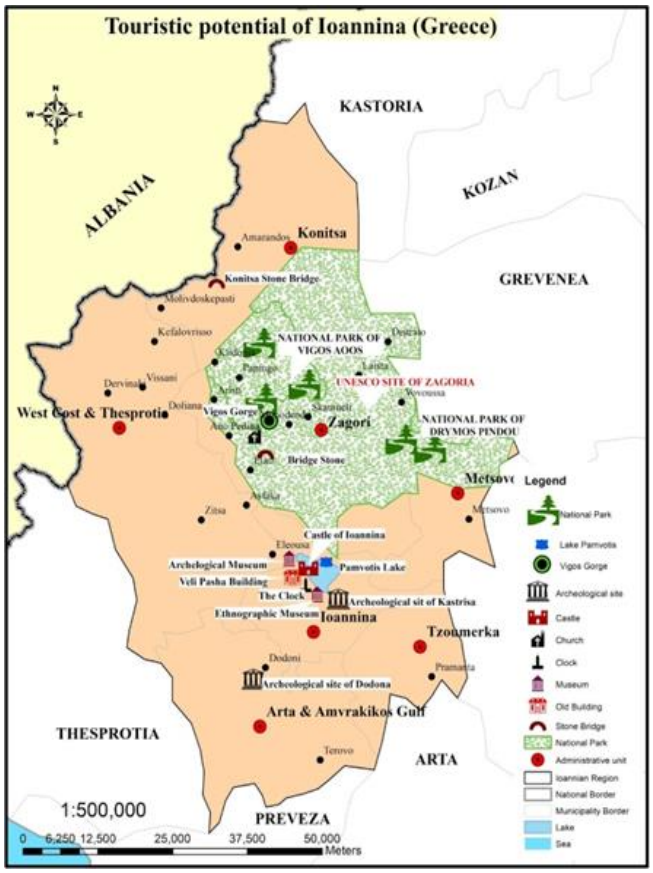


Figure 2. Touristic potential of Ioannina Region (Source: Authors' processing based on data from the Greek National Tourism Organization, Epirus Region Tourism Office, National Parks Management Body of Northern Pindos, and Municipality of Ioannina GIS services (2024)

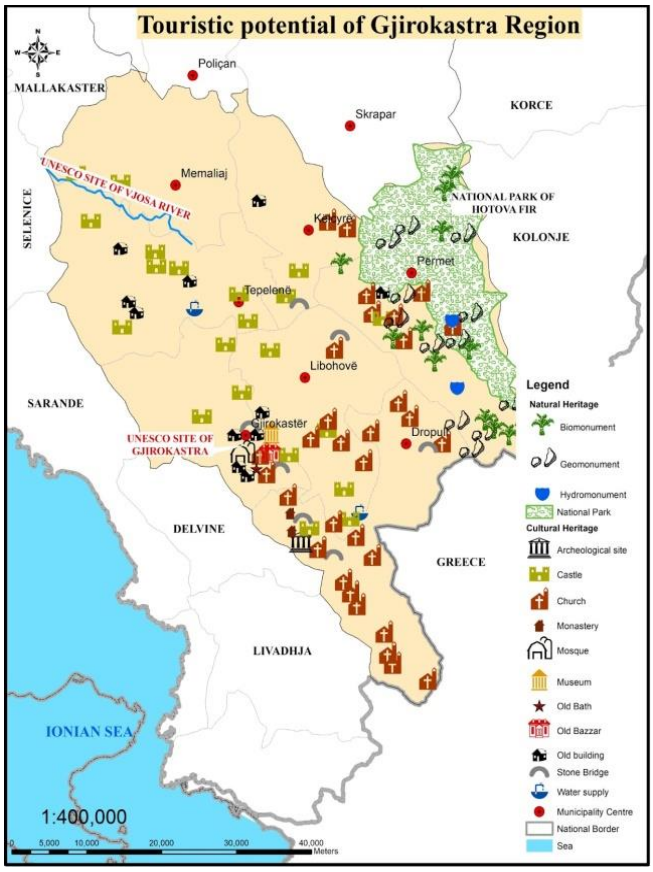


Figure 3. Touristic potential of Gjirokastra Region (Source: Authors' processing based on data from the National Tourism Agency of Albania, Regional Directorate of Cultural Heritage in Gjirokastra, and the Albanian National Geoportal (2024)

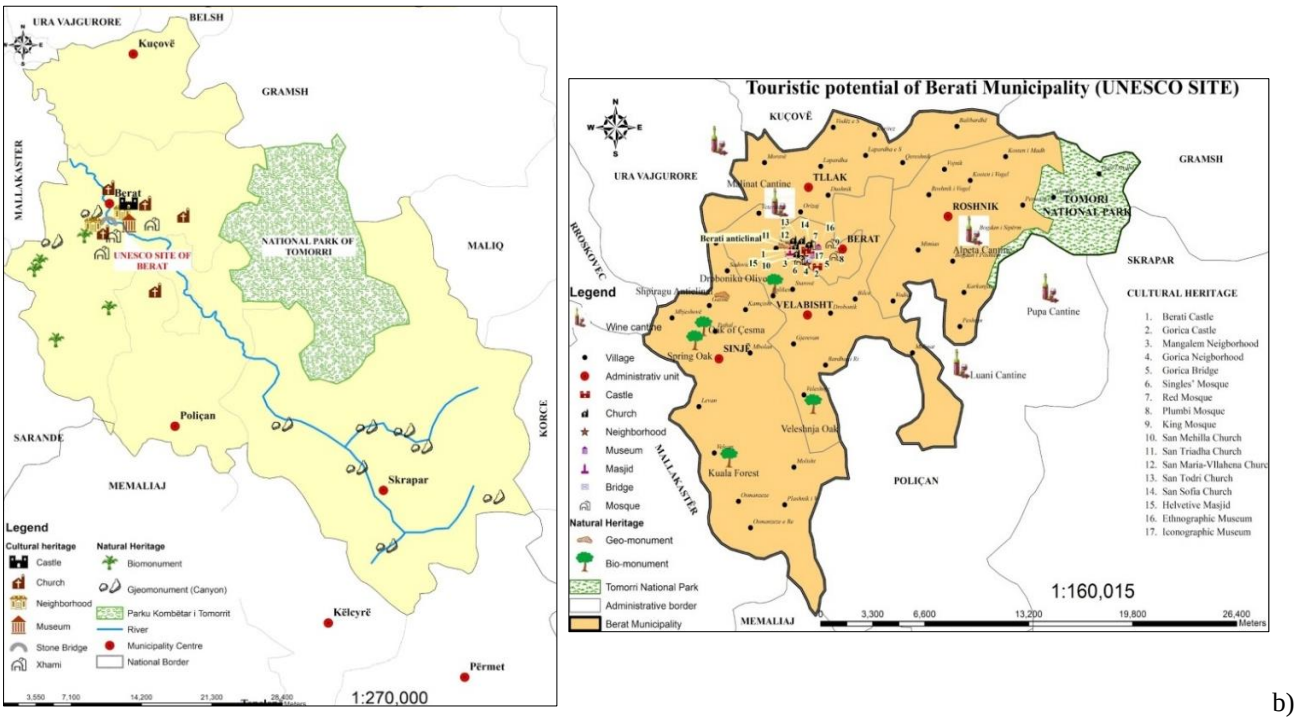
Gjirokastra – The "Stone city" – UNESCO site

Gjirokastra, the "Stone City," represents a unique example of Ottoman-era architecture in the Balkans. Declared a UNESCO World Heritage Site, it offers a journey through history, exploring historic forts, characteristic Gjirokastra houses, and museums, where visitors can learn about art, culture, and traditional ways of life. Figure 3 presents the touristic potential of the Gjirokastra region, highlighting its rich architectural heritage, traditional crafts, and cultural assets that contribute to experiential tourism development. Traditional handicrafts such as carpets, textiles, and wood and stonework offer a unique experience for tourists who want to participate in artisan workshops. Furthermore, the city's rich and unique cuisine and local festivals help create a direct connection between visitors and the local community.

Berat – "The City of One-on-One Windows", UNESCO site

Berat, the "The City of One-on-One Windows", is a key cultural heritage site in Albania. Located along the Osumi River and surrounded by the Tomorr and Shpirag Mountains, it offers a rich tourist experience through visits to the historic castle, the old quarters of Mangalem and Gorica, as well as the iconographic and ethnographic museums, which reflect the identity of the city. Known for its traditional gastronomy, tourists have the opportunity to experience the art of traditional local cooking and wine tasting. Nature lovers can experience the adrenaline of rafting in the Osumi canyons and hiking on Mount Tomorr, adding adventure and ecotourism to the experience. Figure 4.a) illustrates the

overall touristic potential of the Berat region, while Figure 4.b) focuses on the specific assets within Berat Municipality, emphasizing both cultural heritage and opportunities for experiential tourism in urban and rural contexts.



a) b)

Figure 4. a) Touristic potential of Berati Region (Source: Authors' processingbased on data from the National Tourism Agency of Albania, Regional Directorate of Cultural Heritage in Berat, and administrative GIS data (2024); b) Touristic potential of Berati Municipality (Source: Authors' processing based on official data from the Municipality of Berat, the Institute of Cultural Monuments, and the Albanian National Geoportal (2024)

The cross-border region represents an integrated tourist ecosystem where experiential experiences from different historical eras, authentic local cultures and traditions, as well as the potential for experiencing adventurous and relaxing activities in nature are combined. This offer is a strong basis for the development of experiential tourism, which is based on several main pillars:

1. *Region with shared cultural and historical heritage* – The region has a cultural blend of different eras and has experienced dominant influences from different periods. This offers opportunities for itineraries of historical interest, reflecting the historical connections between Epirus and southern Albania.
2. *Culinary tourism* – Authentic experiences in traditional local cuisine, visits and tastings in wineries, cooking courses and traditional festivals, foster a strong connection between tourists and local culture.
3. *Ecotourism and outdoor activities* – Mountainous and water landscapes offer a wide range of activities for adventurous tourists, such as hiking, rafting, kayaking and exploring natural habitats, contributing to the development of sustainable tourism.
4. *Rich heritage of crafts and handicrafts* – Traditional silversmithing, carpet weaving and souvenirs create a unique offer for tourists, who can be involved in their handicrafts. On the other hand, they bring income to the local community, as they are involved in the purchase of souvenirs and traditional crafts.
5. *Cross-border cooperation in destination promotion* – The development of joint Albania-Greece itineraries, coordinated marketing strategies and collaborative investments in infrastructure contribute to increasing the visibility of the region and attracting tourists who want to experience unique history and culture in the Balkans. In this context, the development of experiential tourism in the Albania-Greece cross-border region represents an important opportunity for promoting sustainable tourism development, preserving cultural heritage and diversifying the tourist offer.

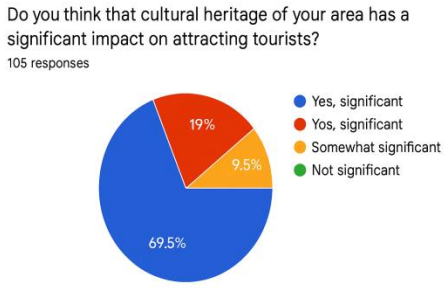
2. Questionnaire analysis

In order to assess the perceptions of the local community on the opportunities and benefits of developing experiential tourism in the Albania-Greece cross-border region, an analysis of the results of the questionnaires was carried out, which identify the importance of cultural heritage, economic and social benefits, main challenges and opportunities for the development of this sector. The results show the impact of experiential tourism on local communities, as an important element for the sustainability of tourism.

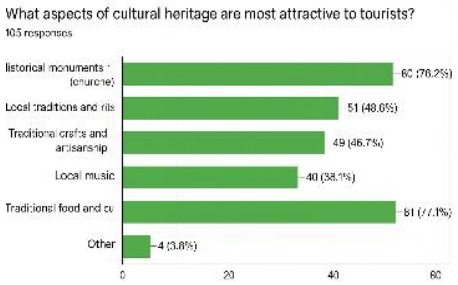
2.1. Analysis of section II: The impact of cultural heritage on experiential tourism

As shown in Figure 5, the survey results show that cultural heritage plays an important role in attracting experiential tourists. The most attractive elements of cultural heritage are identified as gastronomy (77.1%) and historical monuments (76.2%), reflecting the tendency of tourists to experience the combination of history and local cuisine. Half of the respondents (48.1%) consider experiential tourism as an important tool for the promotion and preservation of cultural heritage, seeing it as a mechanism for strengthening local identity and increasing interest in local traditions. In economic terms, 45.7% state that this form of tourism is sustainable and has an impact on the well-being of the community, as it not

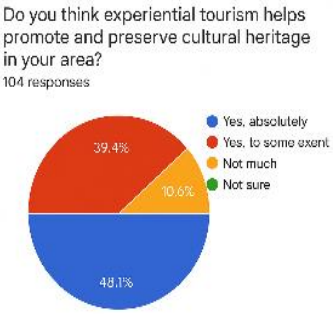
only generates new opportunities for employment and increased income, but also strengthens the connection between the community and the heritage and influences its awareness and preservation.



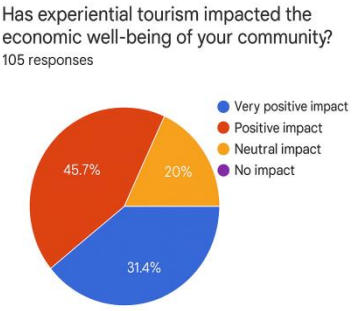
(a) Impact of cultural heritage on attracting



(b) The most attractive elements of cultural heritage for tourists



(c) Impact of experiential tourism on promoting and preserving heritage

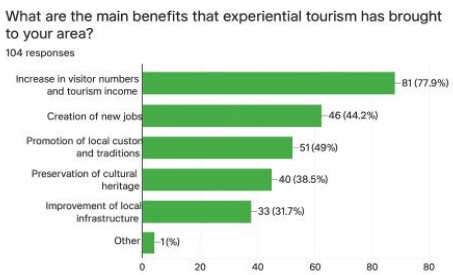


(d) Economic impact of experiential tourism on the community

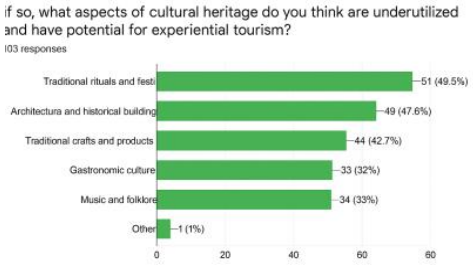
Figure 5. Responses of section II: The impact of cultural heritage on experiential tourism (Source: Authors' analysis based on survey and interview data collected from local community stakeholders in the Albania–Greece cross-border area, August-October 2024)

2.2. Analysis of section III: Opportunities and benefits of experiential tourism

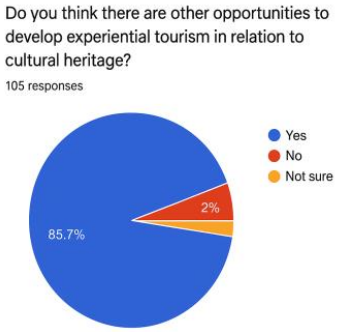
Experiential tourism contributes to the economic income and social development of the community. As illustrated in Figure 6, 77.9% of respondents stated that they have benefited from the increase in the number of tourists in the area and over 44.2% identified it as a source of employment for the community. Interestingly, 49% of them see this form of tourism as an important element of preserving the local traditions of the area.



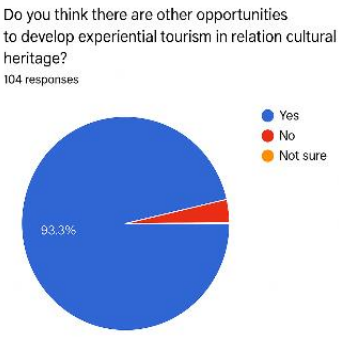
(a) The main benefits that experiential tourism has brought to the study area



(b) Undervalued aspects of cultural heritage that have potential for experiential tourism



c) Perception of the existence of other opportunities for the development of experiential tourism



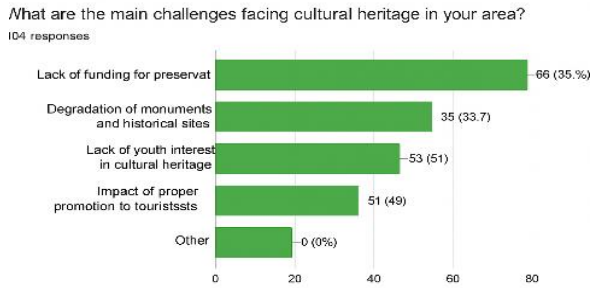
(d) Perception of the connection of experiential tourism opportunities with cultural heritage

Figure 6. Responses of section III: Opportunities and benefits of experiential tourism (Source: Authors' analysisbased on survey and interview data collected from local community stakeholders in the Albania–Greece cross-border area, August-October 2024)

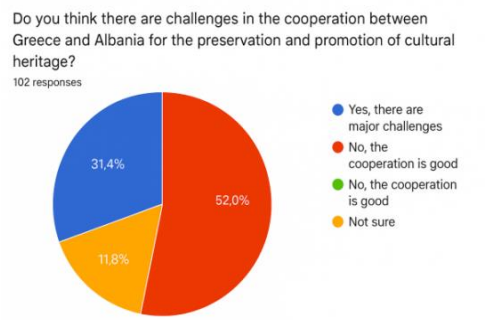
Although they appreciate the increase in tourist interest, 93.3% of respondents emphasize that its potential has not been fully exploited, especially in traditional rituals and festivals (49.5%), historical architecture (47.6%) and handicrafts (42.7%). These findings indicate that experiential tourism can play a key role in preserving cultural heritage, linking it to economic development and community involvement.

2.3. Analysis of Section IV: Challenges for Cultural Heritage and Experiential Tourism

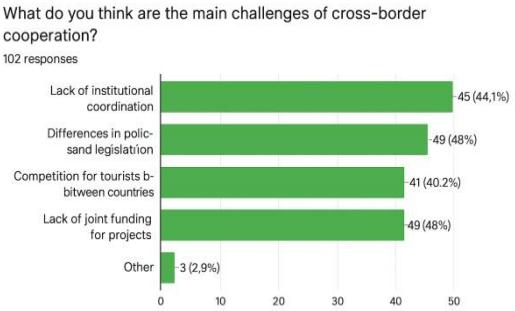
As shown in Figure 7, the challenges faced by this sector are related to the lack of funding for the restoration and maintenance of historical monuments (63.5%) and the lack of interest of young people in cultural heritage (51%), which jeopardize the continuity and appreciation of local traditions. The lack of effective promotion (49%) and the degradation of historical monuments (33.7%) are two issues highlighted by interest groups, for which they state that stronger marketing strategies and investments in the protection of cultural assets are needed. At the cross-border level, the lack of institutional coordination (44.1%), legal barriers (48%) and the lack of joint funds for projects (48%) represent important challenges for the harmonization of strategies and effective cooperation between the two countries.



(a) Challenges faced by cultural heritage in the study area



(b) Perception of challenges of cooperation between Albania and Greece for the preservation and promotion of cultural heritage



(c) Main difficulties in cross-border cooperation for the development of experiential tourism

Figure 7. Challenges for cultural heritage and experiential tourism (Source: Authors' analysis based on survey and interview data collected from local community stakeholders in the Albania–Greece cross-border area, August-October 2024)

2.4. Analysis of section V: Suggestions for improving cultural heritage and experiential tourism

To strengthen the development of experiential tourism in the Albania-Greece cross-border region, 71.2% of respondents emphasize the necessity of improving tourism infrastructure, such as transport and accommodation. Also, 49% of participants identify the need for a more effective promotion of cultural heritage at the international level, aiming to expand the tourist audience and strengthen the image of the destination. Involving local communities in the preservation and promotion of heritage, organizing authentic activities, such as workshops and traditional events, and creating cultural routes connecting the two countries are identified as key steps for the development of tourism. The digitalization of the potential of experiential tourism is an element that significantly affects the improvement of tourist services and the promotion of the destination. These actions will help create rich experiences, increasing the interest of tourists.

2.5. Analysis of section VI: Additional information

In the findings of the last section of the survey, emphasis is placed on the fact that this form of tourism is the tourism of the future with a significant impact on community life. Its sustainable development requires investments in infrastructure, increased marketing and promotion, involvement of the local community in decision-making, and awareness of the preservation of this important heritage. This requires an integrated approach between the public and private sectors, as well as cross-border cooperation between the two countries.

3. Interpretation of the potential assessment Matrix for Experiential Tourism

The Potential Assessment Matrix has been applied for an in-depth analysis of the capacity of the Albania-Greece cross-border region to develop experiential tourism, considering five main dimensions: the quality and diversity of tourism resources, suitability for experiential activities, institutional and political support, the level of existing infrastructure, and suitability for marketing strategies.The findings from the questionnaires showed that the region has significant potential for experiential tourism, but faces challenges that require strategic solutions. The detailed results of this analysis, including the criteria, respondent-based scoring, and interpretation of key factors, are presented in Table 3.

Tables 3. The results of the Matrix analysis
(Source: Results of interviews with local community in cross-border are Albania-Greece, August-October 2024)

Category for evaluation	Critter	Description	Data from interviews & questionnaires	Max point	Earned points
1. Quality and diversity of tourism resources	1.1 Cultural wealth	Monuments, museums, traditions, and local crafts.	89% of respondents consider cultural heritage a very important element in the region (Section II).	20	18
	1.2 Natural wealth	Landscapes, biodiversity, rivers, and natural attractions.	77.1% of respondents emphasize the importance of the natural environment for tourism (Section II).	20	15
	1.3 Uniqueness	Special elements that distinguish the region from other tourist destinations.	Only 48.1% of respondents recognize the unique potential of local culture (Section II).	10	5
2.Suitability for experiential activities	2.1 Capacity for authentic activities	Opportunities to offer experiences such as cooking classes, festivals, crafts, and nature explorations.	77.9% of respondents consider cooking courses and handicrafts to have great potential for experiential tourism (Section III).	15	12
	2.2 Interaction with the community	Involvement of local residents in the creation and management of tourism activities.	44.2% of respondents mention job creation as a key opportunity resulting from community involvement (Section III).	15	8
3. Institutional and political support	3.1 Supporting policies	Existence of programs, strategies, and policies that support experiential tourism.	63.5% of respondents highlight the lack of funding for cultural heritage preservation (Section IV).	10	4
	3.2 Cross-Border cooperation	Links between Albania and Greece for the joint promotion of the region.	48% of respondents identify legal barriers as a major obstacle (Section IV).	10	5
4. Level of existing infrastructure	4.1 Access to tourist attractions	Roads, public transport, and accessibility to sites of interest.	33.7% of respondents cite the degradation of monuments and limited access as a major issue (Section IV).	10	5
	4.2 Services for tourists	Accommodation, restaurants, and other facilities that meet visitors' needs.	71.2% of respondents recommend improving tourist infrastructure (Section V).	10	7
5. Suitability for marketing strategies	5.1Visibility of the region	Promotion of the region at national and international levels.	49% of respondents highlight the lack of promotion as a significant challenge (Section IV).	10	5
	5.2 Potential for market development	Capacity to attract new segments of the tourist market through marketing strategies.	93.3% of respondents believe there are additional opportunities for development (Section III).	10	10
Total point				**140**	**94**

The results of the matrix show that the Albania-Greece cross-border region has high potential for the development of experiential tourism, particularly due to its rich cultural heritage and natural resources.

However, the main challenges include a lack of institutional support, limited infrastructure, and the need for more effective promotion. In this context, a key step to exploit this potential is the creation of a cross-border cultural route, connecting the three main cities of the region in an integrated network of experiential tourism. Based on the study carried out, we present the proposal for the creation of the ***"Heritage route and experience during the cross-border area: Ioannina-Gjirokaster-Berat".*** The creation of this joint cultural route aims to promote a unique and joint tourist product, where history, culture, traditions, gastronomy, nature, adventure, etc. are integrated.

It also affects the strengthening of cross-border cooperation between the two countries, creating an innovative offer that promotes authenticity, community engagement and sustainable development.

The ***"Heritage route and experience during the cross-border area: Ioannina-Gjirokaster-Berat"***itinerary spans seven days, offering a rich combination of historical, cultural, natural, and culinary experiences.

- **Day 1-2:** Begins in Ioannina, exploring Ioannina Castle, Dodona, and Lake Pamvotis, followed by a visit to Drymos Pindus National Park.
- **Day 3:** Visits Zagori Village and Aoos National Park (UNESCO), then travels to Gjirokastër via Drinos Valley, concluding with traditional music and local cuisine.
- **Day 4-5:** Gjirokastër's castle, bazaar, and Antigonea's ruins are explored, followed by a wellness retreat at Bënjë Thermal Baths and Fir of Hotova National Park in Përmet.
- **Day 6-7:** Adventure along the Vjosa River, then exploration of Berat's UNESCO-listed sites, Osumi Canyons, and a farewell dinner.

Figure 8 provides a visual representation of the proposed cross-border cultural route, showcasing the geographic linkage of the three main cities: Ioannina, Gjirokastër, and Berat along with key natural and cultural attractions featured in the itinerary. The figure illustrates how the combination of UNESCO sites, local heritage, and nature-based experiences forms the foundation for a sustainable and competitive tourism model in the Albania–Greece border region.

The creation of the Ioannina-Gjirokastër-Berat Cultural Route constitutes a strategic step for the development of cross-border experiential tourism, placing this region on the map of sustainable and authentic tourism destinations in the Balkans. The integration of all cultural and natural potential, with all the experiences that accompany it, means that this itinerary will offer a rich and comprehensive experience for visitors, while strengthening cooperation and economic development of local communities. Through the use of GIS and digital access to tourist potential, this route will be structured efficiently, creating a new model for the promotion and sustainable management of tourism in this region.

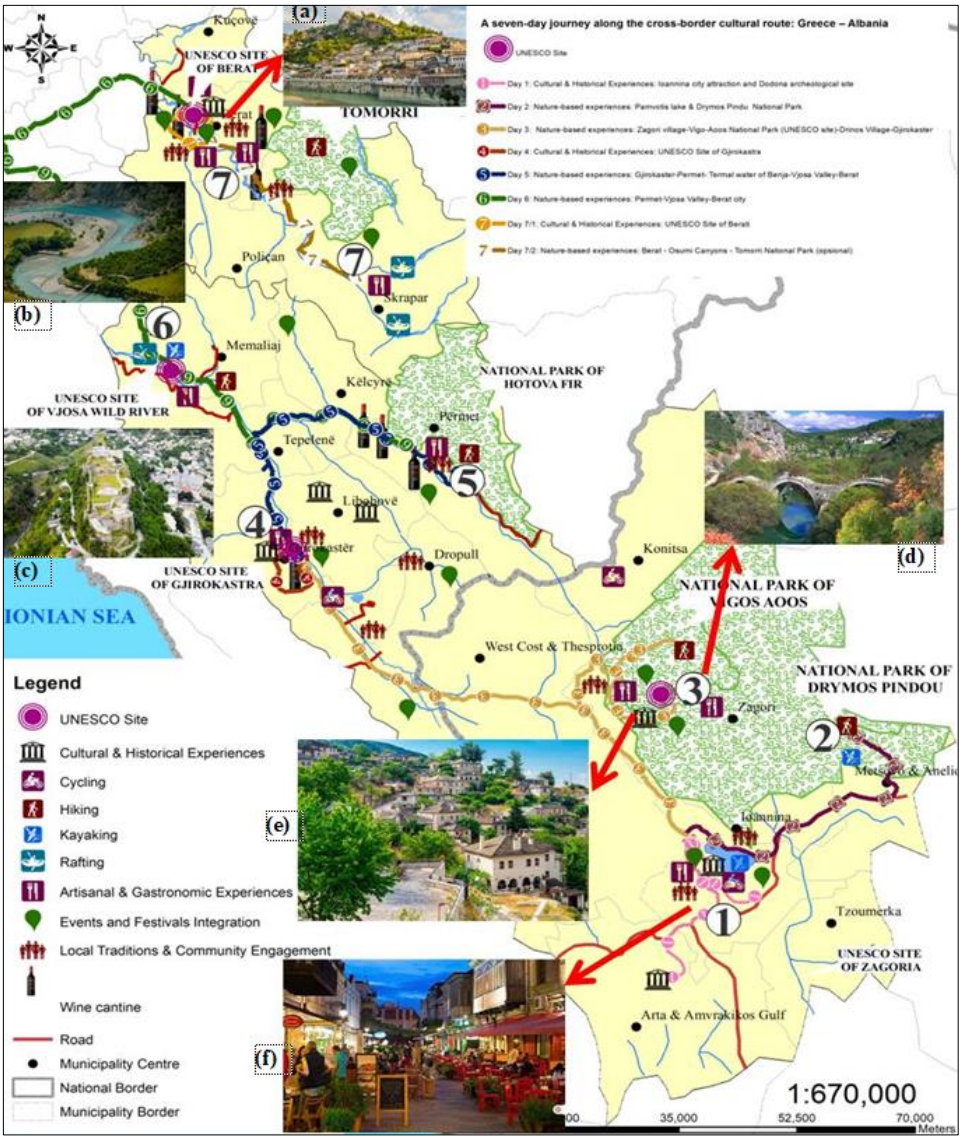


Figure 8. Heritage route and experience during the cross-border area: Ioannina-Gjirokaster-Berat (Source: Authors' processing based on Google Maps (2024), National Tourism Agency of Albania, Institute of Cultural Monuments, Greek National Tourism Organization, and local municipality promotional brochures (Berat, Gjirokastër, Ioannina, Zagori) Note: The photographs presented in the visual include: a) UNESCO Site of Berat – Mangalem Quarter, Berati Castle and Onufri Museum; b) UNESCO Site of the Vjosa Wild River – Europe's last wild river; c) UNESCO Site of Gjirokastër – Castle of Gjirokastra, Traditional Bazaar and Stone Architecture; d) Konitsa Bridge – Historic stone arch bridge over the Aoos River; e) UNESCO Site of AOOS National Park– Zagori village; f) Old Town of Ioannina – Traditional pedestrian street with tavernas

DISCUSSION

Personalized experiences and travel has become a global trend today. Tourists are increasingly looking for new experiences in their travels. Tourist flows in Albania and Greece have increased significantly, during 2023 Albania hosted 10.1 million foreign visitors, while Greece more than 36 million tourists.

This growing interest represents an important opportunity for cooperation between the two countries to design sustainable tourism development strategies. The study highlights some of the main benefits that come from the strengthening and development of experiential tourism in the Greece-Albania cross-border region:

1. *Social and economic impact:* 77.9% of respondents stated that experiential tourism offers a very good opportunity for the economic development of the region, which is related to the creation of new jobs not only in the promoted historical areas, but also in rural areas, where tourists find local authenticity in both gastronomy and local cultures. Traditional artisans in Ioannina, Gjirokastra and Berat report increased demand for their products, thus strengthening local economies.

2. *Preservation of cultural heritage:* The fact that the region has a series of World Heritage Sites represents a special cultural value at an international level, which contributes to the awareness of tourists and the local community for its preservation not only by institutions but also by the community. The study found that 48.1% of respondents see this form of tourism as an effective tool for preserving and promoting cultural heritage, while 49% emphasize its role in supporting local traditions. These results show how the development of experiential tourism affects not only the economic impact, but also the preservation of local heritage and the strengthening of community identity.

3. *Potential for the development of ecotourism:* Part of experiential tourism is also the enjoyment of experiences in nature. The natural landscapes of the region offer opportunities for various outdoor activities such as hiking, rafting and nature-based

tourism, as an integral part of the authentic experience. This form of tourism encourages appreciation by both tourists and local communities for biodiversity, bringing awareness to environmental protection. Although the region has a series of benefits from the development of this tourism model, there are a series of obstacles that hinder its development such as:

1. *Limited institutional support*: In the potential assessment matrix, institutional support was assessed with 4-5 points out of 20. This assessment shows weak governmental and institutional commitment in the function of the development of this tourism model.

2. *Infrastructure deficiencies*: 33.7% of respondents stated that infrastructural difficulties on the road as well as the lack of integrated transport networks, limit the access of tourists to the entire area.

3. *Fragmented marketing strategies*: The promotion of the region as a common tourist destination is very low. About 49% of respondents in the study stated that there is a lack of effective promotional efforts, limiting the visibility of the region in regional and global tourism markets.

An important element that emerges from the study is the role played by the local community in providing authentic experiences. Handicrafts, the establishment of agrotourism businesses, local tourist guides have created a more authentic and attractive offer for tourists. An important element that emerges from the study is the role played by the local community in providing authentic experiences. Handicrafts, the establishment of agrotourism businesses, local tourist guides have created a more authentic and attractive offer for tourists. Recent research also shows that generational differences significantly influence travel motivations and preferences in domestic tourism, suggesting that experiential tourism offers should be tailored to meet the needs of different age groups (Varadzhakova & Naydenov, 2024). This aspect is in line with the literature on experiential tourism, where local empowerment is seen as essential for long-term sustainability (Raymundo et al., 2024). International practices, such as the "Camino de Santiago" route in Spain or the "Via Dinarica" in the Balkans, show that cross-border itineraries can create sustainable economic and cultural networks, if supported by strong co-management mechanisms.

In this context, the "Ioannina–Gjirokastër–Berat" route represents a promising pilot model for cross-border cooperation in the region, combining tangible and intangible heritage, gastronomy, nature and authentic experiences. The introduction of tourism innovation represents an untapped opportunity. Virtual storytelling, interactive maps and mobile applications can complement the missing physical infrastructure and increase tourist engagement. Experience from other destinations confirms that technology can improve promotion, information dissemination and tourism flow management (UNWTO, 2025; WTTC, 2024). Another important challenge is the lack of functional mechanisms for cross-border cooperation. Currently, cooperation is informal, fragmented and dependent on temporary projects. The creation of a joint inter-institutional "task force" would help overcome these obstacles and create a sustainable platform for joint management and promotion of destinations. Similar challenges and solutions have been observed in other European border regions. For example, in the Lower-Tisa Valley, coordinated cross-border tourism strategies have been explored as a way to strengthen regional identity and economic cooperation between neighboring countries (Tóth et al., 2020). The low performance of institutional and cross-border coordination reflects the structural fragmentation still present in the Balkans. This is the result of unstable policy harmonisation, weak inter-institutional communication, cooperative agreements between countries and weak involvement of the local community in decision-making issues. Additional efforts should also be directed towards ensuring that tourism is integrated into the regional context as a whole, their involvement in small and medium-sized businesses, rural towns and artisans.

CONCLUSIONS

The Albania-Greece cross-border region has significant potential for the development of experiential tourism, as a sustainable form that stimulates employment, increases rural community income and helps preserve cultural heritage. The engagement of local communities in the creation and provision of authentic experiences promotes the strengthening of local identity and strengthens cross-border cooperation. Maximizing this potential requires investments in road infrastructure, harmonization of policies and legal frameworks between the two countries, as well as effective and sustainable management of the destination. Integrated marketing and digital promotion are essential for increasing regional competitiveness. The use of technological innovations in virtual tourist guides or promotion through mobile applications can expand the visibility of the region in the eyes of tourists looking for authentic experiences in the Balkans. Also, the diversification of the offer through rural tourism, ecotourism and traditional gastronomy will attract different target groups of tourists. For this, it is necessary to design long-term marketing strategies, taking into account the aspects of the social, economic and cultural development of the region. This is in line with similar cases of the development of this form of tourism in other countries as well as with the literature used, where the emphasis is placed on the need for the involvement of the local community in the design of sustainable tourism development strategies.

The proposed model for the creation of the "Heritage route and experience during the cross-border area: Ioannina-Gjirokaster-Berat"presents a comprehensive approach that combines history, nature and culture, and can serve as a model applicable to other cross-border regions with a common heritage. The involvement and empowerment of the local community is a key element for the long-term success of the development of experiential tourism.

Training and financial support for the local community involved in providing authentic experiences for tourists (artisans, traditional cooks, tourist guides, establishment of agrotourism, etc.) will ensure quality service as well as inclusive and equitable development. Priority should also be given to environmental sustainability, through careful destination management and funds for the preservation of both natural and cultural heritage. Further studies are needed to explore the long-term social, economic and cultural impacts of tourism in this region, as well as the use of innovative tools to overcome gaps in infrastructure and promotion. This study is subject to some limitations. First, primary data were collected from a relatively small sample size in specific locations (Berat, Gjirokastër and Ioannina), which may limit the generalizability

of the findings to other cross-border regions. Second, although a mixed methods approach was used, the qualitative data were limited to short-term engagement and may not capture longer-term trends or deeper community dynamics.

Finally, the analysis relied on self-reported data, which may introduce biases in terms of truth. Future studies should broaden the geographic scope, increase the sample size, and include longitudinal studies to validate and enrich these findings. With these measures, the region has the potential to become a leading experiential tourism destination in the Balkans, offering authentic experiences while ensuring economic and social benefits for local communities.

Author Contributions: Conceptualization: F.P and B.A; Methodology: F.P and B.A; Investigation: F.P, B.A and E.M; Data Collection: F.P, B.A and E.M; Data Analysis: F.P and B.A; Writing – Original Draft: F.P; Writing – Review and Editing: F.P, B.A and E.M; Visualization and maps: F.P; Resources: B.A; Supervision: F.P; Funding Acquisition: F.P, B.A and E.M (self-funded). All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: We sincerely thank the local communities of **Berat, Gjirokastër and Ioannina** for their participation in interviews and surveys, as well as tourism operators, artisans, and businesses for their valuable insights. Your contributions were essential to this study and to advancing sustainable experiential tourism in the **Albania-Greece cross-border region.**

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 18.03.2025 Revised: 01.07.2025 Accepted: 31.07.2025 Available online: 22.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1668-1675
DOI 10.30892/gtg.61325-1535

INVESTMENT DEPENDENCE OF TOURISM INDUSTRY AND DIFFERENCES IN ECONOMIC GROWTH IN THE REPUBLIC OF AZERBAIJAN

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Citation: Imrani, Z., Zeynalova, K., & Babakhanov, A. (2025). Investment dependence of tourism industry and differences in economic growth in the Republic of Azerbaijan. *Geojournal of Tourism and Geosites*, 61(3), 1668–1675. https://doi.org/10.30892/gtg.61325-1535

Abstract: In addition to being a promising sector of the economy, tourism stimulates the activity of socially oriented services. Tourism involves not only the creation and management of natural and recreational zones, the purposeful use of anthropogenic tourism resources, and the preparation and promotion of tourism products, but also the organization of integrated tourism services of the tourism industry. It is from this point of view that the tourism industry is considered one of the leading branches of tourism. The need for the development of the tourism industry is explained by the fact that this sector causes the inflow of foreign exchange to the country, increases employment, regulates the financial balance, leads to the diversification of the economy, and contributes to the improvement of household incomes. In short, the tourism industry has a positive impact on the socio-economic development of the state and forms the image of the country. The main objective of the research work is to determine the investment dependence of the tourism industry and to study the factors that support regional economic growth through comparative analysis. In this context, it involves the interpretation of data related to interregional economic differences and ways to eliminate them by applying functional dependence. Several methods have been employed to achieve the stated objectives during the research process. These include mathematical and statistical calculations, a systematic-structural approach, comparative historical-geographical analysis, as well as the preparation of anamorphic maps with the assistance of GIS. The dynamic growth of the tourism industry is caused by investments allocated to it. Investments affect the creation of new jobs, the expansion of regional capital flows and other economic and social sectors. At the same time, investment in the tourism industry in this area leads to an increase in production and economic activity. The income obtained is transferred to other sectors of the economy and stimulates regional investment activity. Along with the above-mentioned positive developments, the territorial differences in the tourism industry in the Republic of Azerbaijan have become more pronounced in recent years. The analyses conducted in this direction are illustrated in various diagrams and anamorphic maps in the presented article.

Keywords: tourism, tourism industry, economy, investments, cartograms, economic-geographical analysis, sustainable development, socio-economic development

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INTRODUCTION

The tourism industry not only stimulates the dialogue process between civilizations but also acts as an intermediary in addressing significant issues such as poverty and unemployment. In our modern era, the tourism industry is developed within the framework of a market economy, and its dynamism is approached from a new perspective through investment. However, it should not be forgotten that while attracting investments is essential, the optimal distribution of these investments is equally important. In this regard, improving the investment environment in the tourism industry, ensuring the optimal allocation of attracted funds, and facilitating their efficient use are scientifically significant.

The tourism industry is a system of facilities designed to meet the demand for tourist services: production, accommodation, food, transport, trade, entertainment, etc. The tourism industry is of particular importance for coordinating the activities of tour operators and travel agencies, developing standards for accommodation facilities serving tourists, and ensuring the quality of food. Despite this, there are no uniform international standards for countries around the world, each country operates within its own national standards **(**Akentyeva et al., 2014). The tourism industry is recognized as a set of entities included in the tourism register and providing tourism services (including promotional activities) in the Law of the Republic of Azerbaijan "On Tourism". Chapter 3 of the Law refers to the regulation of the tourism industry as: expanding the activities of tour operators and travel agents, improving the quality of service, determining the star categories of accommodation (hotels), training guides and other mechanisms (Law of the Republic of Azerbaijan on Tourism, 2021).

LITERATURE REVIEW

In recent years, certain scientific research studies have been conducted regarding the investment dependence of the tourism industry and regional economic growth. These include: the downturns observed in the tourism industry during global crises

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(e.g., COVID-19) and ways to mitigate them (Brilhane & Rocha, 2023), sustainable development of the tourism industry, as well as a systematic approach to tourism management in strategic planning (Gajdošík, 2023), the stimulation of financing for the tourism business, the preparation of circular economy guidelines aimed at increasing infrastructure investments and collaboration among stakeholders, and the experience of circular economy practices in the tourism industry within the context of developing destinations (Nassanbekova, 2024), the impact of tourism industry activities on the development of the night economy and the services that characterize it (Lei et al., 2023), collaboration in the tourism industry, the formation of tourism products and services, and the gathering of local stakeholders to promote and manage tourism (Šambronská et al., 2025), prospective development directions of the tourism industry reflecting socio-cultural traditions, support for sustainable environmental conservation efforts, and the evaluation of adaptation strategies in tourism (Ghosh et al., 2025), among others.

RESEARCH METHOD

Basis of Research

Official statistics from the State Statistical Committee of Azerbaijan, laws governing travel, and scholarly publications on the growth of the tourist sector serve as the foundation for the study (Akentyeva et al., 2014; Law of the Republic of Azerbaijan on Tourism, 2021). Investment flows and regional disparities were analyzed using a combination of mathematical-statistical, systematic-structural, and historical-geographical approaches.

The classification of regions according to tourism indicators was aided by logical grouping approaches. Geographic Information Systems (GIS) were utilized to create cartograms that visualized territorial differences, and field observations supplemented the statistical research. The identification of critical elements influencing the sustainable growth of tourism throughout Azerbaijan was made possible by this all-encompassing approach. To achieve the aforementioned scientific-methodological approaches, the following stages have been utilized in the step diagram (Figure 1).

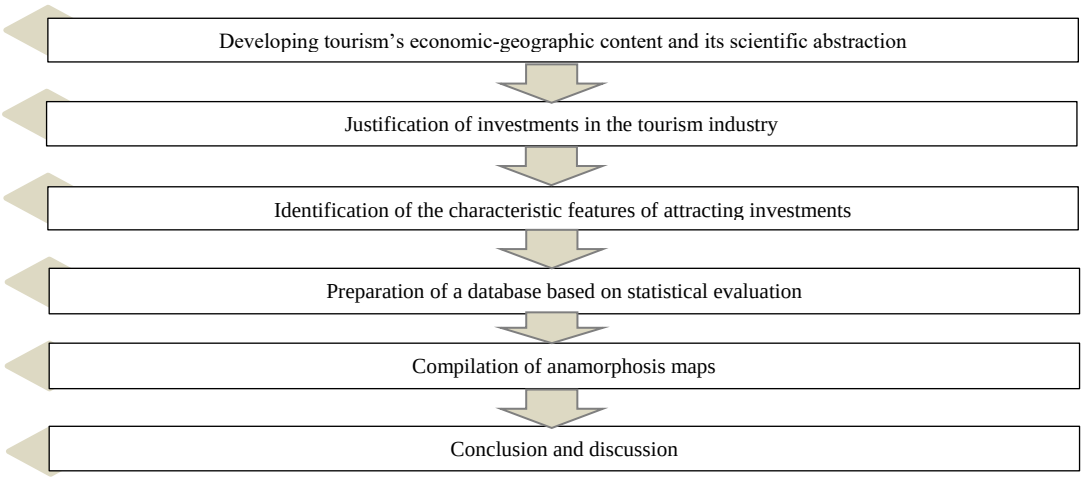


Figure 1. Step Diagram of the Methodology

Research Object

The object of research is the tourism industry of the Republic of Azerbaijan, which has been significantly developed in recent years, but also faces certain problems.

RESULTS

The tourism industry has an appropriate resource base. The tourism industry carries out the production and sale of tourism-related services, serves the effective organization of tourists' leisure time, travel, comfort of rest, strengthening of health and the creation of other tourism products (Imrani et al., 2021). The tourism industry is currently perceived as a complex of specialized interdisciplinary economy. The main task of the tourism industry is to meet the consumer needs of tourists. These needs are in the form of a multi-faceted chain, playing the role of an intermediary structure between "individual tourist service - tour operator - tour agent - tourist". A tour operator plays a special role in the tourism industry, acquiring a tourist product, preparing a service package and selling it (Alirzayev et al., 2011). The tour operator has a powerful mechanism for influencing the tourism market, because the tour operator not only sells various tourism services, but also offers a package of services from its own tourism enterprise (Zinchenko et al., 2019). The tour operator enables tourists to use travel routes, programs, and complex services in one package by standardizing them. This leads to the emergence of mass tourism, which reduces costs and, as a result, increases the number of companies offering competitive offers in the tourism market (Imrani et al., 2021). The main task of the tour operator in the process of organizing a trip is to provide the tourist with transportation, accommodation, food, catering, cultural-educational, and entertainment tours, and to establish contact with the travel agent. A travel agent acts as an intermediary between a tour operator and a tourist client, selling tours offered by the tour operator and providing certain services. A travel agent promotes tourism products on the basis of a contract concluded with a tour operator (Aghakerimov, 2008). A travel agent who provides tourism services operates on the basis of prices previously set by the manufacturer. A travel agent can make certain additions to the manufacturer's sales package for different services (Akhmetova, 2013). The tourism services provided by a travel agent include the following:

– booking a tourism product created by a tour operator;
– promotion and implementation of a tourism product formed by a tour operator;
– organization of individual tourist services, including excursions;
– purchasing tickets for travel, entertainment, sports, recreation and other activities; other services.

The role of travel agents and tour operators is extremely important in terms of tourism promotion and development. With their help, tourists are attracted to the country, participate in tourism turnover and form tourism market segments. Although travel agents and tour operators are considered a less risky sector of the tourism industry, during the COVID-19 pandemic we saw the opposite. According to the United Nations World Tourism Organization (UNWTO) the sector of the economy that was most negatively affected during the COVID-19 pandemic was the tourism industry. In March-December 2020, the number of international tourist trips decreased by 84% compared to the previous year. In 2021, economic losses were between $ 1.7-2.4 trillion, which had a negative impact on the global tourism market (COVID-19 and tourism an update, 2021). The tourism industry has been severely impacted, international tourism has been completely halted, and many sectors related to the tourism industry have experienced a period of decline due to the COVID-19 pandemic (Chang et al., 2021). Such a negative trend related to the COVID-19 pandemic has also manifested itself in Azerbaijan in 2020 and 2021. The number of travel agents and tour operators, as well as the number of employees in them, has sharply decreased in Azerbaijan. Compared to 2019, the number of travel agents and tour operators in 2020 decreased by 132 units, and compared to 2019-2021, it decreased by 282 units, and their number was 150. Of these enterprises, 2 are state-owned and 148 are private enterprises (Budagov, 2022). Accordingly, a decrease in the number of employees in travel agents and tour operators was also recorded. In 2019-2020, 741 employees lost their jobs, and in 2019-2021, 1243 employees lost their jobs (Figure 2).

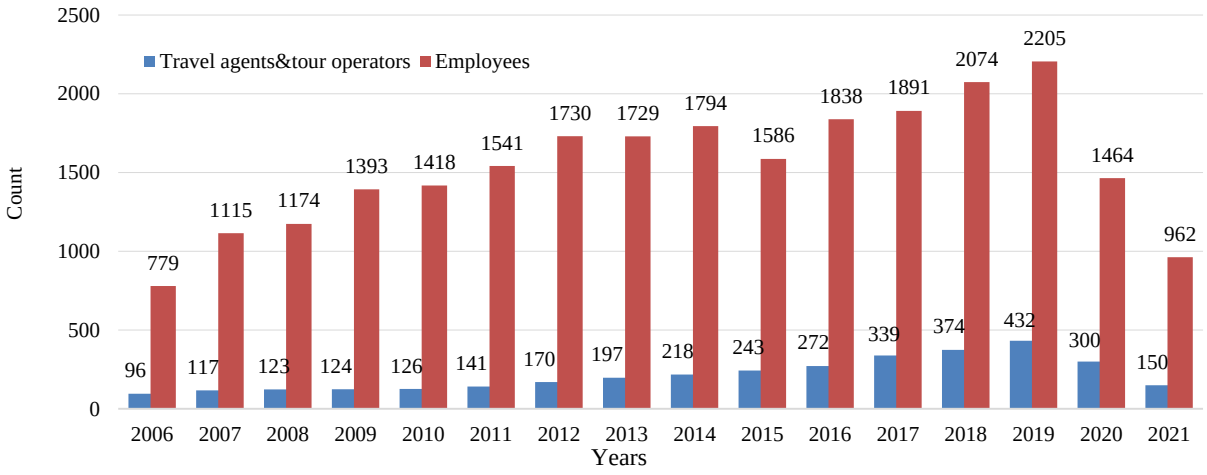


Figure 2. Number of travel agents and tour operators in Azerbaijan (units), number of employees in them (people) (Source: Tourism in Azerbaijan - Baku, 2022)

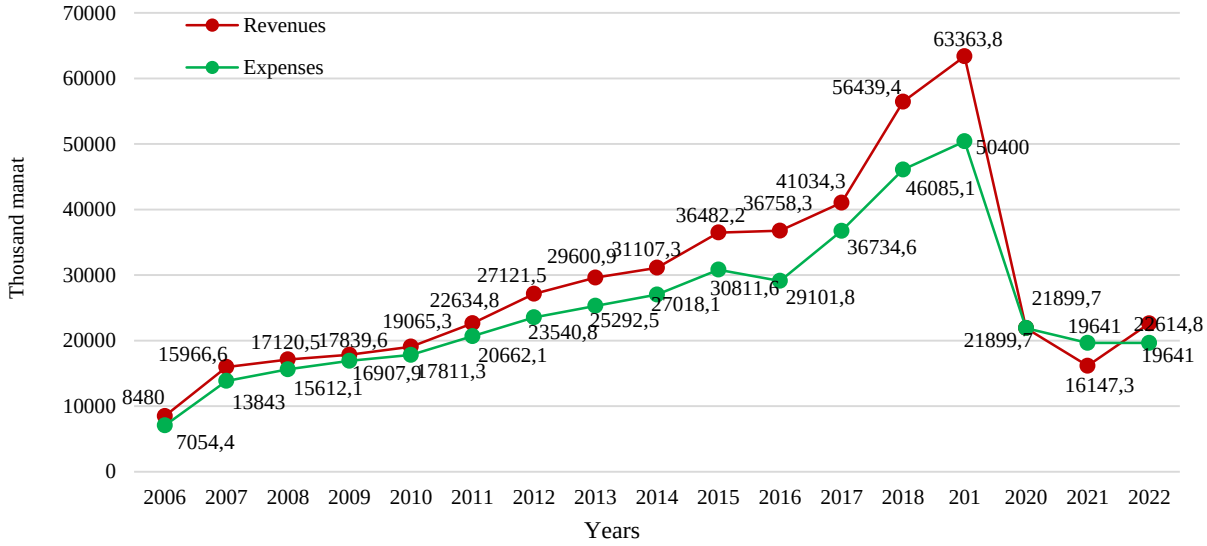


Figure 3. Income and expenses of a travel agent and tour operator in Azerbaijan, thousand manats (Source: Tourism in Azerbaijan - Baku, 2022)

This is a very serious indicator and is among the factors slowing down the development trend in the tourism industry. Since such a development takes the country back 10 years, appropriate steps should be taken to solve it. When analyzing the activities of travel agents and tour operators, one of the main indicators is measured by their income and the costs they incur

in producing the product. Based on mathematical and statistical analysis, we can say that during 2006-2019, the income of travel agents and tour operators was always high, and the costs they incurred for the services they provided to tourists were on an increasing trend, except for 2016. 2019 was also the peak year in terms of income (63.3 million manats) and expenses (50.4 million manats). In the following years, however, there was a sharp decrease due to the COVID-19 pandemic, and already in 2021, income amounted to 22.6 million manats, and expenses amounted to 19.6 million manats (Figure 3).

The main part of the income is obtained from tourists using the services of travel agents and tour operators, while 40.6% of the expenses are allocated to the payment of salaries, 16.6% to the provision of accommodation, transportation, food, excursions, visas and other similar services, 5.4% to the payment of budget revenues, 0.6% to promotion and advertising and other services (Budagov, 2022). The majority of tourists coming to Azerbaijan through travel agents and tour operators are citizens of the United Arab Emirates, Russia, Israel, China, Turkey and other countries. Azerbaijani citizens traveling abroad mainly prefer countries such as Turkey, Russia, Kazakhstan, Georgia and the United Arab Emirates. Tour operators constantly interact with hotels when forming a tourism product and offer hotel services to tourists. When we say modern hotel business, we mean a set of services aimed at satisfying the needs, demands and desires of tourists. Improving the quality of service in hotels also requires the introduction of new types of services that are not typical of the hospitality business. Because hotels are constantly striving to increase their competitiveness in the dynamically developing tourism market. Hotels that build their strategy in this direction successfully integrate into the demanding tourism market by focusing on quality and tourist satisfaction.

Hotels, in turn, determine the development trend of the tourism market. These include: changing needs of tourists (customers), health protection (spa, organic food, etc.), staying in nature, increasing demand for natural and anthropogenic tourism objects, participation in events (sports, cultural, religious, etc.) and other motivations (Batinic, 2016). The activity of hotels is not limited to the offer of products and services. Hospitality experience shows that the quality of service often depends more on material resources. Since this can be easily imitated by competitors, it is necessary to offer a hospitality service focused on superior quality (Chan et al., 2013). Only in this case can hotels operate effectively and take their rightful place in the tourism market. If we conduct a statistical-comparative analysis of 2010-2021, we will see that the dynamics of growth is noticeable in the number of hotels and rooms, as well as in the capacity of hotels. The increase in the number of hotels was 1.4 times, in the number of rooms 1.8 times, and in the one-time capacity of places 1.7 times. However, these indicators are different for economic regions. However, during 2010-2015-2021, along with growth, decreases were observed. The highest growth across all areas we studied occurred in the Baku economic region. The number of hotels in the Baku economic region increased by 2.1 times, the number of rooms and single occupancy by 2.2 times. Currently, 34.1% of hotels, 47.1% of rooms, and 41.3% of single occupancy fall to the Baku economic region (Table 1).

Table 1. Main indicators of hotels by economic regions of Azerbaijan (Source: Regions of Azerbaijan. Baku: 2016, 2021)

Economic regions	Number of hotels, units			Number of rooms, units			One-time capacity, beds		
	2010	2015	2021	2010	2015	2021	2010	2015	2021
Baku	114	125	243	5471	7656	11985	10040	12779	21885
Nakhchivan	22	21	21	654	623	657	1502	1448	1517
Absheron-Khizi	22	22	27	561	570	610	1305	1351	1087
Mountainous Shirvan	44	45	48	553	667	967	1255	1571	2234
Ganja-Dashkasan	14	20	27	676	1102	1397	1245	2277	2814
Karabakh	3	4	11	120	96	278	198	206	599
Gazakh-Tovuz	21	21	23	294	351	500	605	729	1068
Guba-Khachmaz	102	110	108	2921	3794	4377	7905	9691	11032
Lankaran-Astara	68	68	82	1095	1131	1554	2678	2751	3859
Central Aran	20	26	27	523	543	658	1262	1264	1426
Mil-Mugan	10	9	12	93	99	156	172	184	295
Sheki-Zagatala	50	54	73	970	1072	2067	2180	2583	4794
Eastern Zangezur	-	-	-	-	-	-	-	-	-
Shirvan-Salyan	9	11	10	227	249	239	446	444	439
Total:	499	536	712	14158	17953	25445	30793	37278	53049

In addition to providing high-level services to tourists, hotels are also obliged to meet their economic and cultural needs. Because high service culture and quality enhance the image of the hotel, make them more attractive and stimulate their activities to some extent (Roglev, 2009). In recent years, a number of hotels that meet modern requirements have been built and started operating in Azerbaijan. Most of these hotels are the largest hotels that belong to world brands such as Holiday Inn, Marriott, Hilton, Hyatt, Radisson, Excelsior, and have a franchise function (operating under the brand name of a famous hotel). In addition, there are regional hotels such as Qafqaz Riverside, Gabala Garden, Tufandag Mountain Resort, Gabala Karvan, Macara Lake Park, Guba Palace, Sheki Palace, Marxal Resort and others.

The different levels of services provided by hotels have a great impact on the efficient organization of their work, as well as their economic performance (Soltanova et al., 2005). Marketing, which conducts research on the hotel market, implements pricing policy, introduces advertising and new services to guests, and promotes corporate communication and information resources by conducting functional sales divisions (Aghakerimov, 2008). Although the trend between hotel revenues and expenses in Azerbaijan was positive in 2010-2019, due to the COVID-19 pandemic, revenues decreased sharply and expenses decreased relatively in 2020-2021. However, the balance ratio between revenues and

expenses during these years was -55,007.1 thousand manats in 2020 and -21,780.7 thousand manats in 2021, with expenses exceeding revenues (Zinchenko et al., 2019). Although revenues are mainly related to the sale of hotel rooms, the provision of public catering services, and the sale of medical and health packages, expenses are incurred on drinks and food for guests, fuel and energy consumed by them, employee salaries, tax payments, and hotel repairs (Imrani et al., 2023). In terms of income, we can say that the funds obtained from medical and health services, as a negative, are quite low. Although healthcare is not considered the most profitable sector of the tourism industry, it contributed only 2.5% of total tourism revenues in Azerbaijan in 2021. The main source of revenue was from room sales (59.7%) and public catering services (29.0%). Expenditures were related to wages (32.3%), beverages and food (13.9%), fuel and energy consumption (6.8%), tax payments (5.5%), repair work (1.4%), and other expenses (Figure 4 and Figure 5).

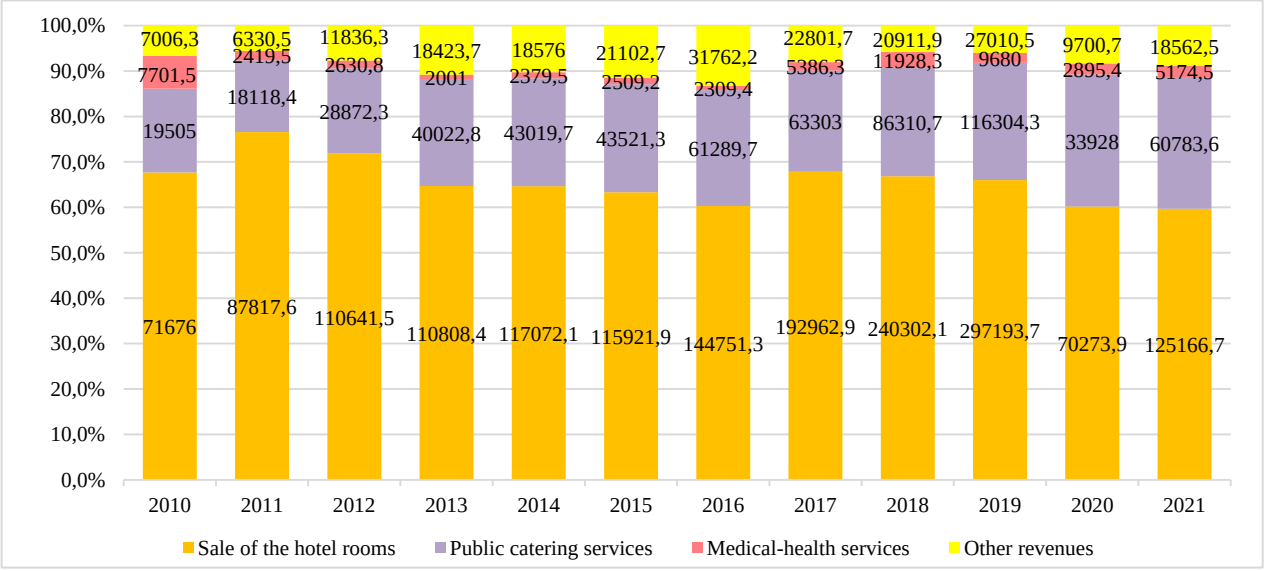


Figure 4. Hotel revenues in Azerbaijan (thousand manats) (Source: Tourism in Azerbaijan. Baku, 2022)

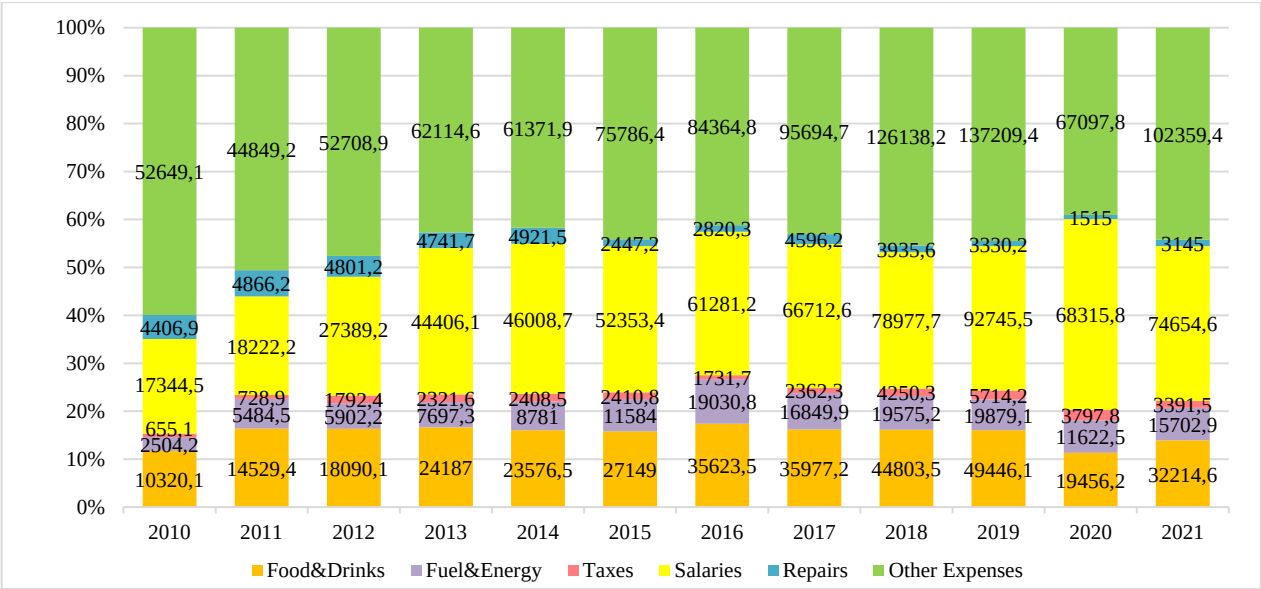
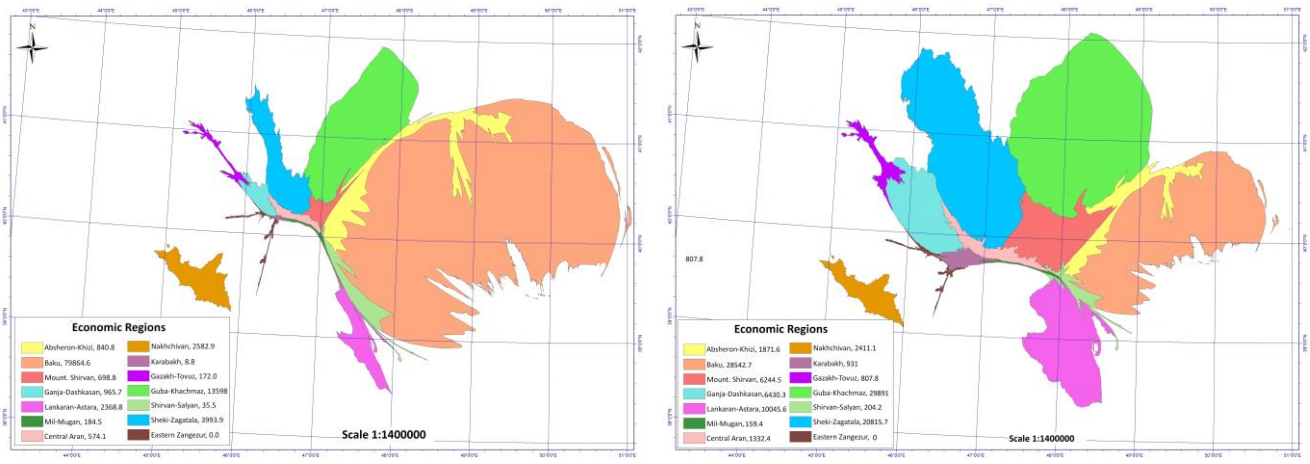


Figure 5. Hotel expenses in Azerbaijan (thousand manats) (Source: Tourism in Azerbaijan. Baku, 2022)

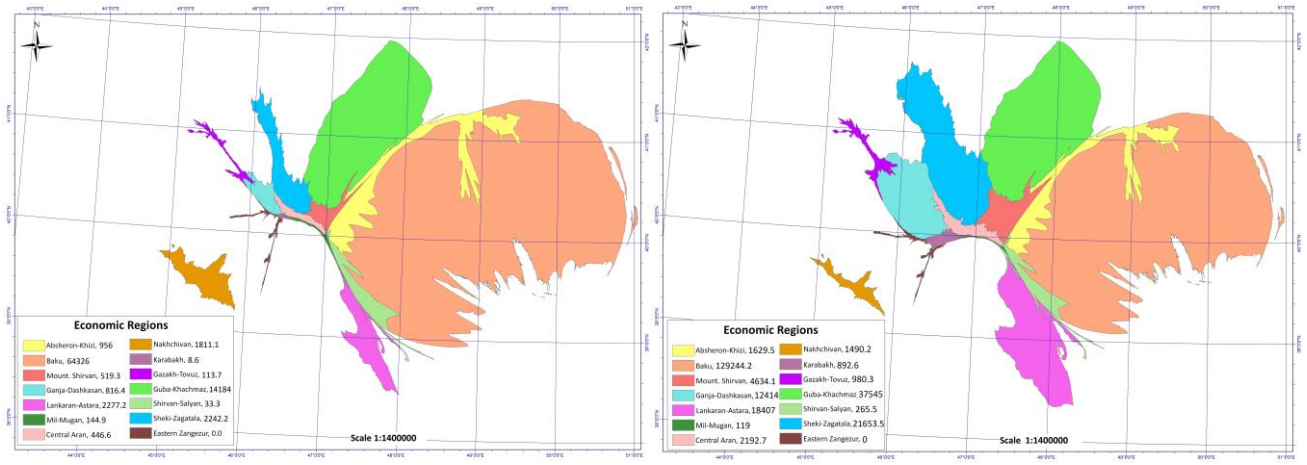
The analysis of the activity of the tourism industry is a complex process, requiring a common approach between economic indicators: income and expenses. Because the assessment of economic impacts on the tourism industry is accompanied not only by income, but also by expenses. The current state of the tourism industry in most regions of Azerbaijan reflects its weak development. In 2021, the main part of income, namely 61.3%, fell to Baku, 14.3% to Guba-Khachmaz, 9.9% to Sheki-Zagatala, 4.8% to Lankaran-Astara, and 55.8% of expenses fell to Baku, 16.2% to Guba-Khachmaz, 9.4% to Sheki-Zagatala, 7.9% to Lankaran-Astara, and 5.4% to Ganja-Dashkan economic regions (Budagov, 2022). Since other economic regions lag behind the development trend of the hotel industry, their statistical indicators between income and expenses are considered quite low. In this regard, in order to study the regional sustainable tourism industry more clearly, cartograms have been compiled and comparative analyses have been conducted with the aim of drawing a general logical conclusion between the income and expenses of hotels.

If we look at the regional analysis of hotel revenues in Azerbaijan, we will see that there are sharp differences between 2010 and 2021. Thus, in 2010, 75.4% of hotel revenues were generated in the Baku economic region alone. The Guba-Khachmaz economic region provided 12.8% of total revenues, Sheki-Zagatala 3.7%, Nakhchivan 2.4%, and Lankaran-Astara 2.2%. Other economic regions attracted attention with their rather weak development. However, in 2021, these indicators have relatively stabilized, with the exception of Nakhchivan and Mil-Mugan, and each economic region has experienced significant development (Figure 6). In 2010, the main part of the expenditures, as well as revenues, fell to the share of Baku economic regions (73.2%), Guba-Khachmaz (16.1%), Lankaran-Astara (2.6%), Sheki-Zagatala (2.5%), and Nakhchivan (2.1%). This is 96.5% of total expenditures. In 2021, expenditures were almost equal in accordance with regional development, with the exception of East Zangezur, Mil-Mugan, and Shirvan-Salyan (Figure 7).



a) Cartogram, 2010 b) Cartogram, 2021

Figure 6. Hotel revenues in Azerbaijan, cartograms (years 2010 and 2021) (Source: Tourism in Azerbaijan. Baku, 2022)



a) Cartogram, 2010 b) Cartogram, 2021

Figure 7. Hotel costs in Azerbaijan, cartograms (years 2010 and 2021) (Source: Tourism in Azerbaijan. Baku, 2022)

DISCUSSIONS

Investment in the tourism industry is mainly supported by the political course of the state. For this, the investment attractiveness of the regions is carried out taking into account the availability of natural and anthropogenic resource potential, as well as the strategic opportunities for the development of the tourism industry. The investment strategy is developed after determining the place and role of the tourism industry in the structure of the economy (Sardak et al., 2019). The active investment policy in the tourism industry is influenced by the mechanisms of financial and economic regulation of tourist flows. Positive results regarding the number of tourists visiting the region and the funds they spend attract investors, and they allocate investments in the relevant areas of the tourism industry.

The main sources of investment in the tourism industry can be funds allocated from the state budget, long-term loans, etc., private capital of the private sector (profits at the disposal of the company, dividends, targeted bank deposits, shares, securities, etc.), loans (investment loans, bank loans, state loans, etc.), etc. (Malskaya et al., 2008). Financial support also helps to achieve maximum efficient use of the tourism industry's existing financial resources.

The volume of investments allocated to the tourism industry (including recreation and entertainment venues) in Azerbaijan in 2021 amounted to 242.4 million manats. If we compare this indicator with 2010, we can see that investment in the tourism industry decreased by 3.9 times, and by 9.1 times compared to 2014, which was considered the peak year (Figure 8). Although the tourism industry is considered the most profitable sector of the non-oil sector, investment in this sector is quite low compared to other sectors.

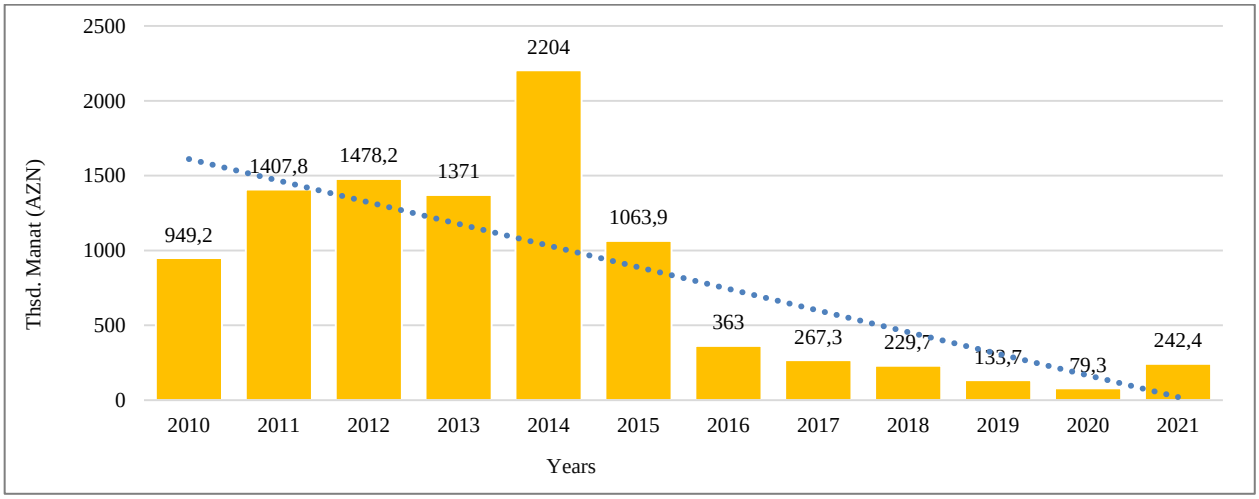


Figure 8. Investments in the tourism industry in Azerbaijan (million manats) (Source: Tourism in Azerbaijan. Baku, 2022)

This factor is slowing down the development of the tourism industry. Because although the development of the tourism industry is related to natural and anthropogenic resources, their sustainable development and involvement in the tourism cycle is directly related to the interest and funds invested by investors in this sector.

The Azerbaijani government should first improve its investment policy in this area in order to develop the tourism industry based on international experience. The State Tourism Agency of the Republic of Azerbaijan should work on the development of regional tourism through investment protection in the tourism industry. However, the agency is discussing tourism relations with countries such as gastronomic tourism in London, cultural tourism focused on Oriental studies, business tourism in Frankfurt, tourism photo exhibition in Tel Aviv, UNESCO and Iraq Road, Turkey, Japan, Israel, Russia, Hungary, Mexico, Pakistan, the United Arab Emirates, etc., and conducting propaganda work among residents of Khinalig, Basgal, etc. villages regarding domestic tourism. All these works do not affect the development of the tourism industry at the desired or expected level. In world practice, along with propaganda work in the regional structure of the tourism industry, investment is considered one of the important tasks.

The tourism industry is an important export sector on the balance of payments. Investments in this sector can bring in relatively high levels of foreign exchange (Huseynov, 2007). It is clear from this that the growth of investment is directly proportional to the development of the tourism industry (Talibov, 2015). Investment directly affects the development of the tourism industry, stimulating its sub-segments from an analytical and geographical perspective.

In general, we can say that investments lead to the realization of tourism potential, increased efficiency, increased income and dynamism in this area (Imrani et al., 2024). However, as we have noted, currently the tourism industry in Azerbaijan cannot meet the requirements of a sustainable regional economy. Its specific features, the characteristics of the economic and geographical development strategy of the theoretical and practical approach require the identification of development trends through modernization and improvement.

CONCLUSIONS

One of the factors stimulating the development of the tourism industry is the development of new and promising areas. Although a number of achievements have been made in this area in recent years, it has not been possible to bring the overall development to world standards. This has been influenced by a number of socio-economic segments. Because the services offered do not always meet the demands of tourists.

As a result of our research, it was determined that although the tourism industry in the Republic of Azerbaijan is one of the profitable sectors, its development is proceeding at a slow pace. Thus, there is a serious difference between income and expenses, which are considered the main economic indicators of the tourism industry. In 2021, the balance between income and expenses of tour agents and tour operators in the tourism industry was 3.0 million manats, and in hotels - 21.7 million manats. During the years studied (2005-2021), the development trend of the tourism industry decreased by 2.5 times. From a regional perspective, when we look at the number of foreign tourists visiting the country and the places where they stayed overnight, we see that only Baku has been developed as a tourism center.

However, the concept of sustainable tourism evaluates this indicator as a negative. Because for overall development, the tourism industry must be fully developed on a regional scale.

Author Contributions: Conceptualization, Z.I.; methodology, Z.I. and K.Z.; software, Z.I. and A.B.; formal analysis, Z.I. and K.Z. and A.B.; investigation, K.Z. and A.B.; data curation, A.B.; writing - original draft preparation Z.I. and K.Z. and A.B.; writing - review and editing, Z.I. and A.B.; visualization Z.I. and A.B.; supervision, Z.I.; project administration, Z.I.; All authors have read and agreed to the published version of the manuscript.

Funding: No funding was received from any financial organization to conduct this research.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 26.03.2025 Revised: 01.07.2025 Accepted: 31.07.2025 Available online: 22.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1676-1682
DOI 10.30892/gtg.61326-1536

TERRITORIAL IMPACTS OF EUROPEAN UNION DEVELOPMENT FUNDS IN THE NORTHERN HUNGARY REGION

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Citation: Bujdosó, Z. (2025). Territorial impacts of european union development funds in the northern Hungary region. *Geojournal of Tourism and Geosites*, 61(3), 1676–1682. https://doi.org/10.30892/gtg.61326-1536

Abstract: The aim of the paper is to determine – in general and through a selected target area – what measurable territorial effects regional development grants, as development policy intervention tools, have. After reviewing the literature I examined the theoretical connections of the European Union's regional policy related to territorial and tourism development. Complex Tourism Impact Index was also used to examine the complex environmental, social and economic impacts of tourism. I conducted an examination of the tourism competitiveness factors (i.e. tourism embeddedness, tourism development, tourism efficiency and capacity utilization) and updated the methodology used to delimit core tourist areas in a previous study (Gyurkó & Bujdosó, 2017). In Hungary, tourism plays a key role in regional development, especially in underdeveloped regions with significant tourism potential. A relationship can be demonstrated between the amount of European Union funding spent on tourism development and the growth rate of the tourism sector's performance. European Union tourism grants have a measurable impact on tourism. According to the used factors, core touristic areas can be signed in the research area. Based TPI, Northern Hungary region can be considered a moderately low saturated destination, however, there are significant regional differences within the region. With my theoretical results, I drew attention to the multifaceted system of connections between tourism and regional development. I presented the cohesion objectives of the European Union's regional policy and their concrete manifestation through a convergence region in Hungary. With the help of my empirical results, I presented the different territorial impacts of the European Union's tourism development funds, as well as the impact of the funds on sectoral and competitiveness factors.

Keywords: development funds, European Union, tourism development, Northern Hungary

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INTRODUCTION

The reduction of territorial disparities resulting from the uneven spatial distribution of development factors has long been a concern not only for decision-makers but also for researchers interested in the topic. By the end of the 20th century, researchers dealing with spatial phenomena began to pay increasing attention to exploring the relationships between direct and indirect development support and the economic, social and environmental responses they triggered.

The role of tourism in regional development has also become a focus of interest. The relationship between tourism and regional development, and the role of this sector in development policies, is multifaceted, and therefore, the opinions of professionals about the relationship between the two sectors are divided, mainly due to differences in conceptual perception (Seidualin et al., 2025). If we view regional development only as a means to reduce regional differences, we cannot deal with a regional development approach that is differentiated based on tourism attractiveness (Kraftné, 2000). However, if we start from the cross-sectoral nature of tourism and also keep in mind the related environmental, nature conservation, cultural and economic efficiency requirements, its regional development function cannot be questioned (Aubert et al., 2000).

According to Vukonic (2012), the debate on tourism as a factor in regional development has been going on for a long time and can be traced back to the early 1950s in tourism research. At the heart of the debate is the concept of the core-periphery dichotomy, i.e. whether tourism actually drives economic growth in peripheral areas and whether tourism is a means to dismantle existing spatial structures (Müller & Jansson, 2007; Hall, 2013).

During my research work, the choice of the sector was justified by several factors. On the one hand, there has long been an interest in measuring the impact and capacity of tourism, but so far there have been relatively few actual results in this area. There is broad agreement in the literature that tourism plays a key role in the development and competitiveness of many regions (Keller, 1987; Pearce, 1988; Oppermann, 1992; Giaoutzi et al., 2006; Müller et al., 2007; Lazzeretti et al., 2008; Dávid & Szűcs, 2009; Alberti et al., 2012; Huijbens et al., 2014; Huang & Chen, 2016; Hojcska & Szabó, 2021; Matlovicova, 2024, Matlovic & Matlovicova, 2025). Due to its positive socio-economic impact, the sector is strongly linked to regional development and social progress in general, especially in economically underdeveloped regions and countries (Pak, 1996; Nurkovic, 2009; Castanho et al., 2021). On the other hand, in recent times due to the growing importance of

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tourism (according to the WTTC, the contribution of tourism to GDP globally ranged between 10-11% in 2024, and in our country, according to the data of the Central Statistical Office, it exceeded 10%), it has played an increasingly important role in both economic, social and political life. Thirdly, one of the main goals of the European Union's cohesion policy is to promote catching up and support lagging regions (Tóth et al., 2020). Tourism, as an indirect tool of regional development, contributes significantly - especially in the area forming the geographical framework of the study - to the achievement of this goal (Kelfaoui & Rezzaz, 2021; Yasir et al., 2021; Gyurkó, 2025). The fundamental aim of the is to determine – in general and through a selected target area – what measurable territorial effects regional development grants, as development policy intervention tools, have. To achieve this objective, I examined the spatial effects of tourism developments implemented with European Union grants, and my aim was to explore the possible multifaceted relationship between grants and territorial development. In connection with the research, I formulated the following objectives:

To analyze a) the tourism processes of the Northern Hungary region since its accession to the European Union, b) the territorial characteristics of tourism in the Northern Hungary region and c) the territorial distribution of tourism development grants awarded in the European Union development periods (2004-2006, 2007-2013, 2014-2020).

To reveal, to identify the territorial impacts of tourism development grants awarded from European Union funds.

Look for connections between tourism grants awarded from European Union funds and changes in tourism indicators in the Northern Hungary region. Since the paper aims to answer scientific questions, my goal was not to conduct development policy and project or program effectiveness analyses. Therefore, I did not examine the sectoral efficiency of programs and priorities, the resource absorption issues related to obtaining grants, the regional and sectoral distribution of applicants and their connections and the implementation of the principles of cohesion policy.

MATERIALS AND METHODS

During my research work, I paid great attention to reviewing the domestic and international literature on the topic, which appears in my paper in two basic ways. On the one hand, – in order to provide a theoretical foundation for the topic – I reviewed the topics of territorial development, territorial processes and territorial development, primarily the definitions used in settlement geography. On the other hand, I examined the theoretical connections of the European Union's regional policy related to territorial and tourism development in Hungary and within it, Northern Hungary, and I reviewed the international and domestic methodological knowledge used to measure the effects of grants.

The source of the data required for the research varies by study area and indicator. To meet the data needs of the research, I relied heavily on existing databases. The source data comes directly from the supported project search application (https://archive.palyazat.gov.hu//tamogatott_projektkereso). The application uses data from the Unified Monitoring and Information System (EMIR), which contains data on all grants awarded. Another pillar of the research databases were parts available from the Public Database of the Central Statistical Office. In addition, the National Spatial Development and Planning Information System (TEIR), publicly available data from Eurostat, and the Statista database (statista.doc) available with institutional subscription were used.

The time interval of the study was 20 years after Hungary's accession to the European Union, i.e. the data from the period 2004-2023 were analyzed. Since this time period encompasses 3 completely closed European Union support cycles (2004-2006, 2007-2013, 2014-2020), and since, based on the study results presented in the literature, the effects of a supported investment take effect after 2-3 years, this time frame is suitable for achieving the research goals.

I used Microsoft Excel to process the collected statistical data. I used artificial intelligence exclusively for the interpretation of research methodology formulas. With the help of Microsoft Excel, I prepared a comparative analysis and calculated indices in order to explore all the factors that influence territorial effects and tourism competitiveness. In addition, I created a database integrated into a GIS system and then performed data analysis in it to perform the center of gravity analysis.

After reviewing and evaluating the research methodological background in detail, I defined the following research methods for analyzing the territorial impacts of funding sources:

In order to compare the changes in support amounts and guest nights, the focus of the evaluation was to explore the relationship between guest traffic and the resources obtained, using the methodology used by KPMG (2017). The territorial studies were conducted at the district and settlement levels.

I used the Complex Tourism Impact Index (Sütő, 2007) to examine the complex environmental, social and economic impacts of tourism in the Northern Hungary region. The territorial studies were conducted at district and settlement levels.

I conducted an examination of the tourism competitiveness factors of the Northern Hungary region, i.e. tourism embeddedness, tourism development, tourism efficiency and capacity utilization (Bujdosó et al., 2025).

I have updated the methodology used to delimit core tourist areas in a previous study (Gyurkó & Bujdosó, 2017). The following indicators and weights were defined for the research:

- Current attractions 20%
- Key tourism products 25%
- Turnover rate 30%
- Tourism networks and development activity 20%
- Local tourist tax 5%

RESULTS AND DISCUSSION

Based on the consequences obtained during my research, I formulated the following results. In Hungary, tourism plays a key role in regional development, especially in underdeveloped regions with significant tourism potential.

A relationship can be demonstrated between the amount of European Union funding spent on tourism development and the growth rate of the tourism sector's performance. Despite the fact that tourism development was not an independent operational program in the Hungarian national development plans, the sector was given a prominent role in the operational programs aimed at regional development. In Hungary, between 2004 and 2020, 25.58% of the European Union regional development funds served tourism development (Table 1). With the results of secondary research, I confirmed that in the Northern Hungary region, both the proportion of regional development funds targeting tourism development (30.07%) and the growth rate of indicators measuring the performance of the tourism sector (tourism embeddedness, tourism development, tourism efficiency, capacity utilization) were higher than the national average (Table 1).

Table 1. Share of tourism development resources from regional development support by region in Hungary, 2004-2020 (Source: own compilation, based on EMIR data)

Region	Total regional development support 2004-2020, HUF	Total tourism support 2004-2020, HUF	Proportion of total tourism and regional development resources, %
Southern Great Plain	357 241 862 443	77 202 858 193	21.61
Southern Transdanubia	336 562 680 029	81 983 752 669	24.36
Northern Great Plain	440 994 626 271	104 913 627 557	23.79
Northern Hungary	**419 364 117 413**	**126 106 888 939**	**30.07**
Central Transdanubia	312 498 245 464	107 734 006 184	34.48
Central Hungary	1,017,138,291,204	45 066 645 917	4.43
Western Transdanubia	223 543 316 071	90 122 763 334	40.32

Table 2. Average relative change in tourism competitiveness factors – based on a three-year moving average – in the regions of Hungary (2004–2023) (Source: Bujdosó et al, 2025)

Area	Tourism embeddedness	No.	Tourism development	No.	Tourism efficiency	No.	Capacity utilization	No.
Northern Hungary	**99.89%**	**4.**	**101.68%**	**1.**	**100.57%**	**2.**	**101.21%**	**1.**
Southern Great Plain	100.99%	2.	101.31%	2.	99.85%	4.	100.45%	2.
Central Transdanubia	99.72%	6.	100.79%	3.	100.63%	1.	100.44%	3.
Southern Transdanubia	99.82%	5.	99.42%	5.	99.85%	5.	99.75%	4.
Northern Great Plain	99.56%	7.	99.39%	6.	100.27%	3.	99.58%	5.
Western Transdanubia	100.06%	3.	98.92%	7.	99.44%	6.	99.41%	6.
Pest	102.67%	1.	100.49%	4.	98.98%	7.	98.88%	7.

The Northern Hungary region (Table 2) can be considered an optimal study area for verifying the aspirations and objectives related to the regional policy of the European Union, as well as the territorial development effects of tourism. In one of the most backward regions of the European Union, including Hungary (convergence region), tourism-related grants have been used to reduce territorial differences and to promote developments based on local characteristics (various geographical and landscape characteristics, attractions). In accordance with the objectives, all types of areas and settlements have benefited from the developments, albeit to different degrees.

The selection of the Northern Hungary region as a research area is also justified by the tourist potential of the area, since its touristic features are diverse, multi-element, and can even be called complex. This fact is a decisive strength of the region. The attraction elements are also outstanding in terms of their significance, the results prove that the region has touristic potential at the domestic and even international level. The size of the support sources of the Northern Hungary region is based on the already mentioned high touristic potential (settlements rich in cultural and historical values, thermal springs, natural attractions, etc.), on the other hand, on the principle of the European Union's cohesion policy, according to which the development of less developed regions is a priority (Table 3). Based on these two factors, the Northern Hungary region was the most prominent region for tourism development in the past planning periods (Figure 1).

Table 3. Awarded tourism grants (ERDF) in the regions of Hungary between 2004-2020 and the level of GDP/capita in 2023 (Source: Own editing; Data: KSH database)

Region	Awarded tourism grants 2004-2020	No	Gross domestic product per capita (GDP/capita), thousand HUF, 2023	No.
Northern Hungary	**126,106,888,939 HUF**	**1**	**4 921 Ft**	**8**
Central Transdanubia	107,734,006,184 HUF	2	6 843 Ft	3
Northern Great Plain	104,913,627,557 HUF	3	5 048 Ft	7
Western Transdanubia	90,122,763,334 HUF	4	6 896 Ft	2
Southern Transdanubia	81,983,752,669 HUF	5	5 161 Ft	6
Southern Great Plain	77,202,858,193 HUF	6	5 482 Ft	5
Budapest	31,443,826,593 HUF	7	17 146 Ft	1
Pest	13,622,819,324 HUF	8	6 676 Ft	4

In the Northern Hungary region, the European Union development funds for tourism served a dual regional development goal. By developing settlements and regions frequented by tourism (tourist center areas), they achieved the

convergence of tourism to the European level and improved its competitiveness. The development of settlements and regions with lower tourism performance and less frequented from a tourism perspective (tourist peripheries) served to reduce internal inequalities and reduce tourism development differences within the country.

In the period 2004-2020, a total of 110 out of the 610 municipalities in the region received EU support for tourism development, which is 18.03% of the municipalities in the region. Out of the 44 cities in the Northern Hungary region, development was implemented in 32 from European Union funds, while 13.66% (78) of the municipalities received support.

In terms of territorial distribution, a significant part of the grants went to the tourist core areas of the region (Mátra-Bükk, Mezőkövesd, Tokaj-Hegyalja, Lake Tisza), with a few World Heritage sites and spa towns as highlights. There are also several connected areas in the region where no tourism grants were received. (Figure 1).

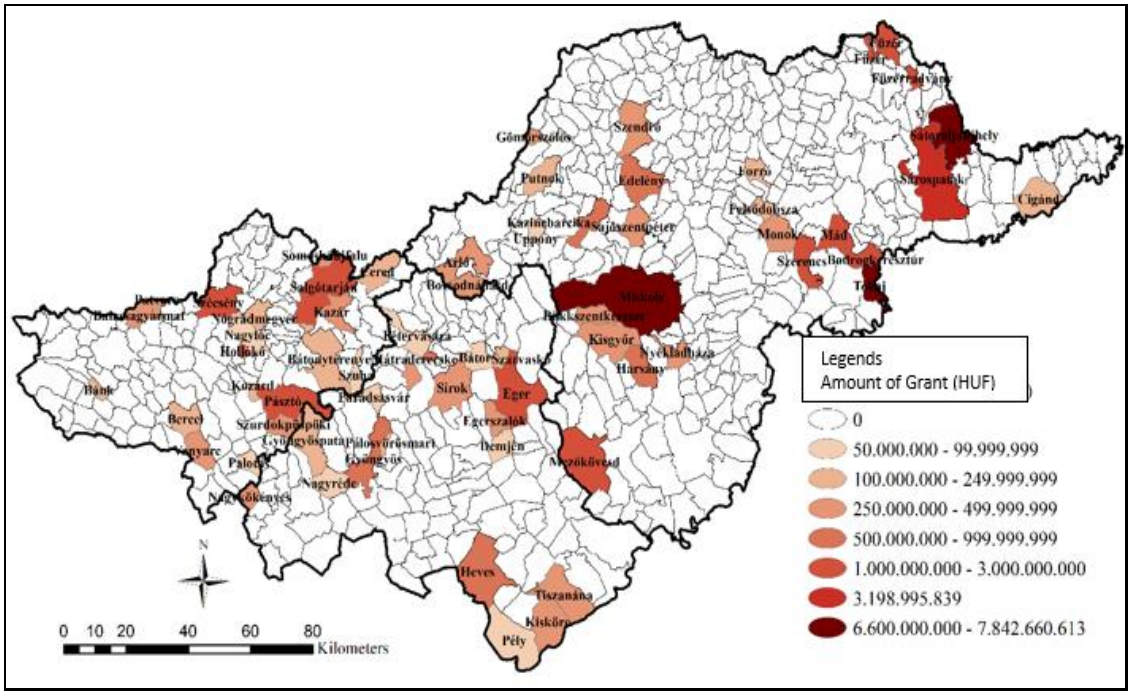

Figure 1. Amount of grants awarded for tourism development (HUF) in the settlements of the Northern Hungary region between 2014-2020 (Source: Own editing)

In terms of their proportion in the settlement structure, the categories between 10,000 and 50,000 people (2.3% and 12.72%) and between 5,000 and 10,000 people (1.97% and 6.36%) stand out among the supported settlement groups (Table 4). At the same time, settlements with less than 500 inhabitants were underrepresented in their proportion (34.26% and 16.36%). In the settlement category between 1000-2000 inhabitants, we can find close values for the two indicators (24.43% and 26.36%). In the Northern Hungary region, settlements form clearly demarcated tourist core areas based on attraction-based tourism products, tourism performance, and tourism networks. Tourism significantly determines the everyday life, social and economic relations of these settlements, thus it also plays an important role in regional development. Tourism core areas may be suitable for use as tourism planning and development units.

Table 4. Number of settlements and Distribution of the number of settlements that received support by population groups (%), 2024 (Source: Own compilation based on KSH Database, 2024)

Area	-499	500-999	1,000–1,999	2,000-4,999	5,000-9,999	10,000-49,999	50,000-
Distribution of the number of settlements							
Borsod-Abaúj-Zemplén county	43.02	20.95	20.11	11.45	2.23	1.96	0.28
Heves county	13.22	23.14	33.88	24.79	1.65	3.31	0.00
Nograd county	29.77	32.06	27.48	6.87	1.53	2.29	0.00
Northern HU region	34.26	23.77	24.43	13.11	1.97	2.30	0.16
Distribution of the number of settlements receiving support							
Borsod-Abaúj-Zemplén county	13.72	15.68	21.56	25.49	9.80	18.72	1.96
Heves county	12.90	16.12	19.35	32.25	6.45	12.90	0.00
Nograd county	21.42	17.85	39.28	7.14	7.14	10.71	0.00
Northern HU region	16.36	16.36	26.36	22.72	6.36	12.72	0.9

In the Northern Hungary region, tourist core areas can be delimited using statistical methods. As a result of a further development of previous research (Gyurkó & Bujdosó, 2017), the methodology used in the research allows five tourist areas within the region to be delimited in the studied area. In addition, Gyurkó (2020) identified two additional transboundary tourist areas and one potential tourist core area, which my studies confirmed (Figure 2).

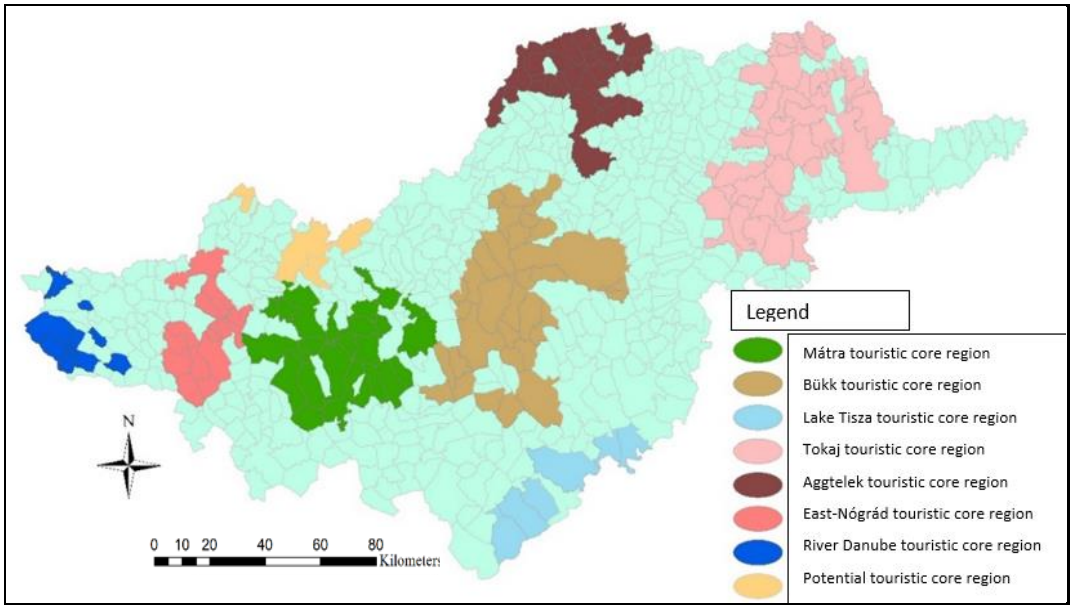

Figure 2. Tourist core areas in the Northern Hungary region (Source: Gyurkó & Bujdosó, 2017 based on Gyurkó, 2020)

The settlements of the Northern Hungary region can be classified into four categories:

– Settlements that cannot be classified as core areas: those settlements that have not experienced measurable tourist traffic or attraction

– Settlements classified as core areas with measurable tourism: those settlements thatalready have a measurable traffic indicator

– settlements classified as core areas with significant tourism: those settlements whose everyday life, social and economic indicators are already significantly influenced by tourism, have accommodation, attractions and tourist services.

– priority tourist settlement: settlements that generate outstanding tourist traffic, have cross-border appeal, and are internationally known.

European Union tourism grants have a measurable impact on tourism. In the Northern Hungary region, the different amounts of grants per area have a different effect on the changes in the most important tourism indicators. The effects of tourism grants can be recognized in the changes in tourism indicators at both district and settlement levels.

However, in the case of some settlements, a positive change in the value of tourism indicators may occur even without a source of support, which supports the important role of private investments. In the Northern Hungary region, all districts except Mezőcsát district received European Union tourism funding (Figure 3).

In the Northern Hungary region, all districts except Mezőcsát district received European Union tourism funding. Despite all this, the number of guest nights increased in 18 out of 29 districts, and in the case of Eger district, a significant amount of support resulted in a significant increase in the number of guest nights.

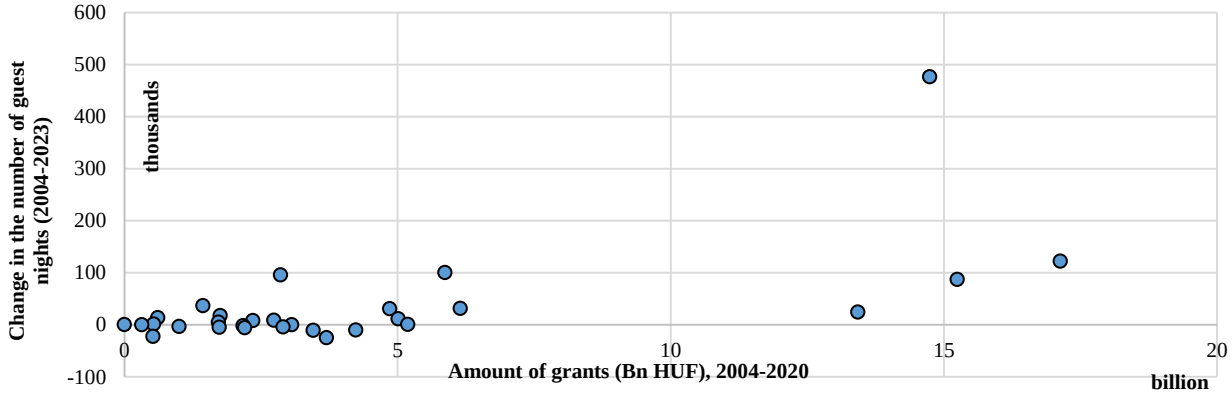

Figure 3. Change in the number of guest nights (2004-2023) and distribution of European Union tourism grants in the districts of the Northern Hungary region (Source: own compilation based on KPMG (2017), based on data from EMIR, IIES, KSH and TeIR)

In the Northern Hungary region, 110 settlements received European Union tourism development support, which is nearly one sixth of the settlements in the region, while 502 settlements did not receive support. Three settlements, Miskolc, Tokaj and Eger, stand out in the region. We can also find 63 settlements in the region that have received European Union tourism support, but their guest traffic has only increased or decreased slightly, while 45 settlements have not received support but have experienced a medium or small increase in the number of guest nights. In terms of the Complex Tourism Impact Indicator, which measures the complex environmental, social and economic impacts of tourism, the Northern

Hungary region can be considered a moderately low saturated destination, however, there are significant regional differences within the region. The region's mature and medium-mature destinations are primarily linked to the tourist core areas.

Based on the TPI index, districts in the region can be classified into all types (Figure 4. 7. Eger district, Bélapátfalva district and Tokaj district can be considered mature destinations, while Mezőkövesd district, Pétervásárári district, Sátoraljaújhely district, Sárospatak district and Gyöngyös district are considered medium maturity areas.

The geographical location of the districts well reflects the main target areas of tourism in the Northern Hungary region, with mature destinations located within the core areas, while low-traffic tourist areas are located outside the core areas.

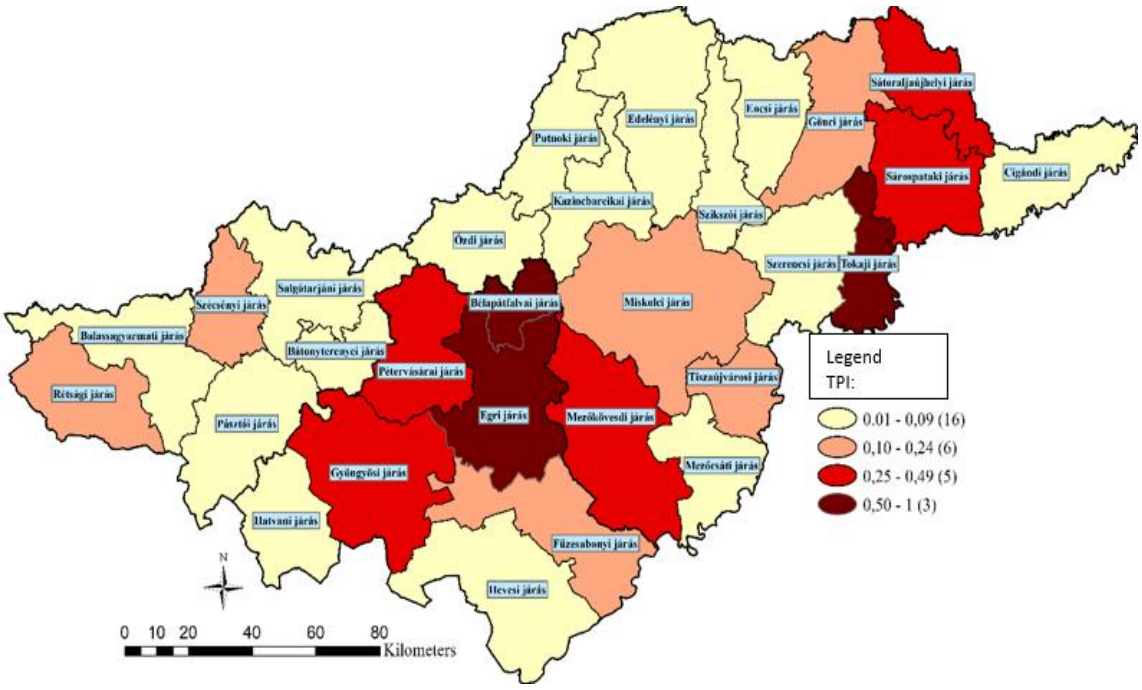

Figure 4. TPI index values in the districts of the Northern Hungary region in 2023 (Source: own editing; járás=district)

At the settlement level, I found that several settlements with low population but significant tourist traffic can already be considered mature destinations, while in the case of larger cities (Eger, Gyöngyös, Miskolc, Mezőkövesd), despite the high number of visitors and guest traffic, the negative complex effect of tourism does not appear even in such a volume.

Based on the changes in tourism competitiveness factors (tourism embeddedness, tourism development, tourism efficiency, capacity utilization), the European Union funds for tourism development purposes arriving in the Northern Hungary region contributed to the development of tourism in the region, to the increase in tourism efficiency and to the strengthening of the role of tourism within the economy.

The Northern Hungary region showed outstanding performance, the 101.68% growth value achieved in tourism development indicates that the revenue of accommodation establishments exceeded the national average in relation to the resident population, which confirms the gradual improvement of the region's tourism offer and the increase in demand, while the 101.21% result achieved in capacity utilization indicates the adequate utilization of the existing tourism infrastructure (Table 2). The outstanding value of these two indicators is also due to the efficient use of European Union grants (modernization of accommodation facilities, creation of new attractions). In terms of tourism efficiency, the Northern Hungary region achieved second place with a growth value of 100.57%, meaning that the revenue per guest night exceeded the national average, but the 99.89% value achieved in tourism embeddedness positioned the region in fourth place (the number of accommodation facilities decreased in relation to the resident population), meaning that the priority in the region was to improve the efficiency of existing capacities (quality development) rather than to establish new capacities.

CONCLUSION

The main aim of my work was to highlight the growing socio-geographical, and regional geographical, significance of tourism. I tried to explore the connections with the applied methodological tools and to prove the complex relationships by performing territorial analyses. My research provided both theoretical and empirical results. With my theoretical results, I drew attention to the multifaceted system of connections between tourism and regional development. I presented the cohesion objectives of the European Union's regional policy and their concrete manifestation through a convergence region in Hungary.

With the help of my empirical results, I presented the different territorial impacts of the European Union's tourism development funds, as well as the impact of the funds on sectoral and competitiveness factors.

The future development of the tourism sector, its impact on regional development, and the size and territorial distribution of development resources still have many open questions. A promising research topic for the future could be the complex analysis of regional development resources and the examination of their utilization from a social and economic perspective. In my opinion, these further researches can expand social geography knowledge with new results.

Author Contributions: Conceptualization, Z.B.; methodology, Z.B.; software, Z.B.; validation, Z.B.; formal analysis, Z.B.; investigation, Z.B.; data curation, Z.B.; writing - original draft preparation, Z.B.; writing - review and editing, Z.B.; visualization, Z.B.; supervision, Z.B.; project administration, Z.B. The author has read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the scientific involvement of the author concerned.

Conflicts of Interest: The author declare no conflict of interest.

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Article history: Received: 15.04.2025 Revised: 02.07.2025 Accepted: 31.07.2025 Available online: 22.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1683-1697
DOI 10.30892/gtg.61327-1537

THE NEXUS BETWEEN GREEN TRANSFORMATIONAL LEADERSHIP AND HOTEL EMPLOYEES' NON-GREEN BEHAVIOR: THE MEDIATING ROLES OF GREEN WORK ENGAGEMENT AND GREEN KNOWLEDGE SHARING

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Citation: Batarfi, M., Khairy, H.A., Agina, M.F., Almubarak, H., AlMekhlafi, A.W., Alasmrai, M.A., AbdAlatti, A., & Ali, M. (2025). The nexus between green transformational leadership and hotel employees' non-green behavior: The mediating roles of green work engagement and green knowledge sharing. *Geojournal of Tourism and Geosites*, 61(3), 1683–1697. https://doi.org/10.30892/gtg.61327-1537

Abstract: This study, which focuses on employees' non-green behavior, corresponds with global interest in green performance. The goal of this study was to examine how green transformational leadership (GTL) affects non-green behavior (NGB) in the hotel industry, with green work engagement (GWE) and green knowledge sharing (GKS) acting as mediators. Data was collected from full-time employees working in five-star hotels operating in Egypt. The PLS-SEM approach was used to analyze 390 valid responses collected by Warppls v.7. The findings revealed that GTL is positively associated with GWE; however, GTL is negatively associated with NGB. In addition, the results revealed that GWE and GKS negatively associated with NGB. Moreover, the negative link between GTL and NGB is found to be mediated by GWE and GKS. Theoretically, screening the literature in the hospitality field revealed that there hasn't been ample research conducted to explain how non-green behaviors might be avoided. The authors' research also reveals a knowledge gap in the mechanisms connecting green transformational leadership, workplace engagement, and knowledge sharing with non-green behavior in hotel businesses. The study shed light on how cutting-edge concepts like green transformational leadership, green work engagement, and knowledge sharing interact to anticipate and reduce non-green behavior in the hotel business. Practically, hotel management should formulate and deliver environmental training programs that would enhance green transformational leadership competencies, get employees committed to paying attention to the involvement in the green processes, and diminish the non-green behavior in hotel enterprises. This study makes a significant theoretical contribution by advancing the understanding of how GTL influences employees' non-green behavior, particularly within the context of five-star hotels in Egypt. By incorporating GKS and GWE as mediators, the study builds on existing leadership and sustainability literature, offering a more nuanced perspective on the mechanisms through which GTL fosters environmentally friendly behaviors. It expands the theoretical framework of GTL by highlighting the importance of knowledge dissemination and engagement in promoting sustainable practices among employees. Additionally, the study enriches the understanding of non-green behavior by linking it to green leadership and work engagement.

Keywords: green transformational leadership; employees non-green behavior; green work engagement, green knowledge sharing

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INTRODUCTION

Recently, there has been a growing awareness among companies about the deteriorating ecological environment, leading to an increased focus and involvement in management practices pertaining to environmental issues (Ahmad, 2015). The hotel business is widely recognized as a substantial source of water and power use, as well as sewage production (Chan et al., 2009). Management in the hospitality industry is compelled to implement environmentally sustainable practices as a response to challenges arising from the decline in biodiversity and resource shortages (Kim et

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al., 2019; Merli et al., 2019; Rezapouraghdam et al., 2019). Adopting organizational strategies that focus on promoting a sustainable environment has become a vital approach for companies to gain an edge over competitors (Liu et al., 2015; Molina-Azorín et al., 2015). Today's astute customers exhibit heightened awareness about the effective utilization of energy and water resources and display a greater satisfaction and inclination towards patronizing hotels that adhere to environmentally sustainable practices (Kim et al., 2019; Merli et al., 2019; Wang et al., 2018). In this regard, Hilton Hotels, for example, has expressed its dedication to achieving a 50% reduction in its environmental impact by the year 2030. This objective will be pursued through the implementation of responsible sourcing rules, waste reduction measures, carbon footprint mitigation strategies, energy conservation efforts, and a decrease in water use (Hilton, 2022).

However, the successful execution of these strategies and attainment of environmental goals are contingent upon the employees' perception of environmental issues, active involvement, and subsequent behaviors (Boiral, 2009; Boiral et al., 2015; Del Brío et al., 2007; Zhang et al., 2014). Therefore, identifying the environmentally responsible activities of employees holds significance for both business effectiveness and environmental conservation (Karatepe et al., 2020). "Non-green behavior" (NGB) denotes employees' lack of involvement in pro-environmental activities (Paillé et al., 2019), while "green transformational leadership" (GTL) represents the conduct that leaders exhibit to inspire their subordinates to pursue green objectives and achieve superior outcomes (Chen & Chang, 2013; Mittal & Dhar, 2016). Hence, it is crucial to foster employees' pro-environmental habits through managerial interventions (Li et al., 2020a).

An examination of existing literature underscores the significance of adopting environmental approaches and fostering sustainable activities among hotel employees (Pham et al., 2019; Wang et al., 2018). Unfortunately, it is widely acknowledged that staff frequently participate in environmentally unfriendly actions (Ones & Dilchert, 2012; Paillé et al., 2019). However, existing empirical hospitality research has investigated the influence of GTL on several environmental outcomes, such as "corporate social responsibility" (CSR) for "small and medium-sized" (SMEs) restaurants located in ecologically sensitive island areas in North Cyprus (Tosun et al., 2022), hotels' green identity and creativity in Uttarakhand, India (Mittal & Dhar, 2016), 3-5-star hotels' green creativity and environmental performance in Bangladesh (Riva et al., 2021), large hotels' environmental innovation, CSR, and performance in Saudi Arabia (Sobaih et al., 2022b), and 4-5-star hotels' green innovation, CSR, and employees' green work engagement in Turkey (Çop et al., 2021), without explicitly examining the effect of GTL on employees' NGBs.

Moreover, there exists a dearth of research on the intermediary functions of GWE and GKS between GTL and hospitality employees' NGBs. Regarding the mediating role of GWE, previous empirical hospitality research has examined it in the impact of, for example, 4-5-star hotels' management dedication to the natural environment on staff's green creativity and cautious work-related environmentally friendly behaviors in Turkey and South Korea (Karatepe et al., 2022a), 4-5-star hotels' perceived green support on staff's work-related environmentally conscious conduct in Kaohsiung, Taiwan (Karatepe et al., 2022b; Agina et al., 2023), and 4-5-star hotels' GTL on green team resilience in Turkey (Çop et al., 2021; Elshaer et al., 2022). Specifically, only one empirical study, conducted by Karatepe et al. (2020), has provided clarification on how to prevent hotel employees' NGBs. However, excluding GTL, Karatepe et al.'s (2020) study investigated the intermediary function of work engagement for guest-contact employees between job uncertainty, absenteeism, and non-green conduct in the global 4-5-star hotels in Guangzhou, China. Considering the mediating role of GKS, prior empirical investigation in hospitality has studied it between several factors, such as inclusive leadership and green innovative service behavior for full-time employees and team leaders in Chinese 3-4-star hotels (Asghar et al., 2023), "environmentally-specific empowering leadership" (ESEL) and green creativity for full-time employees of Pakistani 3-5-star hotels (Badar et al., 2023; Beirat et al., 2025; Agina, 2020), and "green human resources management" (GHRM) and green competitive advantage for full-time employees of South Korean 4-5-star hotels (Kim et al., 2023).

Thus, to the best of the authors' knowledge, no previous empirical research has examined the influence of GTL on hotel employees' NGB or even tested the mechanism (i.e., the intermediary functions of GWE and GKS) through which GTL is associated with NGB. To address this previous literature gap, by drawing on Spence's (1973) signaling theory, "job demands-resources" (JD-R) theory (Demerouti et al., 2001), "conservation of resources" (COR) theory (Hobfoll, 2001), "social exchange" (SE) theory (Cropanzano & Mitchell, 2005), and the "stimulus-organism-response" (SOR) model (Jacoby, 2002; Mehrabian & Russell, 1974; Agina et al., 2017), this study develops and examines an integrative model that seeks to elucidate the influence of GTL on hotel employees' NGB in Egypt. Additionally, it explores the intermediary functions of GWE and GKS between GTL and NGB. The study's findings contribute to the existing empirical research on GTL, GWE, GKS, and employees' NGB in the hospitality industry. It offers insightful knowledge into the influence of GTL, GWE, and GKS on lowering employees' NGBs and proposes practical recommendations for hospitality organizations seeking to promote sustainability and reduce their environmental impact. This study's subsequent sections are as follows: Initially, the notional foundation and propositions formulation are elucidated. Next, the methodology is clarified. Subsequently, the findings are reported and discussed. Afterward, the theoretical and practical implications of the findings are explained. Lastly, the confines and areas for future investigation are highlighted.

2. Theoretical foundation and hypotheses formulation

Drawing on Spence's (1973) signaling theory, JD-R theory (Demerouti et al., 2001), COR theory (Hobfoll, 2001), SE theory (Cropanzano & Mitchell, 2005), and the SOR model (Jacoby, 2002; Mehrabian & Russell, 1974), this study proposes an integrative model, as depicted in Figure 1, of the influence of GTL on employees' NGB and the intermediary functions of GWE and GKS between GTL and NGB.

GTL and employees' NGB

While NGB pertains to the lack of involvement by employees in environmentally friendly practices instead of their deliberate involvement in detrimental actions as such (Paillé et al., 2019), GTL denotes the behavioral patterns exhibited by leaders that stimulate and encourage their subordinates to actively pursue green objectives and surpass their own expectations in order to achieve superior environmental performance (Chen & Chang, 2013; Mittal & Dhar, 2016).

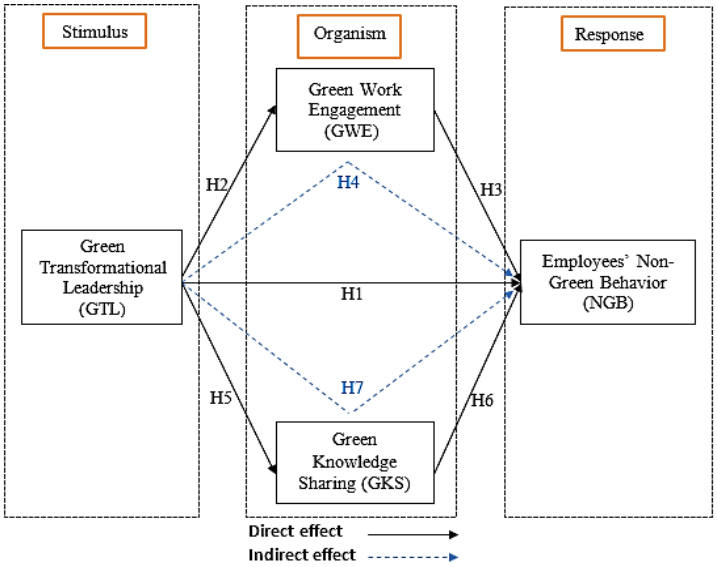

Figure 1. Hypothesized model

GTL can act as a remedy for employees' NGB. Generally, existing empirical studies in the hospitality field have consistently demonstrated the significance of GTL in improving key environmental outcomes. GTL improves CSR for SMEs restaurants located in ecologically sensitive island areas in North Cyprus (Tosun et al., 2022), employees' "organizational citizenship behavior for the environment" (OCBE) in Sharm El-Sheikh hotels in Egypt (Elshaer et al., 2022), 3-5-star hotels' GHRM and staff's environmentally friendly practices in India (Sachdeva & Singh, 2023), employees' environmental value congruence and environmental work-related and work-unrelated activities in six Indian hotels (Agrawal & Pradhan, 2023), employees' environmentally friendly conduct in Pakistani hotels (Xu et al., 2022) and Chinese hospitality corporations (Zheng et al., 2023), staff's work-related and environmentally conscious actions and green performance in food firms in Saudi Arabia (Sobaih et al., 2022a), hotels' green identity and creativity in Uttarakhand, India (Mittal & Dhar, 2016), 3-5-star hotels' green creativity and performance in Bangladesh (Riva et al., 2021), large hotels' environmental innovation, CSR, and performance in Saudi Arabia (Sobaih et al., 2022b), and 4-5-star hotels' employees' GWE in Turkey (Çop et al., 2021). Moreover, Elshaer et al. (2024) examined how leadership styles influence pro-environmental behavior among hotel staff in Egypt, highlighting the importance of cultural and operational dynamics specific to the local context.

The signaling theory (Spence, 1973) justifies the influence of GTL on employees' NGB. A sender communicates information, while a receiver interprets it (Connelly et al., 2011). Company green initiatives and practices serve as indicators of the intentions and priorities set by managerial positions, indicating investment in green knowledge and sustainability, while positive interpretations of these signals lead to employees' environmentally friendly tasks and active environmental conservation (Karatepe et al., 2022a). According to Brown & Kasser (2005), transformational leaders that exhibit environmentally conscious behaviors have the potential to influence the behavior of their followers, as they are perceived as role models. The integration of sustainable practices by a leader within the workplace has the potential to inspire and encourage their followers to adopt similar behaviors (Sachdeva & Singh, 2023). When leaders in the work environment adopt green behaviors, it has a compelling influence on their subordinates, as it facilitates the interchange of environmental values, promotes the utilization of sustainable practices, and encourages the development and implementation of strategies to address environmental problems (Graves et al., 2013). A leader's mindset on environmental damage avoidance, through relevant work and ambitious persuasion, has a significant impact on subordinates' willingness to carry out environmental protective actions (Cordano & Frieze, 2000), hence attenuating employees' NGB. Consequently, an increase in GTL is anticipated to result in a decrease in employees' NGB.

H1: GTL significantly attenuates employees' NGB.

The mediating role of GWE

GWE denotes the extent of employees' commitment and devotion to their obligations to environmentally sustainable work practices. This encompasses their inclination to exert effort in promoting sustainability and their extent of engagement in duties related to environmentally friendly work (Aboramadan, 2022). GWE signifies a characteristic that comprises a strong and active staff's commitment to activities linked to environmental sustainability (Çop et al., 2021). It is defined by qualities such as high levels of energy, mental flexibility, diligence, dedication, excitement, pride, motivation, and active involvement

(Schaufeli et al., 2002; Xanthopoulou et al., 2013). According to Schaufeli et al. (2006), this phenomenon is distinguished by a high level of absorption and the capacity to maintain concentration on tasks connected to environmental concerns. The significance of leaders in cultivating engagement among their followers is widely acknowledged by both scholars and professionals. Generally, prior empirical hospitality research has shown that leadership is a key predictor of employees' work engagement. While it diminishes under abusive supervision in 4-5-star hotels in Accra, Ghana (Ampofo, 2021), work engagement among employees flourishes under high ratings for supervisors' warmth, competence, and morality in US restaurants (Orlowski et al., 2021; Khairy et al., 2024), high ratings for supervisors' motivating language in hotels in Bangkok and Phuket, Thailand (Rabiul et al., 2022), high quality leader-member exchange in a prominent luxurious hotel in southern China (Li et al., 2012), humble leadership in hospitality organizations in Jordan (Al Hawamdeh, 2022), servant and authentic leadership styles in 5-star hotels in Antalya, Turkey (Kaya & Karatepe, 2020), empowering leadership in five upscale hotels in Beijing, China (Wen et al., 2023), and paradoxical leadership in Pakistani hotels (Kundi et al., 2023). Furthermore, transformational leadership encourages greater work engagement among employees. This is the case, for example, in 3-5-star chain hotels in Spain (Buil et al., 2019), luxury hotels in Italy (Aftab et al., 2022), and 5-star hotels in Saudi Arabia (Abolnasser et al., 2023). Specifically, GTL nurtures employees' GWE in 4-5-star hotels in Turkey (Çop et al., 2021).

The relationship between GTL and GWE is elucidated via the lens of the JD-R theory (Çop et al., 2021; Demerouti & Bakker, 2006). The JD-R theory (Demerouti et al., 2001), delineates two key operational factors inside the workplace. Firstly, job demand refers to the exertion of physical or mental effort required in performing tasks. Secondly, job resources encompass elements that mitigate physiological and psychological burdens, establish functional stability, and foster personal development. The presence of job resources might serve as an indication of the aspects that promote work engagement (Bakker & Demerouti, 2008). Job resources encompass several elements such as voice, coaching, supervision, work diversity, social support, prospects, growth, and avenues for learning. These resources are organized and facilitated by transformational leaders (Çop et al., 2021; Demerouti et al., 2001; Alhemimah et al., 2024; Abou Kamar et al., 2023). Recent findings by Suliman et al. (2023) emphasized the role of transformational leadership in shaping environmental engagement among frontline employees in five-star hotels in Egypt.

Non-green work behaviors are unproductive habits (Ones & Dilchert, 2012) that jeopardize an organization's commitment to a sustainable environment (Paillé et al., 2019). The firm's green goals may be compromised by non-green practices, which can be exacerbated by emotional weariness (Karatepe et al., 2021b; Yan et al., 2020; Yu et al., 2020; Zheng et al., 2023). As per the COR theory, people tend to safeguard their limited resources, but when resources are threatened, undesirable behaviors, like non-green behaviors, may result (Hobfoll, 2001).

Work engagement can help offset such harmful behaviors (Karatepe et al., 2020). Consistent with the JD-R theory, motivation has an influence on work performance (Bakker & Demerouti, 2017). Generally, staff who are actively involved in their job have the drive and excitement necessary to succeed (Bailey et al., 2017; Orlowski et al., 2021; Ozturk et al., 2021). Prior studies have demonstrated that employees' involvement has a positive impact on both their work-related and non-work performance (Karatepe et al., 2018). Specifically, highly engaged staff are more inclined to display pro-environmental behaviors because they find their work to be inspiring and important, contribute to the business by doing everyday activities in an ecologically responsible manner, and take initiative to complete their environmental and green chores (Ababneh, 2021; Khairy et al., 2025; Aboramadan, 2022; Karatepe et al., 2021a; Karatepe et al., 2022a, b).

In line with the SE theory, highly engaged staff are more inclined to have strong and reliable ties with their employers, leading to positive outcomes in terms of their jobs (Cropanzano & Mitchell, 2005; Saks, 2006). By doing so, employees may be encouraged to participate in environmentally conscious activities and commit to eco-friendly projects, leading to promoting the idea of environmentally friendly conduct and promoting organizational and community sustainability (Aboramadan, 2022; Luu, 2019). Positive work engagement encourages employees' voluntarily pro-environmental conduct (Raza et al., 2021). In other words, people who work because of positive reciprocal interactions exhibit a low level of non-green conduct (Karatepe et al., 2020), which is crucial for businesses like hotels that make investments in green environments (Kim et al., 2019; Pham et al., 2019; IRAWAN et al.,2024).

The SOR model provides theoretical reasoning to support the notion that GWE's mediating role could clarify the process by which GTL affects employees' NGB. The SOR model (Jacoby, 2002; Mehrabian & Russell, 1974) posits that an ambient cue (a stimulus) exerts influence on the internal cognitive and emotional intermediary state of an individual (organism) that intercedes between the stimulus and the manifestation of an individual's approach or avoidance behavior (response). Overall, previous empirical hospitality studies proved the intermediary function of GWE. GWE has played a crucial role as a mediator in the influence of, for example, 4-5-star hotels' GTL on green team resilience in Turkey (Çop et al., 2021), 4-5-star hotels' management dedication to the natural environment on staff's green creativity and cautious work-related environmentally friendly behaviors in Turkey and South Korea (Karatepe et al., 2022a), and 4-5-star hotels' perceived green support on staff's work-related environmentally conscious conduct in Kaohsiung, Taiwan (Karatepe et al., 2022b). Thus, considering the SOR model, this research suggests that a green transformational leader, who effectively inspires and motivates their followers to actively pursue environmental objectives and exceed their own expectations (stimulus), can enhance employees' engagement and commitment towards their responsibilities related to environmentally sustainable work practices (organism). This, in turn, reduces employees' non-green work practices that undermine an organization's commitment to environmental sustainability (response). Based on the a forementioned reasoning, the following hypotheses are posited:

H2: GTL significantly promotes GWE.

H3: GWE significantly diminishes employees' NGB.

H4: GWE mediates the influence of GTL on employees' NGB.

The mediating role of GKS

GKS encompasses activities that smooth the exchange of both explicit and implicit aspects of environmentally sustainable knowledge for the purpose of environmental protection among hotel employees (Kim et al., 2023). In light of its significance, prior empirical investigation in hospitality has studied how to boost full-time employees' GKS by, for example, inclusive leadership in Chinese 3-4-star hotels (Asghar et al., 2023), ESEL in Pakistani 3-5-star hotels (Badar et al., 2023), and GHRM in South Korean 4-5-star hotels (Kim et al., 2023).

Generally, GKS among full-time employees in the hospitality industry is significantly influenced by inclusive leadership, ESEL, and GHRM (Asghar et al., 2023; Badar et al., 2023; Kim et al., 2023). Inclusive leadership, characterized by openness, accessibility, and providing social and emotional support, fosters a positive work environment where employees feel respected and valued, leading to increased GKS (Asghar et al., 2023; Mulyadi et al., 2024). ESEL further encourages GKS by explicitly empowering employees to participate in environmentally related decision-making, providing them with the autonomy and resources to share green knowledge and ideas (Badar et al., 2023; Yiamjanya, 2024; Agina et al., 2025). GHRM practices, such as green training programs and performance appraisals that consider eco-friendly behavior, equip employees with the necessary knowledge and motivation to engage in GKS (Kim et al., 2023). Overall, these leadership styles and management practices collectively create a workplace culture that values environmental sustainability and encourages the open exchange of green knowledge among employees.

Existing empirical hospitality research has investigated the effect of GKS on, for example, green creativity and environmental performance for managerial personnel of 3-5-star hotels in Bangladesh (Riva et al., 2021) and OCBE for operational-level employees of the Ghanian hotel sector (Andoh et al., 2024).

Generally, GKS is a critical factor that influences both green creativity and environmental performance (Andoh et al., 2024; Yakupova, 2024; Riva et al., 2021). When organizational members, including managers, actively share their green knowledge, it creates a collective understanding of environmental issues and solutions. Riva et al. (2021) emphasized that managers with a strong understanding of environmental concerns can effectively promote green initiatives and strategies within their organizations. By fostering a culture of knowledge exchange, hotels can encourage employees to think creatively and develop innovative solutions for improving environmental performance.

Furthermore, Andoh et al. (2024) emphasize that GKS leads to the development of organizational green culture, which in turn encourages employees to engage in OECB. OECB represents voluntary actions taken by employees to promote environmental sustainability within the organization. Through GKS, employees gain awareness of green expectations and best practices, leading to the establishment of shared green values and norms.

This collective understanding of environmental responsibility encourages employees to go above and beyond their formal duties to contribute to the organization's environmental performance.

The SOR model offers a theoretical framework that elucidates how GKS mediates the relationship between GTL and employees' NGB. The SOR model (Jacoby, 2002; Mehrabian & Russell, 1974) asserts that an ambient cue (stimulus) shapes the inner cognitive and emotional intermediary condition of a person (organism), which mediates the relationship between the stimulus and the resulting approach or avoidance behavior (response). Generally, extant empirical research proved the intermediary role of GKS. GKS has a significant mediating role in the effect of, for instance, GHRM on green service behaviors for frontline employees of Bangladeshi banking industry (Rubel et al., 2021), green leadership on sustainable performance of Pakistan's manufacturing SMEs (Khan et al., 2023), eco-centric leadership on pro-environmental behaviors for employees working at the lower cadre (i.e., sweepers and cleaners) in Pakistani hospitals (Hasan et al., 2024), and GHRM on green self-efficacy for Bangladeshi university staff (Miah et al., 2024).

Extant empirical studies (Hasan et al., 2024; Singtuen & Gałka,2024; Khan et al., 2023; Miah et al., 2024; Rubel et al., 2021) generally support the mediating role of GKS by establishing a logical link between organizational initiatives and individual behaviors. By disseminating environmental knowledge, organizations equip employees with the understanding and awareness needed to make environmentally responsible decisions and engage in pro-environmental behaviors. GHRM practices, as explored by Rubel et al. (2021) and Miah et al. (2024), create a framework for promoting environmental awareness and providing employees with the necessary knowledge and skills to act in an environmentally responsible manner. This knowledge sharing, in turn, empowers employees to translate organizational goals into individual actions, whether it's through green service behaviors or more general pro-environmental behaviors. Similarly, Khan et al.'s (2023) findings on green leadership and sustainable performance highlight the importance of leaders actively fostering a knowledge-sharing environment to achieve organizational sustainability goals.

Hasan et al. (2024) further corroborate this, suggesting that eco-centric leadership indirectly influences pro-environmental behaviors by promoting GKS. Moreover, Miah et al. (2024) demonstrated that GKS not only directly impacts behavior but also contributes to employees' green self-efficacy, which further reinforces their commitment to pro-environmental actions. Therefore, GKS isn't simply a passive transfer of information but an active process that empowers individuals and aligns their actions with organizational sustainability objectives. Overall, GKS serves as a crucial mechanism by which GHRM practices and green leadership can affect favorable environmental outcomes.

By promoting the dissemination and exchange of environmental sustainability knowledge, organizations can enhance environmental awareness and responsibility among employees, leading to improved green behaviors and sustainable performance. Hence, in light of the SOR framework, this research proposes that a green transformational leader, who successfully inspires and motivates their subordinates to actively chase environmental objectives and surpass their own expectations (stimulus), can boost employees' exchange of both explicit and implicit aspects of environmentally sustainable

knowledge (organism). This, subsequently, decreases employees' non-green work activities that weaken a hotel's commitment to environmental sustainability (response). In light of the preceding rationale, the following hypotheses are proposed:

H5: GTL significantly boosts GKS.

H6: GKS significantly reduces employees' NGB.

H7: GKS mediates the effect of GTL on employees' NGB.

MATERIAL AND METHODS

Questionnaire design and study measures

The data required was gathered via a structured survey as part of a quantitative research approach. A survey was utilized to address green transformational leadership in hotel businesses (the five-star hotels) and its impact on green work engagement, green knowledge sharing, and non-green behavior. A two-part survey is included. In the first part, we covered employee profiles, such as gender, age, education, and work experience. In the second part, the three explored concepts were analyzed. A five-point Likert scale was used to evaluate all items. To avoid socially desirable responses resulting from self-reporting, we followed Donaldson et al. (2002) advice, and asked participants at the end of the survey if they felt worried that their answers may jeopardize their employment, to be excluded. Green transformational leadership was measured by a 6-item scale adapted from Chen & Chang (2013). In addition, non-green behavior was assessed by a 5-item scale developed by Paillé et al. (2019). Moreover, green work engagement was evaluated by a 6-item scale adapted from Aboramadan (2022). Finally, five items scale was adopted from Wong (2013); Rubelet al. (2021) to measure green knowledge sharing. A comprehensive measurement scale is presented in Appendix (A).

Sample and data collection procedures

The current research population consists of full-time staff working at five-star hotels in Egypt's Greater Cairo region. Five-star hotels represent the highest tier of service and operational standards within the hospitality industry. These establishments typically employ a large, diverse workforce and operate under structured management systems, making them ideal environments for studying organizational behaviors, leadership practices, and sustainability initiatives.

Their complex operational frameworks and strong brand reputations also necessitate strategic investments in employee engagement, innovation, and corporate social responsibility. Moreover, five-star hotels are more likely to implement and report advanced environmental and HRM practices, thus providing a rich context for exploring variables such as green transformational leadership, work engagement, and sustainability performance. Focusing on this segment enhances the generalizability of findings to other high-standard hospitality settings while ensuring the relevance of insights to both academia and industry. The Egyptian Ministry of Tourism (2018) reported that there were a total of 30 hotels with a 5-star rating in the Greater Cairo region of Egypt. A judgmental sampling technique was used when selecting the five-star hotels.

This sampling approach is especially useful when the researcher does not have the funds or time to conduct a large-scale survey. The convenience sampling method was also employed to obtain data from these organizations' staff members (those who volunteered to participate in the research). Given the wide geographical scope of this study and the distribution of five-star hotels across Egypt, the convenience sampling method was utilized. After making phone calls to human resources departments to obtain permission to visit and distribute the questionnaire on their premises, 600 questionnaires were distributed to the enterprises under investigation. Only 390 valid forms were gathered from 25 five-star hotels, resulting in a 65% response rate. The current study uses the Cochran (1963) sampling equation to produce a representative sample that equals ≥385 responses for large populations when a list of populations, as in the case of the current study, cannot be obtained. This is because there are no official data that reflect the total number of employees in Egypt's five-star hotels, either in total or by region. Cochran's (1963) sampling equation was included in the manuscript as follows:

$$n_0 = \frac{Z^2 pq}{e^2} = \frac{(1.96)^2(.5)(.5)}{(.05)^2} = 385$$

Where n_0 is the sample size, Z^2 is the abscissa of the normal curve that cuts off an area a at the tails (1 - a equals the desired confidence level, e.g., 95%), *e* is the desired level of precision, *p* is the estimated proportion of an attribute that is present in the population, and *q* is 1-p.

Data analysis

PLS-SEM is widely utilized as an analytical instrument across various disciplines, including the study of tourism and hospitality (Amaro & Duarte, 2015). Analyzing complex structural models that establish connections between multiple variables through both direct and indirect pathways is facilitated by this method (Manley et al., 2020).Hence, this study utilized the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach with WarpPLS software 7.0 to analyze the measurement and structural model and to assess the research hypotheses (Kock, 2021).

This study used WarpPLS version 7.0 for Partial Least Squares Structural Equation Modeling (PLS-SEM), a choice that aligns well with the complex constructs studied, such as digital dynamic capabilities, green knowledge management, and green technology innovation. Although SmartPLS 3 and 4 are commonly used for PLS-SEM, WarpPLS offers unique advantages that enhance the study's analysis (Kock, 2017, 2019; Singh et al., 2024).

First, WarpPLS can model both linear and nonlinear relationships, which is crucial for understanding the complex, interactive nature of sustainability-oriented constructs and digital transformation dynamics.

This feature allows for a more comprehensive analysis, capturing potential nonlinearities that linear models may miss. Additionally, WarpPLS provides a broader array of model fit indices, such as the Average Path Coefficient (APC), Average R-squared (ARS), Tenenhaus GoF, and Full Collinearity VIFs. These indices, not available in SmartPLS, strengthen model evaluation by validating both explanatory power and predictive relevance.

Moreover, WarpPLS is particularly effective with small to medium-sized samples, which are common in applied organizational research. This capability ensures accurate estimations even when respondent access is limited, making it ideal for sustainability and innovation studies. WarpPLS also includes features that detect and adjust for statistical biases like common method bias, suppression effects, and Simpson's paradox, which further strengthens the methodological validity of the findings. Another advantage is its ability to model complex relationships, including mediation, with direct outputs for interaction terms, effect sizes, and p-values, essential for analyzing conditional effects in this study.

Finally, WarpPLS's robustness to non-normal data distributions makes it especially suitable for research in the social and environmental sciences, where latent constructs and skewed data are common.

RESULTS

Participant's profile

Table 1 and Figure 2 summarize the demographic profile of the respondents, including gender, age distribution, educational background, and years of work experience. The majority was male, held a bachelor's degree, and had between 2 to 5 years of work experience.

Table 1. Participants' profile (n=390)

		Number	%
Gender	Male	265	67.9
	Female	125	32.1
Age	< 30 years	98	25.1
	30 : < 40 years	104	26.7
	40 :50 years	98	25.1
	>50	90	23.1
Education	High schools/institute	83	21.3
	Bachelor	265	67.9
	Master/PhD	42	10.8
Work experience	< 2 years	92	23.6
	2:5 years	144	36.9
	6:10 years	112	28.7
	>10 years	42	10.8

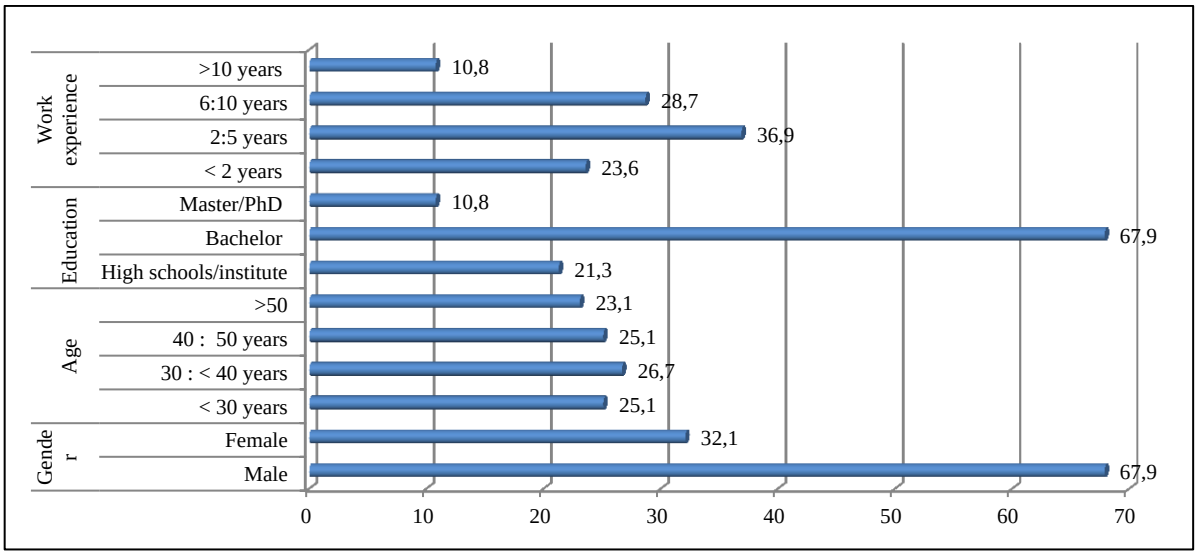

Figure 2. Participants' profile in percentage

4.1. Reliability and validity

A confirmatory factor analysis was conducted, as shown in Table 2. The item loadings were estimated and varied from 0.626 to 0.943. Hair et al. (2010) deemed factor loading values greater than 0.5 as satisfactory. Table 1 demonstrates that the Cronbach's alpha and composite reliability values for all variables above 0.7, indicating a high level of reliability. Moreover, the scales' validity has been shown by satisfying the Hair et al. (2020) requirements, as evidenced by the AVE values over 0.5. Furthermore, variance inflation factors (VIFs) for each latent variable in a model are estimated, suggesting that it is free of common method bias since the VIF values are ≤3.3 (Kock, 2015).

Table 2. Factor loadings, Cronbach's, CR, AVE, and VIF

	Item loading	CR	CA	AVE	VIF
Non-green behavior (NGB)	-	0.892	0.848	0.625	1.106
NGB.1	0.756				
NGB.2	0.663				
NGB.3	0.837				
NGB.4	0.835				
NGB.5	0.847				
Green transformational leadership (GTL)	-	0.890	0.849	0.578	1.435
GTL.1	0.582				
GTL.2	0.799				
GTL.3	0.790				
GTL.4	0.862				
GTL.5	0.860				
GTL.6	0.621				
Green work engagement (GWE)	-	0.903	0.867	0.612	3.123
GWE.1	0.825				
GWE.2	0.881				
GWE.3	0.857				
GWE.4	0.742				
GWE.5	0.806				
GWE.6	0.531				
Green knowledge sharing (GKS)	-	0.911	0.877	0.672	2.726
GKS.1	0.818				
GKS.2	0.786				
GKS.3	0.841				
GKS.4	0.793				
GKS.5	0.857				
"CR: Composite reliability; CA: Cronbach's alpha; AVE: average variance extracted; VIF: variance inflation factors "					

In addition, as stated by Franke & Sarstedt (2019), "the correlation between two latent variables must be significantly less than unity to prove discriminant validity, and the AVE value for each variable must be greater than the greatest common value". According to the results in Table 3, the study model has successfully demonstrated discriminant validity.

Table 3. Discriminant validity results

	NGB	GTL	GWE	GKS
Non-green behavior (NGB)	0.791	-0.260	-0.041	-0.112
Green transformational leadership (GTL)	-0.260	0.761	0.493	0.377
Green work engagement (GWE)	-0.041	0.493	0.782	0.691
Green knowledge sharing (GKS)	-0.112	0.377	0.691	0.820

The findings to confirm validity are good, as shown by the HTMT for validity, which was also calculated (Table 4), where all values were less than 0.90.

Table 4. HTMT for validity

HTMT ratios "good if < 0.90, best if < 0.85"	NGB	GTL	GWE	GKS
Non-green behavior (NGB)				
Green transformational leadership (GTL)	0.306			
Green work engagement (GWE)	0.100	0.625		
Green knowledge sharing (GKS)	0.127	0.443	0.896	

Quality and model fit indices for the research model

Validation of the model's fit is performed prior to hypothesis testing. All model fit and quality index findings are in accordance with the requirements given by Kock (2021) (Appendix B).

The structural model and hypotheses testing results

Results of the structural model and hypotheses testing are shown in Figure (3) and Table (4).Findings indicated that green transformational leadership (GTL) negatively affects hotel employees non-green behavior (NGB) (β=-0.29, P<0.01). This means that GTL decreases hotel employees' NGB. Therefore, H1 is supported. In addition, GTL positively affects green work engagement (GWE) (β=0.56, P<0.01) and green knowledge sharing (GKS) (β=0.44, P<0.01). This means that when GTL increase GWE and GKS tend to be higher. H2 and H5 are therefore supported. Moreover, hotel employees' NGB negatively affected by GWE (β=-0.09, P=0.03) and GKS (β=-0.16, P<0.01). This means that when GWE and GKS increase NGB tends to be lower. H3 and H6 are therefore supported.

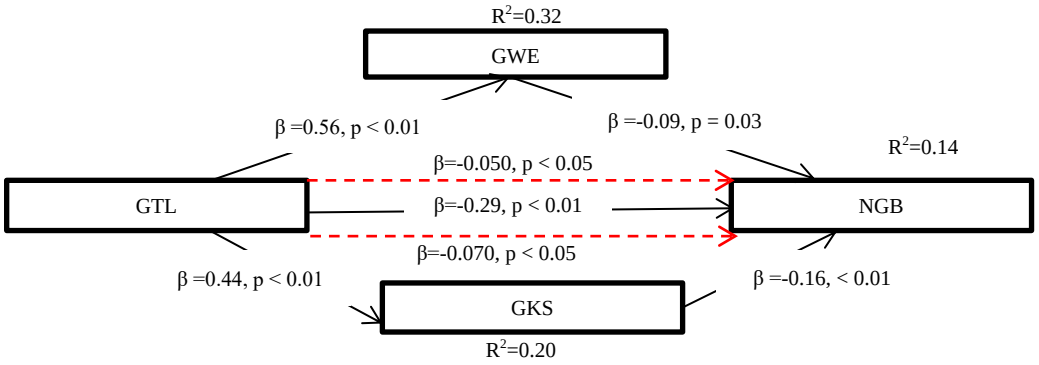

Figure 3. Final model of the study

Lastly, to explore the GTL→GWE→NGB, "Bootstrapped Confidence Interval" analysis was performed (Table 4). For the GWE mediating effect, the indirect effect's Std. β=-0.050 (0.560×-0.090) was significant (p-value <0.05), which had a t-value of -2.191. Furthermore, "95% Bootstrapped Confidence Interval": (LL= -0.095, UL= -0.005), does not intersect a zero point in between, which confirms mediation. Therefore, there was statistically significant evidence for GWE's role as a mediator in GTL→NGB relationship. Thus, H4 is supported. Lastly, to explore the GTL→GKS→NGB, "Bootstrapped Confidence Interval" analysis was performed (Table 4). For the GKS mediating effect, the indirect effect's Std. β=-0.070 (0.440×-0.160) was significant (p-value <0.05), which had a t-value of -3.061. Furthermore, "95% Bootstrapped Confidence Interval": (LL= -0.115, UL= -0.025), does not intersect a zero point in between, which confirms mediation. Therefore, there was statistically significant evidence for GKS's role as a mediator in GTL→NGB relationship. Thus, H7 is supported.

Table 5. Mediation analysis "Bootstrapped Confidence Interval"

Hypothesis 4	Path a GTL→GWE	Path b GWE-NGB	Indirect Effect	SE	t-value	95% LL	95% UL	Decision
GTL→GWE→NGB	0.560	-0.090	-0.050	0.023	-2.191	-0.095	-0.005	Mediation
GTL→GKS→NGB	0.440	-0.160	-0.070	0.023	-3.061	-0.115	-0.025	Mediation

DISCUSSION

The objective of this study is to analyze how green transformational leadership (GTL) influences the non-green behavior (NGB) of hotel employees, specifically by investigating the role of green work engagement (GWE) and green knowledge sharing (GKS) as mediators. Our findings are interesting since previous researchers have urged for a more in-depth investigation of employees' non-green behavior (e.g., Paillé et al., 2019; Tandon et al., 2023), and we can confirm a direct negative relationship between GTL, GWE, and GKS with NGB. Also, we can confirm the indirect effect of GWE and GKS in the GTL→ NGB relationship. A leader's green conduct at work, according to social psychology literature, inspires subordinates to comply with and follow it allows them to share green values, promotes sustainability, and expands and enforces concepts for addressing environmental problems (Graves et al., 2013; Alsetoohy et al., 2022). On the basis of this idea, it is thought that transformational leaders who exhibit environmentally friendly behaviors can influence the behavior of their followers because organizational leaders are viewed as role models (Brown & Kasser, 2005; Sachdeva & Singh, 2023), thereby reducing non-green behavior at work. The notion of transformational leadership supports the beneficial relationship between GTL and GWE and claims that when leaders incorporate green practices in the workplace, they inspire followers to do the same.

According to the theory, transformational leaders can inspire and empower their people to effect good change and improve green practices. This, in turn, can have a positive impact on the organization's green performance (Graves et al., 2013), increasing GWE while decreasing NGB. In addition, employees who are more engaged because of transformational leadership, according to the social exchange theory, are more likely to have secure and high-quality connections with their work, resulting in better work attitude (Cropanzano & Mitchell, 2005; Saks, 2006). Employees may be encouraged to participate in eco-friendly activities and commit to green initiatives as a result of this, supporting the concept of green behavior and organizational sustainability (Aboramadan, 2022; Luu, 2019), this in turn, could decreases non-green behavior.

Moreover, GTL can play a pivotal role in reducing non-green behavior by promoting green knowledge sharing within an organization (Elshaer et al., 2024). Leaders who practice GTL encourage the dissemination of knowledge and expertise related to sustainability, which in turn inspires employees to adopt eco-friendly behaviors. Through fostering open communication and collaboration, GTL helps develop a shared understanding of environmental issues and the importance of sustainable practices among employees. Additionally, GTL supports skill development by providing training programs and workshops that enhance employees' ability to implement sustainable practices effectively. This leadership approach also creates a positive organizational climate that values sustainability, motivating employees to engage in environmentally friendly behaviors. Green knowledge sharing acts as a mediator in this process, reducing non-green behavior (Khan et al., 2022) by enabling employees to identify and correct unsustainable practices. It also enhances environmental awareness, increasing employees' understanding of the impact of their actions on the planet. Furthermore, by sharing best practices and innovative ideas, GKS contributes to improved organizational performance, helping the organization achieve its sustainability goals.

Theoretical implication

This manuscript makes a significant theoretical contribution by advancing the understanding of how GTL influences employees' non-green behavior, particularly within the context of five-star hotels in Egypt. By incorporating GKS and GWE as mediators, the study builds on existing leadership and sustainability literature, offering a more nuanced perspective on the mechanisms through which GTL fosters environmentally friendly behaviors.

It expands the theoretical framework of GTL by highlighting the importance of knowledge dissemination and engagement in promoting sustainable practices among employees. Additionally, the study enriches the understanding of non-green behavior by linking it to green leadership and work engagement, proposing that GTL not only inspires employees to adopt sustainable practices but also encourages the sharing of green knowledge and fosters an organizational environment that supports sustainability. This research contributes to the growing body of literature on green leadership by offering empirical evidence of the impact of GTL on sustainability outcomes and providing a theoretical basis for the development of strategies aimed at reducing non-green behaviors in organizations. The inclusion of GKS and GWE as mediators also introduces new pathways for understanding how green leadership influences organizational sustainability, opening up opportunities for further exploration in different industries and contexts.

Practical implications

This study provides several actionable recommendations for hospitality managers aiming to foster green transformational leadership and improve green competitiveness within their organizations. Based on the findings of our study, we propose the following practical strategies:

First, training programs for developing green transformational leadership should target specific competencies that enable leaders to effectively promote sustainability. These programs should focus on articulating a clear and compelling sustainability vision, providing individualized support to employees' green initiatives, and stimulating innovative thinking related to environmental challenges. Practical interventions may include experiential learning workshops on sustainability leadership, one-on-one coaching for hotel managers, and scenario-based simulations that reflect real-world sustainability dilemmas in hotel operations. These interventions can equip leaders with the tools to drive green behavior at the organizational level.

Second, to operationalize green competitiveness, hotels should embed sustainability into daily practices through systematic strategies. Managers can integrate sustainability indicators into departmental performance evaluations, foster interdepartmental collaboration by forming green committees, and implement digital platforms that facilitate the sharing of green knowledge. These measures will help create a culture where sustainability becomes ingrained in all levels of the organization, driving long-term competitive advantages in an environmentally conscious market.

Third, human resource management practices play a crucial role in ensuring sustainable behavior. Hotels should revise their recruitment and selection criteria to prioritize candidates who demonstrate a commitment to environmental sustainability. Additionally, onboarding programs should include modules on expected green behaviors, and recognition and reward systems should be established to celebrate employees who consistently contribute to sustainability efforts. These HR strategies will foster a more engaged workforce and enhance green work engagement, ensuring sustainability is not just a managerial priority but a shared organizational value. Lastly, to maintain behavioral consistency and ensure accountability, hotels should implement monitoring systems for tracking non-green behaviors. Rather than relying solely on punitive measures, we recommend using constructive feedback mechanisms and establishing peer coaching programs that encourage reflection and behavioral adjustments. By fostering a psychologically safe environment, employees will be more motivated to align their behaviors with sustainability goals, thus strengthening the organization's green competitiveness.

Limitations and further research

This study has several limitations that should be acknowledged. First, the focus on five-star hotels in Egypt may limit the generalizability of the findings to other industries or regions, as the dynamics of the hospitality sector in Egypt may differ from other contexts. Additionally, if the study relies on a cross-sectional design, it restricts the ability to draw causal conclusions about the relationships between GTL, GKS, GWE, and non-green behaviors. The use of self-reported data could introduce biases, such as social desirability bias, potentially affecting the accuracy of the findings.

Furthermore, while the sample size may be adequate within this specific context, future research could benefit from a more diverse sample that includes different types of hotels to provide a broader understanding. Moreover, the study might not account for all potential confounding variables, such as organizational culture, local environmental policies, or economic factors, which could influence sustainability behaviors. For future research, several avenues could be explored to build on these findings. Cross-cultural studies could provide insights into how GTL influences green behaviors in different countries or cultural contexts, helping to understand the global applicability of the findings. Longitudinal research would allow for a deeper exploration of how GTL impacts green behaviors over time, providing valuable information on the long-term effectiveness of green leadership practices. Additionally, research could examine the role of other organizational factors, such as corporate social responsibility initiatives, in shaping sustainable behaviors. A mixed-methods approach combining quantitative surveys with qualitative interviews could offer a more nuanced understanding of employees' experiences with GTL and GKS. Future studies could also investigate additional mediators and moderators, such as intrinsic motivation or leadership styles, to further explain how GTL influences non-green behavior. Exploring the role of technology in supporting sustainability initiatives and conducting studies across different industries could offer further insights into how GTL can be leveraged to reduce non-green behaviors in various organizational settings.

Appendix (A): Measurement Scales

Green transformational leadership (GTL) Chen & Chang (2013).
GTL.1.The leader inspires the organization members with the environmental plans.
GTL.2.The leader provides a clear environmental vision for the members to follow.
GTL.3. The leader gets the organization members to work together for the same environmental goals.
GTL.4. The leader encourages the organization members to achieve the environmental goals.
GTL.5. The leader acts by considering the environmental beliefs of the organization members.
GTL.6. The leader stimulates the organization members to think about green ideas.
Green work engagement (GWE) Aboramadan (2022).
GWE.1.My environmental-related tasks inspire me
GWE.2. I am proud of the environmental work that I do
GWE.3.I am immersed in my environmental work
GWE.4.I am enthusiastic about my environmental tasks at my job
GWE.5.I feel happy when I am working intensely on environmental tasks
GWE.6. With environmental tasks at my job, I feel bursting with energy.
Non-green behavior (NGB) Paillé et al. (2019)
NGB.1. In the workplace, I do not care about the consumption of water or electricity.
NGB.2. At work, I let others worry about environmental protection.
NGB.3. In my work, ask my colleagues to prioritize productivity and not the environment.
NGB.4. Whenever I have the chance, I tell my coworkers that environmental performance is a waste of time.
NGB.5. I do not apply environmental standards that could slow my pace of work.
Green knowledge sharing (GKS) Wong(2013) and Rubelet al. (2021)
GKS.1. I always share green knowledge obtained from newspapers, magazines, journals, television and other sources.
GKS.2. I enjoy sharing environment-friendly knowledge with my colleagues.
GKS.3. In my organization, people share expertise from work experience with each other.
GKS.4. Sharing my knowledge with colleagues is pleasurable.
GKS.5. I believe that knowledge sharing can benefit all parties involved.

Appendix (B): Model fit and quality indices

	Assessment	**Criterion**	Supported/Rejected
Average path coefficient (APC)	0.310, P<0.001	P<0.05	Supported
Average R-squared (ARS)	0.217, P<0.001	P<0.05	Supported
Average adjusted R-squared (AARS)	0.213, P<0.001	P<0.05	Supported
Average block VIF (AVIF)	1.894	acceptable if ≤ 5, ideally ≤ 3.3	Supported
Average full collinearity VIF (AFVIF)	2.098	acceptable if ≤5, ideally ≤3.3	Supported
Tenenhaus GoF (GoF)	0.367	small≥0.1, medium ≥ 0.25, large ≥ 0.36	Supported
Sympson's paradox ratio (SPR)	1.000	acceptable if ≥ 0.7, ideally = 1	Supported
R-squared contribution ratio (RSCR)	1.000	acceptable if ≥ 0.9, ideally = 1	Supported
Statistical suppression ratio (SSR)	1.000	acceptable if ≥ 0.7	Supported
Nonlinear bivariate causality direction ratio (NLBCDR)	1.000	acceptable if ≥ 0.7	Supported

Author Contributions: Conceptualization,H.A., H.K.H., M.B., and M.F.A.; methodology, H.A., H.K.H, M.B.,and A.M.AS.; software, A.A. and M.A.; validation, M.A. and M.A.A. and M.F.A.; formal analysis, M.A. and M.A.A. and A.A.; investigation,H.A.,M.B., H.K.H, M.A.A. and AB.A.; data curation, M.B., M.A., AB.A., M.F.A. and A.M.AS.; writing - original draft preparation,M.B., H.A., M.A. and M.F.A.; writing - review and editing, H.A., M.B., AB.A., M.F.A., H.K.H. and M.A.; visualization H.A., M.F.A., A.M.AS. , A.A., AB.A. and M.A.; supervision,H.A., M.B., AB.A. , A.M.AS., A.A. and H.K.H.; project administration, H.A., M.F.A., M.A., and H.K.H. All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are available upon request from researchers who meet the eligibility criteria. Kindly contact the corresponding author privately through e-mail.

Acknowledgements: This study is supported via funding from Prince Sattam bin Abdulaziz University project number (PSAU/2025/R/1447).The authors extend their appreciation to the Deanship of Research and Graduate Studies at King Khalid University for funding this work through a Small-group Research Project under grant number(RGP.1/31/46).

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 15.04.2025 Revised: 03.07.2025 Accepted: 01.08.2025 Available online: 26.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1698-1708
DOI 10.30892/gtg.61328-1538

CAN TRAINING ACT AS A MEDIATOR BETWEEN EMPLOYEE CSR, ORGANIZATIONAL SUPPORT, AND JOB SATISFACTION IN TOURISM? RESULTS OF RESEARCH AT A HUNGARIAN HOTEL CHAIN

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Citation: Bannour, N., & Varga, E. (2025). Can training act as a mediator between employee csr, organizational support, and job satisfaction in tourism? Results of research at a hungarian hotel chain. *Geojournal of Tourism and Geosites*, 61(3), 1698–1708. https://doi.org/10.30892/gtg.61328-1538

Abstract: Corporate Social Responsibility (CSR) has emerged as a vital strategic tool for organizations aiming to strengthen internal structures while promoting employee wellbeing. This study explores the influence of CSR initiatives on key internal outcomes, specifically focusing on employee engagement, training, job satisfaction, perceived organizational support, and organizational performance. The research was conducted within the hospitality sector using a cross-sectional survey distributed among 259 employees from a prominent luxury hotel and its affiliated partner firm. Quantitative methods were employed, with data analyzed through R Studio and SPSS. Correlation analysis, mediation, and moderation models were applied to investigate the interrelationships among CSR activities and employee-centered variables. The findings demonstrate a significant positive association between CSR initiatives and employee engagement, morale, and retention. CSR was found to indirectly enhance organizational performance by improving employee satisfaction and perceived support. Furthermore, job satisfaction acted as a significant moderator in strengthening the relationship between engagement and performance outcomes. The results reveal a strong positive association between CSR participation and employee morale, perceived organizational support, and professional development. Moreover, CSR involvement was negatively associated with turnover intentions, indicating its potential to strengthen employee retention. Interestingly, the study did not identify a meaningful link between CSR and perceived environmental benefits, suggesting a more pronounced internal impact. These insights highlight the role of CSR not only as an external branding mechanism but as an integral component of internal organizational development. By fostering stronger employee commitment and lowering turnover intentions, CSR contributes substantially to sustainable organizational success in the hospitality industry.

Keywords: Corporate Social Responsibility (CSR), employee engagement, organizational success, training initiatives, employee wellbeing, job satisfaction, perceived organizational support, turnover intentions, tourism, workplace morale

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INTRODUCTION

Sustainable practices in companies positively impact employee engagement and well-being, improving retention and morale while reducing turnover and recruitment costs (Lakshmi et al., 2024). Additionally, sustainability investments often fund training initiatives, equipping employees to support environmental goals—an approach that contributes to employee retention when aligned with corporate social responsibility and innovative leadership practices (Aman-Ullah et al., 2024). This research examines the effect of employee-centric CSR initiatives at a luxury heritage hotel in the heart of the city, in collaboration with MFT Company, on employee well-being, organizational success, and community engagement. Understanding MFT's support for the hotel's workforce provides insights into the effectiveness of their partnership in enhancing service excellence. Zhu, Amoozegar (2024) and Maharani et al. (2025) demonstrate that CSR initiatives in the hotel industry significantly enhance employees' psychological capital, which in turn promotes wellbeing, emotional commitment, and organizational citizenship behavior. Kumar et al. (2021) discusses employer branding, while Özcan & Elçi (2020) explore the impact of worker-oriented CSR on employer brand perception. The hospitality industry's reliance on human capital makes it an ideal setting to study these dynamics. Despite technological advancements and automation, there is still a need for a significant human labor force (Gyurkó et al., 2024).

The aim of this study is to assess the impact of employee involvement in Corporate Social Responsibility (CSR) initiatives on their workplace experience. Specifically, the research focuses on understanding how participation in CSR activities relates to employee training, morale, perceived organizational support, and intentions to stay or leave the organization. The study targets employees at a downtown Budapest hotel and MFT Company, with the intention of gaining insight into how

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CSR practices influence staff engagement and contribute to reducing turnover. By examining these relationships, the research seeks to highlight the internal benefits of CSR from an employee perspective within the hospitality sector.

LITERATURE REVIEW

Corporate social responsibility (CSR) has gained significant attention in the hospitality industry, as it reflects a company's commitment to stakeholder welfare through socially responsible initiatives (Ferreira et al., 2024). While previous research has extensively examined the impact of CSR on consumers (Raza et al., 2023; Kreicbergs et al., 2019; Deep, 2023; Fauzan et al., 2022). There is a need for deeper exploration into how CSR influences employees (Rahman et al., 2021). Corporate social responsibility practices vary significantly across global contexts, requiring organizations to adapt their strategies to diverse cultural and regulatory environments (Wong et al., 2023). A growing trend shows that companies are proactively investing in employee welfare programs as part of their CSR strategy to foster a stronger sense of belonging among employees and enhance their performance—particularly in customer-facing roles (Kinyanjui et al., 2021; Rim & Ferguson, 2020). Understanding the link between CSR initiatives and employee attitudes and behaviors can provide companies with strategies to enhance employee performance in service roles (Wong et al., 2021).

Ahmad et al. (2023) investigated the role of altruistic values and human emotions in shaping corporate social responsibility (CSR) within the tourism and hospitality sector, highlighting CSR's potential to build stakeholder trust and emotional connection. Similarly, Wong et al. (2023) analyzed how hotel employees' perceptions of CSR performance influence their attitudes, emotional responses, and workplace behaviors. Employee participation in decision-making, particularly codetermination, has been shown to enhance corporate social responsibility outcomes and improve environmental, social, and governance (ESG) performance (Crifo & Rebérioux, 2024). This connection may help reduce motivation-related costs and improve overall employee well-being (Kunz, 2020). Furthermore, understanding how CSR initiatives influence employees' motivation can offer insights into designing effective CSR strategies (Ertuna et al., 2022).

Yang et al. (2022) examine how CSR fosters pro-environmental behavior and energy-related motivation among hotel workers. Recent studies confirm that CSR significantly enhances employee outcomes in tourism and hospitality. Wen et al. (2025) and Maneethai et al. (2024) show that CSR perceptions improve job satisfaction and commitment, often mediated by organizational practices such as training. Farmaki et al. (2022) highlight CSR's influence on job satisfaction through complex internal dynamics. Within Hungary, Malatyinszki et al. (2025) and Szentgróti et al. (2025) stress the relevance of CSR and local management practices for sustainable tourism and workforce development. These findings support investigating training as a mediator linking CSR, support, and satisfaction in hospitality settings.

According to Camilleri (2020), strategic CSR enhances profitability while addressing the interests of stakeholders, including employees, clients, suppliers, communities, and the environment. One of the main challenges for hotel operators in the post-pandemic era is attracting and retaining employees (Yin et al., 2022). Social Exchange Theory in hospitality research explains how organizational support, leader-member, and team-member exchanges affect job satisfaction (Meira & Hancer, 2021; Wang et al., 2021; Chung & Jeon, 2020). It is also mediated by organization-based self-esteem, which influences the relationship between social exchange and job satisfaction (Dalgic & Akgunduz, 2022). Social exchanges with customers are also important in shaping employees' job satisfaction (Kim & Qu, 2020), highlighting the theory's relevance. Social Exchange Theory has been applied to understand how perceived organizational support affects job satisfaction (Cheng & Yi, 2018), job performance (Hai & Park, 2024), and turnover intentions (Malik & Shaikh, 2024). Employers focusing on job satisfaction as a strategy to combat labor shortages and foster commitment (Wang et al., 2020) can maximize the benefits of social exchange by facilitating various exchanges between employers and employees (Jehanzeb & Bashir, 2025). Organizational support is a critical resource for enhancing job satisfaction, work efficiency, and reducing employee stress (Zhao et al., 2020). Ahmad et al. (2021) explored the relationship between burnout and turnover intentions among hotel employees. Their results indicated that higher levels of burnout were strongly associated with increased intentions to leave the organization. In the hospitality industry, perceived organizational support is vital for employee empowerment, work-life balance (Ma et al., 2021), reducing turnover (Asghar et al., 2021), and improving job satisfaction (Zhao et al., 2020).This highlights its importance in creating a dedicated and satisfied workforce.

Among hotel staff, room attendants play a critical role in maintaining guest satisfaction (Wijoyo, 2023). Hotels must invest in specialized training for them, as many neglect customer service, safety, and technology, resulting in lower satisfaction and higher turnover (Sari et al., 2023; Abomurad, 2019). The hospitality work environment significantly influenced employees' turnover intentions during the COVID-19 pandemic (Abdou et al., 2022). The study found that work-family conflict played a mediating role, linking poor work conditions to increased intentions to leave the organization. To address these challenges, hotels need to create engaging and comprehensive training programs that align with the evolving demands of the industry. Modern training initiatives should include housekeeping software, sustainable practices, and communication skills (Bhatnagar, 2019). Continuous learning is also crucial for room attendants to keep up with technological advancements and changing guest expectations (Wijoyo et al., 2021). In a globalized environment, personalized service and cultural awareness are key. By equipping room attendants with these skills, hotels can ensure superior service quality and a welcoming atmosphere for diverse guests (Permana & Mistriani, 2024). Such training improves skills, increases productivity, and contributes to higher job satisfaction and retention (Sari et al., 2023).

Therefore, the main research questions are formulated as below.

RQ1: How do employee-centric CSR initiatives at a 5-star hotel and MFT Company impact job satisfaction, turnover rates, and employee engagement?

RQ2: In what ways do these CSR initiatives influence employee well-being and morale at the luxury hospitality firm and MFT Company?

RQ3: How do employee-centric CSR initiatives affect organizational performance, profitability, and overall success at the premium hotel and MFT Company?

The conceptual model in Figure 1 shows how employee-centric CSR initiatives enhance employee well-being and morale, which in turn drive improved organizational performance, profitability, and overall success.

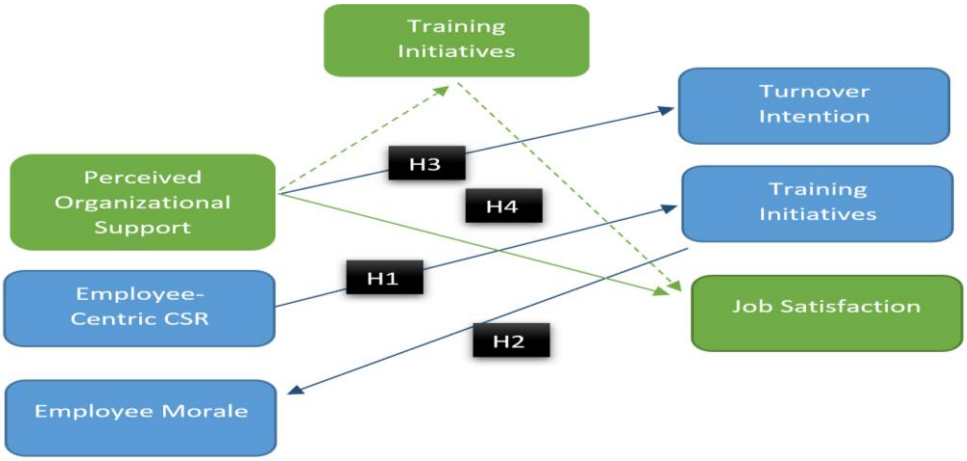

Figure 1. Conceptual model (Source: Author's own construction, 2025)

MATERIAL AND METHOD

A flow chart (Figure 2) outlining the key methodological steps of this research is presented below. This visual representation serves to clearly illustrate the sequence and structure of the study's design, data collection, and analysis process.

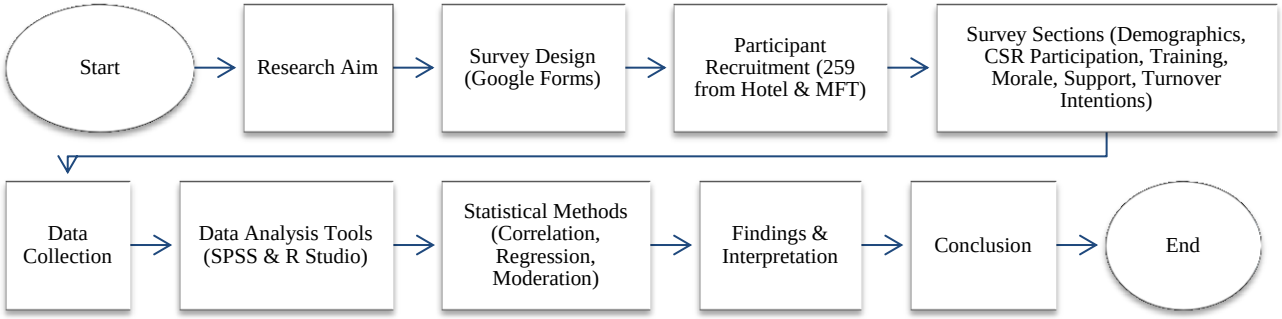

Figure 2. The process of scientific research (Source: Author's own construction, 2025)

This study aims to explore how Employee CSR Initiatives influence employee experience, particularly training, morale, perceived organizational support, and turnover intentions. Data was collected via Google Forms, chosen for its accessibility and ease of use, ensuring smooth participation. The survey involved 259 employees from a premier hotel in Budapest and MFT Company across various departments, offering a comprehensive view of workforce attitudes toward CSR initiatives.

The survey used various question formats to capture diverse perspectives. Likert-scale questions assessed attitudes toward CSR initiatives, employee morale, perceived organizational support, and turnover intentions. Closed questions gathered direct responses about participation in CSR activities and training programs, while multiple-choice questions collected demographic and training-related data. Open-ended questions allowed employees to provide detailed insights on how CSR initiatives and training programs impact their professional development and job satisfaction. SPSS and R Studio were used for data analysis, selected for its advanced capabilities in handling survey data. These tools facilitated hypothesis testing and enabled correlation, regression, and moderation analyses to examine relationships between variables, providing a deeper understanding of CSR's impact on employee experience and organizational dynamics.

Data Analysis

Correlation Analysis: Conducted to assess the relationships between variables such as CSR initiatives, training, morale, and organizational support.

Moderation and Mediation Analysis: Used to examine how training initiatives impact the relationship between perceived organizational support and job satisfaction, and how organizational support reduces turnover intentions.

Hypotheses

H1: We hypothesize that Employee CSR Initiatives **enhance** Training Initiatives.

H2: We assume that Training Initiatives **increase** Employee Morale.

H3: We hypothesize that Perceived Organizational Support **reduces** Turnover Intentions.

H4: We propose that Training Initiatives **moderate** the relationship between Organizational Support and Job Satisfaction.

Hypothesis development

This table clearly presents the hypotheses, showing the relationships between independent and dependent variables, as well as the moderating variable in H4.

Table 1. Hypothesis development (Source: Author's own construction, 2024)

Hypothesis	Independent Variable (IV)	Dependent Variable (DV)	Moderating Variable
H1	Employee CSR Initiatives	Training Initiatives	-
H2	Training Initiatives	Employee Morale	-
H3	Perceived Organizational Support	Turnover Intentions	-
H4	Organizational Support	Job Satisfaction	Training Initiatives

RESULTS

To assess the impact of Hotel's CSR efforts, it's important to consider the survey participants' demographics (Table 2), including gender, age, and employment duration, as these factors shape their perspectives on the CSR programs.
Table 3 reveals the distribution of participants across various age groups.

Table 2. Demographic Breakdown by Gender (Source: Author's own construction, 2024 (n =259)

	N	Percentage
Female	143	55
Male	116	45

Table 3. Demographic breakdown by age (Source: Author's own construction, 2024 (n =259)

	N	Percentage
18-24 Years	19	7
25-34 Years	161	62
35-44 Years	75	29
45-54 Years	4	2

The age distribution of participants reveals a dominant concentration in the 25–34 age group (62%), followed by the 35–44 group (29%), with minimal representation from younger (18–24, 7%) and older (45–54, 2%) cohorts. This skew suggests that geotourism primarily attracts young adults, likely due to their mobility, digital engagement, and lifestyle preferences. Table 4 outlines the employment duration of individuals working at five-star Hotel via MFT

Table 4. Employment Duration at a luxury hotel via MFT Company (Source: Author's own construction, 2024 (n =259)

	N	Percentage
1-5 Months	98	38
11-15 Months	51	20
16-20 Months	17	7
21-Above Months	4	2
6-10 Months	89	34

The data indicates a workforce characterized by short-term employment, with 38% of respondents (n=98) having been employed for only 1–5 months. An additional 34% (n=89) report employment durations of 6–10 months. Collectively, this suggests that 72% of employees have tenures for less than one year, underscoring a high rate of turnover. Employment figures decline sharply thereafter: 20% (n=51) have worked for 11–15 months, 7% (n=17) for 16–20 months, and only 2% (n=4) have remained employed for 21 months or longer. Table 5 lists the amounts of items in each scale along with the Cronbach's Alpha reliability of the various scales utilized in the study.

Table 5. Reliability Analysis using Cronbach's Alpha (Source: Author's own construction, 2024 (n =259)

Scale	N of Items	Alpha
Employee Centric CSR Initiatives	8	0.932
Job Satisfaction	3	0.869
Turnover Rate	10	0.949
Training	6	0.935
Organizational Success	5	0.932
Employee Morale	6	0.797
Organizational Support	7	0.935

The Employee-Centric CSR Initiatives scale (Alpha = 0.932) and Job Satisfaction scale (Alpha = 0.869) show good reliability. The Turnover Rate scale (Alpha = 0.949) has the highest reliability. The Training (Alpha = 0.935) and Organizational Success (Alpha = 0.932) scales also exhibit strong reliability. The Employee Morale scale (Alpha = 0.797) is slightly lower but still acceptable. Most scales show good internal consistency.

The following part presents the hypothesis tests together with its results.

H1: We hypothesize that Employee CSR Initiatives enhance Training Initiatives

The "Summary" table (Table 6) provides key metrics for understanding the relationship between Employee Centric CSR Initiatives and Training Initiatives.

Table 6. Summary of Key Metrics Linking Employee-Centric CSR and Training Initiatives (Source: Author's own construction, 2024 (n =259)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.219	0.048	0.04	0.74
Predictors: (Constant), Employee Centric CSR Initiatives				

The statistical analysis reveals a weak positive correlation (R = 0.219) between employee-centric Corporate Social Responsibility (CSR) initiatives and training initiatives. The coefficient of determination ($R^2 = 0.048$) indicates that only 4.8% of the variance in training initiatives can be attributed to variations in CSR practices. The adjusted R^2 value of 0.040 further confirms the limited explanatory power of the model, suggesting that CSR initiatives, as currently implemented, have minimal predictive strength regarding the scope or quality of training programs.

Additionally, the standard error of 0.74 reflects a moderate level of deviation between observed and predicted values, underscoring the imprecision of the model. These findings imply that, while there is a statistically positive association, the relationship is not substantively strong. This suggests that training initiatives may be influenced more by other organizational factors—such as budget allocations, leadership priorities, or external regulatory requirements—than by CSR policies alone. The "ANOVA" table (Table 7) assesses the overall significance of the regression model.

Table 7. ANOVA Summary: Assessing Overall Significance of the Regression Model (Source: Author's own construction, 2024 (n =259)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.06	1	7.06	12.91	< .001
	Residual	140.60	257	0.55		
	Total	147.67	258			
(a) Dependent Variable: Training Initiatives (b) Predictors: (Constant), Employee Centric CSR Initiatives						

The regression analysis demonstrates that employee-centric Corporate Social Responsibility (CSR) initiatives have a statistically significant, albeit weak, impact on training initiatives. The regression sum of squares (SSR) is 7.06, indicating the portion of variance in training initiatives explained by CSR. In contrast, the residual sum of squares (SSE) is considerably larger at 140.60, showing that the majority of variance remains unexplained by the model. The total sum of squares (SST), which represents the overall variability in the data, stands at 147.67.

The F-statistics of 12.91, accompanied by a p-value of less than 0.001, confirms that the model is statistically significant at conventional levels ($p < 0.05$). This suggests that the observed relationship between CSR and training initiatives is unlikely to be due to random chance.

However, despite the model's statistical significance, the practical significance remains limited due to the small proportion of variance explained ($R^2 = 0.048$). This indicates that while CSR initiatives may influence training activities, they do so to a minimal extent. The findings reinforce the need for a more holistic and strategically integrated approach if CSR is to serve as a meaningful driver of workforce development within the tourism and geosites sector.

The "Coefficients" table (Table 8) provides the details of the regression equation.

Table 8. Regression Output: Coefficient Estimates and Significance (Source: Author's own construction, 2024 (n =259)

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.593	0.24		15.22	< .001
	Employee Centric CSR Initiatives	0.217	0.06	0.22	3.59	< .001
a Dependent Variable: Training						

The regression output reveals that the constant (intercept) is 3.593, indicating that in the absence of employee-centric Corporate Social Responsibility (CSR) initiatives, the baseline level of training initiatives is predicted to be 3.593 units. The unstandardized coefficient for CSR initiatives is 0.217, suggesting that for each one-unit increase in CSR activity, training initiatives are expected to rise by 0.217 units. The standardized coefficient (Beta = 0.22) further indicates a weak effect size in relation to potential other explanatory variables not included in the model.

The t-statistics of 3.59, coupled with a p-value of less than 0.001, confirm that the effect is statistically significant. This provides empirical support for the proposed relationship between employee-centric CSR and training initiatives and lends moderate backing to Hypothesis 1. However, the magnitude of the effect remains limited, implying that while CSR initiatives do influence training efforts, the strength of this relationship is modest at best. These findings suggest that CSR may play a role in fostering training initiatives but is likely one of several contributing factors. The weak standardized coefficient indicates that other organizational, managerial, or structural dynamics may exert stronger influences.

H2: We assume there is an association between participation in Training programs and Employee Morale levels

The cross-tabulation table (Table 9) examines the relationship between participation in training programs and levels of employee morale. Table 9 Training Participation * Employee Morale Cross tabulation

Table 9. Cross-tabulation of Training Participation and Employee Morale (Source: Author's own construction, 2024 (n = 259)

		Employee Morale		
		Low	Medium	High
Training Participation	Yes	0	62	64
	No	133	0	0

The distribution of employee morale levels across training participation status reveals a striking pattern. Among employees who participated in training programs, none reported low morale, while 62 reported medium morale and 64 reported high morale. Conversely, all 133 employees who did not participate in any training initiatives reported low morale, with no instances of medium or high morale observed (Table 10). This pronounced contrast strongly suggests a positive association between participation in training programs and elevated employee morale. The absence of low morale among training participants highlights the potential of training initiatives not only to enhance skill sets but also to foster psychological and motivational well-being in the workforce. Meanwhile, the complete lack of morale diversity among non-participants points to a critical area of concern regarding disengagement and dissatisfaction.

Table 10. Chi-Square Tests (Source: Author's own construction, 2024 (n = 259)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	259.00	2	< .001
Likelihood Ratio	358.86	2	< .001
Linear-by-Linear Association	212.51	1	< .001
N of Valid Cases	259		

The chi-square tests provide robust statistical support for the association between training participation and employee morale. The Pearson Chi-Square value is 259.00 (df = 2, $p < 0.001$), indicating a highly significant relationship between the two categorical variables. This result is corroborated by the Likelihood Ratio test (358.86, $p < 0.001$) and the Linear-by-Linear Association test (212.51, $p < 0.001$), both of which confirm a strong and statistically significant linear association. The analysis, based on 259 valid cases, reveals a substantial divergence in morale levels depending on training participation status. Notably, no instances of low morale were recorded among employees who participated in training programs, whereas 100% of non-participants reported low morale. This clear dichotomy provides compelling empirical evidence in support of Hypothesis H4, which posits a positive link between training engagement and employee morale.

These findings underscore the importance of training initiatives in improving employee morale.

H3: Influence of Perceived Organizational Support on Turnover Intentions

The descriptive statistics for the hypothesis (Table 11) regarding the influence of perceived organizational support on turnover intentions reveal significant differences across varying levels of support.

Table 11. Descriptive statistics (Source: Author's own construction, 2024 (n = 259)

Turnover Intention	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Low Organizational Support	98	4.15	0.84	0.09	3.98	4.32
Medium Organizational Support	76	2.89	0.90	0.10	2.69	3.10
High Organizational Support: Scores	85	2.29	1.23	0.13	2.03	2.56
Total	259	3.17	1.28	0.08	3.02	3.33

The analysis demonstrates a clear inverse relationship between perceived organizational support and employee turnover intentions. Employees who reported low levels of support exhibit the highest mean turnover intention score (M = 4.15, SD = 0.84), indicating a strong propensity to leave the organization. In contrast, those perceiving medium support reported a lower mean turnover intention (M = 2.89, SD = 1.01), and employees with high perceived support show the lowest turnover intention (M = 2.29, SD = 1.23). These results suggest a consistent trend: as perceived organizational support increases, the desire to exit the organization decreases.

Standard deviations across groups further clarify the dispersion of responses. The low support group shows less variability, suggesting more uniform dissatisfaction, whereas higher variability in the high support group (SD = 1.23) may reflect differing degrees of contentment or organizational attachment among those generally perceiving strong support.

Confidence intervals reinforce these patterns. The 95% confidence interval for the low support group (3.98–4.32) remains high and narrow, indicating high certainty around high turnover intentions. In contrast, intervals for medium (2.69–3.10) and high (2.03–2.56) support groups show progressively lower values, confirming reduced turnover intentions as support increases. The one-way ANOVA test results (Table 12) provide statistical confirmation of these differences.

Table 12. ANOVA Results for Turnover Intention Across Groups (Source: Author's own construction, 2024 (n = 259)

Turnover Intention	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	165.67	2	82.84	82.35	< .001
Within Groups	257.51	256	1.01		
Total	423.18	258			

The intergroup differences in turnover intentions are statistically significant ($p < 0.001$), offering empirical support for Hypothesis H3: perceived organizational support significantly influences turnover intentions among employees in tourism-related organizations. Table 12 ANOVA Results for Turnover Intention Across Groups

The one-way ANOVA analysis reinforces the significant role of perceived organizational support in shaping employee turnover intentions. The between-groups sum of squares is 165.67, representing the variance in turnover intention attributable to differences in perceived organizational support (categorized as low, medium, and high). In contrast, the within-groups sum of squares is 257.51, reflecting individual variation within each support level.

The mean square values—82.84 for between-groups and 1.01 for within-groups—yield an F-statistic of 82.35. This high F-value indicates that the variance between groups is substantially greater than the variance within groups. The associated p-value (< 0.001) confirms that these differences are statistically significant at a high level of confidence.

These results offer strong empirical support for Hypothesis H3, affirming that perceived organizational support significantly influences turnover intentions among employees. Specifically, employees who perceive low organizational support are markedly more inclined to consider leaving their jobs, while those with higher levels of perceived support show substantially lower turnover intentions.

The multiple comparisons table (Table 13) using both Tukey HSD and LSD post-hoc tests, reveals significant differences in turnover intentions across different levels of perceived organizational support.

Table 13. Multiple Comparisons of Turnover Intentions Across Perceived Organizational Support Levels Using Tukey HSD and LSD Post-Hoc Tests (Source: Author's own construction, 2024 (n = 259) (Note: DV = Turnover Intention)

	(I) Organizational Support	(J) Organizational Support	Mean Difference (I-J)	Std. Error	Sig.
Tukey HSD	Low Organizational Support	Medium Organizational Support	1.25832*	0.15	< .001
		High Organizational Support: Scores	1.85894*	0.15	< .001
	Medium Organizational Support	Low Organizational Support	-1.25832*	0.15	< .001
		High Organizational Support: Scores	.60062*	0.16	< .001
	High Organizational Support: Scores	Low Organizational Support	-1.85894*	0.15	< .001
		Medium Organizational Support	-.60062*	0.16	< .001
LSD	Low Organizational Support	Medium Organizational Support	1.25832*	0.15	< .001
		High Organizational Support: Scores	1.85894*	0.15	< .001
	Medium Organizational Support	Low Organizational Support	-1.25832*	0.15	< .001
		High Organizational Support: Scores	.60062*	0.16	< .001
	High Organizational Support: Scores	Low Organizational Support	-1.85894*	0.15	< .001
		Medium Organizational Support	-.60062*	0.16	< .001
* The mean difference is significant at the 0.05 level.					

Post-hoc analyses using both Tukey HSD and LSD tests reveal statistically significant differences in turnover intentions across levels of perceived organizational support. Employees perceiving low organizational support exhibit substantially higher turnover intentions compared to those with medium and high support. Specifically, the mean difference between low and medium support groups is 1.258 (SE = 0.15, $p < 0.001$), and between low and high support groups is 1.859 (SE = 0.15, $p < 0.001$), indicating a markedly elevated likelihood of intent to leave among those with low perceived support.

Furthermore, the difference between medium and high support groups is also significant (mean difference = 0.601, SE = 0.16, $p < 0.001$), demonstrating a graded reduction in turnover intentions as perceived organizational support increases.

These consistent findings across multiple post-hoc testing methods robustly confirm Hypothesis H3, underscoring the critical importance of enhancing perceived organizational support to reduce employee turnover intentions. The results emphasize that cultivating a supportive work environment is essential for retaining talent within tourism and geosite-related organizations, where employee commitment directly influences service quality and organizational sustainability.

H4: Training Initiatives significantly moderate the relationship between Organizational Support and Job Satisfaction

A moderation analysis using Hayes' PROCESS macro (Appendix) model 1 with a sample of 259 participants investigated whether Training Initiatives moderate the relationship between perceived Organizational Support and Job Satisfaction. The results indicate a significant positive main effect of Organizational Support on Job Satisfaction (B = 0.1006, p = 0.0353), alongside a robust positive effect of Training Initiatives (B = 0.7908, p < 0.001).

Crucially, the interaction term between Organizational Support and Training Initiatives was statistically significant (B = -0.1438, p = 0.0259), demonstrating that the strength of the association between Organizational Support and Job Satisfaction depends on the level of Training Initiatives. Simple slope analyses reveal that when Training levels are low or average, Organizational Support significantly enhances Job Satisfaction. However, at high levels of Training, this effect diminishes and becomes nonsignificant. This pattern suggests that Training Initiatives buffer or moderate the impact of Organizational Support on Job Satisfaction, supporting Hypothesis H4.

DISCUSSION

This study provides valuable insights into the interplay between employee-centric Corporate Social Responsibility (CSR) initiatives, perceived organizational support, training, and their collective impact on job satisfaction and employee retention. The findings confirm that CSR initiatives positively influence the availability and uptake of training opportunities, corroborating recent work by Kim et al. (2024), who emphasized CSR's critical role in fostering

employee development and skill enhancement. This suggests that employees who perceive their organization as socially responsible are more inclined to participate in training, though the modest effect size indicates that other organizational and individual factors also contribute significantly. The results further validate the hypothesis that training initiatives are instrumental in elevating employee morale (H2), echoing the conclusions of Sari et al. (2023) regarding training's capacity to enhance motivation, engagement, and employees' sense of purpose. This reinforces the argument that training programs not only build competencies but also serve as a motivational lever, particularly relevant in sectors such as tourism and geosites where frontline employee engagement critically shapes service quality.

Consistent with Social Exchange Theory (Meira & Hancer, 2021), the study also demonstrates that perceived organizational support plays a decisive role in reducing turnover intentions (H3). Employees who feel supported by their organization exhibit greater commitment and loyalty, which aligns with broader findings linking organizational support to retention. This underscores the strategic importance for tourism-related organizations to cultivate supportive work environments to mitigate high turnover, a persistent challenge in the industry.

Notably, the moderation analysis reveals a nuanced dynamic (H4) in which training initiatives modulate the relationship between organizational support and job satisfaction. While training amplifies the positive impact of support at low to moderate levels, this effect attenuates at higher levels of training, indicating a saturation or diminishing returns phenomenon. This finding enriches the literature by suggesting that beyond a certain threshold, additional training may not yield proportional increases in job satisfaction (Sagheem et al., 2024; Choo et al., 2025). Practitioners should thus balance training investments with other organizational support mechanisms to optimize employee outcomes. Overall, this study contributes to a more integrated understanding of how CSR, organizational support, and training collectively influence key employee attitudes and behaviors in tourism and geosite management contexts.

Managerial Implications

The findings of this study offer several actionable insights for managers in the tourism and geosites sectors, where employee retention, morale, and job satisfaction critically impact service delivery and organizational sustainability.

Firstly, managers should recognize the strategic value of employee-centric CSR initiatives as a catalyst for training participation. By embedding CSR into organizational culture, managers can foster an environment that encourages continuous learning and skill development, which in turn enhances employee morale and engagement. However, given the modest explanatory power of CSR on training uptake, it is crucial to address additional motivational and contextual factors influencing employee development.

Secondly, the clear link between perceived organizational support and reduced turnover intentions underscores the importance of cultivating supportive workplace environments. Managers must prioritize transparent communication, recognition, and resource availability to strengthen employees' perceptions of support. This is especially vital in sectors prone to high turnover, where loss of skilled staff can undermine operational stability and visitor experience.

Thirdly, the moderation effect of training on the relationship between organizational support and job satisfaction highlights the need for a balanced approach to employee development. While investing in training is essential, managers should be wary of overloading employees with excessive training that may lead to diminishing returns in satisfaction and engagement. Instead, training programs should be tailored, relevant, and complemented by other forms of organizational support to sustain motivation and performance.

Finally, managers are encouraged to adopt an integrative HR strategy that simultaneously leverages CSR, training, and organizational support to create a holistic employee experience. Such an approach not only enhances job satisfaction and morale but also mitigates turnover risks, ultimately contributing to the long-term resilience and competitiveness of tourism and geosite organizations.

CONCLUSIONS

This study underscores the significant role of CSR in shaping employee training, job satisfaction, and retention in the hospitality industry. By incorporating strong CSR practices, comprehensive training initiatives, and consistent organizational support, hotels can cultivate a motivated workforce and elevate service quality. The findings provide a strategic framework for hotel managers, emphasizing employee-centric policies that align business success with workforce well-being. The results confirm that CSR initiatives positively influence training participation, as employees who perceive their organization as socially responsible are more likely to engage in professional development.

However, the relatively small effect size suggests that other organizational factors, such as leadership and job design, also play a role in training engagement. Training initiatives were found to boost employee morale, enhancing motivation, engagement, and purpose within the workplace. This aligns with research on continuous learning's positive impact on employee well-being. Additionally, perceived organizational support is vital in reducing turnover intentions. Employees who feel supported through career development, recognition, and well-being initiatives are less likely to leave, highlighting the importance of a supportive work environment in fostering long-term commitment.

Moreover, the study reveals that training moderates the relationship between organizational support and job satisfaction, strengthening the connection at first. However, its impact weakens at higher levels, suggesting a saturation effect. This implies that while training remains important, it should be complemented by other engagement strategies to maximize its benefits. In conclusion, the study advocates for a holistic approach combining CSR initiatives, training programs, and robust support systems. This approach not only enhances employee well-being and job satisfaction but also reduces turnover, contributing to sustainable organizational success.

Limitations and Future Research Directions

While this study provides valuable insights into the relationship between CSR initiatives and employee experience, several limitations should be acknowledged. First, the research was conducted within a single hotel group, A participating hotel in this study and its partner MFT, which restricts the broader applicability of the findings.

Second, the study mainly examined training as a mediating factor influencing job satisfaction and turnover intentions. However, employee experience is multifaceted, and other variables—such as leadership style, organizational justice, psychological safety, and work-life balance—were not considered.

Third, the use of a cross-sectional design limits the ability to draw causal conclusions. Longitudinal research is needed to explore whether such initiatives have sustained effects on employee engagement, retention, and organizational performance.

Finally, this study relied on self-reported data, which can introduce response bias or social desirability effects, especially in topics like CSR where participants may feel pressure to respond positively. Future research might consider combining survey data with qualitative interviews or organizational performance metrics to triangulate findings and reduce bias.

Appendix

```
Run MATRIX procedure:
***************** PROCESS Procedure for SPSS Version 4.2 *****************
        Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
   Documentation available in Hayes (2022). www.guilford.com/p/hayes3
**************************************************************************
Model  : 1     Y  : Job_Sat    X  : Org_Sup    W  : Training
Sample Size:  259
**************************************************************************
OUTCOME VARIABLE:
 Job_Sat Model Summary
         R       R-sq        MSE          F        df1        df2          p
     .7900      .6241      .2245    141.1412     3.0000   255.0000      .0000
Model             coeff         se          t          p       LLCI       ULCI
constant     4.4185      .0295    149.9412      .0000     4.3604     4.4765
Org_Sup       .1006      .0475     2.1167      .0353      .0070      .1941
Training      .7908      .0391    20.2082      .0000      .7137      .8678
Int_1        -.1438      .0642    -2.2404      .0259     -.2702     -.0174
Product terms key:
 Int_1    :       Org_Sup  x       Training
Test(s) of highest order unconditional interaction(s):
      R2-chng          F        df1        df2          p
X*W      .0074     5.0196     1.0000   255.0000      .0259
----------
    Focal predict: Org_Sup  (X)     Mod var: Training (W)
Conditional effects of the focal predictor at values of the moderator(s):
   Training     Effect         se          t          p       LLCI       ULCI
    -.7565      .2094      .0716     2.9224      .0038      .0683      .3504
     .0000      .1006      .0475     2.1167      .0353      .0070      .1941
     .5746      .0179      .0568      .3159      .7523     -.0939      .1298
Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
DATA LIST FREE/
  Org_Sup    Training   Job_Sat    .
BEGIN DATA.
    -.6253     -.7565     3.6893      .0000     -.7565     3.8202
     .5210     -.7565     3.9293     -.6253      .0000     4.3556
     .0000      .0000     4.4185      .5210      .0000     4.4709
    -.6253      .5746     4.8617      .0000      .5746     4.8729
     .5210      .5746     4.8822
END DATA.
GRAPH/SCATTERPLOT = Org_Sup  WITH     Job_Sat  BY       Training .
************************ ANALYSIS NOTES AND ERRORS *************************
Level of confidence for all confidence intervals in output:   95.0000
W values in conditional tables are 1 SD below the mean, the mean, and the maximum.
NOTE: One SD above the mean is above the maximum observed in the data for W,
      so the maximum measurement for W is used for conditioning instead.
NOTE: The following variables were mean centered prior to analysis: Training Org_Sup
------ END MATRIX -----
```

Author Contributions: Conceptualization: N. B. and E. V.; methodology: N. B.; software: N. B.; validation: N. B and E. V.; formal analysis, N. B. and E. V.; investigation: E. V. and N. B.; data curation: N. B; writing - original draft preparation: N. B. and E. V.; writing - review and editing: E. V.; visualization: E. V. and N. B.; supervision: E. V.; project administration: E. V. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 01.04.2025 Revised: 03.07.2025 Accepted: 01.08.2025 Available online: 26.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1709-1718
DOI 10.30892/gtg.61329-1539

QUALITY AND CARRYING CAPACITY OF KLAYAR COASTAL BEACH TO ENHANCE SUSTAINABLE MANAGEMENT IN GLOBAL GEOPARK GUNUNG SEWU, INDONESIA

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Citation: Setiawan, F.A., Astina, I.K., Sumarmi, & Hanafiah, M.H. (2025). Quality and carrying capacity of Klayar coastal beach to enhance sustainable management in global geopark Gunung Sewu, Indonesia. *Geojournal of Tourism and Geosites*, 61(3), 1709–1718. https://doi.org/10.30892/gtg.61329-1539

Abstract: Klayar Beach, a key site within Indonesia's Gunung Sewu UNESCO Global Geopark, faces growing tourism pressures threatening its ecological integrity. This study evaluates sustainable visitation thresholds by integrating carrying capacity analysis with beach quality assessment, addressing critical gaps in coastal geopark management literature. Using a descriptive-quantitative method, the study integrates beach carrying capacity analysis, including Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC), and Effective Carrying Capacity (ECC), with beach quality indicators, such as accessibility, environmental quality, comfort, and infrastructure. Data were collected using field observations, surveys, GIS mapping, and stakeholder interviews. The result showed that while the beach has high environmental quality (score: 0.93), optimal water quality (1), and no industrial pollution, vendor waste management requires improvement. Poor facilities (score=0.5) are due to inadequate restrooms, limited shade, insufficient safety equipment, and significant limitations in facilities and comfort. Although the PCC exceeds 113,000 visits/day, the ECC is significantly lower at 6,060 visits/day, showing a gap between physical capacity and management capability. The beach was divided into five zones with distinct characteristics and capacities: Zones 1-2 show high development potential (ECC 547-256 visits/day), while Zones 4-5 require strict conservation measures (ECC 105-68 visits/day). The study shows the need for visitor limits, improved infrastructure, and community-based tourism strategies to balance conservation with economic growth. By aligning visitor management with zone-specific capacities, Klayar Beach can mitigate over-tourism and enhance sustainable use. This approach can serve as a model for other coastal geoparks facing similar challenges, promoting long-term environmental and socio-economic resilience. In this regard, a novel framework was provided for integrating carrying capacity and beach quality assessments in geopark contexts, contributing to more sustainable coastal tourism management in Indonesia and beyond.

Keywords: sustainable coastal tourism, carrying capacity, beach quality, UNESCO Global Geopark, Klayar Beach

* * * * * *

INTRODUCTION

Coastal areas are essential for economic development, cultural heritage, and biodiversity conservation hubs. However, unmanaged tourism growth significantly pressures fragile coastal ecosystems, leading to habitat degradation, pollution, and overcrowding (Milano et al., 2024). Recently, coastal tourism has been a rapidly growing sector, driven by increasing global demand for nature-based experiences (Da Mota & Pickering, 2021). Sustainable tourism's challenge was balancing economic benefits with environmental and social sustainability (Williams & Lemckert, 2023).

Indonesia is home to some of the world's most visited coastal destinations and the country faces overtourism issues in places such as Bali, Yogyakarta, and Lombok (Faiz & Komalasari, 2020; Purwandani & Pakan, 2022; Utama et al., 2024). Although these popular destinations have attracted significant attention in tourism studies, lesser-known yet ecologically valuable coastal sites, such as Klayar Beach in Pacitan, remain understudied regarding their carrying capacity and long-term sustainability. Klayar Beach, part of the UNESCO-designated Gunung Sewu Global Geopark, is renowned for its unique karst formations, white sandy shores, and geological heritage. Despite the growing appeal, drawing over 300,000 visitors annually, there is limited understanding of how increased tourism impacts its environmental integrity and visitor experience.

Assessing beach quality in Klayar Beach is essential for safeguarding its UNESCO Global Geopark status by protecting unique geological formations while monitoring human impacts (Pérez-Romero et al., 2023). It complements carrying capacity calculations by revealing how conditions affect visitor distribution and experience quality, aligning with UNESCO's sustainable tourism guidelines (Rocha et al., 2021). Regular quality monitoring establishes climate resilience benchmarks and provides management tools to prevent heritage degradation. This integrated approach offers a

* Corresponding author

model for coastal geoparks worldwide to balance preservation with responsible tourism development (Wu et al., 2022). Beyond visitor thresholds, sustainable coastal tourism also depends on a broader evaluation of beach quality indicators, which provide a holistic measure of sustainability. Previous studies have identified several key factors influencing beach quality, including accessibility, environmental quality, comfort, infrastructure, and safety (Prisco, 2021).

Accessibility is crucial in determining visitor flow and distribution, with well-designed infrastructure facilitating a more even dispersal of tourists while reducing congestion in sensitive areas (Dash & Sharma, 2021). Environmental quality, including water cleanliness, waste management, and pollution control, are important factors in maintaining the ecological integrity of coastal destinations (Peña-Alonso et al., 2018). Visitor satisfaction and tourism experience are influenced by comfort and infrastructure, including rest areas, public facilities, and security measures (Hanaee et al., 2025).

Sustainable coastal management strategies need to account for beach carrying capacity (BCC), the maximum number of visitors an area can sustain without causing environmental degradation or compromising visitor satisfaction (Cisneros et al., 2016). Previous studies have assessed carrying capacities of tourist beaches in Argentina and the Dominican Republic (Cisneros et al., 2016; Cortés-Useche et al., 2021), but there remains a study gap in applying carrying capacity frameworks to Indonesian UNESCO Geopark sites, particularly in integrating environmental indicators with visitor management strategies. Furthermore, while global studies showed the importance of sustainable coastal tourism (Defeo et al., 2021), there are limited empirical reviews on the accurate and effective carrying capacities of Indonesian beaches facing increasing tourism demand. There is a significant gap in studies that integrate both methods within the Indonesian tourism context despite the extensive investigation of carrying capacity and beach quality assessments. Previous studies have primarily focused on carrying capacity calculations or general sustainability assessments, with only a few attempting to merge these methodologies into a comprehensive evaluation framework (Arinta et al., 2022; Cisneros et al., 2016; Insani et al., 2020).

This lack of study challenges local policymakers and tourism stakeholders, who require data-driven insights to develop effective management strategies. This study addressed these gaps by conducting an integrated assessment of Klayar Beach's tourism sustainability, combining carrying capacity calculations (PCC, RCC, and ECC) and evaluating beach quality indicators. By applying this comprehensive framework, valuable insights were provided into the environmental thresholds of Klayar Beach and strategic recommendations for sustainable tourism planning.

MATERIALS AND METHODS

The study used a cross-sectional descriptive-quantitative design to evaluate various aspects of Klayar Beach. This method enables systematic collection and analysis of numerical data, facilitating comparisons and statistical evaluations.

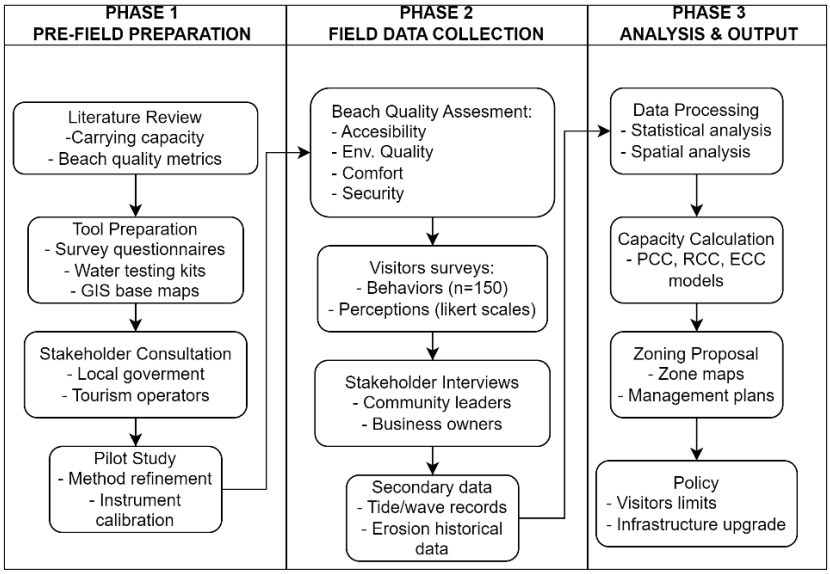

Figure 1. Research flowchart Quality and Carrying Capacity of Klayar Coastal Beach (Source: Author, 2024)

This study was conducted at Klayar Beach, Donorojo District, and Pacitan Regency, Indonesia, focusing on beach quality and carrying capacity assessment. Klayar Beach (approximately 8.123°S, 111.456°E) lies along the southern coast of Java Island, facing the Indian Ocean, and is renowned for its unique coastal geomorphology, including limestone cliffs, white sand, and tidal wave erosion features. Primary data were collected in the field using the direct measurement method. Secondary data were also collected by studying the literature and information on assessing the carrying capacity of the tourism environment. The research flow is shown in Figure 1.

Assessing the beach uses the Beach Quality Assessment indicator (Table 1) and scoring for analysis (Table 2).

Table 1. Beach Quality Assessment Framework ((Peña-Alonso et al., 2018)

Indicator	Parameters Assessed	Measurement Criteria	Data Collection Method
Accessibility (Acc)	-Disabled parking; -Public parking; -Accessible pathways; -Public transport; - Signage	0-4 scale (0=None, 4=Excellent)e.g., "Disabled parking: 0=Absent, 4=Available"	Observation GIS mapping

Environmental Quality (EnvQ)	- Noise pollution; - Odors; - Algae blooms; - Water pollution; - Waste accumulation	Binary (Yes/No) and frequency scales e.g., "Algae blooms: 0=>5/yr, 4=<2/yr"	Water sampling Visual surveys
Water Quality (WatQ)	- Microbiological safety	0=Unsuitable, 4=Suitable	Laboratory analysis
Comfort (Comf)	- Wave energy; - Wind speed; - Temperature; - UV index; - Animal nuisance	Categorical scales e.g., "Wave energy: 0=>1.5m, 4=<0.5m"	Meteorological instruments
Scenic Beauty (SceQ)	- Water clarity; - Landscape integration; - Coastal vegetation	0-4 scales e.g., "Water transparency: 0=Muddy, 4=Clear"	Expert appraisal Visitor surveys
Human Activity Infra. (HumAI)	- Carrying capacity; - Structures; - Urbanization level; - Illegal activities	Mixed scales e.g., "Permanent infrastructure: 0=>75%, 4=0%"	Spatial analysis Official records

Table 2. Beach Quality Classification System

Class	Score Range	Description	Management Implications
Excellent	145-192	Pristine conditions with full facilities and minimal human impact	Maintain current status; focus on monitoring and minor improvements
Good	97-144	Minor issues in 1-2 indicators but generally well-managed	Targeted enhancements (e.g., waste management, accessibility upgrades)
Fair	49-96	Significant deficiencies in multiple indicators require intervention	Major infrastructure investments and visitor management are needed
Poor	0-48	Severe degradation; unsafe or unsuitable for sustainable tourism	Immediate restoration required; potential temporary closure

The carrying capacity assessment framework for tourist attraction zones considers three levels of focus, namely Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC), and Effective Carrying Capacity (ECC). Physical Carrying Capacity (PCC) shows the maximum number of tourists a space can hold at a specific time and was calculated using the preceding formula (Cifuentes, 1992). This measure provides the limit for tourist numbers based on available space.

$$\mathrm{PCC} = \frac{A}{A_U} * T_f,$$

where A is the size of the study area, Au represents the available area based on occupancy criteria, Tf shows how often an individual can visit the area in a day, considering scheduled visits and the time needed for each visit. The occupancy criterion (Au) was based on Norma Cubana's model, which identified three situations, namely high, medium, and low, with 5, 10, and 25 m² of space per visitor, respectively. The study estimated Tf values using data from questionnaires, as described by Cisneros et al. (2016). The Real Carrying Capacity (RCC) is the number of visitors allowed to visit a tourist attraction with a correction factor (CF) obtained from the object features applied to the PCC. The equation used to calculate RCC is as follows (Cifuentes, 1992):

$$\mathrm{RCC} = \mathrm{PCC} * \frac{100 - Cf_1}{100} * \frac{100 - Cf_2}{100} * \frac{100 - Cf_3}{100} * \cdots * \frac{100 - Cf_n}{100}, \qquad Cf_i = \frac{Ml_i}{Mt_i} * 100,$$

RCC is part of the PCC with some external factors, and Cfi is the correction coefficient for each generic factor. All Cfi factors were expressed as percentages using the equation. Mli represents the measured value for each generic factor i, and Mt_i is the maximum allowable value. These factors, including rainfall, strong winds, sunshine, periods of temporary closure, and beach were selected due to the influence on recreational activity (Table 3).

Table 3. Correction Factor Applied in the Research (Source: Cifuentes, 1992; Defeo et al., 2021; Peña-Alonso et al., 2018)

Component	Definition	Units
Rainfall (CF_1)	Percentage of days when precipitation limits beach activities	% days/yr
Strong Winds (CF_2)	Days with wind speeds >20 knots (23 mph) creating safety hazards	% days/yr
Sunlight (CF_3)	Excessive UV index (>8) reducing comfort during peak hours	hours/day
Closure Periods (CF_4)	Scheduled maintenance or ecological recovery periods	days/yr
Erosion (CF_5)	Beach area reduction from sediment loss (≥5% annual change)	m²/year

$$\mathrm{ECC} = \mathrm{RCC} * \frac{\mathrm{MC}}{100}.$$

The equation defines the ECC, where MC is the management capacity of the zone under consideration (Cifuentes, 1992). For the estimation of MC, the factors considered were institutional support (information services, beach management plans, building regulations, access regulations), services (tent rental, restaurants, drug stores), personnel (lifeguards, people trained for natural disaster response) and infrastructure (bathrooms, public lighting, beach buildings, wayfinding/beaches, beach access, recreational areas, lifeguards and fire stations, vehicles and means for natural disaster relief). Qualitative information, such as beach access, accommodation, recreational areas, parking, fishing, dunes, and rock zones, was also included, as shown in Table 4.

Table 4. Classification of BCC qualitative variables: Beach facilities (Source: Cisneros et al., 2016)

Qualitative variable	High (H)	Medium (M)	Low (L)
Beach access	H (>4)	M (between 2 and 4)	L (1)
Accommodation	H (>10)	M (between 4 and 10)	L (<4)
Recreation places	H (4)	M (between 2 and 4)	L (<2)
Parking places	H (>500)	M (between 100 and 500)	L (<100)

The carrying capacity calculation provides the number of tourists allowed per day. Studies calculated PCC, RCC, and ECC, then compared the values with the number of tourists who visit daily (JKr). When the number of tourists per day is greater than the carrying capacity, then the threshold of sustainable tourism is exceeded. However, when the number remains below the carrying capacity, then the value is within the limit, and further development opportunities are suggested. This method ensures accurate assessments for sustainable tourism management (Table 5).

Table 5. Recommended Tourism Classification and Supportability (Source: Cifuentes, 1992)

Type of Tourism Support		Supportability Classification	Recommendation
PCC>JKrRCC>JKr	ECC>JKr	Great Opportunity	Can be developed
PCC<JKrRCC<JKr	ECC<JKr	Overrated	Control and organization
PCC=JKrRCC=JKr	ECC=JKr	Optimal	Effective and Efficient

ANALYSIS AND RESULTS

Klayar Beach is located in the Donorojo Sub-district, about 35 km from Pacitan City (Figure 2). The beach classification was based on the category of Cisneros et al. (2016), namely urban, semi-urban, or natural. The Klayar Beach falls under the semi-urban category. This area has moderate to low population density and limited accessibility.

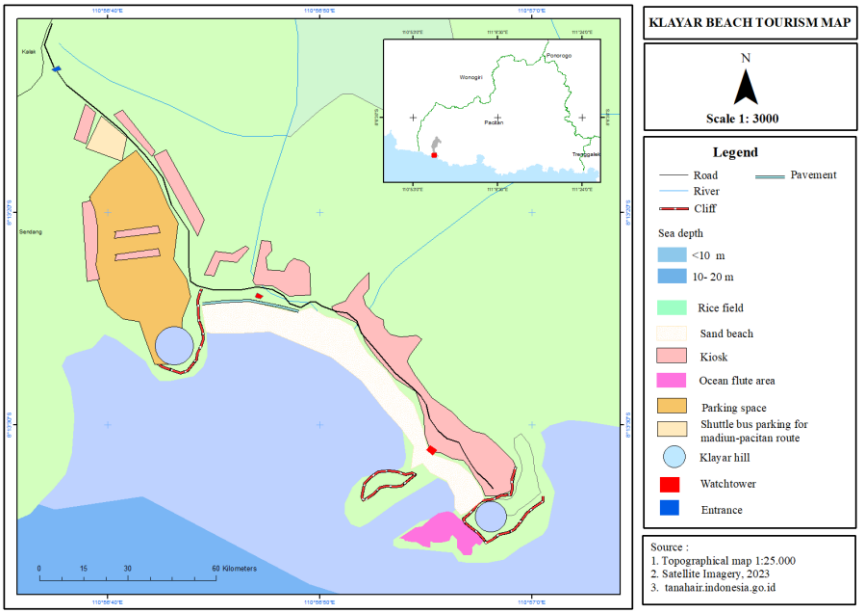

Figure 2. Klayar Beach Map (Source: The authors, 2025)

There is also a moderate presence of visitors and fewer artificial structures compared to urban beaches. The beach offers limited facilities and services, while the permanent residences have sparse essential services, such as primary schools, religious centers, shops, and cafes. The Klayar Beach quality index in this study is described in Table 5.

Table 5. Klayar Beach Quality Index

Indicator	Category					Score
	0	1	2	3	4	
Accessibility (Acc)						
1. Disabled parking	No.	-	-	-	Yes	0
2. Public car park	Insufficient	-	-	-	Simply	4
3. Access to the bathing area for users with disabilities	Zero	-	Without personnel	-	Customized	0
4. Access to beach facilities	0	-	Partially	-	Adapted	4
5. Access points customized for users with disabilities	0	-	1 every >200m	-	1 every <200m	0
6. Transport	No.	-	-	-	Yes	4
7. Fulfilment of transit facilities	It fails	-	-	-	It meets	4
8. Fulfilment of access to the sea	It fails	-	-	-	It meets	4
9. Possibility of access to the beach by public transport	No.	-	1 h/day	-	>2 h/day	2
10. Signs to the beach	0	-	<200m	-	>200m	2
11 . Information signs	No.	-	-	-	Yes	4
Environmental quality (EnvQ)						
1. Permanent noise	Yes	-	-	-	No.	4
2. Permanent anthropogenic odor	Yes	-	-	-	No.	4
3. Episodic algae and/or jellyfish blooms	>5 per year	-	2-5 per year	-	<2 per year	4
4. Episodic water pollution	>2 per year	-	1-2 per year	-	None	4
5. Waste sand	>40%	25-40	15-25%	5-15%	0-5%	4

6. Sewers	>2 in 1 km	-	1-2 in 1 Km	-	None	2
7. Particles/debris floating in water	Yes	-	-	-	No.	4
Water quality (WatQ)						
1. Microbiological water quality	Not suitable	-	-		suitable	4
Comfort (Comf)						
1. Drift current/shore drift	Common	-	Occasional	-	Non-existent	0
2. Wave energy	High (>1.5m)	-	Moderate (0.5-1.5m)	-	Low (<0.5m)	1
3. Wind speed	High	-	Moderate	-	Low	2
4. Air temperature (midday) (^{o}C)	<15/>38	-	15-27/32-38		27-32	2
5. Water temperature. (^{o}C)	<21 C/>27	-	-	-	21-27	4
6. Meteorological conditions	Rainy	Stormy	Overcast	Cloudy	Sunny	4
9. Nuisance animals	Common	-	Occasional	-	Non-existent	4
10. Thermal sensation	Very cool/Hot	-	Cool/Warm	-	Mild	0
11. UV Radiation	>6	-	6	-	<6	2
Scene quality (SceQ)						
1. Water transparency	Muddy	-	-	-	Transparent	4
2. Field of view	3/4 y 1/4	-	-	-	1,5/4- 2/4	4
3. Specific changes by humans	None	-	Rare	-	Very often	2
4. Integration of buildings into the landscape	Low/dense buildings	-	Low/rare Building	-	Moderate density	2
5. Integration of facilities into the landscape	Low integration	-	Partial	-	High	2
6. Integration of access to the landscape	Low integration	-	Partial	-	High	2
8. Contrast of coastal vegetation	Un-vegetated	Low	-	Moderate	High	1
9. Type of sea horizon	Indust/Port/Slum	-	Agricultural/ Islands	-	Natural or free	4
Human activity and infrastructure (HumAI)						
1. Physical carrying capacity	<8 2	-	8-12 2	-	>122	4
2. Dykes and breakwaters	Some/several	-	Only one	-	No.	2
3. Permanent infrastructure (%)	>75	75-50	50-25	25-1	0	2
4. Temporary structures (%)	>75	75-50	50-25	25-1	0	2
5. Degree of urbanization (%)	>75	75-50	-	25-50	<25	4
6. Disturbances	Frequent	-	Occasional	-	No.	4
7. Unauthorised activity	Non-fulfillment	-	Occasional	-	Fulfill.	4
8. Illegal dumping point within 1km	>2	-	2-1	-	None	2
9. Type of environment (urban, industrial)	Industrial	-	Urban	-	Natural	3
Total						**125**
Class						**Good**

The Beach Quality Index (BQI) assessment revealed significant variations across indicators, highlighting strengths and critical challenges for sustainable tourism management. Klayar Beach demonstrated excellent environmental quality (0.93/1.0), optimal water quality (1.0/1.0 for microbiological safety and salinity at 30.9 ppt), and minimal industrial pollution. However, litter management near vendor areas required improvement, as evidenced by episodic waste accumulation (score: 2/4 for sewers within 1 km). Accessibility scored moderately (0.63/1.0), constrained by steep terrain and inadequate disabled facilities (0/4 for customized beach access). Conversely, public parking and transport links scored well (4/4), reflecting localized infrastructure investments. Comfort levels were suboptimal (0.53/1.0) due to strong winds (score: 2/4) and high UV exposure (score: 2/4), while swimming restrictions further reduced recreational appeal. The scenic beauty index (0.66/1.0) benefited from transparent waters (4/4) and dramatic karst landscapes (4/4 for sea horizon aesthetics), though human-made structures partially compromised visual integrity (2/4 for building integration). Human activity infrastructure scored 0.81/1.0, with well-organized parking (4/4) but unauthorized vendor stalls (2/4 for disturbances). The Klayar Beach quality assessment is rated as good, scoring 125. The calculation of carrying capacity starts with identifying zone classifications (Figure 3).

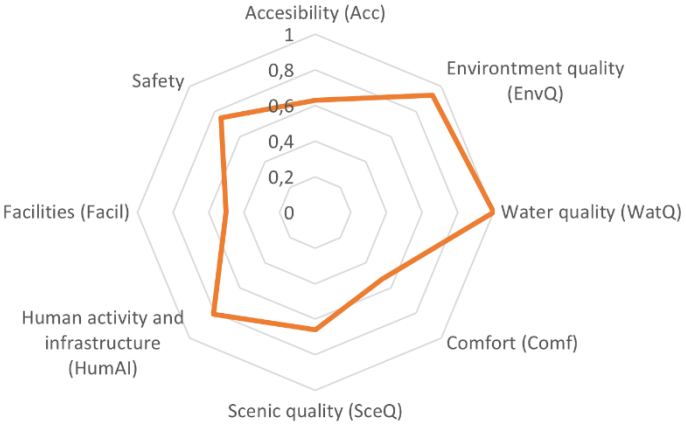

Figure 3. Results of Beach Suitability Index Calculation (Source: author's analysis)

Klayar Beach's zoning as presented in Figure 4 adheres to UNESCO Global Geopark guidelines, dividing the area into Core Zones (4–5) for protecting key geological features, Buffer Zones (2–3) for regulated tourism, and Transition Zones (1) for low-impact infrastructure (Vandenberghe, 2020). This structure ensures conservation while supporting sustainable tourism. The approach balances ecological protection with socio-economic benefits. Zone 1 (A–B) features a paved pathway with safety railings, offering panoramic ocean views and hosting a souvenir market (Figure 5a). Zone 2 (B–C) includes a motorbike parking area, viewing tower, and ATP post, where visitors enjoy a mix of sandy and rocky shores with wave-carved formations (Figure 5b). Zone 3 (C–D) combines lodging, food stalls, and coconut-shaded paths near the beach. Zone 4 (D–E) showcases dramatic karst cliffs and wave-eroded rocks, attracting photographers (Figure 5c).

Zone 5 (E–F), accessible only on foot, features a hilltop gazebo with sweeping views of the Ocean Flute - a geological marvel where waves create flute-like sounds through crevices (Figure 5d). Each zone balances tourism infrastructure with natural preservation, aligning with UNESCO Geopark zoning principles.

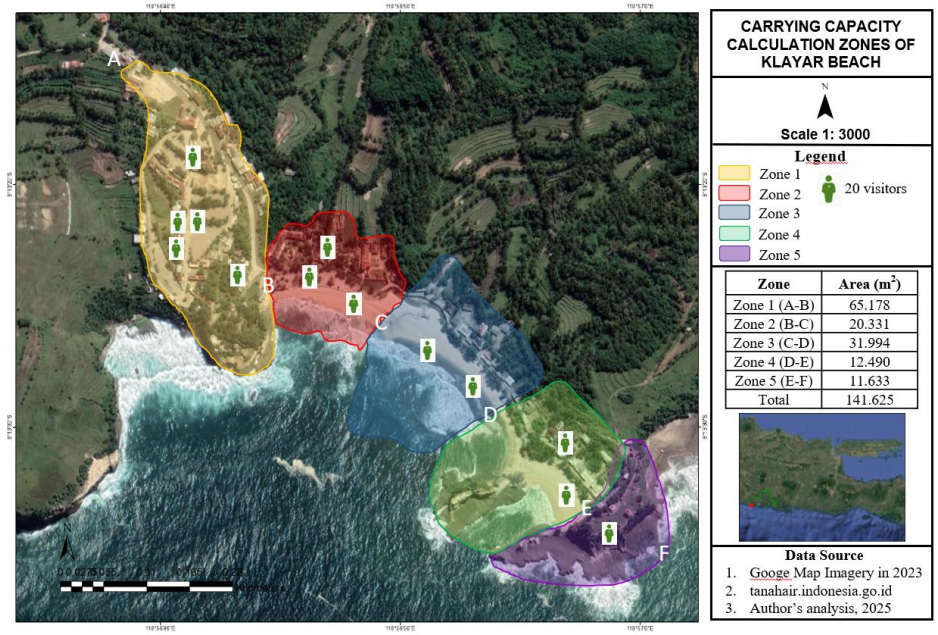

Figure 4. Zones of Klayar Beach (Source: The authors, 2025)

Figure 5. The landscape of the Klayar coastal area (a) Exposed beachrock formations at Klayar Beach. (b) All-Terrain Vehicle (ATV) rental in Zone 2 (IDR 100,000/hour for coastal tours) (c) The 'Sphinx van Java' is a locally designated karst formation shaped by prolonged marine abrasion processes. (d) A natural coastal phenomenon where waves compress water through narrow karst fissures, creating a high-pitched whistling sound reminiscent of a flute (Sea Flute) (Source: The authors, Klayar, December 4-20, 2024)

In this study, the Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC), and Effective Carrying Capacity (ECC) were calculated, and the results are shown in Table 8. PCC, RCC, and ECC were calculated using the three occupancy criteria. Each zone's area, external factors, special zones, and urban capacity management were considered. The five zones have a total planimetric area of 141.625 m² and the PCC values were 113,300, 56,650, and 22,660 daily visits for high, medium, and low occupancy, respectively. These values were calculated using a rotation factor 4 (Ariza Solé, 2007). The RCC values include 11,883, 5,941, and 2,377 visits per day. These values show the maximum number of visitors after applying the correction factor. Finally, ECC was calculated based on information from the MC and the results were 6,060, 3,030, and 1,212 daily visits. These numbers represent the effective capacity for daily visitors. The analysis shows that external factors affecting Klayar Beach record 59 rainy days and 170 windy days per year. The correction percentages for these factors are 16% and 47%, respectively. The beach receives approximately 5,110 sun hours annually, contributing to a correction factor. Klayar Beach loses about 42,000 m³ of sediment annually, reducing the total beach area by 12,000 m² annually. This leads to an erosion correction percentage of 14%. The result shows that Klayar Beach has an average MC score of five across all five zones.

Table 8. PCC, RCC, and ECC for Klayar Beach Beach Supportability Management

ZONE	PCC			RCC			ECC		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Zone1	10428	26071	52142	1094	2734	5469	109	273	547
Zone2	3253	8132	16265	341	853	1706	51	128	256
Zone3	5119	12797	25595	537	1342	2684	48	121	242
Zone4	1998	4996	9992	210	524	1048	21	52	105
Zone5	1861	4653	9306	195	488	976	14	34	68

The study assesses facilities, equipment, human resources, and institutional support. Zones 1, 2, and 3 focus on essential services like shops, hotels, and car parks. These zones also have the highest concentration of beach access. Zones 4 and 5 offer limited services, which correlates with fewer users. Other activities, such as fishing, occur frequently in Zones 3 and 4. The study lists PCC, RCC, and ECC values in Table 9 to support effective beach management.

Table 9. Variables considered for the estimation of MC at Klayar Beach (Source: Authors, 2025)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Zone 1		v	v	v	v		v		v	v		v	v	v				
Zone 2	v	v	v	v	v	v	v	v	v	v	v	v	v		v		v	
Zone 3	v	v	v		v			v	v		v	v	v					
Zone 4	v	v	v		v			v	v	v	v	v	v					
Zone 5			v				v		v		v	v	v	v				

Type: 1: Lifeguard. 2: Bathroom. 3: Public lighting. 4: Information service. 5: Coastal building. 6: Tent hire. 7: Road/beach signage. 8: Beach access. 9: Wastebasket. 10: Restaurant, drugstore. 11: Recreational area. 12: Coastal management plan. 13: Building regulations. 14: Access regulations. 15: First aid. 16: New police and offices. 17: People trained in natural disaster response. 18: Vehicles and facilities for disaster relief

The PCC results in Table 8 show that visitor capacity in all categories is ECC > JKr, showing great opportunity. The actual daily visits to Klayar Beach are only in the hundreds, suggesting that several aspects need improvement to increase the number of visitors. Zones 1 and 2 serve as beach access points, and the carrying capacity offers excellent opportunities for further development. However, in Zones 5 and 6, visitor numbers can exceed ECC, which leads to overcapacity.

DISCUSSION

The assessment of Klayar Beach using the proposed indicators highlights its current strengths and areas needing improvement, aligning with the broader sustainability goals of Gunung Sewu UNESCO Global Geopark. The findings contribute to the geopark's management framework by ensuring that tourism development remains balanced with geological conservation, environmental protection, and community well-being. Klayar Beach's excellent scores in water transparency, low pollution, and minimal anthropogenic disturbances reinforce its role in preserving the geopark's unique karst landscapes and coastal ecosystems. The natural sea horizon and moderate building integration ensure that tourism infrastructure does not degrade the aesthetic and geological value of the area, a core principle of UNESCO Global Geoparks.

Klayar Beach, a popular tourist destination, offers unique geological and scenic features but faces challenges in accessibility and visitor management. The sloping or steep access road and limited facilities for individuals with disabilities, the elderly, and young children showed the need for improvements. Dash & Sharma (2021) defined accessibility as a term that measures the ease of reaching a location, considering time, cost, and effort. Furthermore, Wang et al. (2021) stated that tourism efficiency must account for both economic indicators, such as visitor numbers and revenue, as well as psychological indicators, including comfort and experience. Klayar Beach does not fully accommodate individuals with disabilities. The beach provides vehicle access, parking, and pedestrian pathways, but the steep road requires assistance for specific groups. Accessibility reflects how quickly visitors can access and enjoy the destination, making it a critical factor for improving visitor satisfaction and tourism efficiency. Measures to enhance accessibility can address current limitations and support sustainable development.

Klayar Beach's current conditions significantly influence visitor comfort, which is shaped by physical, psychological, and socio-environmental factors (Zhen et al., 2025). While sunny weather and minimal rainfall enhance comfort, swimming restrictions, high temperatures, and weak winds—except on hilltops—reduce satisfaction, reflecting tourists' subjective environmental evaluations (Lai et al., 2020; Tian et al., 2022; Yung et al., 2019). Facilities score poorly due to unregulated development, including coastal degradation from stalls, parking areas, and private constructions, exacerbating anthropogenic pressures and biodiversity loss (Ștefănică et al., 2021). Despite sustainability mandates, community prioritization of short-term economic gains over environmental management weakens governance, necessitating stricter building standards to align tourism growth with long-term ecological goals.

While the beach has a high Physical Carrying Capacity (PCC), the much lower Effective Carrying Capacity (ECC) indicates that current management practices limit overcrowding, preventing ecological degradation. The division into Core, Buffer, and Transition Zones ensures that high-conservation areas (Zones 4–5) remain protected, while Buffer and Transition Zones (1–3) allow controlled tourism activities. This zoning aligns with UNESCO's approach through protection use. The low urbanization score and absence of industrial disturbances support community-based tourism, a key strategy in Gunung Sewu's development. While some accessibility features (e.g., disabled access) need improvement, public transport and information signs enhance inclusive tourism, benefiting local livelihoods.

Visitor restrictions offer a solution to keep these zones sustainable. Managers limit visitation time as part of conservation efforts. This method helps restore the rehabilitation function of the ecosystem (Al Dilwan & Astina, 2019). Klayar Beach, as part of the geopark, requires maintenance during its development. Sustainable tourism development balances environmental preservation and infrastructure opportunities (Wirahayu et al., 2022).

According to a previous study, community-led initiatives also focus on improving economic welfare (Sumarmi & Shrestha, 2022). This harmonious balance between community benefit and environmental conservation is exemplified by Geopark, which shows tourism principles that promote sustainable development. The ecotourism principle helps coastal areas develop while promoting environmental sustainability (Sumarmi et al., 2022).

A previous study reported that geological phenomena are essential resources for geopark-related tourism (Ruban, 2018). However, resource management often combines geological features with other resources, reducing its uniqueness. Tourism development at Klayar Beach needs to focus on preserving geological heritage.

Ha Long Bay in Vietnam limits motorized vehicles in sensitive areas. The management promotes using environmentally friendly transportation, such as non-motorized boats (Nguyen, 2020). Dry Tortugas National Park in the US applies a reservation system, which limits the number of daily visitors. This system reduces anthropogenic impacts on ecosystems and improves the quality of the tourism experience (Defeo et al., 2021). Edu-eco-tourism concepts maintain the sustainability of the Gunung Sewu Geopark. According to (Baloch et al., 2023), sustainable ecotourism addresses environmental issues caused by poorly planned tourism development. Edutourism helps maintain the cleanliness and sustainability of physical resources at tourist sites (Sumarmi et al., 2023).

Zoning of Geo-Eco Tourism at Klayar Area

The zoning of Klayar Beach integrates geological, ecological, and sustainable tourism principles while supporting the Gunung Sewu UNESCO Global Geopark framework (Figure 6). The five zones (Geological Education, Ecological Conservation, Sustainable Recreation, Tourism and Public Facilities, and Hill and Panorama) balance education, conservation, and community benefits (Nguyen, 2020).

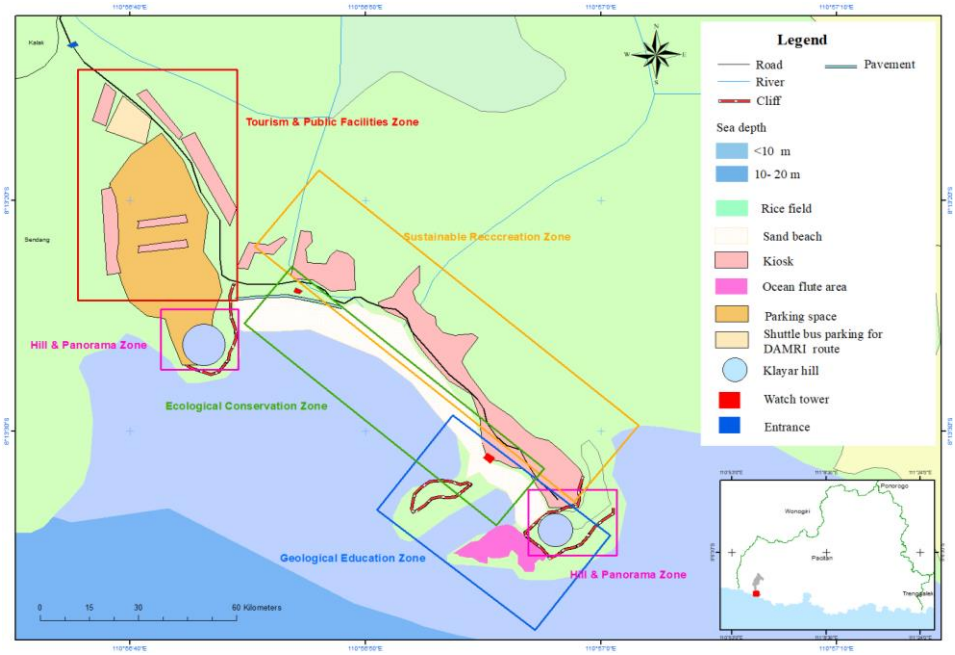

Figure 6. Zoning of Geo-Eco Tourism at Klayar Area

The Geological Education Zone, featuring karst cliffs and ocean flutes, serves as a key geosite for geopark-based learning, using digital tools and guided tours to minimize degradation (Zafeiropoulos, 2024). Meanwhile, the Ecological Conservation Zone protects coastal biodiversity through community-based methods, aligning with global geopark goals. The remaining zones prioritize low-impact recreation, local economic growth (Dłużewska & Giampiccoli, 2021), and scenic trekking with ecological markers (Karuppiah et al., 2022), ensuring holistic sustainability. This zoning model strengthens Klayar's role in the Gunung Sewu Geopark by designating areas for geoheritage education, biodiversity protection, and community-led tourism. The Geological Education Zone, for instance, functions as an outdoor classroom, while the Tourism and Public Facilities Zone mirrors geopark visitor centers, enhancing waste management and stakeholder engagement. Such structured zoning simplifies management (Nguyen, 2020) while advancing the geopark's mission—offering a replicable template for coastal geotourism within UNESCO-designated sites. Future studies should refine participatory mapping to optimize Klayar's integration into the geopark network.

CONCLUSION

Klayar Beach faced several challenges: limited infrastructure, accessibility issues, environmental degradation risks, and inadequate visitor management strategies. Despite the growing popularity, there was a lack of empirical studies on balancing tourism growth with environmental sustainability in this unique coastal ecosystem.

The results of this study provided a data-driven method for sustainable tourism planning, integrating Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC), and Effective Carrying Capacity (ECC) assessments with beach quality indicators, such as accessibility, environmental health, and visitor satisfaction.

According to the results, Klayar Beach had high tourism potential, but existing infrastructure and management strategies were insufficient to support long-term sustainability. Specific challenges included poor accessibility, lack of inclusive facilities, unregulated tourism activities, and risks of overcrowding in sensitive ecological zones.

To address these issues, the study showed five key areas of intervention, namely (1) infrastructure improvements to enhance accessibility and visitor experience, (2) visitor management policies, such as quota systems and controlled entry to prevent overcrowding, (3) environmental conservation measures to protect the beach's fragile ecosystems, (4) community engagement to foster local economic benefits and environmental stewardship, and (5) regulatory frameworks to ensure consistency between tourism development and conservation priorities.

Author Contributions: Conceptualization, F.A.S. and I.K.A.; methodology, F.A.S. and S.; validation, I.K.A., and S.; formal analysis, F.A.S. and S.; investigation, F.A.S.; data curation, I.K.A. and S.; writing – original draft preparation, F.A.S.; writing – review and editing, I.K.A., S., and M.H.H.; visualization, F.A.S.; supervision, I.K.A., S and M.H.H.; project administration, F.A.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received full financial support from the Indonesian Education Scholarship (BPI), PPAPT Kemendikbudristek, and LPDP Indonesia (BPI No. 202231103813).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The authors gratefully acknowledge the financial support for this study provided by the Indonesian Education Scholarship (BPI), the Center for Higher Education Funding and Assessment (PPAPT) of the Ministry of Education, Culture, Research, and Technology of Indonesia, and the Indonesian Endowment Fund for Education (LPDP) through the scholarship program at Universitas Negeri Malang. We also extend our sincere gratitude to the Tourism Office of Pacitan Regency (Disparbudpora Pacitan) for their invaluable assistance and facilitation during the research process.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 02.04.2025 Revised: 03.07.2025 Accepted: 01.08.2025 Available online: 26.08.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1719-1729
DOI 10.30892/gtg.61330-1540

A SUSTAINABILITY MODEL OF GEOPARKS APPLIED TO THE TUNGURAHUA VOLCANO GEOPARK

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Citation: Verdugo, C., Piray, M., Salas, E., Montufar, S., Guilcapi, E., Zurita, S., Frey, C., & Toulkeridis, T. (2025). A sustainability model of geoparks applied to the Tungurahua Volcano Geopark. *Geojournal of Tourism and Geosites*, 61(3), 1719–1729. https://doi.org/10.30892/gtg.61330-1540

Abstract: The Tungurahua Volcano Geopark (GVT), is located in the center of the Ecuadorian Andes, and comprises an area of 2,397 km^2. The name-giving Tungurahua Volcano, which is one of the most active volcanoes in Ecuador, is only one of many other volcanic complexes to be part of the GVT. All these volcanic edifices are the result of the subduction of the oceanic Nazca plate below the South American continental plate, along the active continental margin. A novel sustainability model of geoparks has been applied to the GVT, of which methods consisted of revising secondary information from documents and interviews with experts and primary data collected and validated during field trips performed in two stages, where twenty Geosites were defined. Furthermore, we structured a scientific committee of seven Universities, two NGOs and other stakeholders. Additional elements of our management and assessment included to describe the evolutionary history of this particular area since the Lower Devonian, and, to elaborate a monitoring and conservation plan that includes the placement of signage, interpretive scripts and tourist mapping. The key has been the joint work and strategic alliances based on local development axes such as geoeducation, geoconservation and geotourism focused on the Sustainable Development Goals. To present a novel sustainability model for geoparks, applied in a case study in Ecuador. Review of information and guide questionnaires that directed the interviews with experts of other geoparks. Validation of obtained data in the field. Inventories of sites where geotourism were performed. A novel sustainability model of geoparks has been applied by the described methods. A scientific committee was structured. A description of the evolutionary history of the study area is given. A monitoring and conservation plan was elaborated and presented. We reached a joint work, focused on the SDG´s. Generation of economic income, creation of strategic alliances and protection of the given heritage; Networking with Global Geoparks; recognition and conservation of geological heritage within the SDG´s. Especially the consolidation of global collaboration networks, the professionalization of staff, and the acquisition of sustainable resources are aspirations that, for the present times, may not allow to be achieved in the short or medium term due to budgetary and management constraints.

Keywords: geopark, geotourism, UNESCO, Ecuador, Tungurahua, volcano, sustainability, natural heritage

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INTRODUCTION

A geopark is a territory with a remarkable geological heritage that promotes sustainable development through education and tourism (Carcavilla & Cortés, 2018). Since 2015, UNESCO has recognized Global Geoparks as key spaces for assessing the planet's geological heritage and evolution. Hereby, UNESCO began the proposal to create or support programs for the preservation of Natural and Cultural Heritage in 1945, Biosphere Reserves in 1971 and later Geoparks (Boylan, 2008; Henriques & Brilha, 2017). Thus, in the nineties, Germany, Spain, France and Greece were the first countries in Europe to have territories under the figure of experimental projects of geoparks (Fassoulas et al., 2013; Blersch et al., 2023; Hose & Vasiljevic, 2016; Golfinopoulos et al., 2022).

In 2000 the European Network of Geoparks was created, and later in 2004 the UNESCO legalized the Global Geopark Network, which currently has 213 Geoparks in 48 countries (Zouros, 2004; Ruban & Yashalova, 2024). In the Americas, there are 18 recognized Geoparks, of which ten are situated in South America. In Ecuador, besides the Imbabura UNESCO Global Geopark, there is an aspiring Tungurahua Volcano Geopark (GVT), besides others (Rosado-González et al., 2020; Simbaña-Tasiguano et al., 2024; Toulkeridis et al., 2025).

The GVT candidate in Ecuador covers 2,397 km² and is home to 1,049,484 inhabitants (National Council for Gender Equality, 2021). Its diverse climate, ranging from warm dry to cold high mountains, sets the stage for productive and

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tourist development. The GVT Project is a beacon of hope, aiming to forge a cultural identity rooted in the conservation of geological heritage and to promote geotourism and a sustainable territorial development model that enhances the quality of life for the local population. Prior to 2015, no comprehensive long-term strategies focused on regional sustainability. However, the future looks promising, given the potential economic benefits that this Geopark may be able to provide (Geoparque Volcán Tunguraua, 2023). This project predominant aims have been to secure the 'UNESCO Global Geopark designation to bolster local identity and development.

Therefore, the given objectives have been to include organizing and socializing the project, integrating education, tourism, and conservation axes from a geological perspective, and designing a sustainable management model that encourages collaboration between local actors such as academic institutions, governments, and communities (Sánchez, 2023). The Governance model, a key component, outlines the decision-making processes, roles and responsibilities, and mechanisms for stakeholder engagement. In addition, it promotes awareness and good practices in the rational use of resources, valuing geological heritage in tourist scripts (Nguyen & Kieu, 2024).

The project dossier was presented to UNESCO on April 8, 2024. Success lies in collaboration and strategic alliances based on pillars of local development (International Labor Office Geneve, 2010), such as geoeducation, geoconservation, and geotourism, oriented towards fulfilling the Sustainable Development Goals (Stephens, 2020). These actions promote economic opportunities, highlighting education (Martínez-Martín, 2022) as essential for disseminating and strengthening the Geopark and actively involving children, adolescents, and the local community (Zheng et al., 2024; Martínez-Martín et al., 2024; Zelenka et al., 2025; Randy et al., 2024; Kovacs et al., 2025).

Based on the aforementioned, the current research has been based on the presentation of a novel sustainability model of geoparks based on the assessments elaborated within the aspiring Tungurahua Volcano Geopark.

Hereby, the main key may be on the collaboration and joint work of local development axes such as geoeducation, geoconservation and geotourism focused on the Sustainable Development Goals. This will certainly allow to generate new and sustainable economic incomes, and subsequently also the protection of the given heritage. Furthermore, it is expected to enhance the networking with Global Geoparks on a regional and may global scale.

MATERIALS AND METHODS

Initially, the research process comprised reviewing secondary information from documents such as reports, theses, and others generated by the sectional governments and cooperating institutions, as well as guide questionnaires that directed the interviews with experts from Ecuador's main geoparks and allies in Latin America. Subsequently, data was meticulously collected and validated in the field, starting with a situational diagnosis of each Geosite (GS), focusing on the social, cultural, environmental, and economic aspects. This diagnosis was guided by two fundamental characteristics, being the dynamics that generated the current situation and its projections in the medium or long term and the causality, which identifies the positive or limiting factors that originated it (Hannel del Valle, 2005).

The first characteristic allows for implementing measures that adapt to the changing realities that occur in the future, and the second is aimed at eliminating deficiencies or enhancing favorable conditions (Secretaría Nacional de Planificación y Desarrollo SENPLADES, 2005). In addition, the situational diagnosis allowed to understand the reality of the GS by organizing the research in two project stages. The first comprised the geological vision based on the Geoheritage and Geodiversity that the territory has, while the second has been involving the territory within a historical, economic, sociological, and anthropological vision. Therefore, to complete stage one, inventories of sites where geotourism were performed using known methodologies (Brilha, 2018). Hereby, several geosites were valued and characterized, with their respective historical and geological inquiry. Furthermore, inventories of flora and fauna were realized due to the transect techniques that allowed data to be taken in the field (Gregoire & Valentine, 2003).

Finally, the use of GPS for the management of peripherals and mobile systems and data analysis using ArcGIS for the taking of geographic points and their respective mapping were also involved. To achieve the second aim, a bibliometric study and analysis of existing studies realized on geoparks to date was performed, with all their contributions to the evolution of the Tungurahua volcano and its historical, geological, anthropological, and sociological influence on nearby populations with the guidance of academics and experts from friendly institutions. Based on their analysis, we complemented the work of stage one to generate five decisive documents, being (1) the inventory of 20 Geosites with their inventory of Flora and Fauna (Geoatractivos, 2024); (2) the description of an evolutionary history of the earth since the lower Devonian, some 417 Ma; (3) a Monitoring and Conservation Plan (including informative signage, interpretive scripts, and tourist mapping (Galindo et al., 2009; Chávez González & González Guillén, 2015); (4) a document on the Sustainable Use of Mineral and a Governance model and (5) a Communication and Marketing Plan.

RESULTS

1. Inventory

1.1. Regional geology and corresponding remarkable Geosites

The regional geology of the GVT is composed of a wide geodiversity, which includes various geological processes that occurred from the Lower Devonian, passing to the Upper Triassic through a geochronological discontinuity, continuing towards the Lower, Middle and Upper Jurassic to advance to the Lower and Upper Cretaceous until a new geochronological discontinuity that marks the contact with the Miocene towards the Pliocene to finally encounter events located in the Pleistocene and Holocene of the Quaternary period, including lithotectonic terrains, formations, units and

geological deposits (Figure 1). It includes the units Agoyán (UAgy), Tres Lagunas (UTLg), Upano (UUpo), Cuyuja (UCyj), Cerro Hermoso (UCHm), Alao - Paute (UAPt), Misahuallí (UMsh), Maguazo (UMgz) and Peltetec (UPet), in addition to the intrusive bodies Abitagua granite (BAbt) and Azafrán granodiorite (UGAz). On the other hand, the Napo (FmNp), Hollín (FmHn) and Tena (FmTn) formations, in addition to the Zumbagua (VZmg), Pisayammbo (VPsy) and Cotopaxi (VCtx) volcanic formations that are located west of the Geopark (Toulkeridis, 2016; Noble et al., 1997; Pratt et al., 2005; Villares et al., 2021; Aspden & Litherland, 1992; Massonne, & Toulkeridis, 2012).

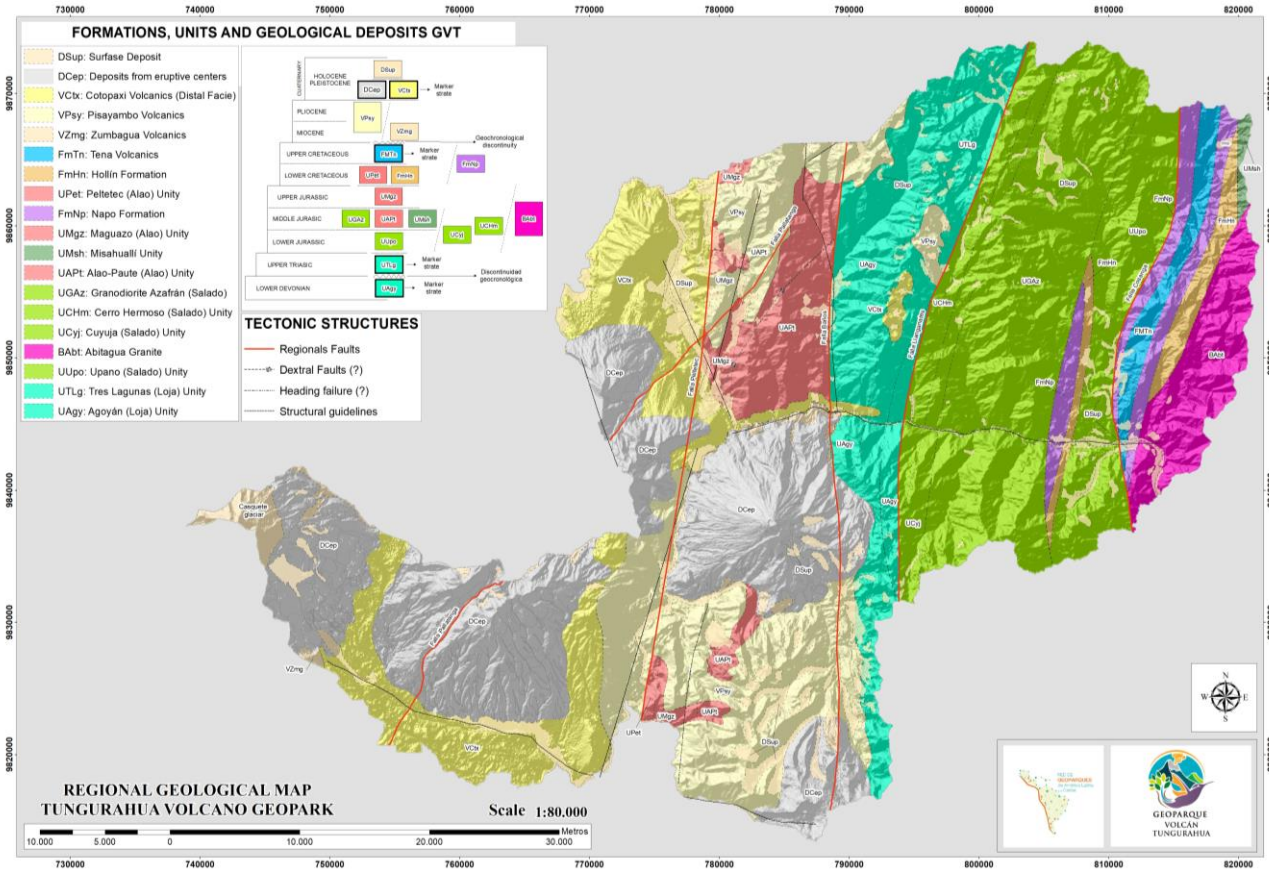

Figure 1. Map of Regional Geological Formations, Units and Deposits of the Tungurahua Volcano Geopark – CGVT, 2024 (Source: This map is based on Geological Map of the Republic of Ecuador, Scale 1:1000000, 2017; SIGTIERRAS, 2015; Geological Map of Ecuador, Scale 1:100000 – Chimborazo, Baños de Agua Santa (Tungurahua Volcano Geopark, 2023)

Finally, the eruptive center deposits (DCep) and surface deposits (DSup) represent the juvenile processes existing in the Geopark (Consorcio Geoparque Volcán Tungurahua, 2023). Likewise, it is possible to emphasize that the formations, units and deposits are in interaction with tectonic structures characterized as regional faults, dextral faults, strike-slip faults and structural lineaments. As previously mentioned, the geology immersed in the Geopark area includes diverse materials that have originated from approximately 417 Ma to the present (Mojzsis et al., 1996), so it houses an evolutionary history related to the formation of a section of the Cordillera Real, the Inter-Andean Valley and the Western Cordillera.

Geosites are areas that present a high geological, scientific, environmental, tourist, cultural, and conservation interest, which, due to their unique and representative nature, allow the study and interpretation of the origin and evolution of large geological domains, including the processes that have shaped them, past climates and their paleobiological evolution (Carrión et al., 2021; Toulkeridis et al., 2021). Therefore, it is necessary to consider that the impact caused by tourist visitation can have long-term effects. Thus, activities focused on their conservation and maintaining the interaction with various biotic factors that are part of the surrounding ecosystem must be performed (Factors affecting ecosystems, 2015). The code, name, and canton to which each Geosite (GS) belongs are described below. Five places have been added to the list presented in the 2019 application dossier, which currently has twenty GS representing the Geological Heritage of the GVT (Table 1; Figure 2). Within the listed twenty geosites, there are several morphologically outstanding sites being represented by voluminous volcanic edifices or complexes with a vast history of volcanic eruptive phases and often associated destruction of nearby areas, such as the active Tungurahua and Chimborazo volcanoes, besides the extinct El Altar, Igualata and Huisla volcanoes (Figure 3). The Tungurahua Volcano, also known as "the throat of fire" in the Kichwa language, is one of the most active volcanoes in Ecuador (Toulkeridis & Zach, 2017; Alvarado et al., 2023).

Located near the tourist city of Baños de Agua Santa, this andesitic stratocone has been forming and collapsing throughout its evolution to form Tungurahua I (293 to 79 ka), Tungurahua II (29,000 to 3,000 years) and the actual Tungurahua III (2,300 years to present) (Hall et al., 1999; Bablon et al., 2018).

Table 1. Geosite Matrix of the Tungurahua Volcano Geopark (Source: Soria et al., 2020)

Code	Geosite	Canton
GS-01	Tungurahua Volcano	Baños de Agua Santa
GS-02	Pailón del Diablo Waterfall	Baños de Agua Santa
GS-03	Las Juntas lava flow	Baños de Agua Santa
GS-04	Los Pájaros pyroclastic flow	Baños de Agua Santa
GS-05	San Martín canyon	Baños de Agua Santa
GS-06	La Virgen hot springs	Baños de Agua Santa
GS-07	El Salado hot springs	Baños de Agua Santa
GS-08	Puela hot springs	Penipe
GS-09	El Altar Volcano	Penipe
GS-10	Amariila Lagoon	Penipe
GS-11	El Gorila de Pelileo Waterfall	Pelileo
GS-12	Ojo del Fantasma Waterfall	Penipe
GS-13	Chimborazo Volcano	Guano
GS-14	Igualata Volcano	Guano
GS-15	El Templete volcanic dome	Patate
GS-16	Yamate viewpoint	Patate
GS-17	El Obraje de San Idelfonso macrosliding	Pelileo
GS-18	Mulmul Volcano	Pelileo
GS-19	Huisla Volcano	Pelileo
GS-20	Las Caras petrified roots	Pelileo

The most recent eruptive phase has been visible since October 1999 up to the summer of 2016, with initially phreatic to strombolian type of eruptions, later including sub-vulcanian explosions with eminent ash precipitations, frequent pyroclastic flows and lahars, besides minor lava flows (Hall et al., 2015; Toulkeridis & Zach, 2017). Due to this activity, social problems arose such as forced evacuations in 1999-2000 and failed, fatal alerts in 2006, 2008 and 2010 (Toulkeridis et al., 2007; Herrera-Enríquez et al., 2021; Wright et al., 2012). Culturally, Tungurahua has been a central figure in local myths. According to indigenous stories, Tungurahua is linked to the Chimborazo Volcano, with whom it has a symbolic relationship of love and conflict, representing masculine and feminine forces of nature (Pungaña, 2022).

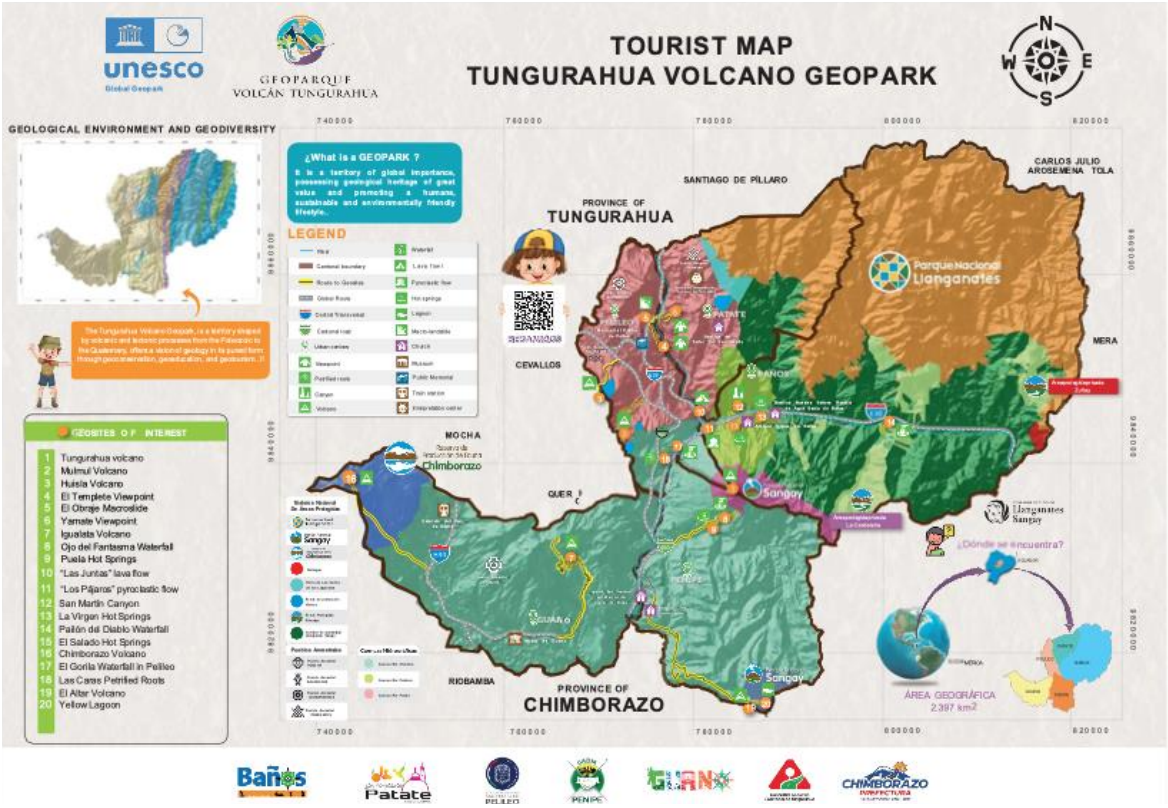

Figure 2. Map of geosites located in the GVT (Source: Tungurahua Volcano Geopark, 2023)

The Chimborazo volcano, Ecuador's highest summit, is 6,263 meters above sea level, and one of the most iconic mountains in the Ecuadorian Andes. In addition to being the highest dormant volcano in the country, its summit is the planet's closest point to the sun due to its equatorial bulge (Mora et al., 2022). The Chimborazo compound volcano, is

composed of three main edifices, named basal edifice (CH-I), intermediate edifice (CH-II) and the final young cone (CH-III) (Kilian et al., 1995; Barba et al., 2008). The CH-I was active between 120 to 60 ka, ending with a massive collapse and corresponding debris avalanche, while CH-II was active since up to 35 ka ago. The active, now dormant CH-III has regular intervals of activity, the most recent one being dated around 1250 years BP (Samaniego et al., 2012). Its slopes are covered with glaciers that feed several vital rivers, such as the Chimbo and Guano Rivers.

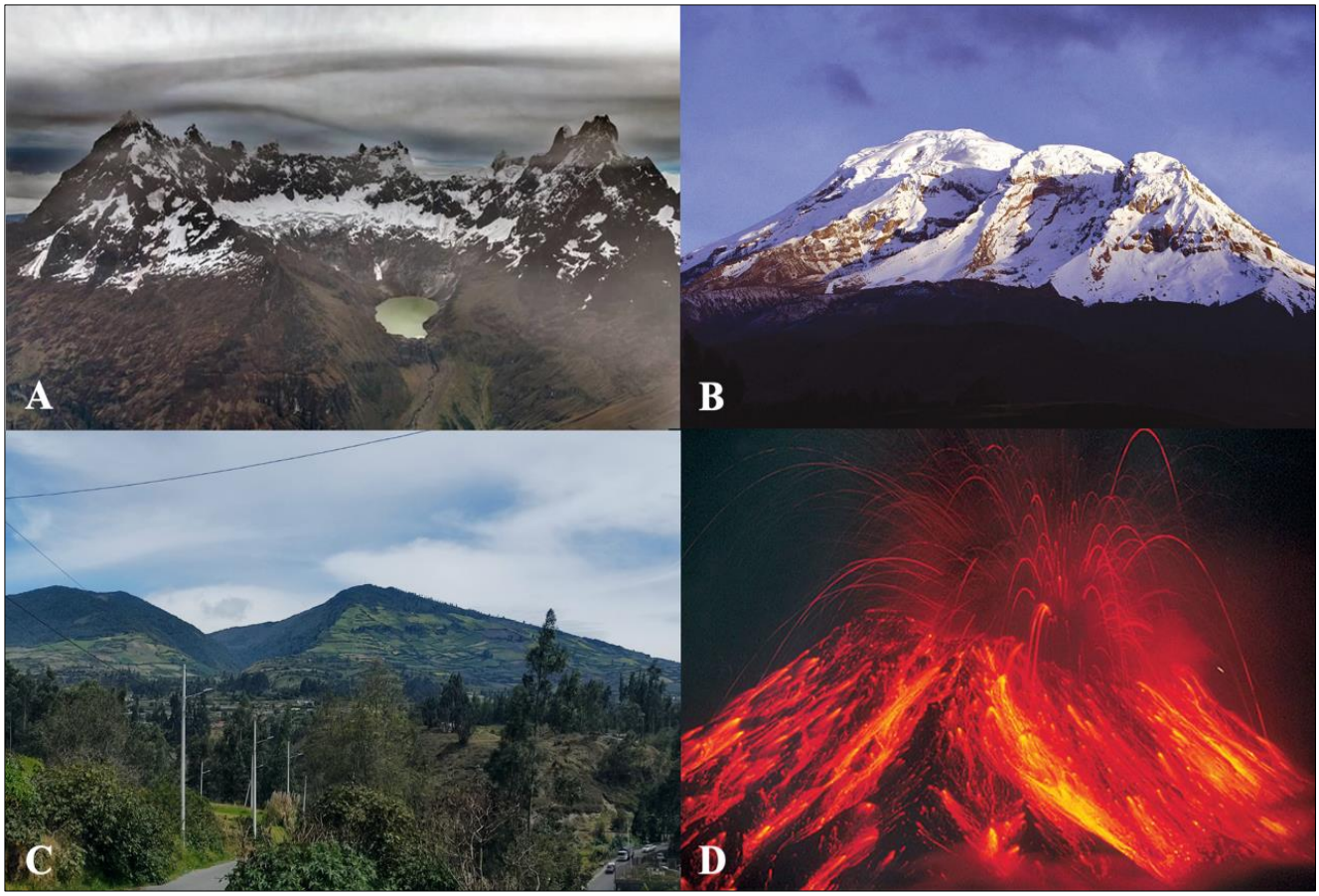

Figure 3. A: El Altar volcano in 2002 (credit Juan Anhalzer); B: Chimborazo volcano in 2001 (credit Alois Speck); C: Huisla volcano in 2024 (own picture); D: Tungurahua volcano in 1999 (credit Alois Speck)

However, climate change has significantly decreased these glaciers. In 1802, the explorer and scientist Alexander von Humboldt attempted to climb Chimborazo. Although he did not reach the summit, his expedition marked a milestone in the history of geography and science, contributing to understanding Andean altitude and ecosystems (Murray & Whimper, 1980). Chimborazo has a deep meaning in Ecuadorian identity. It is mentioned in the national anthem as a symbol of greatness and freedom. It is also associated with local myths, such as its relationship with the Tungurahua Volcano, considered its "companion" in the indigenous worldview.

The volcano is located within the Chimborazo Wildlife Production Reserve, a protected area home to species such as the vicuña, the Andean condor, and a wide variety of flora adapted to extreme altitudes. This unique ecosystem combines Andean moors and glaciers, offering an environment of great ecological and tourist value.

The 4430 m high, extinct Igualata volcano is a severely eroded and tectonically affected edifice, as it is crosscut by the Pallatanga fault (Baize et al., 2016). The main edifice has been formed approximately between 380 and 350 ka, with some later activity some 237 and 107 ka ago (Bablon et al., 2019). Later, this volcano been capped by a glacier during the Younger Dryas and/or Neoglacial periods (Clapperton, 1990). Similarly, the 3763 m high Huisla andesitic edifice, is a volcano with older to up to recent activities. Ages of lava flows of this volcano range from 621-147 ka, while some younger plinian eruptions occurred in the last 39 ka (Bablon et al., 2019). The plinian fallout deposits from this volcano are interbedded with the Carihuairazo volcano, which is situated equally right next to the Chimborazo volcano.

Later, this edifice experienced a massive sector collapse on its southeastern side. Finally, the El Altar volcano, also known locally as Cápac Urcu (the mighty one or the lord of the volcanoes), is part of the Eastern Volcanic Cordillera above the Cordillera Real. This volcano has a spectacular landscape, as due to several giant collapses, which formed horseshoe-shaped edifice, open to its west, prior to 35 ka (Bablon et al., 2019).

It forms some seven prominent snow-capped peaks of which the highest reaches some 5,319 m a.s.l. In its inner part is a colorful glacial lake, which experienced several glacial tsunamis of up to 125 m high waves, due to massive rock fall as a result of climate change and corresponding glacial retreat (Toulkeridis et al., 2022). In the inner part of the

caldera appears a gabbroic intrusion, which seems to represent part of the original magma chamber. There are also many are brecciated andesitic and rhyolitic lavas and dikes.

1.2. Flora and Fauna

Due to its location close to the foothills of the eastern mountain range, the area has a great variety of phylogenetic resources (Gobierno Autónomo Descentralizado del Cantón Baños de Agua Santa, 2014; Gobierno Autónomo Descentralizado del Cantón Penipe (2022-2026), 2022). Tungurahua Volcano Geopark in Ecuador stands out for its biodiversity, where fauna plays a key role in the ecological balance and sustainability of ecosystems. Its animal species, such as endemic birds, mammals and reptiles, are essential for natural processes and ecotourism. The conservation of these resources is crucial to maintaining the natural wealth of the geopark and its resilience to climate change.

2. A Monitoring and Conservation Plan

The monitoring and conservation plan for the Tungurahua Volcano Geopark is presented as a strategic document designed to ensure the preservation of its natural, cultural, and geological heritage and promote sustainable development in the area. The structure of the plan has been structures with the defined objective and the goals to be achieved within the monitoring and conservation plan were set out, considering the scope of application within the territories of geosites identified in the provinces of Tungurahua and Chimborazo and their consequent geographic delimitation and the elements subject to conservation, which are the 20 geosites identified to explain the geological, ecological and cultural value of the place. It also includes an initial diagnosis and a resource inventory, where the geological heritage is characterized, as well as the natural resources related to the flora and fauna characteristics of the place.

3. Cultural and archaeological heritage

Tungurahua Volcano Geopark in Ecuador stands also out for its cultural, archaeological, gastronomic and touristic wealth. Its geological heritage is complemented by the ancestral heritage of its communities, which preserve traditions, art and festivities. Local gastronomy and ecotourism contribute to the development and conservation of the region's natural and cultural heritage. In this respect, there are three main archeological sites, being Pacaicaguan, the Assumption Monastery Ruins and the Monoliths as well as Petroglyphs on Luishi Hill. The Pacaicaguan are archaeological sites of the San Gerardo parish, a ceremonial-funerary site associated with the Puruhá culture in the Integration Period (800 AD – 1530 AD) (Vela, 2025), while the Assumption Monastery Ruins are part of the first Franciscan Church built in Guano, which was affected by the 1797 earthquake and the August 5, 1949, earthquake. Furthermore, there are rhree monoliths with figures of the face of the Inca were carved by hand using the pickaxe as a tool by the artist Luis Reinoso in the 1940s.

There are plenty gastronomic and tourist sites, which include stone tortillas, apple, pear, small red plums and peach fruit orchards, fried pork, knife sweet, creole chicken broth, roasted guinea pigs with boiled potatoes, apple, blackberry and small red plums liqueur, as well as sugar cane juice with liquor and lime juice, reed, marshmallows and guava sweets. Furthermore, there are scenic places of mountains, waterfalls, rivers, trails, snow-capped mountains and hot springs in the El Altar Volcano, Paramito natural viepoint, Ojo del Fantasma geological formation, Pailón del Diablo, Manto de la Novia Waterfall, besides various natural viewpoints of Tungurahua Volcano and due to the geographic proximity to the Ecuadorian Amazon (Gobierno Autónomo Descentralizado del Cantón Penipe, 2022; FLACSO, 2005).

4. Hazards and risks

Identification of pressure factors as mass tourism, especially in Baños de Agua Santa the most touristic place of the area, considering that tourism attracts hundreds of thousands of tourists on each of the four main holidays annually (Herrera & Rodríguez, 2016). It is still a small number compared to other emerging destinations, however, there is evidence of an increase in the amount of waste generated by this demand and the subsequent difficulty of treating it without affecting the ecosystem, excessive noise, social problems such as crime and drug micro-trafficking (Ocaña et al., 2015). Additionally, the tourist carrying capacity is increasing in tourist places and protected natural areas within the Geopark area and local populations are not necessarily benefiting from the income generated by tourism and all the businesses associated with it such as food and beverages, lodging, agency and others related (Valdez et al., 2024).

The use of key indicators to measure conservation which were presented in the UNESCO application dossier and taken from various documents on Biodiversity present in the area, while soil quality and erosion, historical evolution of the geology of the area are described in depth in the proposal for Management of mining resources in the area.

5. Sustainable Use of Mineral and a Governance

5.1. Sustainable use of mineral

As established by UNESCO in the Statute of the international program of earth sciences and Geoparks in Part B in article 1. UNESCO Global Geoparks indicates that UNESCO Global Geoparks are the mechanism of international cooperation (Henriques & Brilha, 2017) with a conservation approach together with local communities that must adopt a sustainable approach to the development of the area.

Links of this document to Ecuadorian legal regulations, demonstrate that the Tungurahua Volcano Geopark Consortium does not participate directly or indirectly in the sale of geological materials, identify existing geological materials in the Geopark area, to establish their relationship between customs, traditions and their sustainable use.

The GVT has replicated the precepts set by UNESCO on the responsible management and use of resources by providing information to the population on the sustainable use of natural resources, while promoting respect for the environment, integrity and conservation of landscapes. However, due to its geological diversity and its wealth of mineral and stone resources, the economic, technological and social development of communities has required the use of these resources since ancient times (Flor, 2024), but despite technological evolution and socioeconomic advances, they are currently facing the problem of the sustainable use of these resources, due to several reasons such as lack of governance, poor regulations, lack of public policies, among others.

GVT also followed the guidelines proposed by UNESCO through the project "Mineral resources in UNESCO Global Geoparks in Latin America and the Caribbean" which aims to understand the current situation of Geoparks in terms of the use of mineral resources and their relationship with sustainable development, and proposes analysis, measures and promotes networking in experiences and learning of good practices applied to the guidelines of Geoconservation, Geoeducation, Geotourism and Sustainable Development (Rosado-González et al., 2020).

The use of the different geological materials of the Ecuadorian territory is regulated and controlled by the Mining Regulation and Control Agency (ARCOM) (Reglamento General de La Ley de Minería, 2017), therefore, the areas destined for the execution and development of mining investment projects, being regulated by this institution, are represented in the Mining Cadastre Geoportal (Ministerio De Energía Y Recursos Naturales No Renovables Viceministerio De Minas, 2024), in which it is possible to see the concessioned areas, name, owner, phase of the mineral resource, type of request, registration date, term, province, canton, parish, mineral of interest, current state, surface, type of mineral and the exploitation regime. Therefore, it is possible to observe the different concessioned areas in the Geopark area that are destined for the use of geological materials, whether metallic, non-metallic or stony.

Among the customs linked to the use of geological materials is the preparation of corn tortillas on volcanic rock in the cantons of Penipe and Baños (Aucancela, 2023), the production of stone crafts such as carved figures, mortars, cooking plates, among others, and finally, we may mention the tradition of the Guano stone cutters (Vargas, 2016). Baños de Agua Santa, being a national and international tourist center, mobilizes artisans from various parts of the country and the world, who bring mineral elements and rocks that do not come from the geological environment of the Tungurahua Volcano Geopark (Sánchez, 2023; Hernández-Medina et al., 2025). The artisans sell the crafts made with the materials (allochthonous to the GVT). The Tungurahua Volcano Geopark promotes sustainable use with artisans. However, it does not have the power to limit its commercialization because it is not its jurisdiction. In addition, the articles contemplated in the Mining and Commerce Law authorize the commercialization of crafts without obtaining a License for the sale of these products. The governance system is key to meeting the objectives set with clear strategies to manage the geological heritage for sustainable development through the formation of the Consortium for the Management of the Tungurahua Volcano Geopark. This management structure ensures the continuity and efficiency of work in the territory.

The consortium is a public law entity, with legal personality, administrative and financial autonomy, created to fulfill the specific purposes expressly determined in the creation agreement, which brings together the Honorable Decentralized Autonomous Provincial Governments of Tungurahua and Chimborazo and the Decentralized Autonomous Municipal Governments of Baños de Agua Santa, Patate and Pelileo in the province of Tungurahua as well as Penipe and Guano in the province of Chimborazo. The consortium has its mission, objectives, principles, organizational structure, legally constituted under the number CONS-067-2021-CNC, in the Public Registry of Associations and Consortiums of the National Council of Competencies, on January 6, 2022.

5.2. Governance Structure

In reference to the organizational structure, it is established that the Consortium must have the following staff: General Coordination, Secretary / Accountant, Geologist plus the Technical Support Team: Officials assigned to the Commissions of the member GADs. The Support Commissions are made up of the assigned officials of the Decentralized Autonomous Governments that make up the CGVT, such as Tourism, Cultural Strengthening, International Cooperation Management, Biodiversity and Environmental Protection, Productive Promotion, Research and Communication. The ancestral indigenous people's representative of the two provinces that are part of the Geopark are Salasaca of the Province of Tungurahua and Puruha of the province of Chimborazo belonging to the Kichwa Nationality of the mountains who have been incorporated into the social, political, environmental management, and gender context manifested in the full exercise of their citizenship (Maldonado-Erazo et al., 2021; 2023).

6. Communication and Marketing Plan

This plan not only seeks to promote the geopark itself, but also to establish a significant connection with all stakeholders, both internal and external. The main objective of this plan is to organize, systematize and enhance all communication activities, both internal and external, to strengthen the recognition and positioning of the Tungurahua Volcano Geopark at local, national and international levels. Through this strategy, we aim to raise awareness of the geological and cultural importance of the geopark, as well as promote sustainable and responsible tourism (Hardeman et al., 2017). The initial analysis shows that the importance of establishing a solid and coherent visual identity for the geopark is emphasized, as well as the need to develop educational and attractive content that involves diverse audiences, from students to potential tourists (Carrera et al., 2024). Furthermore, greater collaboration with local and national institutions, as well as with international organizations dedicated to conservation and sustainable tourism, is suggested.

The Plan defines a philosophical framework detailing its Mission and Vision, as well as strategic objectives, a SWOT study, Public Relations techniques that will allow the dissemination and projection of the values and activities of the Geopark with the intention of obtaining recognition from the stakeholders, the design of the Geopark's brand and slogan and finally an Action Plan to execute all the above (Scolozzi et al., 2014).

DISCUSSION

Based on the inventories of 20 GS, the inventories of flora and fauna biodiversity, and various sites and cultural manifestations as part of the region's heritage, it is demonstrated that in the Geopark area there was an important historical, geological and anthropological evolution, since the three areas are linked based on an integral and binary conception of territory, highlighting the dependence of physical geography and human geography subject to all the changes that nature presents. Therefore, it can be stated that the documented geological and biological wealth reaffirms the relevance of the Geopark as a space for conservation and education. It is also believed that the data obtained allow for the establishment of conservation priorities and serve as a basis for more precise monitoring plans. In the end, there are great challenges to consider, since there are still some areas that could not be fully studied due to their inaccessibility, which underlines the need for advanced technological methods such as drones or satellite images.

At the same time, the geology of the area demonstrates an evolutionary history that spans an analysis of approximately 417 million years, including processes such as volcanism, sedimentation and tectonics, supporting one more reason to understand the great biodiversity and landscape of the area. These findings strengthen the scientific narrative of the geopark, turning it into a natural laboratory for geological studies. In addition, there is the potential to develop more specific and attractive educational programs. However, the challenge is to continue developing firm conservation strategies because the conservation of areas with high geological exposure is at risk due to climatic factors such as erosion, landslides in winter and unregulated tourism.

Regarding the Monitoring and Conservation Plan, the highlighted results established key indicators for monitoring, such as the condition of soil, water, stability of geological formations and diversity of flora/fauna. Consequently, restoration strategies were established in degraded areas with a view to achieving regeneration of native vegetation and recovering degraded areas. The plan allows for systematic monitoring of the geopark's situation, which facilitates data-based decision-making. Local communities played a fundamental role in the implementation of conservation measures, demonstrating that their participation is essential. To ensure continuity of all this, it is necessary to ensure continued funding and strengthen the training of those responsible for monitoring. The sustainable use of minerals linked to the governance of the area is essential, since guidelines were developed for the sustainable extraction of minerals, reducing the environmental impact, and governance agreements were established between communities, companies and local authorities of the Geosites (Carrión Mero et al., 2018). The regulation of mining activity has reduced pollution and the alteration of the landscape, although there are still challenges in its effective compliance. Participatory governance improves the perception of justice and equity among the actors involved. Finally, it is observed that there are still tensions between economic interests and conservation priorities. It is necessary to strengthen the mechanisms for monitoring and resolving conflicts with spaces for periodic meetings to give prominence to all stakeholders.

Finally, some results are highlighted regarding the Communication and Marketing Plan of the GVT. Communication campaigns were designed to highlight the uniqueness of the geopark and its importance for sustainable development and the geopark registered a 2% increase in visits thanks to digital marketing strategies and alliances with tour operators. The strategies implemented are promoting responsible tourism and attracting a greater diversity of visitors, as well as effective communication has raised awareness among the local population about the importance of the geopark, encouraging their participation. It also remains to diversify communication tools to reach international audiences and improve tourism infrastructure using the internal situation and membership within the World Geoparks Network (Font et al., 2017).

The strategies implemented combine several fronts to strengthen the geopark and its ties with the community and visitors. These include the development of activities that promote tourism that respects the environment and local culture, while also designing products and experiences that appeal to different travel profiles. This not only protects the geological heritage but also expands the offering and prevents seasonality. Furthermore, through information campaigns, workshops, and guided tours, the local population has become aware of the scientific, educational, and economic value of the geopark. This has encouraged their direct involvement, from volunteering to the creation of community-based tourism initiatives. Taking advantage of the geopark's status as a member of a global network of Geoparks, the goal is to optimize trails, signage, interpretation centers, and basic services, adapting them to international standards and benefiting from collaborations, training, and funding linked to the network.

CONCLUSIONS

The GVT, as a UNESCO Candidate, has worked jointly with all stakeholders on the observations issued by the UNESCO Global Geoparks Council based on the axes of geoeducation, geoconservation and geotourism, focused on the SDG´s. Strategic alliances have been created with public institutions such as the Ministries to strengthen actions in the areas of Geotourism and Geoconservation, which has allowed the development of geotourism and scientific tourism as tools for the protection of natural and cultural heritage, generating sources of economic income for entrepreneurs in the territory.

The government projects contribute to the achievement of an inclusive, equitable and quality education, with education being the fundamental factor for the dissemination and empowerment of children and adolescents and local population.

Networking with Global Geoparks and Geoparks Network of Latin America and Caribbean "GeoLAC" has allowed the strengthening of the work team's actions by opening spaces for the exchange of experiences and advice to human capital and local population´s empowerment. The GVT has complied with the observations issued by the Global Geoparks Council thanks to the commitment of its stakeholders who have believed the area has an international geological value and its recognition will contribute to conserving the geological heritage within a line of sustainable development which will improve its inhabitant's quality life. One of the main limitations of the GVT's UNESCO nomination is the lack of adequate tourism infrastructure and communication tools that allow for international exposure. Although there is strong local commitment and a high geological value, the consolidation of global collaboration networks, the professionalization of staff, and the acquisition of sustainable resources are aspirations that, for now, cannot be achieved in the short or medium term due to budgetary and management constraints.

Author Contributions: Conceptualization, C.V.; methodology, M.P. and M.S.; validation, E.G. and P.M. and M.Z.; formal analysis; investigation, C.V., T.T. and C.F.; data curation; C.V. and T.T.; writing - original draft preparation, C.V and T.T.; review and editing, T.T.; visualization, M.P; project administration, M.P. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 03.04.2025 Revised: 08.07.2025 Accepted: 04.08.2025 Available online: 01.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1730-1737
DOI 10.30892/gtg.61331-1541

AN ANALYSIS OF THE SERVICE PROFILES OF FOUR-STAR WELLNESS HOTELS IN HUNGARY

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Citation: Csobán, K., Hevessy, G., Sánta, Á.K., Pető, K., & Kóródi, M. (2025). An analysis of the service profiles of four-star wellness hotels in Hungary. *Geojournal of Tourism and Geosites*, 61(3), 1730–1737. https://doi.org/10.30892/gtg.61331-1541

Abstract: The health tourism market has been growing steadily, driven by increasing global awareness of health and well-being. To meet the diverse and ever-changing market demand, health tourism businesses strive to differentiate their products. In Hungary, hotels offering wellness services typically position themselves as either "wellness" or "medical" hotels and communicate their profiles through various marketing tools. The present research, focusing on four-star hotels in Hungary, aims to explore their positioning, identify wellness sub-profiles based on specific services, and develop a classification system for wellness hotels. By analysing the services provided by 238 four-star hotels in Hungary, it was found that 91 hotels primarily target wellness guests. Descriptive statistical methods were employed to assess the wellness services and categorise the selected hotels based on deviations from the mean, standard deviations, and concentration measures. Following the analysis of the wellness offerings, two major service groups were identified: the "wellness service group", which primarily requires substantial infrastructure, and the "selfness service group", which is more reliant on human resources. The wellness and selfness potential of a hotel, derived from the evaluation of its services, also serves as an indicator of market impact. Based on the characteristics of the services, the hotels were classified as relaxing wellness, health-conscious wellness, holistic wellness, medical wellness, and hotels with no distinctive profile. The proposed categorisation has practical implications for both hotel and destination management, as resource optimisation and economic efficiency require clearly defined hotel profiles. The inclusion of certain services in a hotel's offering is a strategic decision with direct implications for the allocation of material and human resources. At the same time, at the macroeconomic level, it would also be important for national tourism management to reintroduce the recently abolished regulation prescribing services related to the terms "wellness" and "medicinal". This would allow for a uniform interpretation from both the service provider and the consumer side, which would also entail profile cleaning. It would also facilitate national economic summarization and the measurement of profile performance in the future. The increasing importance of clinical medical tourism in Hungary could be clearly distinguished.

Keywords: health tourism, wellness hotel, wellness profile, market segmentation, spa, hotel management

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INTRODUCTION

Health tourism has become one of the most dynamic tourism products, reflecting the global trend of health-conscious living. This is also true for both of its two main product groups, wellness and medical tourism, although the pace of development of the former is undoubtedly much faster than that of the latter. The concept of health and wellness tourism is closely linked to well-being, stress reduction, physical and mental balance and leisure activities (Chen & Petrick, 2013).

The desire to be fit and beautiful is a motivation as strong as the desire to heal, but the phenomenon is also polarised for other reasons. Health services and treatments are often identified with a concept of illness as a result of the environment in which they are offered. Many people still would like to use the various treatments because of the health benefits but strive to avoid any association with illness. The contradiction can be solved by using the term "wellness" instead of "medical", offering wellness treatments instead of medical treatments (Kóródi, 2023).

Among other things, the emotional background of the guests' conceptualisation has led to a shift in the service mix of the so called „medical hotels", which were historically the first to offer health tourism services. Medical hotels have to make a strategic decision whether to maintain a pure medical profile specialising in treatments best suited to their natural, human and technical resources or adopt a mixed profile (medical and wellness) adding new, wellness services and targetting new market segments. The mixed profile, in addition to the risk of losing the old clientele, also requires greater flexibility in marketing communication, emphasizing a sub-profile satisfying the actual demand. Given the downward

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trend in medical treatment numbers and the underfunding of state subsidised treatments, a complete change of profile is also possible, with the hotel having to enter a new market by developing new and existing wellness services, partly adapting to the expectations of the environment. Both the wellness hotels originally established and operating with a wellness profile and the newly built wellness hotels are increasingly forced to position themselves efficiently if they intend to distinguish themselves from resort hotels, where wellness services are also increasingly part of the offer (Boros et al., 2011).

Health tourism businesses have to face various economic, social, political and environmental challenges. In general, national governments strive to enhance economic development, while decreasing expenditure on public healthcare and health-related services (Lukose et al., 2024). In Hungary, besides medical and wellness hotels, thermal spas also provide a wide range of medical, wellness and recreational services to their guests, thus increasing competition at the tourism market (Kővári-Tóth et al., 2024). In addition to the constantly changing circumstances, the reorganisation of the international markets has taken place as a result of wars and economic crisis at certain source markets. The purpose of the present study is to address these challenges by exploring the potential elements of the service mix and the communicated profile of four-star wellness hotels. The specific aims are to explore the positioning of wellness hotels on the health tourism market, identify wellness sub-profiles based on specific services, and develop a classification system for wellness hotels.

LITERATURE REVIEW

Although "health", "medical" and "wellness" tourism are often used interchangeably in the scientific literature, each category has its distinctive features, including different services, demand factors and motivations (Wong et al., 2024). Health tourism is a tourism product where the travellers' primary motivation is to improve or maintain their health, i.e. to recover or prevent illness (Kóródi, 2024). Health tourism that promotes physical, mental or spiritual health can be divided into two main categories: medical and wellness tourism (Smith & Puczkó, 2014). While medical tourism aims at health restoration, wellness tourism focuses on prevention, recreation and the maintenance of health (Mueller & Kaufmann, 2001; Voigt et al., 2011, Martins et al., 2025). Medical tourism includes clinical and surgical tourism that may also involve medical operations at special treatment facilities (Ruszinkó & Donka, 2019).

Suess et al. (2022) argue that it is a type of niche tourism which originates from the fast increase of domestic and international travelers in search of medical treatments for various health conditions. A related form is the so called traditional health tourism, which focuses on traditional and alternative therapies and combines locally rooted healthcare practices with unique tourism experiences (Yan, 2024). Wellness tourists travel in order to enhance their physical, psychological, spiritual and social well-being (Voigt et al., 2011). At the beginning wellness tourism was only related to the spa sector, however by these days it has become a more generic term including other tourist products and reaching new customer segments (Printz-Markó et al., 2017; Ciobanu & Luches, 2018). Wellness travellers can be grouped into primary wellness travellers who are primarily motivated by pursuing some kind of wellness activity, and secondary wellness travellers who engage in wellness treatments or activities while undertaking any other type of travel (Datta, 2022). The holistic part of wellness tourism also includes yoga, meditation and other services that belong to the New Age trend (Smith & Puczkó, 2010). International research highlights that yoga, Ayurveda, spirituality and meditation contribute to the satisfaction level of wellness tourists to a great extent (Datta, 2022). In general, wellness tourism businesses offer specific products that aim to improve people's quality of life (Chen et al., 2008).

Wellness tourism may also involve medical services, which have an outstanding role in preventative healthcare (Huang & Xu, 2018). Furthermore, in addition to the infrastructure to support wellness tourism, the culture of spa and wellness alongside with the health destination environment, and the potential for developing innovation and cooperation are the most significant decisive factors in the competitiveness of a wellness destination (Phuthong et al., 2023). Innovation in tourism, which may manifest itself in health tourism product development, is a strategic feature that also frequently contributes to the sustainability of businesses and destinations alike (Pilelienė et al., 2024).

Sustainability has become an integral part of long-term tourism strategies aiming to optimize economic benefits, minimize negative socio-cultural impacts on local communities, and protect the natural environment (Ivancsóné Horváth et al., 2025). As wellness tourism is frequently based on natural resources, especially thermal water, the requirements of sustainability must receive special emphasis in tourism development.

Health tourism has great market potentials in Hungary as a result of the rich natural resources, the newly developed balneological and tourism infrastructure and the cultural traditions of thermal spas (Csobán et al., 2022). Wellness tourism attracts not only senior tourists but also members of the Generation X and Y. In Hungary Generation Y are open to take advantage of wellness services, as well as physical and mental recreation facilities (Ivancsóné Horváth & Printz-Markó, 2018). The Hungarian National Health Tourism Development Strategy (hereinafter NHTD) claims that the aim of wellness tourism is health promotion, whereby healthy people in their free time, at their own expense or with additional funding (e.g., health insurance) acquire a package of services including health elements (mental, physical, biological) in an attractive and entertaining environment. The medical wellness target group, which includes guests suffering from illnesses and/or aiming to prevent illness on a medical-professional basis, was defined.

The approach is based on a preliminary assessment of the guest's condition, the corresponding information on healthy lifestyle and the selection of the most individually recommended services (OEFS, 2007). Medical tourism as a well-defined and important part of health tourism was dominant in Hungary until 2005, as all trips motivated by the use of medical or spa treatments fell into this category. Then, in the tourism development documents (OEFS, 2007; Magyar Turisztikai Ügynökség, 2021), wellness tourism was distinguished from health tourism, broadening the definition of health tourism to include the prevention function.

Medical and wellness tourism have recently become the focus of destination management and marketing (Mason et al., 2023). It is notable that the range of tourism products is expanding and the services within each product are becoming more diverse and specialised (Ruszinkó & Donka, 2019).

Wellness service providers have also started to become differentiated within the sector. The wellness profile covers a specialised range of services offered by establishments where "wellness is accompanied by some function that makes the service provider special and thus its service can be presented to the market as a Unique Selling Product.

Such profiles include Turkish and Roman baths, naturopathy, nutrition centres (digestive treatment), thermal waters, manager cures (circulatory, digestive, cancer screening, stress management), conference and wellness, family holidays, aquaparks, adventure baths, and Far Eastern therapies (OEFS, 2007). Wellness is often descibed as multidimensional including six dimensions, such as physical (regular exercise, nutrition, sleep), spiritual (meaning and purpose of human existence), mental (intellectual mind), social (connection to one's community), emotional (awareness and acceptance of emotions) and environmental (environmental awareness) (Global Wellness Institute, 2024). However, this multidimensionality is of limited use for profiling and positioning wellness hotels due to their synergistic relationship with each other.

MATERIALS AND METHODS

In-depth interviews with decision-makers in charge of product development in hotels, as well as website observation and analysis in the case of hotels that display their offers on their websites are adequate methods to explore the profile-specific composition of the service mix (Boncz, 2015). In this research, the latter was applied, i.e. the content analysis of the offers displayed on the websites of a systematically selected sample was implemented (Lehota, 2001; Gyulavári et al., 2017). Objectivity was ensured by a pre-tested evaluation sheet. The assessment was conducted in October 2024, selecting from the four-star hotels in Hungary (N=238) those that either have a name that refers to their services or offer wellness services that appear to be above average. Finally 91 hotels were selected for analysis. The four-star category has been chosen because it attracts both domestic and international guests who expect high quality services. The evaluation sheet was developed with 40 criteria, out of which the services of the adventure pools and the sauna services as classic wellness services were given double weight. Five wellness hotels (Aquaworld Resort, Budapest, Hotel Europa Fit Hévíz, Bonvital Hotel Wellness & Gasztro, Hévíz, Sungarden Wellness & Conference Hotel Siófok, Hotel Golden Lake Resort, Wellness and Conference Hotel Balatonfüred) with **** superior rating were selected for the testing. Based on the results of the pilot test, the number of criteria to be rated was reduced to 37. No further differentiation was necessary. The scope of weighted counting was narrowed down to ten services, resulting in a total of 47 points.

Simple descriptive statistical methods with Microsoft Excel support were used for the analysis. The analysis started by summing up the scores obtained during the evaluation, ranking the hotels, calculating the average wellness tourism potential and grouping them according to the deviation from the average, and then proceeded to interpret the position of the hotels by assigning deciles (Gerzson, 2011; Kóródi, 2011). Similarly, the examination of services by summing the occurrence values allowed for ranking and sub-ratio analysis. By separating the services by wellness characteristics, a complex analysis became possible, by plotting the deviation of the average rating values from the mean in the two criteria, the quarters of the coordinate system were divided into characteristic groups of the hotels studied. The resulting positions may influence strategic decisions on the directions of development (Figure 1).

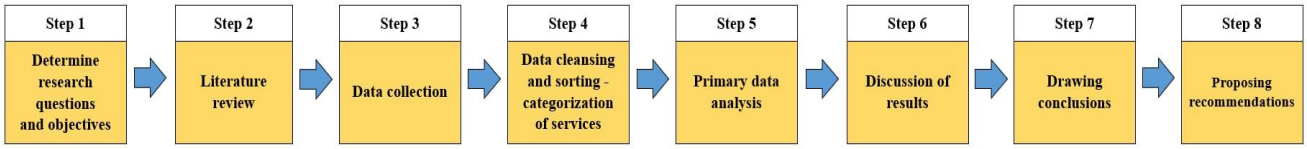

Figure 1. Methodology flowchart (Source: Authors' own compilation, 2025)

RESULTS

Based on the scores obtained for the services, the selected wellness hotels can be classified into five categories according to their service potential relative to the average (Figure 2), with outstanding, above average, average, below average and insignificant. The average potential of the services offered is 15.34, with a high relative variance (0.81).

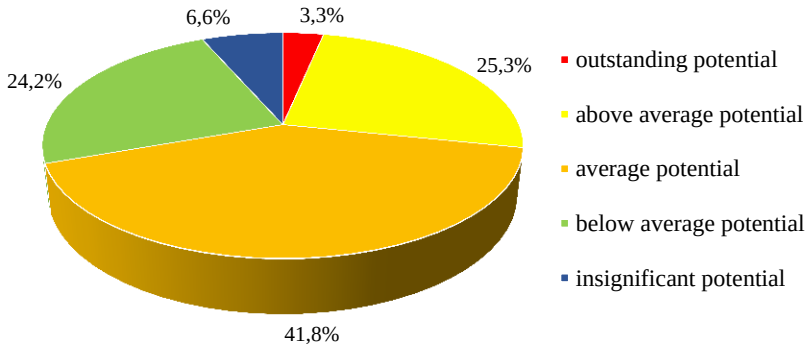

Figure 2. The distribution of Hungarian wellness hotels based on their specific service potential (Source: Own database (n=91))

41.8% of the hotels fall into the average wellness service potential, 25.3% have an above average service potential and 3 hotels have an outstanding service potential (3.3%). 24.2% of the hotels are in the below average category, 6.6% have an insignificant rating based on their relation to the average. In terms of their geographical location, hotels from Western Hungary, Hévíz, Zalakaros, Balatonfüred, Zalakaros and Szentgotthárd dominate the ranking, followed by hotels from the rest of the country. In the lower decile, the actual existence of a wellness character has been noted, but when examining the hotels individually (e.g. Smart Hotel Budapest, Calendula Ayurvedic and Medical Hotel Siófok), differentiation and the offer of special services are typical instead of general wellness services (Figure 3). Services are highly concentrated, with 9 out of 37 services covering more than half (51.9%) of the services offered, with Finnish sauna, classic massage, whirlpools, massage jets, alternative massages, other adventure pools, steam baths, infrared sauna and relaxation room ranking in the top quartile. Frigidarium, life coaching, sound therapy, nutritional counselling, mindfulness, and yoga appear at the bottom of the ranking with low prevalence, although their therapeutic utility is unquestionable. When looking at the concentrated occurrence of services, the cumulative amounts and cumulative frequencies calculated from the ratings show a strong concentration (GINI index: 0.554), i.e. the higher rated hotels have the higher proportion of services (Figure 4).

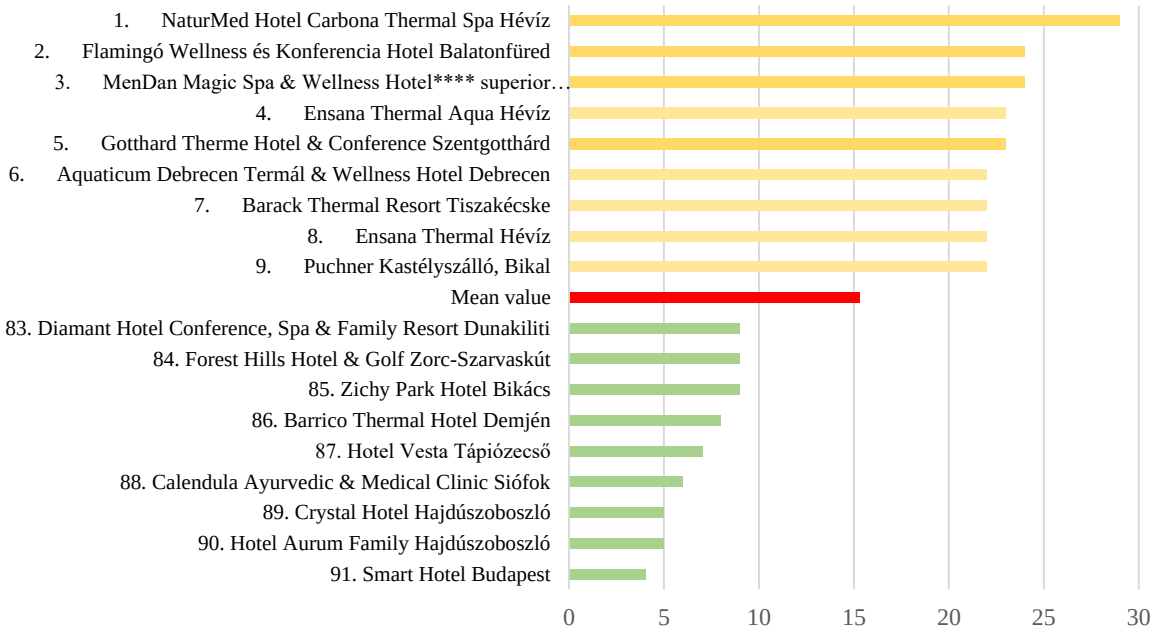

Figure 3. The specific service potential of Hungarian four-star wellness hotels' lower and upper decile (Source: Own database (n=91))

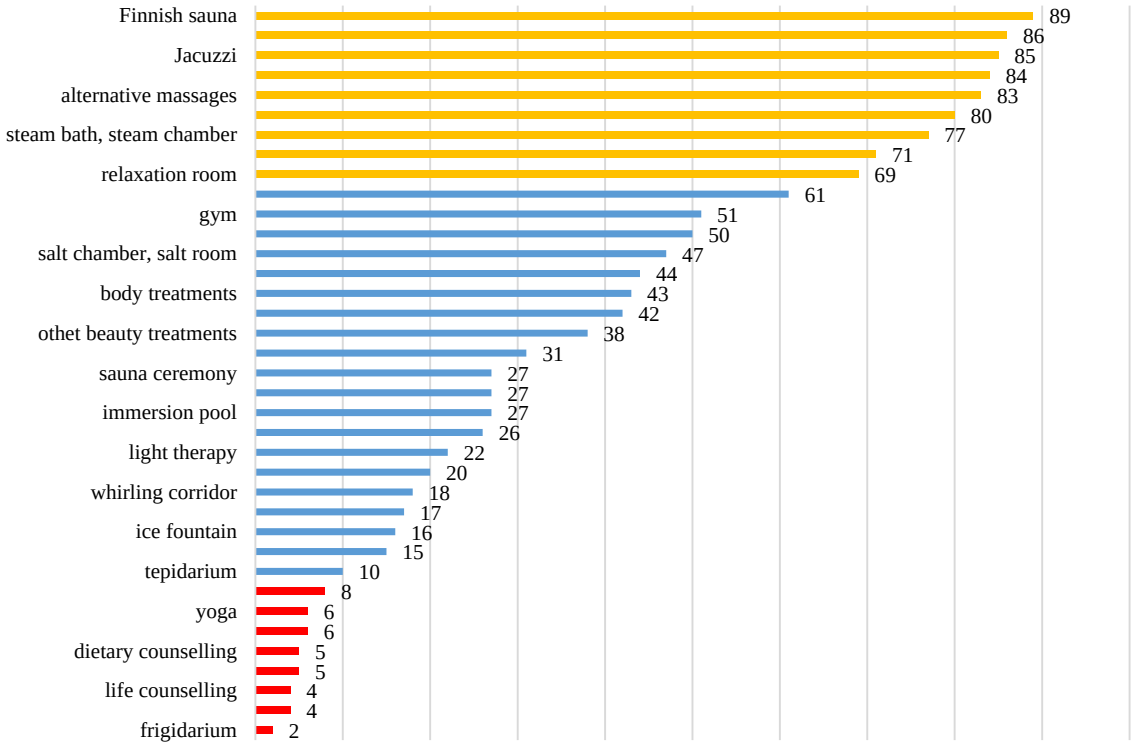

Figure 4. The occurence of service types in Hungarian four-star wellness hotels (Source: Own database (n=91))

Two major groups of services and four subcategories have been identified when analysing the services offered by wellness hotels (Table 1). The ”wellness service group” mainly requires ample infrastructure, while the ”selfness service group” requires human resources. From the point of view of their development, the first category of both groups mainly includes services that appeared earlier, while the second category includes services that were introduced later.

Table 1. The categorization of wellness services at Hungarian four-star hotels (Source: Own database - n=91)

Wellness		**Selfness**	
Classic services	**Differentiated services**	**Massage, treatments**	**Active, spiritual and holistic services**
jacuzzi	salt chamber	classic massage (Swedish, Finnish)	training programmes (nordic walking, etc.)
neck and back hydro massage noozles	aroma chamber	alternative massages	training in gym
hydromassage pool	adventure shower	instrumental massage	yoga
adventure pool	whirling corridor	child massage	movement therapy
Finnish sauna	ice fountain	facial treatments	sauna ceremony
steam bath	hot tub	body treatments	sound therapy
infrasauna, infrachamber	solarium	other beauty treatments (fish pedicure, special cosmetics)	light therapy
immersion pool	cryosauna		ayurveda
relaxation room	tepidarium		mindfulness
	frigidarium		dietary counselling
			life counselling

The inclusion of services in the offering is a strategic decision, with organisational and management implications for the provision of material and human resources. Therefore, the wellness and selfness potential of a hotel resulting from the evaluation of the selected wellness services is also an indicator of market impact. Taking the average of both indicators (wellness sub-profile 9.1, selfness sub-profile 6.3) as an axis, it is possible to draw conclusions on the profile of hotels in terms of services based on their position in relation to the average. The individual points in the coordinate system indicate the position of the hotels. There are several hotels in the same position, and the accumulation of points is not indicated, however the table illustrating the groupings allows the hotels to be followed individually in the categories that have been created (Figure 5). The position of the hotels also makes it possible to identify the main competitors.

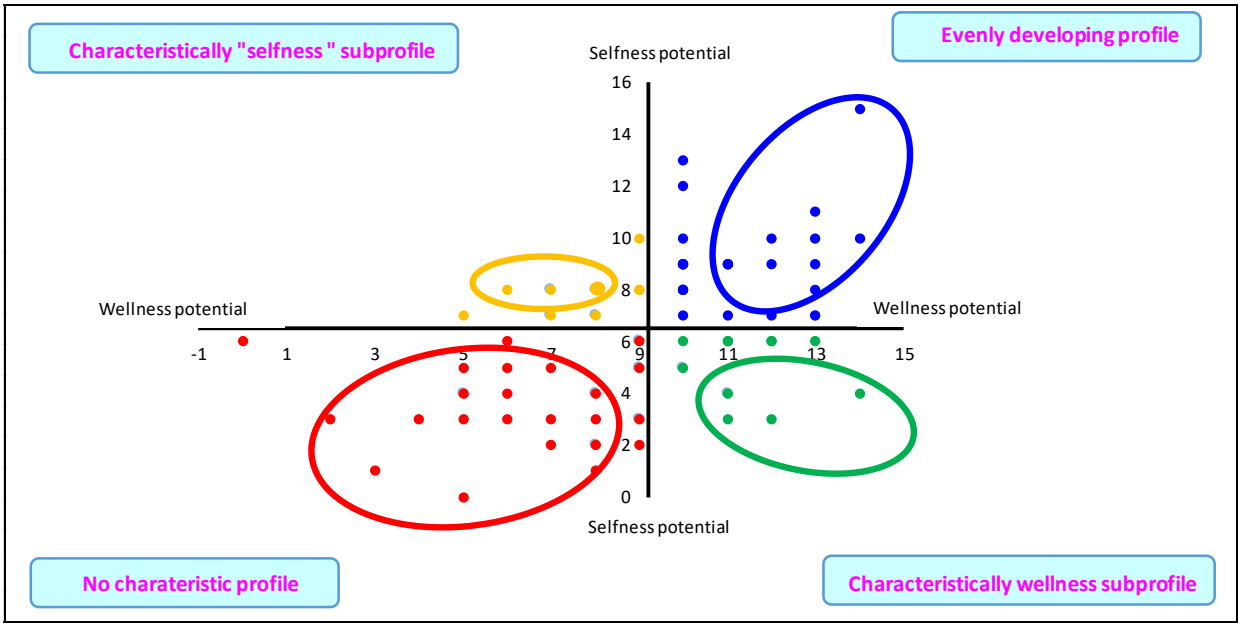

Figure 5. Wellness and selfness profile characteristics of four-star wellness hotels in Hungary (Source: Own database (n=91))

Compared to the axes formed by the average of the potentials, hotels with above average ratings for both wellness and selfness services can be considered as having an evenly developing profile. This includes 29 (31.9%) of the 91 hotels (Figure 5, 6) with a varied spatial distribution. Hotels with a high wellness potential but lower than average selfness potential (13 hotels, 14.3%) more typically belong to the wellness sub-profile group.

Hotels with above-average selfness potential but below-average wellness potential were classified in the group of "more characteristically selfness subprofile" (16 hotels, 17.6%). Hotels with below-average wellness and selfness potential do not show a differentiated profile, so 33 hotels (36.3%) were classified in the group of "no characteristic profile", several of which have services that can be complemented with the existing services at the destination.

Within the established groups of hotels with a steadily developing profile, the diagram identifies hotels with a long history of spa resorts, which, in line with the change in demand, have introduced wellness and then selfness services (e.g., hotels at the traditional spa destinations of Hévíz, Hajdúszoboszló, Zalakaros, Bük, Mezőkövesd).

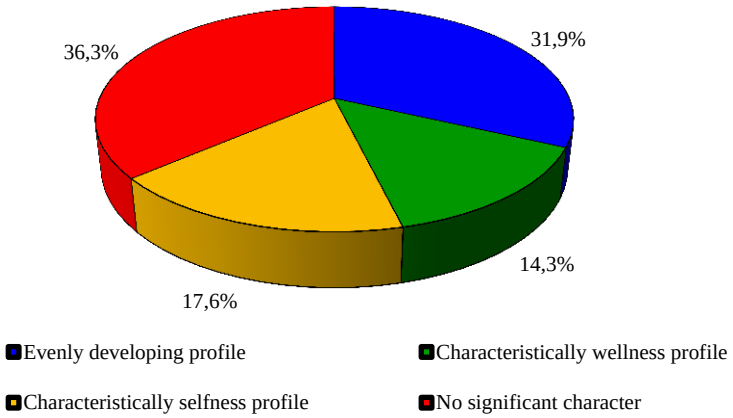

Figure 6. The distribution of Hungarian wellness hotel based on its profile characteristics (Source: Own database (n=91))

In the category with a more typical wellness profile, there are several younger hotels were originally positioned as wellness hotels. Most of the hotels with a typically selfness profile do not have thermal water, so services focus on individual treatments and programmes. Some of the hotels that do not have a distinctive subprofile, but communicate the wellness character in some way, can be classified as resort hotels, or as new and experimental hotels with special services that need further development and differentiation. This does not imply that their customers are not satisfied with the service, but communication could be more effective if these hotels were more clearly profiled.

CONCLUSIONS AND RECOMMENDATIONS

The results of the research suggest positioning strategies for each wellness hotel in terms of product development, depending on the strategy for the target market segments. However, in terms of communication, it is advisable to distinguish between the three branches of health tourism, possibly highlighting medical wellness as the fourth. According to the medical wellness approach it is the guest's own decision to seek medical support, which is likely to determine the success of treatments. Choosing one of the seven wellness profiles and narrowing down the services accordingly is an unfortunate choice, as it would be able to define a very small target market in relation to capacity. Several wellness hotels offer treatments available to the local population, presumably in order to take full advantage of capacity. This could be enhanced by welcoming guests from other hotels.

Taking into account economic considerations, the relative spending of the wellness guest is higher, so aiming for a balanced service profile may be a realistic goal for hotels with a spa profile rather than an effort to increase the number of spa guests. Multi-profiling also allows for greater scope for adaptation, for example to replace guests from the East who have been left behind due to the war. The conscious specialisation and profiling of the product range of spas and health resorts, as well as marketing and sales promotion, can be a further way forward, helping to revitalise the culture of health tourism at home and reposition it at the international tourism market, with a leap in service quality and guest experience. It must be noted that the protection of the natural resources and the maintenance of a relaxing, pleasant and safe physical enviroment are prerequisites for a competitive and sustainable health tourism destination (Szőllős-Tóth & Vargáné Csobán, 2021). It can be concluded that traditional medical spa tourism in Hungary may not be seen as a successful sector any longer due to a declining and price-sensitive customer base and stagnating health insurance subsidy levels. Wellness hotels should strive to become more than just hotels with some wellness services, but to become wellness hotels, either with traditional relaxation, or differentiated innovative services, focusing on more conscious selfness and comprehensive holistic services with a unique profile.

The integration of physical activity as part of wellness tourism could also increase the positive impacts of tourism and lead to the tourists' greater satisfaction level (Khunnikom et al., 2025). Consequently, a well-established strategic decision is required from the hotel management on the composition of the service mix, a change of the image and a renewal of communication in order to target new market segments (Kóródi, 2023).

In conclusion, health tourism in Hungary has proven its resilience to environmental, economic and social challenges, but continuous transformation is inevitable for Hungarian medical and wellness hotels to remain appealing for both domestic and international visitors.

Limitations of the research and future research agenda

The first limitation of the study arises from the imprecise nomenclature of the Hungarian hotels, since the actual profile of the hotels is not always clearly communicated, and the terms ”wellness”, ”spa” and ”medical” hotels are not coherently applied. Consequently, the comparison of the services was not implemented in relation to officially approved standards, but according to the benchmarking system of the present research.

As the unification of the national certification system is still in progress, the unambiguous nomenclature of wellness and medical hotels is expected to be introduced in the future, which may require conducting the study at a later date.

Secondly, this study was implemented in Hungary, where health tourism is the major tourism product and has its distinctive features. The findings of this research may not fully apply to the hotel industry of other countries as they follow diverse policies and practices, therefore international wellness hotels should be examined from a global perspective.

Author Contributions: Conceptualization, M.K. and K.CS.; methodology, Á.K.S. and M.K.; software, G.H. and M.K.; validation, M.K. and K.CS. and K.P.; formal analysis, M.K. and Á.K.S.; investigation, Á.K.S. and G.H. and M.K.; data curation, M.K. and Á.K.S. and G.H.; writing - original draft preparation, M.K. and K.CS.; writing - review and editing, G.H. and M.K. and K.CS.; visualization, Á.K.S. and K.CS. and M.K.; supervision, M.K. and K.CS. and K.P.; project administration, M.K. and K.CS. and K.P. All authors have read and agreed to the published version of the manuscript.

Funding: This article was prepared with funding from the University of Debrecen

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: This research was supported by the University of Debrecen.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 06.04.2025 Revised: 09.07.2025 Accepted: 05.08.2025 Available online: 01.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1738-1750
DOI 10.30892/gtg.61332-1542

ASSESSMENT OF POLICIES TO PRESERVE THE CULTURAL VALUES OF ETHNIC MINORITIES IN AN GIANG PROVINCE, VIETNAM

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Citation: Hai, N.C. (2025). Assessment of policies to preserve the cultural values of ethnic minorities in an Giang Province, Vietnam. *Geojournal of Tourism and Geosites*, 61(3), 1738–1750. https://doi.org/10.30892/gtg.61332-1542

Abstract: In the process of sustainable development in Vietnam, preserving and promoting the cultural values of ethnic minorities is a task, so there should be sustainable solutions to preserve cultural identity and strengthen national solidarity. The process of modernization, urbanization, along with factors such as market economy and cultural change, has posed many challenges to conservation work. An Giang province, the long-standing residence of the Khmer, Cham, and Chinese communities, is an area with high ethnic cultural diversity, but is also affected by cultural change. This study aims to evaluate the effectiveness of implementing the policy of preserving the culture of ethnic minorities in An Giang, identify influencing factors, and propose practical policy solutions. The study uses quantitative methods with a questionnaire surveying 750 subjects, including ethnic minority people and cultural officials in Tri Ton, Tinh Bien, Chau Phu districts, and Chau Doc city. Data were processed through the following steps: descriptive statistics of survey sample characteristics; testing the reliability of the scale using Cronbach's Alpha; exploratory factor analysis (EFA) to determine the structure of observed variables; and confirmatory factor analysis (CFA) to test the suitability of the measurement model. The analysis results identified five groups of factors that positively affected the effectiveness of implementing the policy on preserving ethnic minority culture, including (1) The suitability of policy objectives and content with local cultural characteristics; (2) Support resources in terms of finance, human resources and facilities; (3) Implementation organization and management capacity at the grassroots level; (4) Level of community participation in planning, monitoring and implementation; (5) Conservation results expressed through the level of satisfaction and the ability to restore and maintain cultural values. The study found limitations including the lack of inter-sectoral coordination mechanisms, unstable investment resources, and superficial community consultation. The study proposed solutions to improve the substance of policies, increase sustainable investment, and especially empower ethnic minority communities to play a central role in preserving and promoting national cultural identity.

Keywords: Ethnic minority culture, conservation policy, community participation, support resources, Vietnam

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INTRODUCTION

Vietnam is a multi-ethnic country with 54 ethnic groups, and the culture of ethnic minorities is an important part of Vietnam's cultural identity. The State considers the preservation and promotion of ethnic minority cultural values. Cultural preservation is not only about preserving ancestors' heritage but also contributes to strengthening national unity and promoting sustainable development. Promoting the cultural values of ethnic minorities is considered a pillar to strengthen the soft power of national culture (Chi et al., 2022). The National Target Program on Socio-Economic Development of Ethnic Minority Mountainous Areas for the 2021-2030 period has integrated the goal of preserving and developing ethnic minority culture, mobilizing resources to preserve the unique cultural heritage of the community. An Giang Province, in the Southwest, bordering Cambodia, is a locality with cultural and ethnic diversity. An Giang's population is about 2.1 million people, including four ethnic groups of over 10,000 people and many ethnic groups of less than 10,000 people.

The Kinh ethnic group accounts for the majority at 95%, the Khmer community accounts for about 3.98% (over 75,000 people), the Cham people account for about 0.6% (about 15,000 people), and a small number of Chinese and other ethnic groups (General Statistics Office, 2019). Each ethnic group here has its customs, festivals, traditional occupations, and folk arts, creating a colorful and unique cultural picture of An Giang. These cultural values are the pride of the ethnic communities, and at the same time, are an important resource for the development of cultural tourism and social cohesion.

Faced with the impact of modernization and integration, many traditional cultural values are at risk of being lost. In An Giang, cross-border cultural exchanges and the influence of urban lifestyles have made some ethnic minority youth less interested in their mother tongue, traditional rituals, or ethnic crafts. Some customs and practices are changing; many folk knowledge, such as folk tales and epics, are at risk of being lost (Huong et al., 2020).

The Cham community is facing the loss of their written language, and traditional folk songs and musical instruments are rarely performed outside the scope of religious rituals. The Khmer people are concerned that the younger generation is no longer fluent in Khmer and does not fully understand the meaning of ethnic festivals (Van Duong, 2020).

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These challenges require the government and the community to have timely solutions to preserve and promote unique cultural values, avoiding the loss of spiritual heritage in the flow of integration (Dau Tuan, 2023). An Giang province has issued and implemented many policies and programs to preserve the values of ethnic minority groups. An Giang province has established a project to preserve the Du Ke stage art (a traditional singing and dancing form of the Khmer people) and the brocade weaving craft of the Cham people, including these heritages in the national intangible cultural heritage list to have appropriate protection mechanisms. The local government has supported the organization of traditional festivals (Via Ba Chua Xu Nui Sam Festival, Ramadan of the Cham people, Ok Om Bok of the Khmer people) and opened Khmer and Cham language classes at pagodas and mosques. At the same time, the state has invested funds to restore Khmer pagodas, mosques, and cultural relics of ethnic minorities. The local government has actively integrated the goal of preserving ethnic minority culture into poverty reduction programs, community tourism development, and new rural construction, aiming to improve the material and spiritual life of the Khmer and Cham groups comprehensively (Van Vien et al., 2024). The results achieved are quite good, however, the effectiveness and efficiency of cultural preservation policies in An Giang should be evaluated objectively. This evaluation study helps clarify the relevance of policies to community needs and factors affecting the effectiveness of policy implementation (Nguyen, 2022). From there, propose solutions to improve policies to preserve the culture of ethnic minority groups in An Giang in the future.

LITERATURE REVIEW

Preserving ethnic minority culture is a topic that attracts the attention of many domestic and foreign studies, spanning the fields of ethnology, cultural studies, public policy, and sustainable development. In the world, the concept of cultural preservation is closely linked to the protection of the tangible and intangible cultural heritage of indigenous and ethnic minority communities in the context of globalization (Bao et al., 2024).

The approach based on cultural rights is promoted, considering culture as a basic human and community right. According to this approach, individuals and ethnic minority communities have the right to maintain and promote their cultural heritage, and their participation in the preservation process is a decisive factor for success. Cultural heritage should be viewed from a human rights perspective, in which local communities play a central role, instead of just a top-down approach based on the interests of the state and international organizations (Adinolfi, 2019).

Effective conservation policies should be associated with community empowerment, respect for indigenous knowledge, and the active participation of local people in heritage management and preservation (Do & Mori, 2024).

Many international studies have shown that mobilizing communities and non-state organizations to participate in conservation will be more effective and sustainable than one-way imposition from the government. Heritage protection in many countries shows the participation of local communities in the success of conservation efforts, The community is the subject that creates and continues the heritage; they clearly understand the value and meaning of that heritage to life (Dang & Nguyen, 2023). Many international organizations have promoted programs to protect intangible cultural heritage (such as languages, festivals, crafts, performing arts, and folk knowledge), which is a treasure that needs to be passed on, and emphasized the role of communities in identifying, listing, and teaching heritage. The inclusion of a cultural practice in the National and International Intangible Heritage List is not only to honor, but also to act as an action plan to protect, support the community that owns it, and continue to maintain it in the living environment (Hoang et al., 2022).

In the Southeast Asian region, many countries have had active policies to preserve ethnic minority culture. Indonesia has enacted a law to protect intangible cultural heritage, provide financial support to folk artists, and open language schools for ethnic minorities; China has built "cultural villages" to preserve intact ethnic minority customs, develop sustainable tourism to create livelihoods for local people; Laos and Cambodia have programs to revive the writing and traditional festivals of tribes, along with efforts to reduce poverty and improve people's knowledge.

International experience shows that the preservation of ethnic minority culture should be approached comprehensively, including respecting the community's right to cultural self-determination, and integrating it into socio-economic development strategies to ensure sustainability (Akbar et al., 2020).

In Vietnam, preserving and promoting the cultural identity of ethnic minorities is identified as a key task in building a unified and diverse culture. The viewpoint that ethnic groups are equal, united, respect, and help each other to develop has been recognized in the Constitution and specified through many policies. Ethnic and cultural issues in Vietnam have focused on preserving the heritage of ethnic minorities. The Government has issued many policies in the cultural field, and the Law on Cultural Heritage has created an important legal framework for protecting the tangible and intangible heritage of ethnic groups. From 2011 to 2020, Vietnam has implemented the Project "Preserving and developing the culture of ethnic minorities to 2020" focusing on supporting the restoration of traditional festivals, preserving craft villages, teaching ethnic minority languages and scripts, honoring folk artisans, and restoring ethnic minority folk festivals; Many intangible cultural heritages of ethnic groups have been inventoried and recorded for inclusion in the national list, showing that these activities have contributed to reviving cultural life in ethnic minority areas, enhancing pride and awareness of preserving traditional culture in the community (Lan et al., 2021).

Many studies on ethnic minority culture and conservation work have shown that culture includes both tangible and intangible culture in many diverse fields, reflecting the characteristics of wet rice farming residents. Studies assess the current status of promoting Khmer cultural values and emphasize the importance of raising awareness of Khmer people about their heritage (Van Tuan et al., 2024). Understanding the proud traditional cultural values will help Khmer people be aware of preserving and promoting values, while gradually eliminating backward and negative customs. Regarding the Cham group culture, many studies focus on traditional music and musical instruments of the Cham group, pointing out the

worrying situation, including the types of Cham folk music that are becoming less popular, gradually disappearing in modern life. It is proposed that there should be preferential policies to encourage Cham people to inherit their ancestral heritage, meeting the tastes of the times. Many challenges are arising, so the Cham group culture should be preserved (Le et al., 2023). Preserving the Cham language should be taught in schools, establishing local Cham cultural centers to display and preserve historical artefacts, and promoting Cham cultural values through sustainable community tourism.

At the policy level, studies on ethnic minority cultural management in Vietnam have shown achievements and limitations. Vietnam has built a system of ethnic cultural museums and organized many national cultural festivals with ethnic minority characteristics. These activities create opportunities for the exchange and promotion of ethnic minority heritage to the public nationwide and internationally (Kiên, 2023). However, on-site preservation work in ethnic minority communities faces many difficulties, such as limited local budgets, insufficient incentives for artisans, and the risk of extinction still exists when young people are less interested in traditional culture.

Some preservation programs are still formalistic, lacking the real participation of the people, so the effectiveness is low. Having too many support policies at the same time sometimes causes a mentality of waiting and relying, reducing the community's self-motivation in preserving culture (Thi et al., 2023).

Therefore, the recent trend is to shift from "passive conservation" (the state does it for the community) to "active conservation" (the state plays a supporting and guiding role, while the community takes the lead and actively participates). Studies show that preserving the culture of ethnic minorities should harmoniously combine the following contents: A solid policy and legal framework from the state; Appropriate investment resources (finance, facilities); Community participation as the subject of heritage; Education and communication to raise awareness for the younger generation; and Integrated development - linking cultural conservation with livelihoods, sustainable tourism, and poverty reduction. This is the foundation for building a theoretical framework for research.

THEORETICAL FRAMEWORK AND RESEARCH STRUCTURE

Theoretical framework

Based on the research overview, the theoretical framework for evaluating the policy of preserving the cultural values of ethnic minority groups in An Giang is developed. This theoretical framework combines the theory of public policy management and the theory of cultural studies, including (1) the Theory of policy cycle applied to the field of ethnic minority culture; (2) Approach based on cultural rights and community participation; (3) Model of factors determining the effectiveness of cultural preservation. According to the policy cycle model, policy evaluation should consider the stages, including policy planning, implementation, results, and impact. In the context of preserving ethnic minority culture, attention should be paid to the content of the policy, including goals and solutions. The implementation process includes implementation organization, coordination between state agencies, the level of people's participation, and the results of improved conservation level, community satisfaction assessment. This theory suggests evaluation criteria such as the suitability, effectiveness, efficiency, and sustainability of policies.

The policy of preserving and developing ethnic minority culture in Vietnam is identified as an important part of the strategy of building an advanced culture with a strong national identity. State policies such as Resolution 33-NQ/TW on cultural development, the Law on Cultural Heritage (amended in 2009), the National Target Program on Socio-economic Development of Ethnic Minority and Mountainous Areas for the period 2021–2030 have identified the task of preserving, restoring, and promoting ethnic minority cultural values associated with sustainable development. The theoretical framework of the study approaches current policies based on evaluation criteria, including suitability, effectiveness, implementation efficiency, and sustainability of policy impacts (Evans, 2020).

According to studies (Giang, 2017; Hai et al., 2023), the policy of preserving ethnic minority culture in Vietnam focuses on the main contents of preserving tangible and intangible cultural heritage; restoring traditional occupations; protecting ethnic languages and scripts; improving spiritual and cultural life; encouraging community participation. However, in practice, there are still many challenges in implementation, such as limited resources, formality in community consultation, and the decline of many cultural values in the context of integration. Based on cultural rights, ethnic minority communities have the right to preserve their cultural heritage, and the state has the responsibility to support the implementation of these rights (Long & Van, 2022). Therefore, a good conservation policy should create conditions for ethnic minorities to proactively participate and transmit their culture. Inheriting the views of UNESCO and the United Nations, local communities must be at the center of efforts to protect their heritage; the higher the community participation, the more effective the policy. According to the theory of sustainable development and cultural rights (Jeffers, 2015), each ethnic minority community has the right to preserve and develop its traditional culture. The State not only plays a "support" role but also needs to create conditions for the community to proactively maintain, transmit, and create culture.

Cultural rights are associated with meaningful community participation from policy formulation, implementation of conservation activities, to monitoring results (Fisher-Borne et al., 2015; Yosso & Lopez, 2023). Research by Thao et al. (2023) and Turner et al. (2016) shows that cultural conservation policies are only sustainable when they truly empower communities, encourage initiative, autonomy and voluntary participation in the conservation process (Thao et al., 2023). This theoretical framework affirms that the more policies facilitate active participation of people, the higher the conservation effectiveness. Community participation is a central factor determining the sustainability and spread of cultural conservation results (Turner et al., 2016). The practical situation in the Mekong Delta, An Giang province, is an area with a strong presence of ethnic minority communities such as Khmer, Cham, and Chinese, with rich and unique cultural identities (Ha & Lien, 2024; Huong et al., 2020). Typical cultural values such as the Bay Nui bull racing

festival, Du Ke art, Cham brocade weaving, the system of religious festivals, and folk knowledge are formed and developed closely associated with community life.

According to research by Long & Nguyen (2018), Tuan (2022), the preservation of cultural values in An Giang has achieved some positive results such as restoring festivals, supporting artisans, maintaining Khmer classes, but also facing many challenges: rapid urbanization, changes in youth lifestyles, lack of grassroots cultural human resources, dependence on unstable funding sources (Long & Nguyen, 2018; Tuan, 2022).

In this context, the assessment of cultural preservation policy in An Giang should closely follow the reality, clarify the relationship between the suitability of policy objectives and actual cultural needs; The level of resource mobilization and effective implementation; The central role of ethnic minority communities in cultural preservation; The results achieved and the real satisfaction from the beneficiary community.

Hypotheses

The hypothesis is that there are many factors that positively affect the policy of preserving ethnic minority culture. If the policy is designed appropriately, resources are guaranteed, implemented effectively and there is active participation of the community, the conservation results will be good and people will be satisfied.

Hypothesis 1: The factor of appropriateness of policy objectives and content affects the policy of preserving ethnic minority culture. The appropriateness of policy objectives and content is the level of achievement of the content, orientation, and objectives of the policy of preserving ethnic minority cultural values that closely meet the actual needs, aspirations, cultural characteristics, and living conditions of the local ethnic minority community (Turner et al., 2016).

Hypothesis 2: The factor of supporting resources affects the policy of preserving ethnic minority culture. Supporting resources in the preservation of ethnic minority culture are all the material, financial, human, infrastructure, equipment, and supporting factors necessary to implement policies, programs, and activities to preserve and promote the cultural values of ethnic minorities in the locality (Thao et al., 2023).

Hypothesis 3: The factor of policy implementation and management affects the policy of preserving ethnic minority culture. The implementation and management of the policy of preserving ethnic minority culture is the process of organizing and implementing the State's policies, programs, and action programs into practical life to preserve and promote the cultural values of ethnic minorities (Tuan, 2022). The effectiveness of policy implementation and management greatly determines whether conservation activities are implemented synchronously, on schedule, are suitable for reality, and bring practical value to the community

Hypothesis 4: The factor of community participation affects the policy of preserving ethnic minority culture. Community participation in the conservation of ethnic minority culture is understood as the extent to which people, artisans, religious dignitaries, and prestigious people in the ethnic minority community directly or indirectly participate in activities to preserve and promote the traditional cultural values of their ethnic group (Ha & Lien, 2024).

Hypothesis 5: The factors of conservation results and satisfaction have an impact on the policy of preserving ethnic minority culture. Conservation results and satisfaction are factors that reflect the level of success of the policy of preserving ethnic minority culture through the perception and assessment of people and the community (Yen, 2023). This factor measures the actual effectiveness of cultural conservation activities (preservation, promotion, and transmission) and the level of satisfaction and trust of the ethnic minority community in the conservation policies and activities implemented locally. The hypotheses proposed should be tested through model analysis, using data collected from ethnic minority areas, to determine causal relationships and impacts.

Research structure

Based on the overview of documents and theoretical framework, the study evaluates the policy of preserving ethnic minority cultural values, proposes a model with 5 independent factors including the suitability of objectives and policy content; Support resources; Policy implementation and management; Community participation; Conservation results and satisfaction that impact the policy of preserving ethnic minority cultural values in An Giang, Vietnam, shown in Figure 1.

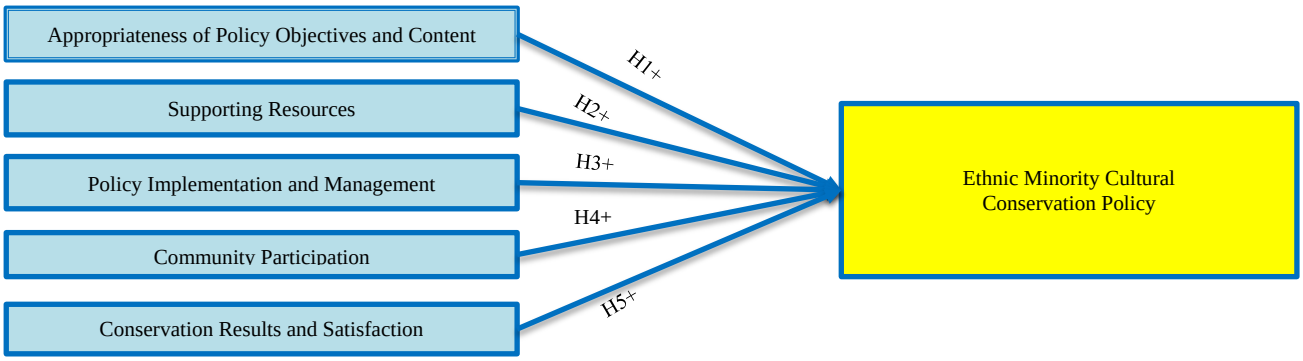

Figure 1. Structural model (Source: Author, 2025)

Factors and variables observed in the structural model of factors affecting the policy of preserving ethnic minority cultural values are shown in Table 1.

Table 1. Factors and observed variables in the structure (Source: The author synthesized from available studies, 2025)

Factors in the structural model	Encode	Observed variables within the factor
Appropriateness of policy objectives and content	APOC	(1) identify cultural values that need to be prioritized for preservation; (2) Respond appropriately to the aspirations of ethnic minority communities; (3) Cover both tangible and intangible culture; (4) Have an orientation to link cultural preservation with socio-economic development; (5) Pay attention to preserving ethnic languages and scripts; (6) Have a plan to support education and cultural transmission to the younger generation.
Supporting resources	SURE	(1) Support funds are limited and do not meet actual needs; (2) Service facilities are lacking and degraded; (3) Traditional equipment, tools, costumes, and musical instruments are lacking or old; (4) The staff doing cultural work at the grassroots level is small, they hold many jobs, and have not received in-depth training in ethnic minority culture; (5) Artisans and people knowledgeable about ethnic culture have not been supported, honored, and promoted; (6) Classes to teach traditional languages, writing, and crafts have not been organized regularly due to lack of funds and resources.
Policy implementation and management	PIAM	(1) Local authorities regularly organize activities to preserve ethnic minority culture; (2) Local cultural officers are enthusiastic, close, and support people in preserving culture; (3) Coordination between relevant agencies in preserving ethnic culture is well implemented; (4) Administrative processes and procedures related to supporting cultural preservation are public, transparent, and easy to access; (5) Local authorities regularly inspect and supervise the implementation of cultural preservation policies at the grassroots level; (6) People can easily access and receive support from the authorities when they need to participate in cultural preservation.
Community participation	COPA	(1) People are allowed to participate in giving opinions and suggestions when the government develops policies and plans for cultural preservation; (2) People regularly participate in activities to preserve and promote national culture; (3) Artisans and prestigious people are given opportunities to teach folk culture to the younger generation; (4) Communities have organizations, clubs, and self-managed groups on ethnic culture; (5) People are allowed to participate in monitoring and criticizing the implementation of cultural preservation policies in the locality; (6) People feel proud and responsible for preserving national culture.
Conservation results and satisfaction	CRAS	(1) Local ethnic cultural values are well preserved and restored; (2) Many traditional cultural values are of interest to the community and are regularly practiced in daily life; (3) Young generations in ethnic minority communities are taught, approached and participate in ethnic cultural activities; (4) People feel proud, attached and conscious of preserving ethnic cultural identity; (5) The policy of preserving ethnic culture helps strengthen solidarity and cohesion in ethnic minority communities; (6) Satisfied with the results of preserving and promoting local ethnic cultural values.
Ethnic minority cultural conservation policy	EMCC	(1) The policy on preserving the culture of ethnic minorities in the locality is built by the cultural characteristics of each ethnic group; (2) The policy on preserving is implemented consistently, continuously and with support from many levels and sectors; (3) The policy has created positive changes in preserving and promoting the cultural values of ethnic minorities in the locality; (4) The policy on preserving the culture of ethnic minorities in the locality is highly appreciated and it is expected that it will continue to be maintained and improved in the future.

METHODOLOGY

The methods used in the study to evaluate the policy of preserving ethnic minority cultural values include descriptive statistics of data, testing of scales using Cronbach's alpha coefficient, factor suitability analysis, and testing of research structure. The steps in the research method are shown in Figure 2.

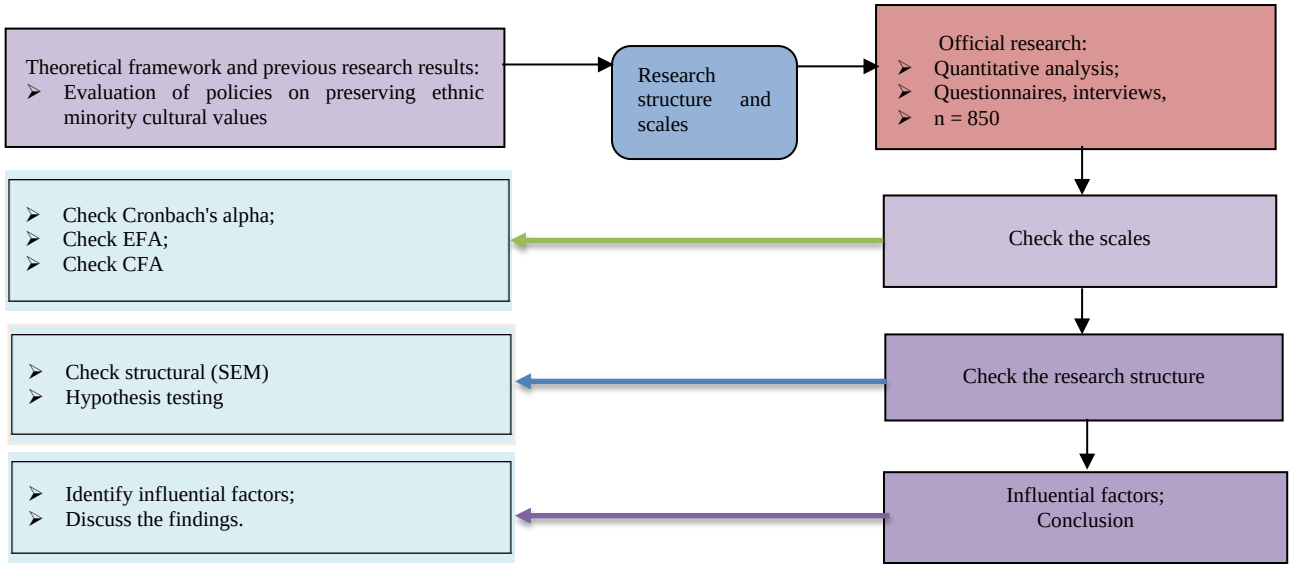

Figure 2. Flowchart of research methodology steps (Source: Author, 2025)

Research area

The study was conducted in An Giang province, Vietnam, where the Khmer and Cham ethnic minority communities are concentrated, as shown in Figure 3. To ensure representativeness, the study selected 5 survey areas in areas with a large ethnic minority population, including Tri Ton district and Tinh Bien town (the Bay Nui area, with a large Khmer population of more than 80,000 people), An Phu district and Tan Chau town (an area with many Cham villages living along the Hau River), Chau Phong, home to the famous Mubarak mosque, and Chau Phu district (with both Khmer and Cham communities intertwined) (General Statistics Office, 2019). In addition, a part of the sample was conducted in Chau Doc city, a religious center with the Ba Chua Xu Nui Sam temple, which has been recognized by UNESCO as a representative intangible cultural heritage of humanity, and several Cham communities, to record the opinions of provincial cultural officials. The selection of these areas aims to fully cover the Khmer ethnic region, the Cham ethnic region, and local cultural management levels. The survey subjects include ethnic minority people (including Khmer, Cham, and a small number of Chinese) living in An Giang, Vietnam, aged 18 and above, knowledgeable about the traditional culture of their community; and local cultural managers and officials (including officials of the District Department of Culture and Information, officials of the Ethnic Minority Committee, Religious Committee, Monument Management Board, heads of Khmer pagoda management boards, Cham churches, and officials in charge of cultural management). Collecting opinions from both groups helps to collect multi-dimensional assessments, from the perspective of policy beneficiaries (people) and policy implementers (officials).

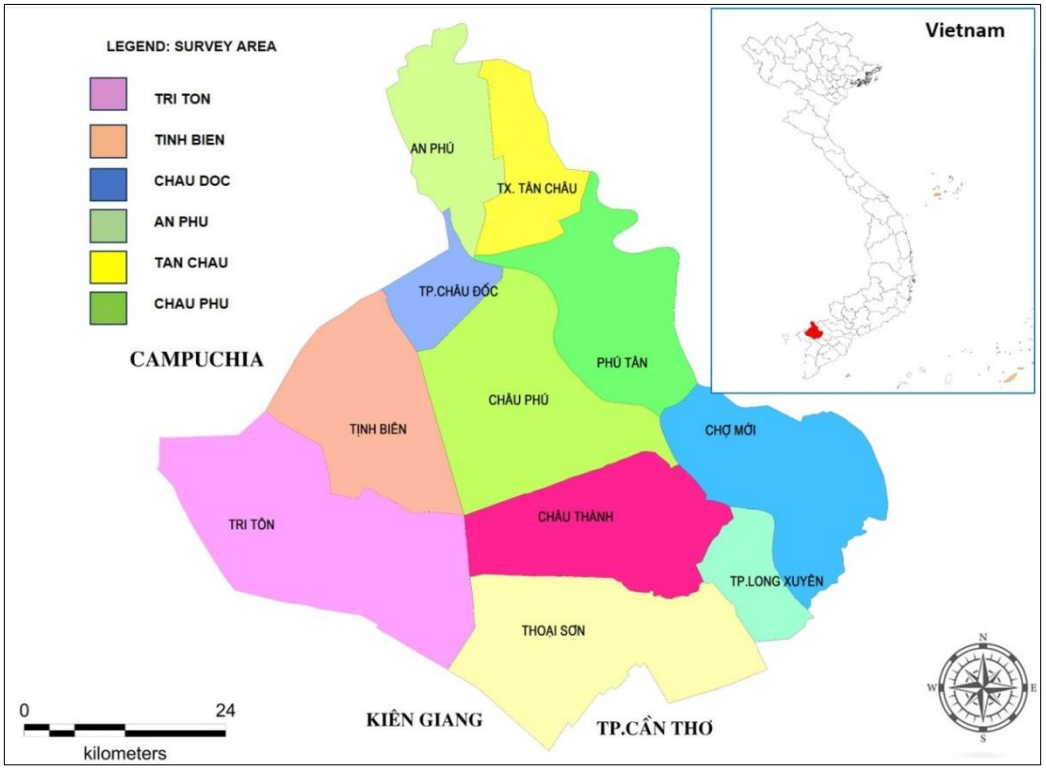

Figure 3. Research survey area in An Giang, Vietnam (Source: Author, 2025)

Survey sampling

The research sample was selected using a combination of stratified and purposive convenience sampling. First, the study stratified the target group (people and management staff), and within the group of people, it was stratified by ethnicity (Khmer, Cham, Chinese). Then, in each stratum, a convenient sampling method was used, ensuring that people were taken from many different locations. Specifically, in each commune/hamlet with a large number of ethnic minorities, with the support of the hamlet chief, the head of the pagoda or church management board, people were invited to participate in the survey, trying to ensure gender and age balance. For officials, cultural and ethnic officials working in the 5 surveyed districts/towns, and some provincial officials were selected. Although not a completely random sample, this method is appropriate because the research subjects are specific and need support to access.

Based on the theoretical framework and previous studies, a questionnaire was developed on the evaluation of the policy on the conservation of ethnic minority cultural values. The survey questionnaire has 47 Likert items, including 5 demographic scales and 34 scales for 6 factors (5 independent factors and 1 dependent factor). The survey data collection process took place from January to March 2025. A 5-point Likert scale (range from 1 to 5) was used to measure the respondents' perceptions (1: strongly disagree to 5: strongly agree). The respondents answered the questionnaire directly. The questionnaire was distributed to 750 people in An Giang province, Vietnam. A total of 715 valid responses were collected (95.3%), and 35 invalid responses were eliminated (4.7%), which is shown in Figure 4. The study was conducted. The responses from the survey were coded and analyzed using SPSS version 25 and AMOS version 24 software.

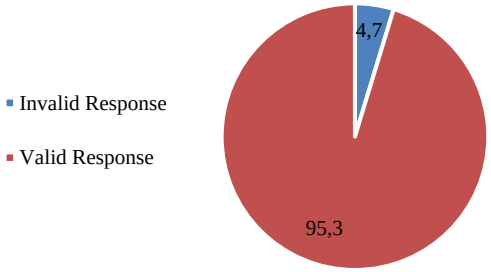

Figure 4. Response results by respondents (Source: Author)

Research data analysis

The collected data were coded and analyzed for the study of policy assessment of ethnic minority cultural value conservation policies. The statistical results describing the demographic characteristics of the survey area are shown in Table 2. Cronbach's Alpha is a test that reflects the close correlation between observed variables in the same factor.

Table 3 shows the results of the survey data analysis, showing that all 6 scales have high reliability. The Cronbach's Alpha coefficient of the scales is> (.8) and the Corrected Item-Total Correlation is> (.3) (Cronbach, 1951). It shows the suitability of the factors in the research structure. Exploratory Factor Analysis (EFA) of the structure showed Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .854 (.5 ≤ KMO ≤ 1), and Sig Bartlett's Test of Sphericity = .000 (<.5).

The test results show that Total Initial Eigenvalues = 1.366 (≥ 1). The Cumulative Extraction Sums of Squared Loadings = 77.616% (≥ 50%); (EFA) analysis shows that the structure of the model is appropriate. Therefore, all six factors in the structure are retained in the research model (Nunnally & Bernstein, 1994).

Table 2. Demographic characteristics of the survey sample (Source: Author analysis of survey data, 2025, n = 715)

Demographic characteristics and survey area	Number of survey respondents	Percentage
1. **Survey area (**An Giang Province)	715	100%
Tri Ton District	126	17.6
Tinh Bien District	141	19.7
An Phu District	101	14.1
Tan Chau Town	132	18.5
Chau Phu District	89	12.4
Chau Doc City	126	17.6
2. The gender	715	100%
Female	365	51.0
Male	350	49.0
3. Policy participants	715	100%
Civil servants	183	25.6
Citizens	532	74.4
4. Ethnic Minority	715	100%
Khmer	171	23.9
Cham	173	24.2
Chinese	148	20.7
Other	223	31.2
5. **Education**	715	100%
Master's degree or higher	42	5.9
College or Bachelor's degree	214	29.9
Professional degree holder	182	25.5
Other	277	38.7

Table 3. Test results of the scales of the structure (Source: SPSS data analysis by author, 2025, n = 715)

Factors	Encode	Number of observed variables	Cronbach's Alpha	Corrected Item-Total Correlation range	Mean
Appropriateness of policy objectives and content	APOC	6	.915	.657 - .864	2.952
Supporting resources	SURE	6	.888	.636 - .827	3.357
Policy implementation and management	PIAM	6	.965	.834 - .916	3.092
Community participation	COPA	6	.933	.684 - .897	3.998
Conservation results and satisfaction	CRAS	6	.960	.725 - .941	3.597
Ethnic minority cultural conservation policy	EMCC	4	.934	.798 - .900	3.760

Table 4 - the rotated component matrix shows 34 observed variables, which are classified into six factors. All observed variables have factor loadings > .5. Therefore, all six factors are retained in the research model (Baumgartner & Homburg, 1996). Confirmatory Factor Analysis (CFA) of the research model is shown in Table 5. The results of reliability and

convergence testing of the factors. The test result (CR) > (.8) shows that the reliability of the scale is guaranteed (Hair et al., 2010). Besides, (AVE) > (.5) and (MSV) < (AVE), the square root of AVE (SQRTAVE) > the Correlation coefficient between the structures. Therefore, reliability and convergence in the structure are guaranteed in all scales.

Table 4. Rotated component matrix (Source: Author' analysis of survey data, 2025, n = 715)

	Component					
	1	**2**	**3**	**4**	**5**	**6**
PIAM5	.929					
PIAM6	.927					
PIAM3	.904					
PIAM4	.899					
PIAM1	.896					
PIAM2	.866					
CRAS4		.966				
CRAS3		.962				
CRAS5		.957				
CRAS6		.940				
CRAS2		.830				
CRAS1		.748				
COPA5			.938			
COPA6			.935			
COPA1			.869			
COPA4			.852			
COPA2			.764			
COPA3			.739			
APOC5				.884		
APOC6				.866		
APOC3				.813		
APOC4				.804		
APOC1				.739		
APOC2				.723		
SURE6					.897	
SURE5					.842	
SURE4					.817	
SURE3					.733	
SURE2					.715	
SURE1					.699	
EMCC2						.832
EMCC4						.805
EMCC1						.773
EMCC3						.689

Table 5. The results of reliability and convergence testing of the factors (Source: Survey data analyzed by the author, 2025, n = 715)

Factor construct	CR	AVE	MSV	MaxR(H)	PIAM	CRAS	COPA	APOC	SURE	EMCC
PIAM	.945	.743	.096	.998	**0.862**					
CRAS	.953	.777	.042	.997	-0.129***	**0.882**				
COPA	.923	.672	.085	.998	0.126***	0.084*	**0.820**			
APOC	.915	.646	.273	.946	0.276***	-0.076†	0.118**	**0.803**		
SURE	.888	.576	.146	.933	0.074†	-0.049	0.122**	0.266***	**0.759**	
EMCC	.936	.785	.273	.945	0.310***	0.205***	0.291***	0.523***	0.382***	**0.886**

RESULTS AND DISCUSSION OF THE FINDINGS

The AMOS test results on the structure of the assessment of the policy of preserving ethnic cultural values are shown in Figure 3. The results show that Chi-square/df = (3.724); GFI = (.873); CFI = (.959); RMSEA = (0.062); PCLOSE = (0.000). The analysis results show that the structural model is appropriate (Doll et al., 1994).

Table 6. Results of testing the relationship between concepts in the research structure
(Source: Analysis of survey data by the author, 2025, n = 715)

The relationship direct effects	Estimates	P-value (Sig)	Standardized estimates
EMCC <---- APOC	.382	.000	.387
EMCC <---- SURE	.306	.000	.260
EMCC <---- PIAM	.271	.000	.192
EMCC <---- COPA	.181	.000	.162
EMCC <---- CRAS	.229	.000	.254

The results of the linear regression test of the model of the assessment of the policy of preserving ethnic cultural values are shown in Table 6. The analysis data shows that the P-value (Sig) of the APOC scale = .000 (<.05), SURE = .000 (<.05), PIAM = .000 (<.05), COPA = .000 (<.05), CRAS = .179 (>.05). Thus, six factors have proven to have an impact

relationship between the independent variables and the dependent variable (Hu & Bentler, 1999). Table 6. Results of testing the relationship between concepts in the research structure, and Figure 5. Results of the structural test of the assessment of the policy of preserving ethnic cultural values. It shows that there are five factors affecting the policy of maintaining ethnic cultural values by level, including APOC = (.387), SURE = (.260), PIAM = (.192), COPA = (.162), and CRAS = (.254). And the level of factors affecting the policy of preserving ethnic cultural values can be shown in Figure 6.

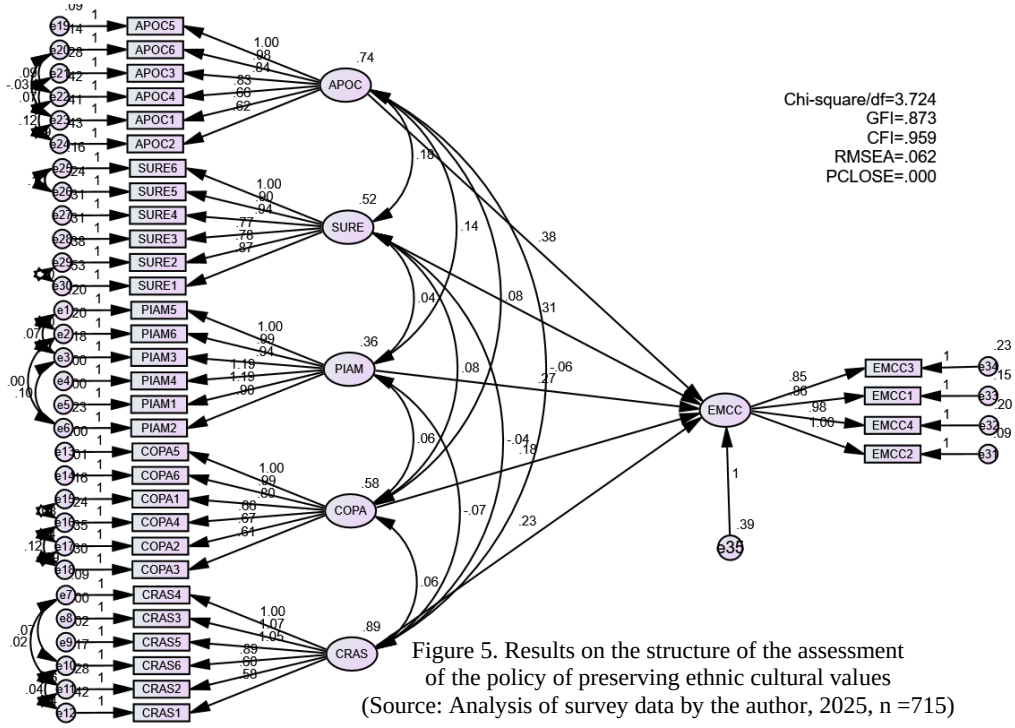

Figure 5. Results on the structure of the assessment of the policy of preserving ethnic cultural values
(Source: Analysis of survey data by the author, 2025, n =715)

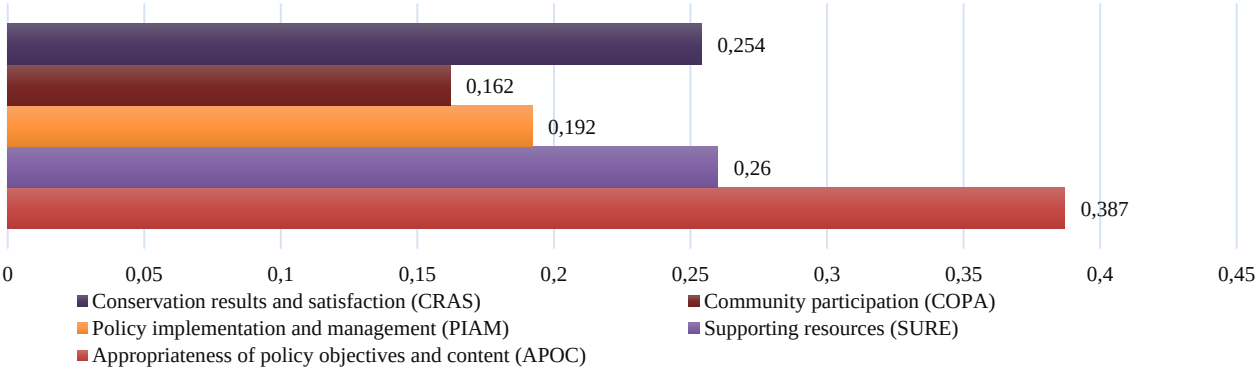

Figure 6. Level of factors affecting the policy of preserving ethnic cultural values (Source: Analysis of survey data by the author, 2025, n = 715)

The study's findings show that five factors affect the policy of preserving ethnic cultural values, including the appropriateness of policy objectives and content, support resources, policy implementation and management, community participation, and Conservation results and satisfaction level.

Assessment of the policy of preserving ethnic cultural values by gender groups. The study performed the Independent-Samples Test to assess the difference between the two groups of men and women. Assessment of the policy of preserving cultural values has Sig test = .356 (>.05); there is no difference in variance between the two groups of men and women. The study will use the test results of Equal variances assumed Sig test = .198 (>.05). Thus, the assessment of the policy of preserving cultural values between male and female groups, the average value is almost the same. It shows in Table 7.

Table 7. Analysis of the difference in assessment of the policy of preserving cultural values between male and female groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Assessment of the policy of preserving cultural values	Equal variances assumed	.852	**.356**	1.289	713	**.198**	**.07792**	.06044	-.04074	.19657
	Equal variances not assumed			1.289	711.778	.198	**.07792**	.06044	-.04074	.19657

Evaluation of the policy of preserving ethnic minority cultural values by Policy Participants. The study conducted an Independent Samples Test to evaluate the difference in the evaluation of the policy of preserving ethnic minority cultural values between the two groups of Civil Servants and People. The evaluation of the policy of preserving ethnic minority cultural values had a Sig = .553 (>.05); there was no difference in variance between the two groups of Civil Servants and People. The study used the results of the equal variance test with the assumption of Sig = .372 (>.05). Thus, the evaluation of the policy of preserving cultural values between the two groups of Civil Servants and People; there was no difference in the mean value between the two groups. Evaluation of policies for preserving ethnic cultural values by the Ethnic Minority group. One-way ANOVA test to evaluate the differences in policies for preserving ethnic cultural values by the Ethnic Minority group. Table 8. Test of Homogeneity of Variances by Ethnic Minority shows that based on the Mean, it has a Sig Levene Statistic of 0.103 (>0.05), which means that there is no difference in variance between the Ethnic Minority group.

The study used the results of Table 9. ANOVA by Ethnic Minority, the sig test was 0.251 (> 0.05); it showed that there was no difference in the mean value of the assessment of the policy of preserving the cultural values of ethnic minorities between the Ethnic Minority group. Evaluation of policies on preserving ethnic minority cultural values by the Education group. One-way ANOVA test to evaluate the difference in evaluation of policies on preserving ethnic minority cultural values by education level. Test of Homogeneity of Variances by Ethnic Minority shows that based on the Mean, it has a Sig Levene Statistic of 0.181 (>0.05); it shows that there is no difference in variance between education level groups. The study uses ANOVA results by Education group, the Sig test is 0.430 (>0.05); it shows that there is no difference in mean value in the evaluation of policies on preserving ethnic minority cultural values by education level groups. Evaluation of policies on preserving ethnic minority cultural values by the Survey Area. Table 10. Test of Homogeneity of Variances by Survey Area shows that based on the Mean, has Sig Levene Statistic of 0.000 (<0.05), indicating that there is a difference in variance between the Survey Area groups. The study used the results of Table 11. ANOVA by the Survey Area, the sig test was 0.000 (<0.05); it shows that there is a difference in the mean value in the assessment of the policy of preserving the cultural values of ethnic minorities between the Survey Area. In addition, Figure 7. The average value of the assessment of the policy of preserving the cultural values of ethnic minorities in the districts, including Tri Ton, is 3.6766, Tinh Bien is 3.7642, Tan Chau is 3.9356, An Phu is 3.6023, Chau Doc is 3.5955, and Chau Phu is 3.9821. The research results show that people in the districts have different average assessments of the policy of preserving the cultural values of ethnic minorities.

Table 8. Test of Homogeneity of Variances by Ethnic Minority

		Levene Statistic	df1	df2	Sig.
The policy of preserving cultural values	Based on Mean	2.067	3	711	**.103**
	Based on Median	1.881	3	711	.131
	Based on Median and with adjusted df	1.881	3	696.063	.131
	Based on trimmed mean	1.815	3	711	.143

Table 9. ANOVA by Ethnic Minority

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.681	3	.894	1.370	**.251**
Within Groups	463.741	711	.652		
Total	466.421	714			

Table 10. Test of Homogeneity of Variances by Survey Area Group

		Levene Statistic	df1	df2	Sig.
The policy of preserving cultural values	Based on Mean	5.251	5	709	**.000**
	Based on Median	4.259	5	709	.001
	Based on Median and with adjusted df	4.259	5	695.252	.001
	Based on trimmed mean	5.305	5	709	.000

Table 11. ANOVA by the Survey Area

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15.905	5	3.181	5.006	**.000**
Within Groups	450.517	709	.635		
Total	466.421	714			

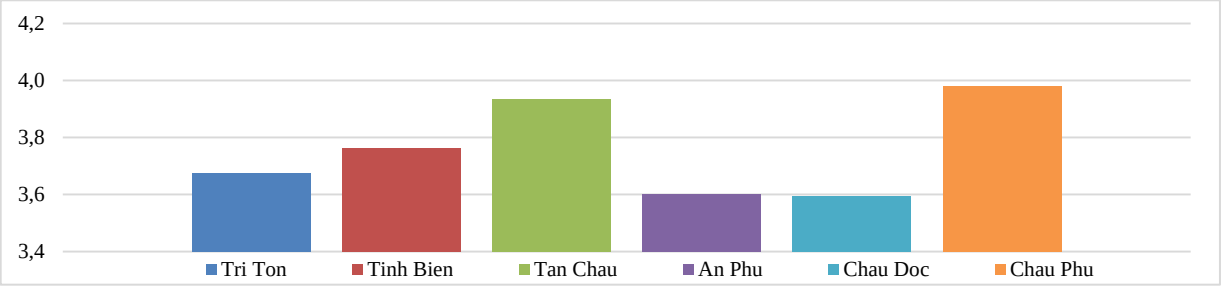

Figure 7. Average value of the assessment of the policy of preserving the cultural values of ethnic minorities in the survey areas

The factor of relevance of policy objectives and content has an impact on the policy of preserving ethnic minority culture is 0.387. The factor of relevance of policy objectives and content shows a strong impact on the effectiveness of implementing policies to preserve ethnic minority culture. This shows that when policies have clear objectives, realistic content, and meet the cultural preservation needs of ethnic minority communities, they will contribute to promoting people's participation, improving feasibility and effectiveness in the implementation process.

From this result, local authorities should carry out governance work, including organizing assessments of actual needs from ethnic minority communities before formulating policies; Integrating specific cultural values of each ethnic group into specific policy objectives (Yan, 2023); Building a two-way feedback mechanism, ensuring that policy content is regularly reviewed and updated according to practice. At the same time, enhance the role of local authorities, village elders, and prestigious people in social consultation and criticism, thereby ensuring that policies are both legal and community-based, suitable for diverse cultural contexts (Nguyen & Tran, 2023). The factor of supporting resources affecting the policy of preserving ethnic minority culture is 0.260. The factor of supporting resources shows that it greatly affects the effectiveness of the policy of preserving ethnic minority culture. This reflects that although the policy has the right goals and appropriate content, if there is a shortage of resources, including finance, professional human resources, facilities, and technology, the implementation will still encounter many difficulties, even failing to achieve the desired results. In practice, many localities in ethnic minority areas still face a lack of stable budgets, non-professional cultural staff, and poor facilities for preservation. This leads to the fact that activities such as restoring festivals, teaching ethnic languages, and preserving traditional craft villages are difficult to maintain regularly and long-term (Purnomo et al., 2020).

To enhance the effectiveness of resource management, the state should have a solution to allocate a separate budget for preserving ethnic minority culture at the provincial and district levels; Strengthen training of grassroots cultural staff, prioritizing the selection of qualified ethnic minority people; Promote public-private cooperation and connect with social organizations to mobilize more social resources; Apply digital technology in archiving and spreading ethnic minority cultural values, reducing dependence on traditional resources (Dnistrianska et al., 2022).

The factor of policy implementation and management affecting the effectiveness of the policy on preserving ethnic minority culture is 0.192. The factor of policy implementation and management affects the effectiveness of the policy on preserving ethnic minority culture. Although this is a key step in the policy implementation chain, this result reflects the reality that the implementation has not promoted the role of coordination, supervision, and adjustment suitable to the cultural characteristics of ethnic minority areas (Brass, 2023). The reason may come from the management apparatus lacking in-depth expertise in ethnic minority culture, and the lack of a close coordination mechanism between levels, sectors, and localities. The lack of periodic assessment tools and the lack of community participation in the process of monitoring and criticizing policies have led to low implementation efficiency (Nguyen & Nguyen, 2019).

To improve the quality of policy implementation and management, the state should build a close inter-sectoral coordination mechanism, especially between the culture - education - ethnic sectors; Strengthening policy management capacity for local officials through in-depth training on ethnic minority cultural management; Establishing a periodic monitoring and evaluation system associated with specific indicators; Encouraging the participation of ethnic minority communities in monitoring, reflecting and contributing opinions to adjust policies by reality (Pourfaraj et al., 2020).

The factor of community participation has an impact on the policy of preserving ethnic minority culture, with a value of 0.162. The factor of community participation has an impact on the effectiveness of the policy of preserving ethnic minority culture. This result reflects a noteworthy reality, although the community is the cultural subject, the person who preserves and practices traditional values, it has not been given a central role in the process of building, implementing, and monitoring policies. The reason may stem from the lack of a mechanism to mobilize and listen to community opinions, especially at the grassroots level. Some localities consider people as beneficiaries rather than active partners (Kodir, 2018). In addition, language barriers, policy awareness, and educational level also limit the ability of ethnic minority people to contribute to the process of cultural governance. To enhance governance effectiveness, local authorities should establish a regular consultation mechanism with the participation of village elders, artisans, and prestigious people in the community; Integrate grassroots democracy methods into the process of policy making and adjustment; Organize training and policy communication in ethnic languages, raise awareness and critical capacity of the community; Ensure ethnic minority communities have the right to co-create and supervise cultural preservation activities (Nguyen & Khuat, 2024).

The factors, Conservation results, and satisfaction have an impact on the policy of preserving ethnic minority culture at 0.254. The factor Conservation results and people's satisfaction have a high impact on the policy of preserving ethnic minority culture. The results show that although the policy may have been issued and implemented, the results achieved are not convincing and have not created consensus and satisfaction in the ethnic minority community, which is the direct beneficiary. The reason may be that the conservation results are not sustainable or are only formal, such as organizing festivals according to the movement, restoring heritage without depth; Lack of periodic assessment of the level of community satisfaction, leading to a gap between policy goals and actual expectations (Gloria & Castellanos, 2023); People have not felt the practical benefits from cultural conservation, such as being associated with livelihoods, community tourism or traditional education. To improve, local authorities should develop a set of criteria to measure conservation results, including both tangible and intangible factors, associated with community participation in assessment; Organize periodic satisfaction surveys, thereby adjusting conservation activities to better suit people's aspirations and needs (Truong et al., 2023); Combine cultural conservation with livelihood development such as traditional craft villages and community tourism, to increase sustainability and real benefits; Strengthen propaganda and education on traditional culture in schools and communities, helping to enhance people's pride and attachment to culture (Trang, 2022).

CONCLUSION

The study conducted a systematic and empirical assessment of the policy of preserving the cultural values of ethnic minorities in An Giang province, through a survey of 715 subjects, factor analysis, and theoretical model testing. The results showed that the policy of An Giang province, Vietnam, in recent years has achieved success in determining the right direction, maintaining festivals, traditional occupations, and enhancing awareness of preserving identity in the Khmer, Cham, and Chinese ethnic communities. Five factors affecting the policy of preserving cultural values of ethnic minorities were confirmed, including: (1) the suitability of policy content; (2) Support resources; (3) Implementation and management; (4) Community participation; and (5) Conservation results and satisfaction.

However, the study pointed out some shortcomings that need to be overcome, such as limited investment resources for ethnic culture; The grassroots cadres have not been trained in depth; the community's participation is not proactive; some traditional cultural values are at risk of being lost. Therefore, localities should promote inter-sectoral coordination mechanisms, enhance the role of the community, prioritize investment in ethnic cultural education for the younger generation, and at the same time, integrate cultural preservation policies with sustainable economic development. The results and recommendations from this study can serve as a reference for localities with similar conditions, contributing to the improvement of ethnic minority cultural policies in the current context of integration.

Author Contributions: Conceptualization, H.N.C.; methodology, H.N.C.; software, H.N.C.; validation, H.N.C.; formal analysis, H.N.C.; investigation, H.N.C.; data curation, H.N.C.; writing - original draft preparation, H.N.C.; writing - review and editing, H.N.C.; visualization, H.N.C.; supervision, H.N.C.; project administration, H.N.C.. Author have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The author thanks the survey subjects and local authorities for supporting the data collection.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 21.04.2025 Revised: 10.07.2025 Accepted: 06.08.2025 Available online: 01.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1751-1757
DOI 10.30892/gtg.61333-1543

METAPHORIZATION IN TOURISM DISCOURSE: FROM THE LANGUAGE OF GUIDEBOOKS TO CONCEPTUAL MODELS IN THE GLOBAL DEVELOPMENT OF THE TOURISM INDUSTRY

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Citation: Buzrukova, M. (2025). Metaphorization in tourism discourse: From the language of guidebooks to conceptual models in the global development of the tourism industry. *Geojournal of Tourism and Geosites*, 61(3), 1751–1757. https://doi.org/10.30892/gtg.61333-1543

Abstract: This article investigates the pivotal role of metaphor as a cognitive and linguistic mechanism in shaping the specialized vocabulary of the tourism industry. Drawing on the conceptual metaphor theory developed by George Lakoff and Mark Johnson, as well as the cognitive-linguistic perspectives of A.D. Arutyunova, the study underscores that metaphor is not merely a rhetorical or stylistic device but a fundamental tool for conceptualizing, interpreting, and communicating human experiences. Metaphors serve as mental models that bridge abstract and concrete domains, allowing tourism professionals and consumers alike to comprehend complex or novel phenomena through familiar conceptual structures.The research is based on an in-depth analysis of English-language tourism discourse, focusing on metaphorical terms that have emerged within this rapidly developing field. These metaphors are not incidental; rather, they play a systematic and constructive role in naming, classifying, and promoting tourism experiences, services, and destinations. The study adopts a cognitive and anthropological approach to the analysis of metaphorical transfers, emphasizing their heuristic, explanatory, mnemonic, and communicative functions. Drawing on the classification framework proposed by Lakoff and Johnson, the article distinguishes between structural, orientational, ontological, synesthetic, simple, and extended metaphors. Each category is exemplified with authentic terminology and usage extracted from tourism industry texts, websites, guidebooks, and marketing materials. Particular attention is paid to structural and ontological metaphors, which are most frequently employed in tourism terminology. Structural metaphors map knowledge from concrete domains like “home” or “journey” onto more abstract tourism concepts, while ontological metaphors help conceptualize experiences and places as entities or living beings. By exploring the metaphorical richness of tourism discourse, the article demonstrates how metaphor facilitates conceptual innovation, enhances the aesthetic and emotional resonance of communication, and strengthens intercultural understanding. Metaphor is shown to function not only as a linguistic resource but also as a reflection of the dynamic, imaginative, and associative nature of human cognition. Ultimately, the metaphorization of tourism vocabulary contributes to the formation of a vivid, expressive, and globally resonant terminological system, promoting both linguistic creativity and cognitive accessibility within the field.

Keywords: nominative function, heuristic, mnemonic, live metaphor, dead metaphor, animalistic metaphor, anthropomorphic

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INTRODUCTION

Metaphor is considered an essential source for reflecting the diversity of reality in human consciousness and helps expand the terminological richness of the tourism industry's vocabulary through linguistic perception of surrounding objects and phenomena. Arutyunova (1990) views metaphor not only as a stylistic device but also as a fundamental element in the process of conceptual thinking and perceiving the world. According to her, metaphor plays a central role in forming and transmitting knowledge as it allows for the transfer of meanings from one domain to another, enriching the understanding of various phenomena. The scholar emphasizes that metaphorical thinking is fundamental to human cognitive activity as metaphors help us demonstrate our experiences, express and interpret emotions and abstract ideas. She argues that metaphors not only reflect our perception of the world but also actively shape it, influencing our way of thinking, communicating, and acting (Arutyunova, 1990). Lakoff (1993), an American linguist and one of the founders of the theory of conceptual metaphor in cognitive linguistics, considers metaphor not just a rhetorical device or speech ornament but a primary mechanism of our thinking and understanding of the world. Lakoff asserts that metaphors are deeply rooted in everyday communication and play a central role in how humans perceive and conceptualize experiences.

According to Lakoff (1993), metaphors do not only aid in communicating abstract ideas but actively shape the understanding of reality. He refers to this process as "conceptual metaphor," where one conceptual domain (source) is used to understand or describe another conceptual domain (target). For example, when we talk about time in terms of money ("spending time", "investing time"), we use the TIME IS MONEY metaphor, which helps us express our concept of time through the concept of money, a more familiar notion. Lakoff (1993) emphasizes that metaphorical thinking is not something artificial or external; it is an integral part of our cognitive apparatus, influencing our perception, thoughts,

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and actions at the most fundamental level. He and his colleagues, including Mark Johnson, have studied many types of everyday metaphors, showing how they shape our understanding of concepts such as time, love, politics, and war.

In his works, including "Metaphors We Live By" (Lakoff & Johnson, 2004), Lakoff (1993) notes that metaphorical thinking is not just an aspect of language but a fundamental aspect of human thought, rooted in the structure of our minds. This perspective opens up new approaches to studying language, thinking, and human culture in general (Lakoff, 1993).

Context and the Study Area

In this part of our work, we attempted to analyze English tourism discourse terms created based on metaphorical transfer. Anthropological and cognitive approaches help interpret metaphorical terms when examining metaphorical transfers. According to Alekseeva (1998), linguistic metaphorization is a key process in forming and developing terminology across various fields of knowledge. Alekseeva (1998) emphasizes that metaphor plays a crucial role in creating new terms, not merely serving as a stylistic element, enabling scientific and professional communities to effectively express complex ideas in a concise and understandable form. Her work focuses on how metaphorical transfers help transform abstract and complex concepts into clear and understandable terms. This is because metaphor allows for the use of already known and understandable objects to describe new phenomena or concepts, facilitating the process of accepting and assimilating new information (Alekseeva, 1998).

Indeed, the introduction of a term into language is determined by associative connections or similarities in shape, function, or emotion. Existing lexical units are used to linguistically express these signs, resulting in the semantic expansion of this unit at that moment. In scientific discourse, the following functions of metaphor are distinguished:

- Nominative (naming a phenomenon).
- Informative (providing information about a phenomenon).
- Text-forming.
- Heuristic, i.e., facilitating the acquisition of new knowledge.
- Explanatory.
- Mnemonic.

Clearly, the primary role of metaphor in scientific discourse, besides directly naming a phenomenon or object, is manifested in its heuristic function. This is related to the necessity of accurately expressing the internal form of the given lexeme, thereby finding a vivid external form that, while preserving the essence of the information, not only helps explain the phenomenon being named but also aids in better retention, serving an additional mnemonic function.

The text-forming function of a metaphorical term is evident when an obscure metaphor requires reference to the text for proper understanding. Here, the text-forming function is closely related to the explanatory function.

“Metaphor first manifests as a cognitive phenomenon that influences human thinking,” says Baranov (2004). This underscores that metaphor is not merely a linguistic tool or speech ornament but is deeply connected to our way of understanding and interpreting the world. It activates our knowledge and experience, allowing us to see connections and relationships between seemingly unrelated concepts and objects.

The impact of metaphor on cognitive processes makes it a powerful tool in education, art, science, and even everyday communication. Metaphors help explain complex ideas in simple and understandable language, making them more accessible to a wider audience. They support creative thinking, encouraging us to view familiar things from a new perspective and seek unconventional solutions (Baranov, 2014).

It is hard to overstate the importance of metaphorical transfers that reflect emerging phenomena in the formation of new lexical units. The tourism industry, by its nature, is a field of dynamically developing processes and phenomena. Therefore, in this area of human activity, metaphor serves as an effective source for expanding the terminological thesaurus and the vocabulary of the tourism industry. In classifying and categorizing the metaphors identified during the analysis of practical material, we used the mechanism described by Lakoff & Johnson (2004), which distinguishes between the source domain (the domain from which the metaphor is drawn) and the target domain (the domain to which the meaning is transferred).

In their work "Metaphors We Live By", the authors consider metaphors as mental processes that help structure cognitive experience and distinguish between the “source domain (i.e., the domain from which the conceptualization is sourced) and the target domain (i.e., the domain to which the meaning is transferred)” (Lakoff & Johnson, 2004).

METHODOLOGY

Before describing the activation of conceptual metaphors ("living metaphors") in the field of tourism discourse terminology, let's first discuss the characteristics of ordinary metaphors.

In the terminology of the tourism industry, as in other types of communication, there are many "faded" or "dead" metaphors that were initially very vivid but lost their imagery due to frequent use and were replaced by new, more vivid expressions. Gak (1998) referred to language as a "graveyard of dead metaphors," noting that many of the stable expressions and constructs we use in everyday speech today were originally metaphors. Over time, these metaphors have become so embedded in the language that their original figurative meaning has been lost or is unclear to modern language users. Thus, metaphors that were once lively and creative expressions have become ordinary linguistic units, losing their initial expressive power and becoming part of the standard lexicon (Gak, 1998).

Conceptualization encompasses the objects and phenomena of objective reality, which proceeds in accordance with the nature and mode of reflection of the metaphorization process (Efremov, 2013). This process shows how existing metaphors in the language help shape our worldview and aid in understanding reality.

The division into source domain and target domain helps in analyzing the content of the metaphorical sign, revealing its multilayered meaning - considering both the primary and auxiliary subjects simultaneously and determining by which attribute the comparison occurs. At the same time, the following classes of metaphors can be distinguished:

Animalistic metaphor - based on comparison with animals.

Anthropomorphic metaphor - based on comparing humans with objects, plants, or animals, including human emotions, intellect, creative and personal qualities, and human and animal physiology.

Physical world phenomena: including the physical properties of phenomena in the physical world. Social relations, culture, ideology, etc. Based on the terminological system of a particular field: legal, medical, sports, technical, musical, biological, automotive, and others. Lakoff & Johnson (2004) propose studying conceptual metaphors in three types: structural, ontological, and orientational. The main characteristic of structural metaphors is the conceptualization of abstract entities through known elements in experience.

Directional metaphors conceptualize abstract ideas through spatial relationships, such as up and down, inside and outside, near and far. These metaphors help us understand abstract concepts by relating them to our physical and spatial experiences. For example, when talking about concepts like happiness, time, and moral relationships, we often use directional metaphors, depicting them through spatial concepts such as "being on top of the world", "moving forward", "being close to one another", or "crossing a boundary". This undoubtedly makes understanding complex ideas easier.

Ontological metaphors allow us to perceive abstract phenomena as concrete entities with specific characteristics or as physical objects by separating the person from abstract events. Thus, we can describe abstract concepts as "things" with shape, location, or capable of interacting with other objects in physical or conceptual space. For instance, we might describe time as a "river," emotions as "things" that can be "held" or "released," or ideas as a "light illuminating our path."

Synesthetic metaphors, which hold a special place in the system, are based on linking different sensory-tactile experiences with new experiences. Levchina (2003) considers synesthetic metaphor as a tool expressing unique connections between different sensory experiences. These metaphors are created by transferring experiences from one sensory domain to another, such as associating colors with sounds or sounds with tastes. Levchina (2003) analyzes the use of synesthetic metaphor in poetry, literature, and art, emphasizing its significant role in enriching our speech and creative expression. These metaphors expand the possibilities of expressing a complex and multifaceted sensory experience, helping to create new and unexpected sensations through the art of words (Levchina, 2003).

By distinguishing two structurally different types described by Arnold (2002), one can gain a deeper understanding of the mechanisms of forming and perceiving metaphors in language. A simple metaphor has a single image, creating a direct comparison and allowing the language user to quickly grasp the essence of the association. This type of metaphor is often used to simplify and clarify abstract concepts by presenting them through concrete images.

In addition, an extended metaphor, which forms a secondary associative plan, has a more complex structure. This type of metaphor involves multiple levels of association and imagery, allowing for broader comprehension and interpretation. Extended metaphors add deep and multi-layered meaning to the text, stimulating the active thinking and imagination of the reader or listener. They help create a more powerful emotional impact and support complex ideas and themes (Arnold, 2002). It should be noted that categorizing metaphorically-formed terms into a specific type of metaphor is often subjective, as many metaphorical terms can be multi-layered and may simultaneously belong to several types of metaphors described in modern linguistics.

RESULTS AND DISCUSSION

Now, let's examine the metaphors used in tourism discourse terminology.

1. Structural Metaphors in Tourism Industry Terminology

Block: A number of rooms, seats, or spaces booked in advance, usually by wholesalers, tour operators, or incoming operators, with the intention of selling them as components of tour packages.

Source Domain: "Home and Household". Association Vector: metonymic transfer. Since a room is considered a primary place of rest for a person, its booking is associated with the overall booking of a hotel or inn. Target Domain: hotel service organization.

Complimentary room: A hotel room provided without charge. Complimentary rooms are usually occupied by the tour group manager or driver.

Source Domain: "Home and Household". Association Vector: metonymic transfer. It is a token of gratitude from the hotel for the clients brought in. Target Domain: hotel service organization.

Example: A hotel might offer a complimentary room to a guest who experienced a significant issue during their last stay, such as a room not being ready on time or a malfunctioning air conditioning unit. The complimentary room would typically be of equal or greater value than the one originally booked and would include all the amenities and services that a paying guest would receive. This gesture helps maintain customer satisfaction and loyalty (Ilies et al. 2023).

Continental plan: A hotel rate that includes an overnight stay with a continental breakfast.

Source Domain: "Home and Household". Association Vector: daily routine, where the guest leaves in the morning (light breakfast after an overnight stay) and spends most of the day outside the hotel. Target Domain: typology of hotel services.

Full house: Indicates that all hotel rooms are booked.

Source Domain: "Home and Household". Association Vector: metonymic transfer, comparing the hotel to a home and the lack of available space within it. Target Domain: typology of hotel services.

Example: The annual jazz festival enjoyed a full house on its opening night, with fans from all over the country filling the venue to enjoy performances by renowned artists (Ilies et al. 2023).

Dine-around-plan: A plan allowing tourists to dine at various restaurants during their trip using vouchers and coupons.

Example: We are planning a vacation to Bermuda in September or October and am wondering if anyone has used the "dine around" option that they offer at the Reefs or Cambridge (Bakir, 2012).

The excerpt illustrates the terminological definition where tourists are provided with the opportunity to dine at various restaurants using special coupons during their stay.

2. Directional Metaphors

Here are examples of metaphorical terms related to location or movement through time and space in the field of tourism:

Frontier destinations: Refers to places at the edge or boundary of the explored or known world, offering a sense of adventure and discovery within the scope of familiar things.

Example: Antarctica, which, despite its harsh conditions, attracts adventurers looking to experience its immense ice landscapes, unique wildlife, and the sheer remoteness that comes with being one of the least visited places on Earth. This frontier destination appeals to travellers seeking adventure, solitude, and a deep connection with nature and traditional cultures (Caciora et al., 2024).

Gateway city: A city that serves as an entry point to a country or region, providing travellers with their first impressions and the opportunity to embark on further explorations. This metaphor is based on functional similarity.

Orientation tour: A tour designed to introduce a new city or area, helping travellers develop a sense of direction and become familiar with the main attractions.

Example: At the start of a week-long guided vacation package in Paris, the tour operator might include an orientation tour of the city on the first day. This tour would typically be conducted on a bus or walking tour format, taking guests past iconic sights like the Eiffel Tower, the Louvre Museum, Notre Dame Cathedral, and along the Seine River. The guide would provide an overview of Paris's history, pointers on navigating the city's public transportation system, tips for dining out, and advice on local customs (Wendt et al., 2021).

Panoramic view: Describes a wide, unobstructed view of an area, usually from a high vantage point, offering a comprehensive orientation of the landscape.

Trailhead: The starting point of a trail or route, indicating the beginning of a journey for hiking or exploration. This metaphor is based on functional similarity.

Example: One of the most famous trailheads in the United States is the start of the Mist Trail in Yosemite National Park. This trailhead serves as the gateway to some of the park's most iconic sights, including Vernal Fall and Nevada Fall. The journey begins at the trailhead located near the Happy Isles Nature Center, offering hikers the chance to immerse themselves in the stunning natural beauty of Yosemite. The path leads through lush meadows, alongside rushing streams, and up steep granite steps, culminating in breathtaking views of waterfalls that mist the air, hence the trail's name. The Mist Trail Trailhead is not just a starting point but an invitation to explore the wonders of one of America's most beloved national parks (Lyon, 1999).

Cross-country: Refers to traveling across rural or local areas, navigating through various landscapes and routes. The metaphor is based on the inner form of the verb "cross" – to traverse, breaking continuity. The metaphorical meaning is created through the combination of lexical units.

Cultural compass: As a metaphorical term, it offers guidance through the cultural landscape of a destination, helping tourists become familiar with local customs, traditions, and landmarks.

Landmark navigation: Using important or easily recognizable landmarks to navigate through a city or area.

Pathfinder tours: Tours that lead tourists through unknown or lesser-known areas, metaphorically serving as a guide or orientation in unfamiliar territory.

Eco-directional tourism: A branch of tourism oriented towards sustainability and environmental conservation, guiding tourists to make environmentally responsible travel choices.

Example: Costa Rica is renowned for its dedication to conservation and ecotourism, and the Monteverde Cloud Forest Reserve is a prime example of this commitment. Situated in the heart of the country, this reserve is home to thousands of plant species, hundreds of animal species, and an extensive network of trails that allow visitors to explore its unique ecosystem without causing harm. The reserve's efforts in conservation, research, and community involvement make it a model for eco-directional tourism. Visitors can participate in guided nature walks led by local experts, bird-watching tours focusing on the reserve's diverse avian population, and sustainable coffee plantation tours. These activities not only provide a direct connection to nature but also support the local economy and conservation efforts. Monteverde Cloud Forest Reserve exemplifies how tourism can be both a journey of discovery and a means to protect natural environments for future generations (Lyon, 1999).

Culinary map: A conceptual or actual map highlighting notable food and drink spots in a region, guiding tourists to gastronomic experiences. This metaphor is based on functional similarity.

3. Ontological Metaphors

Ontological metaphors used in the field of tourism terminology provide abstract concepts with more concrete, "living" characteristics, allowing for a deeper understanding and appreciation of the essence of the tourist experience:

Heart of the city: The city is depicted as a living being, with its heart symbolizing the central, most lively, and vibrant part.

Face of the city: The city is considered to have a face, representing its uniqueness and character visible through its architecture, squares, and streets.

Breath of history: History is not only an element of the past but "breathes" through monuments, architecture, and museums, providing a sense of living history.

Example: Rome, known as the Eternal City, breathes history at every turn, and the Colosseum stands as a monumental example of this. Built nearly 2,000 years ago, the Colosseum is a testament to the architectural ingenuity and the cultural depth of the Roman Empire. Walking through its arches, visitors can almost hear the echoes of gladiators' battles and the roar of the ancient crowds. The Colosseum not only serves as a physical link to Rome's glorious past but also invites contemplation on the human stories that unfolded within its walls. This iconic structure embodies "The Breath of History," offering an immersive experience that connects the present with the timeless narrative of human endeavor and civilization's progress (Dubrovskiy, 2012).

Travel through time: Time becomes a place that can be traveled through, allowing for the experience of different periods and historical moments.

Living culture: Culture is presented as an entity that can grow, develop, and change, highlighting its dynamic and active nature.

Language of cuisine: Cuisine is depicted as a language used to express culinary ideas, emotions, and cultural characteristics, emphasizing its communicative and expressive functions.

Voices of the city: The city "speaks" through the sounds of its streets, markets, and squares, conveying its unique atmosphere and mood.

Embrace of nature: Nature is depicted as an entity that can embrace, creating a sense of protection, comfort, and closeness to the natural environment.

These ontological metaphors help tourists feel and understand the essence of tourist destinations more deeply, transforming abstract concepts into more tangible and relatable images.

4. Synesthetic Metaphors

Touristic terms, by using synesthetic metaphors, blend various senses, creating vivid and memorable descriptions. These metaphors enrich the narration of travel experiences and evoke a deeper emotional connection to the described places:

Palette of flavors: This term imagines the diverse culinary experiences of a destination as if one could see the tastes through colors, creating a visual experience.

Example: A traditional Moroccan tagine is a vibrant example of a palette of flavors, combining sweet, savory, spicy, and tangy elements to create a harmonious and complex taste experience (Borzenko, 2012).

Symphony of landscapes: This phrase suggests that the visual experience of various landscapes is akin to listening to a complex musical composition, where different elements harmonize.

Example: New Zealand offers a symphony of landscapes within its relatively small landmass. Travelers can witness the serene beauty of its rolling green hills in the Waikato region, contrasted by the dramatic, jagged peaks of the Southern Alps. Alongside these, the deep blue of the fiords in Fiordland National Park adds a serene, almost mystical quality to the mix. Not far away, the thermal wonderlands of Rotorua present steaming geysers and bubbling mud pools, showcasing the Earth's raw power. Completing this natural symphony, the golden beaches of the Coromandel Peninsula offer a tranquil finale, with their soft sands and gentle waves. Each of these landscapes contributes its unique notes to New Zealand's overall melody, making it a destination that sings with natural beauty and diversity (Bakir, 2012).

Canvas of lights: This describes the visual effect of a city's or place's lights at night as akin to lines in a painting, suggesting that the vibrancy and 'texture' of the place can be felt through viewing.

Example: The cityscape at night creates a canvas of lights, where the bright illuminations form a picturesque view that brings the city's vibrancy to life, making each light an integral part of the overall masterpiece.

Whispering sands: This metaphor combines sound and touch, suggesting that the movement of soft sand can be felt as a whisper against the skin, evoking an intimate experience of being in the desert.

Example: As you walk along the dunes, the whispering sands caress your feet, creating a sensation that merges the gentle rustling sound of the grains with a soft tactile experience, capturing the essence of the desert's tranquility and beauty.

Example: The Sahara, stretching across several countries in North Africa, is the largest hot desert in the world. It's a place of extreme beauty and stark contrasts, where the endless dunes seem to communicate with visitors through their gentle movements and soft whispers. The experience of standing amidst the Sahara's dunes as the wind creates a tranquil sound of shifting sands can feel like listening to ancient stories being whispered by the desert itself (Gritzner et al., 2025).

Tapestry of cultures: A term suggesting that the rich, intricately connected cultural experiences of a place are woven together like a beautiful fabric, blending the "textures" and "colors" of various traditions and histories.

Example: India is a country known for its tapestry of cultures, languages, religions, and traditions. India's vast diversity is evident in its many festivals, such as Diwali, Holi, Eid, and Christmas, which are celebrated with great enthusiasm across the nation (Wolpert et al., 2025).

Melody of the streets: This phrase suggests that by walking through the streets of a place, one can "hear" its history, culture, and the daily life of its people, as if the atmosphere of the city creates a unique musical score.

Scented hues: A term suggesting that the distinct scents of a place can evoke vivid "colors" in one's imagination, combining the experiences of smell and sight to paint a picture of the location.

Example: This experience of scented hues makes the lavender field more than just a visual spectacle; it becomes a multi-sensory journey, where the color purple is forever remembered not just for its beauty but for the serene feeling it invokes, blending sight and scent in a memorable tapestry of sensory delight (Bakir, 2012).

Velvet nights: Evokes the feeling of deep tranquility, luxury, or richness in the atmosphere of an evening. This term suggests a smooth, almost tactile sensation of the night, indicating an enchanting and comforting profound experience.

Example: Imagine a small, ancient city nestled in the mountains, where after sundown, the streets become illuminated by soft, warm lanterns. On these velvet nights, the air is cool and crisp, carrying the faint scent of woodsmoke and the distant sound of a guitar serenading (Dubrovskiy, 2012).

5. Simple Metaphors

In touristic terminology, simple metaphors often use vivid imagery to make destinations, experiences, and attractions more understandable and memorable for potential visitors:

The city's heartbeat: This metaphor describes the lively, invigorating atmosphere of a city, likening it to the beating heart of a living organism.

Nature's canvas: Used to describe breathtaking natural landscapes, this metaphor suggests that the scenery is as beautiful and carefully crafted as paintings on a canvas.

A gem of the sea: This phrase is used to describe a beautiful coastal town or island, indicating that it is precious and highly sought after like a valuable gem.

The melting pot: A metaphor for a place rich in cultural diversity, where various cultures and traditions mix together like ingredients in a pot to create something unique and valuable.

A tapestry of history: This term suggests that the historical layers of a place are woven together like a fabric, creating a rich, textured story of the past.

A stairway to heaven: Used to describe breathtakingly beautiful and peaceful places, this metaphor suggests that visiting the place feels like ascending to a heavenly, serene location.

An open-air museum: This metaphor is used to describe cities or towns where historical buildings, streets, and monuments are so well-preserved and abundant that the entire area feels like a museum without walls.

A crossroads of cultures: Used to describe a place where various cultural influences intersect, suggesting that different cultural "roads" meet, creating a lively and dynamic environment.

6. Extended Metaphors

In touristic terminology, extended metaphors use a broad metaphorical framework to enrich the description and provide a more immersive experience:

The City as a Theater: This extended metaphor can describe the city's vibrant street life, historic architecture, and cultural events as if the city is a grand stage, its residents and visitors are actors, and each street and square are scenes of an ongoing performance. The narrative can delve into the city's daily dramas, its festivals as grand performances, and its ancient facades as silent storytellers of history.

Garden of Earthly Delights: Borrowed from Hieronymus Bosch's famous painting, this metaphor can describe a lush, tropical destination as a sensory paradise. The narrative explores the destination's natural wonders, vibrant wildlife, and exotic flora as elements of an earthly paradise, inviting visitors to revel in its beauty and mysteries.

The Lighthouse of Civilization: An ancient city or historical site can be described with this extended metaphor, presenting it as a beacon guiding humanity through history. The site's monuments, ruins, and artifacts are portrayed as lights that have illuminated paths of innovation, culture, and understanding over the centuries.

Example: The ancient city of Alexandria could be described as "The Lighthouse of Civilization" due to its legendary Library of Alexandria and the Pharos, one of the Seven Wonders of the Ancient World. The library was a monumental center of learning and scholarship, attracting scholars, scientists, poets, and philosophers from across the known world, facilitating the exchange of ideas and the accumulation of knowledge (Goldschmidt et al., 2025).

The Melting Pot of Flavors: For a destination known for its culinary diversity, this metaphor goes beyond the mix of simple ingredients to explore the historical, cultural, and social influences that have shaped the culinary culture. Each dish tells a story of migration, trade, and fusion, inviting visitors to taste the world in a single bite.

Example: Straddling two continents, Istanbul's cuisine embodies a melting pot of flavors influenced by European and Asian culinary traditions. Dishes like kebabs, mezze, and sweets like baklava offer a taste of the rich cultural interchange that has shaped the city (Safarov et al., 2023).

CONCLUSION

As a result of the analysis of metaphorized terms in touristic discourse, it is necessary to highlight primarily structural and ontological metaphors.

The list of signs and situations where associative transfers occur in the formation of new terms is not limited to those mentioned above, as the classification of metaphors is still an open issue in modern linguistics.

According to the theory of cognitive metaphor, the source domain, as a reflection of the diversity and generalization of the world view in language, is continuously expanding, finding new expressions in "the constantly recurring processes of human physical interaction with reality" (Lakoff & Johnson, 2004).

Author Contributions: Conceptualization, M.B.; methodology, M.B.; software, M.B.; validation, M.B.; formal analysis, M.B.; investigation, M.B.; resources, M.B.; data curation, M.B.; writing - original draft preparation, M.B.; writing - review and editing, M.B.; visualization, M.B.; supervision, M.B.; project administration, M.B.; funding acquisition, M.B. Author have read and agreed to the published version of the manuscript.

Funding: This research work was carried out within the framework of the project "Development of Methodological Foundations for Organizing Inclusive Tourism" (based on the example of Kiziltepa, Nurata, and Khatirchi districts of Navoi region), Project code: IL-9124093892-R3.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author. Methods for Optimizing Property Relations as a Key Aspect of Stimulating the Development of the Tourism Industry.

Acknowledgements: The research undertaken was made possible by the scientific involvement of the author.

Conflicts of Interest: The author declare no conflict of interest.

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Article history: Received: 17.04.2025 Revised: 11.07.2025 Accepted: 07.08.2025 Available online: 02.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1758-1766
DOI 10.30892/gtg.61334-1544

THE IMPACT OF AN ARTIFICIAL INTELLIGENCE-BASED FORECASTING MODEL ON THE DEVELOPMENT OF SUSTAINABLE TOURISM

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Citation: Kupi, M. (2025). The impact of an artificial intelligence-based forecasting model on the development of sustainable tourism. *Geojournal of Tourism and Geosites*, 61(3), 1758–1766. https://doi.org/10.30892/gtg.61334-1544

Abstract: This research investigates the application of artificial intelligence (AI) and Web 3.0 technologies in promoting sustainable urban tourism, with a particular focus on demand forecasting and environmental impact assessment. The study presents a two-layered AI-based model aimed at supporting data-driven decision-making in destination management, addressing the need for forward-looking strategies that align with both operational and sustainability goals. The research applies the Facebook Prophet algorithm to forecast monthly tourism demand in two Hungarian cities—Budapest and Győr—selected for their contrasting tourism profiles. Forecast outputs were then integrated into a sustainability impact module estimating carbon dioxide emissions, water consumption, and waste generation, based on empirically defined conversion factors. Results indicated strong seasonal peaks in Budapest, with over 1.3 million overnight stays projected for August 2026, and corresponding environmental impacts surpassing 62,000 tons of CO_2. In contrast, Győr exhibited more moderate fluctuations and lower error margins, reflecting a more stable tourism pattern. Forecast accuracy was assessed using MAE, RMSE, and MAPE metrics, showing acceptable performance for strategic use, although with reduced reliability in low-demand periods. The sustainability module effectively highlighted peak periods of ecological burden, enabling targeted interventions such as infrastructure scaling, service optimization, and seasonal policy adjustments. In addition to its forecasting functionality, the model offers practical guidance for municipalities by identifying where and when ecological pressure is likely to arise. The dual-model framework offers a scalable and replicable approach for cities seeking to balance tourism growth with environmental and community well-being. By integrating predictive analytics with sustainability assessment, the model provides valuable insights into the timing and magnitude of tourism's impact. This supports smarter capacity planning, emission reduction strategies, and the alignment of visitor flows with local resilience thresholds. The findings contribute to the evolving discourse on smart and sustainable tourism in the Web 3.0 era, positioning AI as a critical enabler of holistic and proactive destination management.

Keywords: artificial intelligence, tourism demand forecasting, sustainable tourism, urban tourism, smart destination management, machine learning in tourism

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INTRODUCTION

The rapid advancement of digital technologies, including Web 3.0 and artificial intelligence (AI), is opening up new opportunities in the tourism industry on a daily basis. The decentralized platforms of Web 3.0 and AI-based applications enable more personalized and efficient services, while also contributing to the achievement of sustainability goals. For example, the application of AI significantly enhances the efficiency and sustainability of tourism in the world's leading tourist destinations. These innovations not only improve the visitor experience but also promote environmental and social sustainability. The development of tourism has a significant impact on the environment and local communities. Poorly planned and managed tourism can lead to environmental degradation, including the overconsumption of natural resources and increased waste generation (Baloch et al., 2023). Furthermore, the sociocultural structures of local communities may also be altered due to the influence of tourism, which can result in the erosion of local identity and traditions. Therefore, sustainable management of tourism is essential, one that considers both environmental and social factors (Alamineh et al., 2023).

The aim of the present research is to contribute to the sustainable development of tourism through the application of Web 3.0 and AI technologies, specifically by designing an AI-based model. The integration of intelligent automation and blockchain technology into tourism offers a means to address sustainability issues, such as minimizing food waste and reducing environmental footprints (Majid, Iis et al., 2023). Through its practical application, this research enables tourism industry stakeholders to plan and manage their activities more efficiently, while simultaneously contributing to the achievement of sustainability goals. The research has two main objectives:

1. Development of a tourism demand forecasting AI model: To create an artificial intelligence-based model capable of predicting tourism demand on a monthly basis, broken down by specific cities.

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2. Integration of a sustainability impact assessment model: To combine demand forecasts with an AI module that estimates the ecological and environmental burden of the predicted tourist traffic, including carbon dioxide emissions, water consumption, and waste generation. Within this framework, the following research questions arise: **RQ1:** To what extent is the AI-based tourism demand forecasting model capable of accurately predicting tourism demand in different cities? and **RQ2:** How can the sustainability impact assessment model be integrated into demand forecasting, and with what level of accuracy can the environmental effects of tourism be estimated?

The research is guided by the following hypotheses:

1. The AI-based demand forecasting model is capable of accurately predicting tourism demand, taking into account seasonal and regional differences.
2. Through the integration of the sustainability impact assessment model, the environmental impacts of tourism can be precisely determined, which supports more sustainable tourism management.

LITERATURE REVIEW

Digital Tourism and Web 2.0 vs. Web 3.0

The relationship between tourism and digital technologies has undergone significant transformation over the past two decades. The emergence of Web 2.0 enabled a new type of interaction between tourists and tourism service providers, while Web 3.0—characterized by the use of semantic web and decentralized systems—has brought a higher degree of personalization, security, and data interpretation to the sector. The evolution of the concept of digital tourism is closely linked to the proliferation of these web generations, and increasingly incorporates blockchain (Kupi et al., 2025), artificial intelligence (AI), and Internet of Things (IoT) technologies (Gretzel, Reino et al., 2015).

Web 2.0, often associated with the "read-write" internet, enabled tourists to actively create content, such as travel blogs, reviews, or social media posts. This user-generated content (UGC) revolutionized tourism marketing and decision-making mechanisms (Mariani & Borghi, 2019). Travelers no longer relied solely on official tourism information, but increasingly on each other's experiences, leading to decentralized trust and the dominance of reputation systems (e.g., TripAdvisor).

However, Web 2.0 did not solve structural challenges in digital tourism, such as the over-centralization of data, the lack of transparency, and the increasing digital ecological footprint (Stankov et al., 2020). These limitations laid the groundwork for the need to adopt Web 3.0, which promises decentralized, data-centric, and AI-supported operations.

Web 3.0—often referred to as the “semantic web” or “decentralized web”—is opening new horizons in tourism as well. AI-based systems are capable of analyzing tourist behavior patterns and offering personalized experiences (Del Vecchio et al., 2018). Furthermore, blockchain technology enables the use of smart contracts for travel bookings, ensuring transparency and security (Mariani et al., 2018). This new phase of digital tourism—often called “smart tourism”—integrates IoT devices, Big Data analytics, and predictive modeling, allowing cities and destinations to proactively manage travel demand and sustainability considerations (Gretzel, Werthner et al., 2015). One of the most important contributions of Web 3.0 is not only the enhancement of the tourist experience, but also the improved planning of local communities, environments, and infrastructure. It is important to note, however, that the application of Web 3.0 in tourism is still in its early stages and faces significant challenges - especially due to lack of technological literacy, regulatory uncertainty, and issues of interoperability (Yung & Khoo-Lattimore, 2019). The development of digital competencies and the spread of open-source platforms may play a key role in democratizing the technology. Thus, while Web 2.0 laid the foundations of digital tourism through community interaction, Web 3.0 offers a more intelligent, personalized, and structured approach. Future research and practice should focus on integration, social impacts, and maximizing sustainability potential.

The Role of Artificial Intelligence in Tourism

The rise of artificial intelligence (AI) in recent years has had a significant impact on the tourism sector, transforming the way services are provided and opening new possibilities for achieving sustainability goals. The use of AI in tourism not only serves to increase efficiency but also contributes to the realization of Sustainable Development Goals (SDGs) (Gössling & Mei, 2025). One of the most important applications of AI in tourism is demand forecasting. The latest transformer-based models enable more accurate forecasting of tourism demand by accounting for seasonal and trend-based variations (Li et al., 2024). These advanced algorithms are capable of processing and analyzing large volumes of data, which is essential for understanding the dynamically changing tourism markets and ensuring proper capacity planning.

In the field of virtual tourism, AI-based applications offer tourists the opportunity to experience interactive and personalized journeys without being physically present at the location. A recent study pointed out that AI-supported virtual tourism has a positive impact on tourists’ environmentally conscious behavior, encouraging the adoption of more sustainable travel habits (Wu & Wang, 2025). However, the application of AI in tourism is not without challenges. Achieving sustainability goals requires a thorough assessment of the risks and opportunities generated by AI. Gössling and Mei (2025) emphasize that although AI can contribute to the sustainability of tourism, potential negative impacts—such as social tensions resulting from job automation or data privacy concerns—must also be considered.

Moreover, the role of AI and intelligent automation in sustainable tourism is becoming increasingly prominent. A comprehensive literature review highlighted that the application of intelligent automation offers numerous opportunities to address the challenges of sustainable tourism, including more efficient use of resources and reduction of environmental impacts (Majid, Tussyadiah, et al., 2023). Thus, artificial intelligence plays a significant role in transforming tourism, particularly in achieving sustainability goals. However, the responsible and thoughtful application of this technology is essential, with careful consideration of both its opportunities and potential risks.

Sustainability in the Tourism Context

The concept of sustainability has gained increasing importance in tourism in recent years, as the growth of global tourism has raised numerous environmental, social, and economic challenges. The aim of sustainable tourism is to meet the needs of present tourists and host regions while protecting and enhancing the potential for the future (Guo et al., 2019). This includes the preservation of natural and cultural resources, supporting the well-being of local communities, and ensuring a fair distribution of economic benefits. In recent years, the significance of sustainable tourism has further increased due to the impact of the COVID-19 pandemic. The pandemic highlighted the vulnerability of the tourism sector and made it necessary to develop more sustainable and resilient tourism practices. According to research, the development of sustainable tourism can contribute to the revitalization of the tourism industry by helping reduce mass tourism and promoting safer travel experiences (Higgins-Desbiolles, 2020). The implementation of sustainable tourism comes with several challenges. The involvement and support of local communities are crucial to the success of sustainable tourism. Studies have pointed out that participation and commitment of local residents are essential for sustainable development in community-based ecotourism (Radwan et al., 2023). Moreover, the environmental impacts of tourism development must also be considered, as poor planning and management can have negative effects on the natural environment (Buckley, 2001). Education and awareness-raising also play a vital role in promoting sustainable tourism. Increasing environmental awareness among tourism workers and tourists alike can contribute to the spread of more sustainable practices and to the reduction of environmental burdens (Rosiński, 2023).

The Impact of Tourism on the Well-Being of Local Communities

Tourism has a significant impact on the social, economic, and environmental aspects of host communities around the world. While tourism can contribute to economic growth and the preservation of cultural heritage, it is also important to consider its potential negative consequences for the well-being of local populations. One such aspect is the role of economic effects. Tourism development can create jobs and increase local revenues, contributing to the economic well-being of communities. However, the economic benefits derived from tourism are not always distributed evenly, which can lead to social inequalities. For example, some studies suggest that tourism-generated revenues often go to larger enterprises, while smaller local businesses benefit less from these advantages (Markandya et al., 2008).

Beyond economic dimensions, tourism can support the preservation of cultural heritage and strengthen local identity. Nevertheless, excessive tourism may lead to cultural homogenization and distortion of local customs, which can negatively affect community well-being. Moreover, interactions between tourists and residents may create tensions, especially when tourist behavior does not align with local norms (Gössling, 2001). Tourism growth can also place a burden on the environment, which directly affects the quality of life for local residents. Excessive visitor numbers may lead to the depletion of natural resources, pollution, and habitat destruction. Therefore, environmental impacts must be considered in the development of sustainable tourism, with a strong focus on minimizing those effects (Becken, 2014).

The active involvement of local communities in tourism planning and management is crucial for sustainable development and community well-being. Resident participation increases support for tourism and contributes to positive social outcomes. For example, community-led tourism projects can boost residents' income and strengthen social cohesion (Drumm & Moore, 2005). Educational programs and training related to tourism help improve the skills of local people, increasing their employability and contributing to the economic development of the community. Through education, local residents gain a better understanding of the benefits and challenges of tourism, which promotes the adoption of more sustainable tourism practices (Mir et al., 2024). In conclusion, tourism has a significant impact on the well-being of local communities, both positive and negative. The development of sustainable tourism requires the involvement of local residents, the equitable distribution of economic benefits, and the preservation of environmental and cultural values, while also considering all these factors in destination management and planning processes.

Web 3.0 and Artificial Intelligence in the Service of Community Well-Being

The application of AI and machine learning in tourism enables more accurate forecasting of visitor numbers and demand. For example, one study demonstrates that deep learning methods, such as convolutional neural networks, can be effectively applied to predict tourism demand, thereby improving planning and resource allocation decisions (Law et al., 2019). Another study examines the application of transformer-based models in tourism demand forecasting, highlighting their accuracy and efficiency (Zhang et al., 2025). Artificial intelligence is increasingly used not only to forecast demand but also to estimate the environmental and social impacts generated by tourism. For instance, Roumiani et al. (2023) modelled the ecological footprint of tourism in Indian national parks using AI-based simulation and pointed out how carbon dioxide emissions generated by tourists correlate with seasonal variations in visitor numbers (Roumiani et al., 2023). Similarly, Zhen (2025) developed a sustainability index combined with machine learning, which estimates the environmental burden of destinations based on variables such as water consumption, waste generation, and transportation data (Zhen, 2025). Web 3.0-based technologies—such as blockchain, smart contracts, and decentralized applications (DApps)—enable communities participating in tourism to become actively involved in processes. Several studies (e.g., Wenhua et al., 2023) emphasize that blockchain can be used to create transparent and traceable tourism ecosystems, which help ensure a more equitable distribution of revenues and enhance the competitiveness of local service providers (Wenhua et al., 2023). In addition, semantic web-based systems enable personalized information delivery and promote sustainable tourist behavior (Buhalis & Amaranggana, 2015.). This can manifest, for example, in real-time notifications about environmental pressure or in recommending less frequently visited sites.

MATERIALS AND METHODS

In the course of this research, an artificial intelligence-based multivariate tourism demand forecasting model was developed with the aim of predicting tourist traffic at a regional level, applicable both in urban and regional contexts. The study follows a quantitative, deductive approach to model development, directly linking demand forecasting based on secondary data with impact elements that are key from a sustainability perspective. The model comprises two interrelated modules:

1. Tourism demand forecasting AI model, which models the number of overnight stays using a time series–based method, broken down by month, utilizing the open-source Prophet time series forecasting algorithm.
2. Sustainability impact assessment AI module, which estimates the environmental impacts of tourism—specifically carbon dioxide emissions, water consumption, and waste generation—based on the forecasted number of overnight stays derived from the demand model.

The primary objective of this research is to develop the model itself as a practical tool for decision-makers; however, this publication presents results focusing on two Hungarian cities: Budapest and Győr. The selection of these cities was strategic, as they possess distinctly different tourism profiles: Budapest is a major destination with high volumes of international tourism, whereas Győr operates with a smaller-scale, primarily domestic visitor base.

The timeframe analyzed spans from January 2015 to December 2023, with monthly data granularity—providing sufficient input for training a reliable time series model. The analyzed data were obtained from secondary sources:

- Hungarian Central Statistical Office (KSH): monthly datasets on overnight stays, disaggregated by city;
- Google Trends: regional and time-series-based interest data specifically related to tourism searches (e.g., "Budapest hotel", "Győr szállás"). Google Trends indices were used as additional predictors in the model;
- Empirically estimated conversion factors for the sustainability model: 1 overnight stay = 6 kg CO_2, 150 liters of water, 2 kg of waste (based on findings by Majid et al., 2023).

The analytical process began with the implementation of the Prophet model—an additive time series model that performs forecasting by accounting for trends, seasonality, and potential outliers. The model was trained separately for Budapest and Győr. This was followed by forecast validation, for which the accuracy of the model was evaluated using the MAE (Mean Absolute Error), RMSE (Root Mean Squared Error), and MAPE (Mean Absolute Percentage Error) indicators.

The sustainability impact estimation was then carried out by applying multiplier values to the forecasted number of overnight stays, thereby producing estimates of CO_2 emissions, water consumption, and waste generation.

Despite the model's utility, several limitations must be acknowledged:

- Data on overnight stays may be incomplete or distorted during certain periods (e.g., during the COVID-19 pandemic);
- Sustainability multipliers are based on a single research source;
- The model does not account for local political changes, major events, or extreme weather conditions.

Future research aims to expand the models to additional cities, integrate more predictors (e.g., exchange rates, weather conditions, economic indicators), and develop interactive dashboards for use by decision-makers.

The model prototype was developed in a Python environment (Google Colab), as shown in Figure 1, enabling further expansion with additional modules—such as the sustainability impact assessment module.

```
IMPORT PANDAS AS PD
FROM PROPHET IMPORT PROPHET
IMPORT MATPLOTLIB.PYPLOT AS PLT

DF = PD.READ_CSV("BUDAPEST_GYOR_VENDEGEJSZAKAK.CSV")  # <- EZT KELL ELŐBB ELMENTENED

DF_BUDAPEST = DF[["DÁTUM", "BUDAPEST_VENDÉGEJSZAKÁK"]].RENAME(
    COLUMNS={"DÁTUM": "DS", "BUDAPEST_VENDÉGEJSZAKÁK": "Y"}
)
DF_BUDAPEST["DS"] = PD.TO_DATETIME(DF_BUDAPEST["DS"])

MODEL = PROPHET()
MODEL.FIT(DF_BUDAPEST)

FUTURE = MODEL.MAKE_FUTURE_DATAFRAME(PERIODS=12, FREQ='M')

FORECAST = MODEL.PREDICT(FUTURE)

FIG1 = MODEL.PLOT(FORECAST)
PLT.TITLE("BUDAPEST – VENDÉGÉJSZAKÁK ELŐREJELZÉSE (PROPHET)")
PLT.XLABEL("DÁTUM")
PLT.YLABEL("VENDÉGÉJSZAKÁK SZÁMA")
PLT.GRID(TRUE)
PLT.TIGHT_LAYOUT()
PLT.SHOW()

FIG2 = MODEL.PLOT_COMPONENTS(FORECAST)
PLT.TIGHT_LAYOUT()
PLT.SHOW()

DF_GYOR = DF[["DÁTUM", "GYOR_VENDÉGEJSZAKÁK"]].RENAME(
    COLUMNS={"DÁTUM": "DS", "GYOR_VENDÉGEJSZAKÁK": "Y"}
)
DF_GYOR["DS"] = PD.TO_DATETIME(DF_GYOR["DS"])


MODEL_GYOR = PROPHET()
MODEL_GYOR.FIT(DF_GYOR)

FUTURE_GYOR = MODEL_GYOR.MAKE_FUTURE_DATAFRAME(PERIODS=12, FREQ='M')
FORECAST_GYOR = MODEL_GYOR.PREDICT(FUTURE_GYOR)

FIG1 = MODEL_GYOR.PLOT(FORECAST_GYOR)
PLT.TITLE("GYŐR – VENDÉGÉJSZAKÁK ELŐREJELZÉSE (PROPHET)")
PLT.XLABEL("DÁTUM")
PLT.YLABEL("VENDÉGÉJSZAKÁK SZÁMA")
PLT.GRID(TRUE)
PLT.TIGHT_LAYOUT()
PLT.SHOW()

FIG2 = MODEL_GYOR.PLOT_COMPONENTS(FORECAST_GYOR)
PLT.TIGHT_LAYOUT()
PLT.SHOW()

FROM SKLEARN.METRICS IMPORT MEAN_ABSOLUTE_ERROR, MEAN_SQUARED_ERROR, MEAN_ABSOLUTE_PERCENTAGE_ERROR
IMPORT NUMPY AS NP

MAE = MEAN_ABSOLUTE_ERROR(MERGED_BUDAPEST["Y"], MERGED_BUDAPEST["YHAT"])
MSE = MEAN_SQUARED_ERROR(MERGED_BUDAPEST["Y"], MERGED_BUDAPEST["YHAT"])
RMSE = NP.SQRT(MSE)
MAPE = MEAN_ABSOLUTE_PERCENTAGE_ERROR(MERGED_BUDAPEST["Y"], MERGED_BUDAPEST["YHAT"])

PRINT("MAE:", ROUND(MAE, 2))
PRINT("RMSE:", ROUND(RMSE, 2))
PRINT("MAPE:", ROUND(MAPE * 100, 2), "%")


DF_BUDAPEST["MONTH"] = DF_BUDAPEST["DS"].DT.MONTH
SEASONALITY = DF_BUDAPEST.GROUPBY("MONTH")["Y"].MEAN()
PRINT(SEASONALITY)
PRINT(DF_BUDAPEST.GROUPBY("MONTH")["Y"].MEAN())


FORECAST_2026 = FORECAST[FORECAST["DS"].DT.YEAR == 2026]
FORECAST_2026[["DS", "YHAT"]]
FORECAST[FORECAST["DS"].DT.YEAR == 2026][["DS", "YHAT"]]
```

Figure 1. Prototype of the Model, own source

RESULTS

The results of this study are based on the output of two artificial intelligence–based models: one designed to forecast tourism demand, and the other to estimate sustainability-related impacts. For training the Prophet model, monthly overnight stay data from 2015 to 2023 were used. In the case of Budapest, the average number of overnight stays exceeded 1 million per month during the summer, while in Győr, the monthly figures hovered around 50,000. The model generated forecasts from 2024 through 2026, which were analyzed both visually and using statistical metrics. Forecasting accuracy for Budapest:

- MAE (Mean Absolute Error): 219.82
- RMSE (Root Mean Squared Error): 267.80
- MAPE (Mean Absolute Percentage Error): 43.1%

The relatively high MAPE value highlighted the model's weakness in forecasting for the lower-volume months (January and February)—although values between 20% and 50% are generally considered acceptable. In contrast, the summer season forecasts proved to be much more accurate. The Prophet model reliably captured the annual seasonality cycles and exhibited a stable, gradually increasing long-term trend.

As shown in Figure 2, the highest forecasted value is projected for August 2026, with over 1.3 million overnight stays.

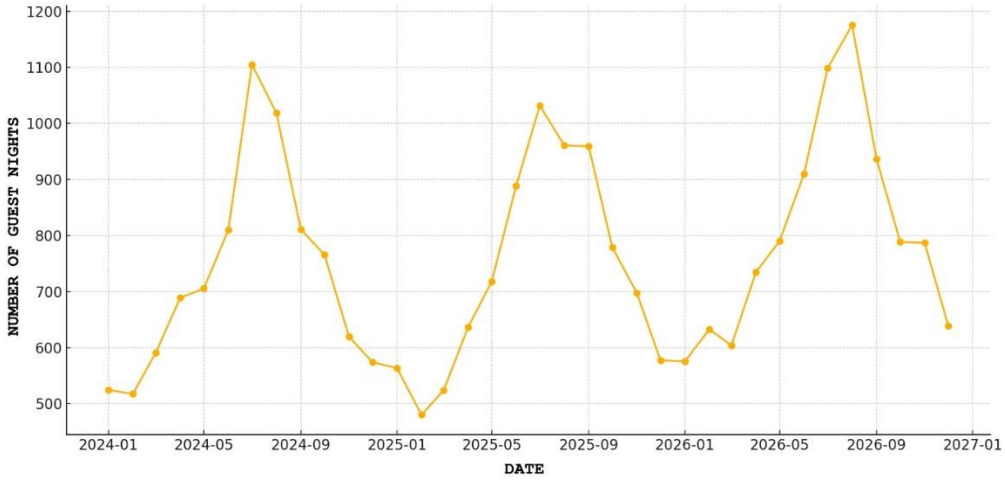

Figure 2. Number of Actual and Forecasted Overnight Stays (Budapest) (Source: own analysis output, based on the Prophet forecast)

Despite the smaller sample size, the error metrics of the Győr model were more favorable:

- MAE: 6.42
- RMSE: 9.17
- MAPE: 35.8%

This is due to the fact that - as illustrated in Figure 3 - Győr exhibited smaller annual fluctuations, fewer outliers, and a more even trend. The model reliably detected the summer peak periods here as well, although the annual trend did not show a significant upward trajectory.

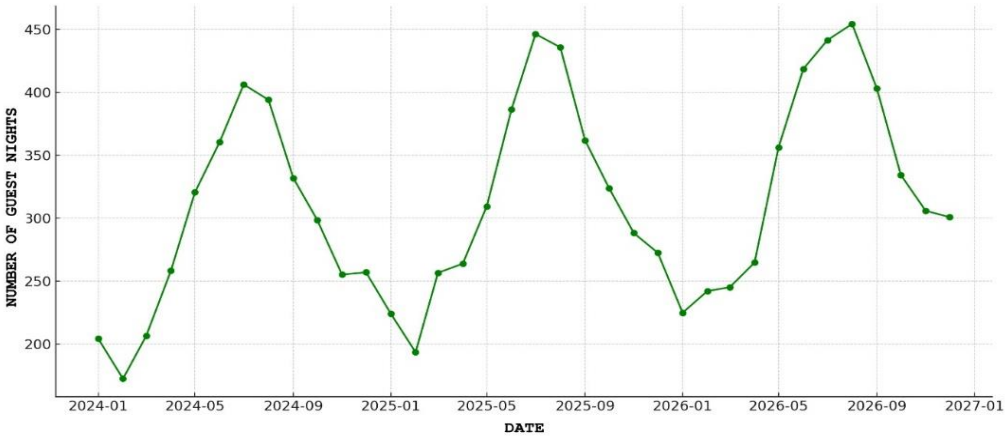

Figure 3. Number of Actual and Forecasted Overnight Stays (Győr) (Source: own analysis output, based on the Prophet forecast)

Using the forecasted number of overnight stays, the sustainability impact assessment module generated the following indicators: Budapest (2026):

- Estimated number of overnight stays: approx. 10.4 million
- CO_2 emissions: ~62.4 million kg (62,400 tons)
- Water consumption: ~1.56 billion liters
- Waste generation: ~20.8 million kg (20,800 tons)

Győr (2026):
• Estimated number of overnight stays: approx. 790,000
• CO_2 emissions: ~4.74 million kg
• Water consumption: ~118.5 million liters
• Waste generation: ~1.58 million kg

According to the data, Budapest's sustainability burden is more than ten times greater than that of Győr (see Figure 4), which is consistent with the difference in overnight stay volumes. In the annual breakdown charts, the highest emission and consumption values were recorded during the peak summer season months. The three subcharts in Figure 4 illustrate the predicted environmental impact of tourism in Győr for the period 2024–2026.

- **(a)** The CO_2 emissions chart shows seasonal peaks in emissions during the summer months, in correlation with higher visitor traffic.
- **(b)** Water consumption follows a similar pattern, reflecting increased infrastructure use during high season.
- **(c)** Waste generation demonstrates a steady rise across the summers, with lower values during the winter months.

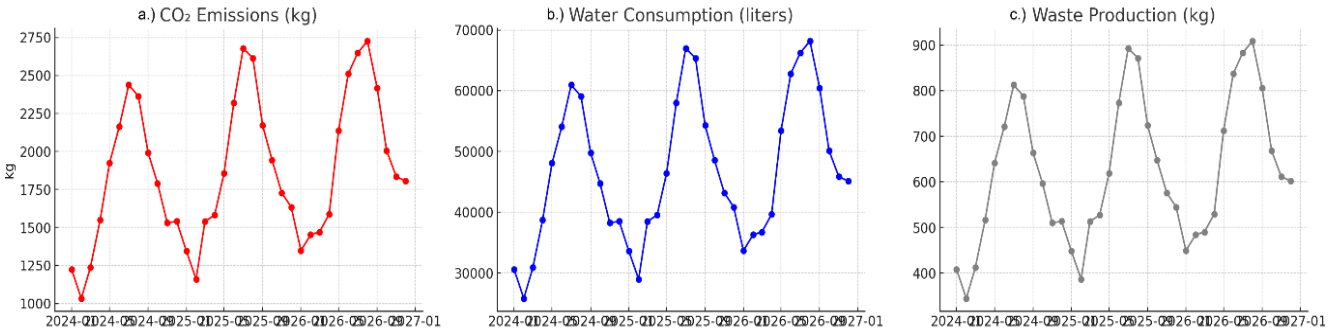

Figure 4. Sustainability Impact Forecast - Győr, 2024 – 2025 (Source: own analysis output, based on the Prophet forecast)

The results and impacts of the models for the two cities differ significantly. In terms of volume, Budapest's tourism sector is at least ten times larger than that of Győr. When analyzing seasonality, the summer peak months have an extreme impact in Budapest, whereas in Győr, the fluctuations are more moderate. The model errors are lower in the case of Győr, but the practical significance of the results is greater for Budapest. The CO_2 emissions, water consumption, and waste generation indicators increase proportionally with the volume of overnight stays.

While the model results were applied specifically to these two Hungarian cities, the framework can be extended to multiple areas, such as destination management, where traffic forecasts support seasonal capacity planning, as well as accommodation and workforce allocation. In the formulation of environmental strategies, the sustainability module's indicators aid in developing plans to reduce CO_2 footprints and water consumption. In the context of risk management, the early detection of seasonal surges and declines enables timely intervention.

The findings from this two-stage artificial intelligence–based model demonstrate that, even when relying solely on secondary (or potentially primary) data, it is possible to produce accurate demand forecasts and environmental impact estimates that meaningfully support sustainable destination management and the improvement of local community well-being.

DISCUSSION

The tourism demand forecasts revealed strong seasonality in both Budapest and Győr, although the magnitude of variation differed significantly. In Budapest, the number of overnight stays increases by approximately 1.5 times during the summer peak months compared to the winter period. This indicates that tourism in Budapest is highly seasonal, concentrated mainly in the summer, which poses considerable challenges for sustainability. Imbalances in seasonality may lead to infrastructure overload, hinder stable workforce management, and complicate the maintenance of consistent service quality. In contrast, Győr displayed a much more balanced and less volatile demand, creating a more favorable context for sustainable destination management. In such destinations, the temporary overuse of infrastructure is less prominent, making environmental pressures more predictable and manageable.

By using the forecasted number of overnight stays, the sustainability indicators generated by the model—along with their seasonal distribution—allowed the study to identify when the greatest ecological burdens occur. During the summer months, CO_2 emissions, water consumption, and waste generation increase dramatically. This highlights that the environmental impacts of tourism are not linear but rather concentrated in specific time periods.

Furthermore, the model enabled the spatial and temporal analysis of impacts, rather than limiting evaluation to absolute figures. This provides a data-driven foundation for decision-making processes, allowing authorities to determine when and where specific interventions are required to improve sustainability indicators.

The ecological pressure caused by tourist flows manifests not only in environmental terms but also affects the daily quality of life of local communities. Excessive tourism during peak periods can lead to increased noise levels, air pollution, traffic congestion, and deterioration of public services available to residents (e.g., hygiene, cleanliness, parking availability). These effects diminish well-being, heighten frustration, and may ultimately reduce local tolerance for tourism.

In contrast, Győr's more balanced tourism demand minimizes such negative impacts. A lower, but more stable tourism volume tends to have a direct and positive effect on local communities: it can contribute to the development of public services, the growth of local businesses, and enhance community cohesion.

The AI-based model presented in this study enables destinations and municipalities to plan their tourism capacity consciously and based on data. With the help of accurate forecasts, infrastructure overload can be prevented, and the timing of public service development can be optimized. The sustainability module further enables the setting and tracking of emission-reduction goals. This is particularly important in the era of Web 3.0, where tourism must be viewed not merely as an engine of economic growth but also as a balancing element for maintaining local well-being and ecosystem equilibrium.

Throughout the study, several research questions were addressed. The first of these was:

(RQ1) *To what extent can an AI-based demand forecasting model accurately predict tourism demand in different cities?*

This question was linked to the following hypothesis:

(H1) *The AI-based demand forecasting model can predict tourism demand with high accuracy, taking into account seasonal and regional differences.*

The Prophet-based demand forecasting model was tested using data from two cities with distinct tourism profiles—Budapest and Győr. The model predicted the number of overnight stays on a monthly basis, incorporating both seasonal patterns and historical time series.

In the case of Budapest, the model exhibited higher absolute error, which is to be expected given the city's high-volume and volatile tourism sector. Nevertheless, the MAE (219.82), RMSE (267.8), and a relatively high MAPE (43.1%) do not necessarily indicate poor performance. The model was able to identify seasonal peaks and troughs, and its trend component effectively captured the post-COVID recovery trajectory.

In contrast, Győr, with its smaller volume and less turbulent tourism dynamics, yielded more stable predictions with lower error values, albeit with less pronounced seasonality.

While the model may not achieve equal accuracy across all periods or cities, it is suitable for forecasting major tourism trends, spikes, and seasonal variations. These forecasts provide valuable input for sustainable destination management, including capacity planning, marketing timing, and infrastructure forecasting.

The second research question posed was:

(RQ2) *How can the sustainability impact assessment model be integrated into demand forecasts, and with what accuracy can tourism's environmental impacts be estimated?*

This was accompanied by the second hypothesis:

(H2) *By integrating the sustainability impact assessment model, it is possible to accurately estimate the environmental pressures generated by tourism, thereby supporting more sustainable tourism management.*

The sustainability impact assessment module was built on the outputs of the demand forecasting model. It calculated environmental burdens based on monthly overnight stays, using the following conversion factors:

- 6 kg CO_2 per tourist per night
- 150 litres of water per tourist per night
- 2 kg of waste per tourist per night.

These values were directly derived from the AI model's forecasts, enabling the calculation of monthly and annual environmental impacts in advance.

The results clearly identified peak burden periods (especially in the summer), when CO_2 emissions and water consumption increased significantly, particularly in Budapest. For instance, during a single summer month, hundreds of thousands of kilograms of CO_2 and millions of liters of water may be consumed, unless active capacity management or sustainable tourism incentives are applied.

Such foresight is invaluable not only for destination management, but also for infrastructure planning and community development. The ability to forecast when and where environmental burdens will be most intense allows for optimized resource management, including urban service provision (e.g., water systems, waste management, public transport) and the development of sustainability indicators.

In conclusion, the responses to both research questions and the testing of the related hypotheses confirm that the two-layered AI-based system (demand forecasting and impact assessment) provides a functioning framework that can deliver useful insights even when relying solely on publicly available data. The system is scalable to other cities and regions, and can be further enhanced with additional predictors (e.g., weather data, event calendars, transportation metrics).

This dual-model approach is valuable not only because of its predictive accuracy, but also because it promotes community well-being, smarter resource use, and the long-term sustainability of tourism.

CONCLUSIONS

The aim of this study was to explore how artificial intelligence (AI) can be applied to forecast tourism demand and how such predictions can be used to develop a sustainability impact assessment model that supports community well-being and informed tourism management. The research findings confirmed that even a two-tier AI model based on publicly available data is capable of identifying demand trends and quantifying related environmental impacts.

The demand forecasting model, built using the Prophet algorithm, effectively identified seasonality, trend shifts, and volume differences in both Budapest and Győr. The accuracy of the forecasts was evaluated using the MAPE, MAE, and RMSE indicators. As expected, errors were higher in Budapest due to the larger volume and fluctuation of tourism, whereas Győr produced more precise results due to its smaller and more stable tourism patterns.

The sustainability impact assessment model successfully estimated CO_2 emissions, water consumption, and waste generation based on overnight stays. The highest ecological burdens were recorded in the peak summer months, underscoring the necessity of strategies aimed at balancing seasonality. The model offers a practical tool for decision-making, enabling early identification of peak periods and their environmental consequences, thus facilitating long-term planning. Based on the research findings, several recommendations can be made:

- Stimulate off-season tourism with targeted promotional campaigns aimed at attracting specific market segments, thereby reducing seasonality.
- Scale up infrastructure during peak months (e.g., waste collection, water supply systems).
- Implement awareness campaigns to minimize environmental damage during high-traffic periods.
- Develop an interactive dashboard version of the model to support municipalities and accommodation providers with capacity management.
- Integrate sustainability indicators into tourism planning KPIs to support data-driven policy.

Future objectives of the research include extending the model to additional cities and tourism regions, as well as integrating supplementary predictor variables (e.g., weather data, event calendars, exchange rates), which would further enhance the model's predictive capabilities. The study also aims to explore the role of Web 3.0 technologies in tourism—such as blockchain, tokenization, and NFT-based access solutions. AI-based modelling opens up new opportunities to guide tourism not only from an economic but also from a social and environmental perspective. The toolset presented in this paper may contribute to the evolution of tourism in the Web 3.0 era into a more sustainable, inclusive, and data-driven industry that serves not only visitors but also the well-being of local communities.

Author Contributions: Conceptualization, M.K.; methodology, M.K.; software, M.K.; validation, M.K.; formal analysis, M.K.; investigation, M.K.; data curation, M.K.; writing - original draft preparation, M.K.; writing - review and editing, M.K.; visualization, M.K.; supervision, M.K.; project administration, M.K. The author has read and agreed to the published version of the manuscript.

Funding: Supported by the EKÖP-24-4-II-SZE-13 UNIVERSITY RESEARCH FELLOWSHIP PROGRAM of the Ministry for Culture and Innovation from the source of the National Research, Development and Innovation Fund.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the scientific involvement of the author concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 10.04.2025 Revised: 14.07.2025 Accepted: 08.08.2025 Available online: 02.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1767-1775
DOI 10.30892/gtg.61335-1545

EXPERIENTIAL MARKETING AND CUSTOMER SATISFACTION IN LIMA'S FAST FOOD DELIVERY: CHALLENGES AND OPPORTUNITIES

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Citation: Guillen, D., Medina, A., Guillen, N., & Regalado, M. (2025). Experiential marketing and customer satisfaction in Lima's fast food delivery: Challenges and opportunities. *Geojournal of Tourism and Geosites*, 61(3), 1767–1775. https://doi.org/10.30892/gtg.61335-1545

Abstract: The fast food sector represents an industry with an economic impact in many countries, driven by changes in customer consumption habits. The growing demand for convenience has motivated restaurants to focus their strategies on customer satisfaction, ensuring that product and service delivery are accessible and efficient. The objective of the research was to examine the relationship between experiential marketing and customer satisfaction in tourist districts of the city of Lima with home delivery service in fast food restaurants. As a methodology, a quantitative correlational approach and a cross-sectional design were used, with instruments subjected to high reliability and descriptive and inferential statistical analysis. The data was collected through a survey administered to 383 participants, selected according to the criteria established in the methodological design. The results showed a positive correlation between experiential marketing and the satisfaction of customers who use the delivery service in fast food restaurants. A Spearman correlation coefficient (rs) of 0.306 was obtained, with a bilateral significance level of 0.00 (< 0.05), which allows us to affirm that there is a significant relationship between the variables analyzed and that this relationship is not due to chance, but rather reflects a consistent association within the data set studied. In conclusion, it was obtained that the experience of sensations is the most important dimension of experiential marketing because various factors such as smell, touch, sound, taste, among others, are applied within their commercial and advertising strategies to attract consumers. Furthermore, stimulation is the main element of the sensation experience that increases customer satisfaction. Therefore, this study was important for companies in this sector to design and implement innovative improvements in the online delivery service experience through experiential marketing actions in order to increase sales, build long-term customer loyalt, strengthening the brand's positioning in the market, generating sustainable relationships based on satisfaction, trust, and service differentiation, and fostering a community of loyal users who act as natural brand promoters. Furthermore, these actions will allow us to gather valuable information on consumer behavior, optimize logistics processes, and anticipate customer needs in a highly competitive and constantly evolving environment.

Keywords: experiential marketing, customer satisfaction, restaurants, fast food, delivery, performance experience, relationship experience

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INTRODUCTION

Currently, there is an evolution in customers' exclusive consumption habits, which has generated growing concern through restaurants that sell fast food, which prioritize the accessibility of the product and service to satisfy the demands of their customers, especially with the expansion of online food delivery services in recent years.

In this context, the concept of experiential marketing is worth mentioning. Li et al. (2023) highlights the relevance of focusing on experiences that involve the customer's entire being and have a notable and positive impact on sales and, at the same time, on the perception of a mark. It is essential to analyze the aspect of customer satisfaction, especially in their post-pandemic recovery, given that the fast-food sector has a significant role in consumption patterns.

On the other hand, Elliot et al. (2025) point out that customer satisfaction arises when the experience exceeds their expectations. From the customer's perspective, the dining experiences should be pleasant, attractive, and memorable, as indicated by Oh et al. (2007) highlighting the importance of offering rewarding experiences to establish emotional and affective connections with customers. Now, experiential marketing has evolved to adapt to an environment where consumers are increasingly sophisticated and selective. This approach adds value to the product and service by focusing on the customer-focused experience during consumption or use (DiPietro, 2017; Li et al., 2023). Companies must think strategically about what experiences to offer to satisfy and compensate customers' wants and needs.

According to Roy et al. (2025) fast food sales in Latin America, particularly in nations such as Chile and Mexico, have increased due to the convenience, speed, and competitive prices that characterize this type of service. Income from online food delivery orders is projected to grow generally by 2021. In the Peruvian context, with the approach of the

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"new normal," significant changes have been evident in consumption habits, which have marked increased use of online delivery services during the pandemic. According to Li et al. (2023) price is the primary motivator for consumers who use restaurant mobile applications; other aspects, such as the place's location, offers, promotions, and personalization, are also considered. Therefore, experiential marketing is a strategic tool to strengthen the brand, differentiate the service, consolidate a solid image, encourage innovation, and cultivate customer loyalty. In addition, its applicability covers various industries, such as tourism, restaurants, and entertainment (Kochling, 2021).

In previous studies, Salomão & Santos (2022) investigate whether the influence of experiential marketing practices and the perception of the quality of the good leads to immediate satisfaction through experiential value and, consequently, induces positive behavior after the purchase - acquisition to get customers to revisit the brand. According to Alalwan (2020) applied their study in a coffee shop in Indonesia and analyzed the influence of experience marketing and customer satisfaction. Likewise, Spence (2019) analyzed the influence of experiential marketing through five strategic experiential dimensions (SEM) to explain the relationship between satisfaction and customer loyalty.

This research explores the interrelationship between experiential marketing and customer satisfaction in the context of delivery services offered by fast food restaurants in zone 7 of Lima City. It focuses on various dimensions of experience, such as sensations, feelings, thoughts, and relationships, to provide an exhaustive and insightful analysis of this dynamic.

LITERATURE REVIEW

Experiential marketing

Errajaa et al. (2025) conceptualize marketing as the identification and social fulfillment of human demands with the goal of profit. This process involves groups and people acquiring what they want through the generation, offering, and free transaction of valuable goods. This activity involves the participation of groups and individuals in obtaining valuable goods through creation and offering. Köchling (2021) emphasizes the responsibility of companies to generate value for their customers, which requires considerable effort and the application of substantial skills. Furthermore, Obadia & Vida (2024) focus on marketing as a process that seeks to generate benefits for customers and establish relationships that are established in the long term, in turn obtaining benefits from them.

In addition, Errajaa et al. (2025) identify different stages in the evolution of marketing, adapting to changes in consumer habits and society. Ball & Brennett (2024) present experiential marketing as a modern way to strengthen the customer's emotional connection to a brand. Cepeda et al. (2017) argues that experiential marketing involves tangible experiences contributing to sales and brand growth. Same & Larimo (2012) and Tuli et al. (2025) suggest that experiential marketing is based on providing access to products before purchase to create emotional connections with customers, promoting brand loyalty. Li et al. (2023) defines experiential marketing as establishing relationships based on emotional experiences, while Phau & Ferguson (2013) highlighted their focus on the customer's emotions and feelings to create positive experiences. These visions of experiential marketing highlight the importance of generating emotional experiences and promoting brand loyalty and success in a competitive environment (Table 1).

Table 1. Comparative characteristics between traditional and experiential marketing

Traditional Marketing	Experiential Marketing
It focuses exclusively on features and practical benefits.	Develop products and strategies that capture the interest of the clients.
Institute limits and competencies in the product.	Establish what types of products are appropriate in the consumer field and improve customer experience.
It states that customers make decisions rationally.	They make decisions influenced by logic and emotions.

Li et al. (2023) suggests that customers combine rational and emotional aspects of purchase. This is even though traditional marketing focuses on the product or service's functional attributes and assumes the consumer's rationality. This latter approach uses quantitative methods and is limited in analyzing the product or service's competencies. Besides, Rico (2023) comments that traditional marketing orients towards short-term individual sales, prioritizing the characteristics of a product and showing low commitment to the customer.

Experiential marketing theories

According to Kochling (2021), argues that experiential marketing creates value by focusing on direct interactions between the product and the customer, highlighting the importance of generating emotions to create memorable experiences that increase the perception of value and offer unique differentiation. To understand this concept, four types of experiences are classified through two dimensions (Spence, 2019; Gu et al., 2024).

In summary, they suggest exploring different areas to design participatory experiences, combining these categories to provide enriching experiences for the client. On the other hand, there is the theory of Strategic Experiential Modules (MEE) by Li et al. (2023), who highlights that brand are closely related to experiences that encompass emotions, feelings, and senses. It proposes merging communication elements, events, and contact points so that customers associate the brand with their user experience. In addition, Experiential Marketing analyzes various dimensions of the customer experience, including sensory, emotional, cognitive, physical, and relational.

Customer satisfaction

"Customer satisfaction" refers to your evaluation after consuming a service, comparing the value received with your

previous expectations (Nam et al., 2011; Shamah et al., 2018). Also, Iacobucci et al. (1995) describe this process as emotional and based on comparing the product's performance and customer expectations. This satisfaction is influenced by several factors (Fournier & Mick, 1999; Shankar, 2022). According to Lin et al. (2023), it represents consistency in service results, while Anderson & Srinivasan (2003) can be divided into transactional and cumulative satisfaction. Errajaa et al. (2025) defines it as the emotional response to a product's expectation and actual purchase.

Furthermore, it is a precursor to customer loyalty (Sokolova et al., 2024). Also, Cock (2024) describes it as the comparison between the actual performance of the product or service and expectations, while Ali & Anwar (2021) see it as the measure of the satisfaction of customer expectations (Table 2).

Table 2. Concepts of the dimensions belonging to the customer satisfaction variable

Dimension	Concept	Author
Food Quality	When food is suitable for consumption, we speak of its quality, which is determined by several factors such as variety, flavor, freshness, temperature, healthy options, and nutritional value.	Kim et al. (2018); Juuse et al., (2024); Boukis (2024).
Electronic Service Quality	In the context of the online marketplace, quality refers to a website's effective and efficient ability to facilitate the acquisition, purchase, and delivery of a service or product.	Zeithaml et al. (1988).
Price	Price is the amount the customer pays for a product or service, and perception is influenced by price level, perceived value, advertising, offers, and promotions, which affect customer satisfaction.	Cetin & Dincer (2013); Errajaa et al. (2025).
Payment	In e-commerce, speed is of the essence, as online shoppers expect fast transactions, and an efficient payment system contributes to customer confidence in their online experiences.	Sokolova et al. (2024).
Delivery	Speed of delivery is also essential for customer satisfaction and retention in e-commerce, as time is a vital resource for online and in-store purchases.	Sokolova et al. (2024).

Regarding the study variable, reference is made to the Quality Theory SERVQUAL Model. Service quality is the customer's perception of whether it meets or exceeds expectations. According to Brady & Cronin (2001) and Eisingerich & Bell (2008), this perception is considered the general assessment customers make of the service. Zeithaml et al. (1988) identified four main dimensions of service quality: empathy, reliability, tangibility, responsiveness, and guarantee, which were evaluated using their SERVQUAL scale, which allows for measuring service quality and understanding customer expectations. Excellence in quality makes a difference in a service context.

Edward & Sahadev (2011) argued that it fosters customer loyalty, highlighting the importance of positive attention and experience during service. Wu (2013) states that service quality influences recommendation and the willingness to be loyal customers. However, the SERVQUAL model is relevant because it provides detailed information on customer opinions and employee perceptions and compares performance with other institutions. On the other hand**,** Customer perception theory focuses on how companies interpret customers' sensory stimuli, according to Monfort et al. (2025) and Xiong et al. (2025) suggests that this theory seeks to understand customer behavior by analyzing motivations for purchasing specific goods, including self-perception, price perception, and benefit perception.

This approach is relevant to experiential marketing, especially in the dimension of "Sensation (sensory) experience," which considers how customers interpret and respond to the sensory experiences offered by companies.

The information society and the importance of digital technologies

New technologies are drastically changing how society accesses information and conducts online transactions. This change, driven by the internet, smart devices, and other technological advances, redefines social structures but also presents challenges regarding the privacy and security of customer data (Roy et al., 2022).

Today's society, characterized by the abundance of information and the prevalence of technology, is closely related to people's ability to understand and use digital tools. The COVID-19 pandemic has highlighted the importance of Information and Communication Technologies (ICT) in daily life and the business environment (Ashraf et al., 2017; Lalaleo et al., 2021). This has changed how we interact, work, and transact business, driving companies to adopt digital transformation strategies to adapt to new circumstances. Thanks to the advancement of ICT, consumers' greater access and control over information shapes their consumption habits and future expectations.

Ali & Anwar (2021) and Sutiadiningsih et al. (2024) conclude that understanding how customers use these technologies and how they influence their lifestyles is crucial. Furthermore, the importance of the speed and accessibility of online products is highlighted, as well as the role of ICT in the formation of purchasing decisions and the creation of user experiences, as observed in the studies (Momtaz et al., 2013).

Fast food restaurants in Peru

In the gastronomic Field, "restaurant" refers to places that offer prepared meals, while in marketing, it is defined as establishments that provide fast food at low prices (DiPietro, 2017). The fast-food restaurant industry shows constant growth globally (Uddin, 2019). Fast food delivery stands out for its efficiency, but the construction of customer loyalty also depends on emotional factors, perception, and expectations (Juuse et al., 2024).

The importance of fast-food restaurants lies in their impact on the customer's dining experience. They seek to provide complete experience beyond simply delivering a product (Kim et al., 2018). On the other hand, experiential marketing, related to the quality of products, environment, and service, determines customer satisfaction and their propensity to repurchase (Ryu et al., 2012; Skandalis et al., 2019).

MATERIALS AND METHODS

The study was developed through a quantitative research design, which involves collecting numerical data to evaluate hypotheses and behavioral patterns, as noted by Elliot et al. (2025). A relational approach was adopted with a cross-sectional design, allowing the researcher to explore the connections between events and phenomena. This facilitated the practical assessment of correlations between variables at a specific time point (Griffith, 2024).

This research examines the relationship between experiential marketing and customers' satisfaction using the home delivery service in fast food restaurants in Lima City. The target population consisted of individuals who consume fast food through an online delivery service and reside in the selected districts of the study area. Intentional non-probabilistic sampling was applied, involving 383 people who met the study's inclusion and exclusion criteria (Laudien et al., 2024). Two questionnaires were administered. To develop the instrument, various sources were consulted, such as Brady & Cronin (2001) and Salomão & Santos (2022) for the Experiential Marketing variable. Regarding the Customer Satisfaction variable.

From these references, 43 items distributed in 12 constructs were developed, translated into Spanish, and applied with filter questions. The scale developed was a 5-point Likert type. Likert describes this scale as a measure of respondents' reactions to different statements, where a statement is presented that must be evaluated by the respondent. The collected data were analyzed using IBM SPSS 29 to evaluate normality and correlation coefficients, as Shao et al. (2019) recommended. Respondents were assured that the study would be used exclusively for scientific purposes and that their data would be kept confidential. The instrument's validity was established through comprehensive content analysis and subjected to the Aiken V test. Likewise, internal consistency reliability was evaluated using Cronbach's Alpha coefficient (Malkewitz et al., 2023; Nivornuist et al., 2024). The Alpha values obtained, which ranged between 0.838 and 0.702, exceeded the accepted range (0.60–0.70) for social science research (Ursachi et al., 2015).

The values from Salomão & Santos (2022) for "Experiential Marketing" and Edward & Sahadev (2011) for "Customer Satisfaction" were used. A descriptive analysis was performed to examine the sample, and correlation tests, such as *Spearman's* Rho (Figure 1). The results use tables, highlight significant correlations, and discuss their implications.

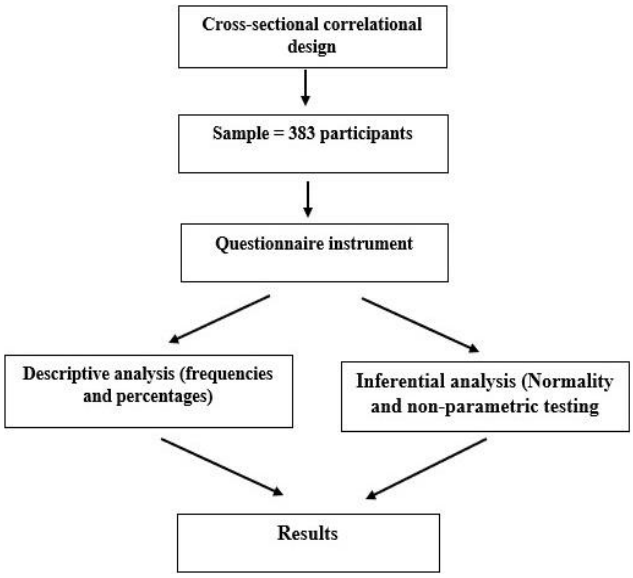

Figure 1. Quantitative analysis process.

RESULTS AND DISCUSSION

According to the results of this study, most customers who used the online delivery service of fast-food restaurants in zone 7 of Lima City were women (60.1%) compared to men (39.9%). Most users were between 18 and 29 years old (54.8%), followed by those between 30 and 35 years old (26.6%) (Figure 2 and Figure 3).

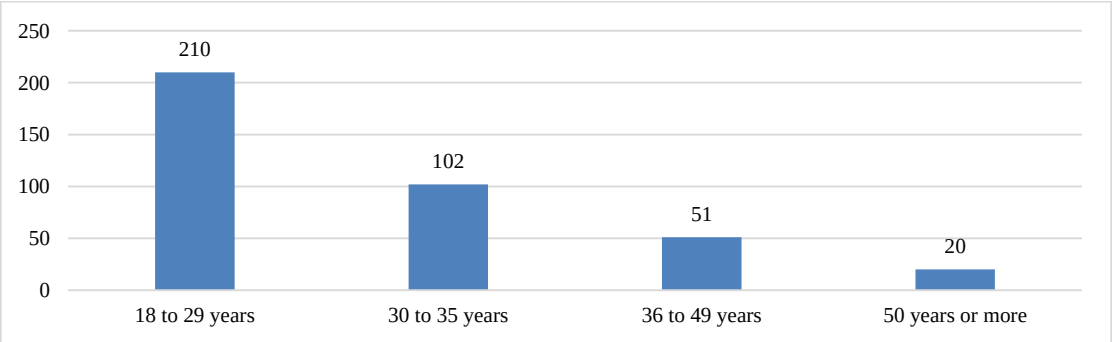

Figure 2. Survey results by age

Regarding purchasing frequency, most customers aged 18 to 29 placed orders once a month (75%), followed by 48% who bought twice a week and 44% who bought once a week. For the 30 to 35-year-old group, 52% shopped once a month, 22% twice a week, and 21% once weekly. The age groups that most frequently made purchases, whether once a month or once or twice a week, were in the 18 to 35 range (Figure 2 and Figure 3).

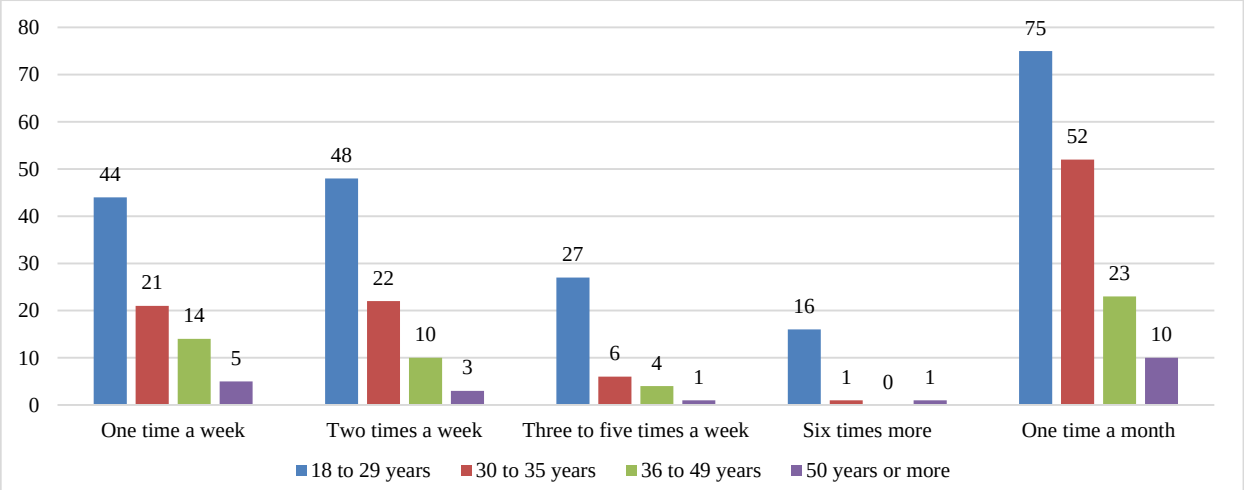

Figure 3. Survey results by age and purchase frequency

In this study, the Kolmogorov-Smirnov normality test was used to examine whether the data collected from the sample followed a parametric or non-parametric distribution and to evaluate possible correlations between the variables (Table 3).

Table 3. Normality test Kolmogorov-Smirnov sample

	Experiential Marketing (V1)	Customer Satisfaction (V2)
N	383	383
Sig. (bilateral)	.001	.052

According to the results of the Kolmogorov-Smirnov test with a sample of 383 respondents, the Experiential Marketing (V1) has a significance value (Sig.) of 0.001, which indicates a non-normal distribution. For the Customer Satisfaction (V2), the Sig. is 0.052, suggesting a possible normal distribution. Therefore, the Alternative Hypothesis (Ha) for V1 is accepted, and non-parametric tests such as Rho Spearman will be used in the analysis.

The general hypothesis was taken as Ha: There is a relationship between experiential marketing and customer satisfaction using delivery in fast food restaurants in Lima City. Ho: There is no relationship between experiential marketing and customer satisfaction using delivery in fast food restaurants *in* Lima City (Table 4).

Table 4. General hypothesis- Rho Spearman correlation coefficient result

			Customer satisfaction
Spearman's Rho	Experiential Marketing	Correlation coefficient	0.306
		Sig. (bilateral)	0.001
		N	383

Table 4 reveals a correlation coefficient (rs) of 0.306 between experiential marketing and customer satisfaction, indicating a weak positive correlation. With a bilateral significance level of 0.001, less than 0.05, the alternative hypothesis (Ha) is confirmed, and the null hypothesis (Ho) is rejected. This suggests a significant relationship between experiential marketing and customers' satisfaction using the delivery service in fast food restaurants in Lima City.

For the first specific hypothesis, the alternative hypothesis (Ha) suggests that sensory experience is significantly related to the satisfaction of customers who use the home delivery service in fast food restaurants in Lima City. Meanwhile, the null hypothesis (Ho) states that no significant relationship exists between sensory experience and customer satisfaction in this context (Table 5).

Table 5. First specific hypothesis- Rho Spearman correlation coefficient result

			Customer Satisfaction
Spearman's Rho	Experience of sensations	Correlation coefficient	0.126
		Sig. (bilateral)	0.014
		N	383

Table 5 shows a correlation coefficient (rs) of 0.126 between sensory experience and customer satisfaction. Although this correlation is weak, the two-sided significance level of 0.014 (<0.05) indicates a significant relationship. Therefore,

the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected, concluding that the sensory experience significantly relates to customers' satisfaction using the home delivery service in fast food restaurants.

For the second specific hypothesis, the alternative hypothesis (Ha) suggests that emotional experience is significantly related to customer satisfaction using the home delivery service in fast food restaurants in Lima City. The null hypothesis (Ho) states that no significant relationship exists between emotional experience and customer satisfaction in this specific context and period (Table 6).

Table 6. Second specific hypothesis- Rho Spearman correlation coefficient result

			Customer Satisfaction
Spearman's Rho	Experience of Feelings	Correlation coefficient	0.202
		Sig. (bilateral)	0.001
		N	383

Table 6 shows a correlation coefficient (rs) 0.202 between emotional experience and customer satisfaction. Although this correlation is weak, the two-sided significance level of 0.001 (<0.05) indicates a significant relationship.

Therefore, the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected, concluding that the emotional experience is significantly related to customers' satisfaction using the home delivery service in fast food restaurants. For the third specific hypothesis, the alternative hypothesis (Ha) states that the experience of thoughts is significantly related to the satisfaction of customers who use the home delivery service in fast food restaurants in Lima City. Meanwhile, the null hypothesis (Ho) maintains no significant relationship between the experience of thoughts and customer satisfaction in this context (Table 7).

Table 7. Third specific hypothesis- Rho Spearman correlation coefficient result

			Customer Satisfaction
Spearman's Rho	Thought experience	Correlation coefficient	0.079
		Sig. (bilateral)	0.125
		N	383

Table 7 shows a correlation coefficient (rs) of 0.079 between thought experience and customer satisfaction. This correlation is very weak, and the bilateral significance level is 0.125 (≥ 0.05), indicating no significant relationship. Therefore, the alternative hypothesis (Ha) is rejected, and the null hypothesis (Ho) is accepted, concluding that the experience of thoughts is not significantly related to the satisfaction of customers who use the home delivery service in fast food restaurants in Lima City. For the fourth specific hypothesis, the alternative hypothesis (Ha) suggests that the experience of actions is significantly related to the satisfaction of customers who use the delivery service in fast food restaurants. Meanwhile, the null hypothesis (Ho) states that no significant relationship exists between the experience of actions and customer satisfaction in this context (Table 8).

Table 8. Fourth specific hypothesis- Rho Spearman correlation coefficient result

			Customer Satisfaction
Spearman's Rho	Performance experience	Correlation coefficient	0.246
		Sig. (bilateral)	0.001
		N	383

Table 8 shows a coefficient (rs) of 0.246, indicating a weak positive correlation between performance experience and customer satisfaction. Furthermore, the level of bilateral significance (Sig.) was 0.001, less than 0.05, which leads to accepting the alternative hypothesis (Ha) and discarding the null hypothesis (Ho). Consequently, it is concluded that the experience of action is significantly linked to the satisfaction of customers who use the delivery service in fast food restaurants in Lima City. Finally, for the fifth specific hypothesis, the alternative hypothesis suggests a significant connection between the experience of relationships and the satisfaction of customers who use the delivery service in fast food restaurants in Lima City. On the other hand, the null hypothesis states that there is no significant relationship between relationship experience and customer satisfaction in this context (Table 9).

Table 9. Fifth specific hypothesis- Rho Spearman correlation coefficient result

			Customer Satisfaction
Spearman's Rho	Relationship experience	Correlation coefficient	0.355
		Sig. (bilateral)	0.001
		N	383

According to the data in Table 9, a correlation coefficient (rs) of 0.355 is between relationship experience and customer satisfaction. This value indicates a weak positive correlation. Furthermore, the bilateral significance level (Sig.) was 0.001, below 0.05, which leads to accepting the alternative hypothesis (Ha) and rejecting the null hypothesis (Ho). Therefore, it is concluded that the relationship experience is significantly related to the satisfaction of customers who use the delivery service in fast food restaurants in Lima City.

From the general objective of this present study, the results were verified with the general hypothesis that there is a weak positive correlation between experiential marketing and the satisfaction of customers who use delivery service in fast food restaurants, concluding that, through the use of the coefficient (rs) it was 0.306 whose bilateral Sig. level=0.000<0.05, affirming that it does have a significant relationship between the mentioned variables. These findings are in line with previous theories, in direct relation to the theory of "Strategic Experiential Modules", who maintains that companies can create and manage experiences through stimuli directed at customers since this theory was corroborated by the relationship with the experiential marketing variable and its five experience modules.

Finally, it is essential to compare the background and theories previously supported with the results of this present research since 73.1% and 83.3% of the people surveyed indicated that they "Agree" that experiential marketing positively influences the satisfaction of customers who use the delivery service.

When examining the first specific hypothesis, the first dimension, "Experience of sensations" and customer satisfaction, presents a very weak positive correlation; it was concluded that from the result, there was a coefficient (rs) 0.126 with a bilateral Sig. Level =0.014<0.05, stating that the alternative hypothesis is accepted and is supported by the fact that the experience of sensations is significantly related to the satisfaction of customers who use the delivery service. This result is contrasted through the research of Dabestani et al. (2016), who also used Li et al. (2023) "Experiential Strategic Modules" theory to analyze whether experiential marketing of sensations exists in a relationship with the satisfaction of hotel customers. Likewise, it was concluded that various sensory elements such as smell, vision, touch, sound, taste, appearance of the staff, and the establishment's infrastructure have a positive influence that generates experience in the service, increasing the satisfaction of these customers.

Similarly, Salomão & Santos (2022) argued that the experience of sensations (sensory) is the most important thing within the experiential module to create experiential value in customers when they receive the service. Regarding the "Feeling Experience," a significant positive correlation with customer satisfaction was identified, supporting the idea that emotional interactions during service influence customer satisfaction and can influence the recommendation of the service to others (Holbrook & Hirschman, 1982; Kochling, 2021). This finding is consistent with previous research and highlights the importance of stimulating positive emotions in customers to create satisfying experiences.

However, for "Thought Experience," no significant relationship was found with customer satisfaction, suggesting that although thought experience may motivate customers to think and contribute to their creativity, it is not necessarily linked to their satisfaction (Salomão & Santos, 2022). Regarding the "Performance Experience," a weak but positive relationship with customer satisfaction was observed, indicating that physical experiences during service are linked to customer satisfaction. However, some studies contradict this finding, highlighting the role of influential figures in advertising to improve customer experience (Fusté-Forné & Filimon, 2025). Finally, a weak positive correlation was found between "Relationship Experience" and customer satisfaction, supporting the importance of personalized attention and communication in the customer experience (Parasuraman et al., 1988; Anderson & Srinivasan, 2003; Salomão & Santos, 2022).

CONCLUSION

Experiential marketing is a determining factor in customer satisfaction and subsequent loyalty toward fast food establishments. In this study, it has been found that sensory experience, characterized by multisensory stimuli such as smell, sound, and taste, plays a fundamental role in generating satisfaction, which supports the proposed hypothesis. Similarly, the emotional experience, which seeks to establish emotional connections with customers through advertising and service interactions, is crucial in increasing satisfaction and improving brand perception, thus corroborating the hypothesis raised. On the other hand, the cognitive experience, focused on the customer's thought and reflection processes during the service, has not significantly influenced their satisfaction, supporting the null hypothesis.

Likewise, the performance experience, which involves the customer's physical participation and interaction with other individuals in the service process, has been revealed as a positive factor in improving customer satisfaction. Finally, the relational experience, which seeks to strengthen the ties between the customer and the company, has proven crucial to promoting long-term satisfaction and loyalty. Regarding the limitations of the study, the sample was composed of 383 participants, which is statistically representative, the results cannot be generalized to the entire population without considering possible selection biases. Selection based on age criteria may have influenced the composition of the group, privileging certain sociodemographic profiles.

Author Contributions: Conceptualization, D.G., A.M., M.R. and N.G.; methodology, D.G. and A.M.; software, A.M.; validation, D.G.; formal analysis, M.R. and N.G.; investigation, D.G., A.M.; data curation, M.R. and N.G.; writing - original draft preparation, D.G., A.M., M.R. and N.G.; writing - review and editing, M.R. and N.G.; visualization, D.G.; supervision, A.M.; project administration, M.R. and N.G. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 14.04.2025 Revised: 15.07.2025 Accepted: 11.08.2025 Available online: 09.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198
Year XVIII, vol. 61, no. 3, 2025, p.1776-1782
DOI 10.30892/gtg.61336-1546

ANALYSIS OF THE VARIABILITY OF THE ECOSYSTEM OF THE TASHKUMYR COAL MINE, KYRGYSTAN

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Citation: Donbaeva, G., Barvinok, Y., Toktorova, R., Narynbek, u.K. & Kalmanbetova, A. (2025). Analysis of the variability of the ecosystem of the Tashkumyr coal mine, Kyrgystan. *Geojournal of Tourism and Geosites*, 61(3), 1776–1782. https://doi.org/10.30892/gtg.61336-1546

Abstract: Coal plays a crucial role in global economic development and remains the most widely used fossil fuel worldwide. The exploitation of open-pit and underground coal mines certainly has an impact on the environment. This impact varies in the degree of their influence on the state and prospects of environmental services and biodiversity of coal-producing regions. Some researchers note a serious obstacle to the sustainable use of regional lands and the well-being of residents of such regions. Others believe that the problem lies in poor legislation and improper use of resources. It has been established that environmental change is the result of a combination of various factors, which determines the need for a differentiated approach to assessing their impact on specific ecosystems. The Tash-Kumyr coal mine has been in operation for almost a hundred years. Throughout this period, the economic activity of the mine has a significant impact on the environment of the region. At the same time, significant changes in local ecosystems occur, associated with the complete or partial destruction of plant species, degradation of land cover and changes in the distribution range of wildlife. Scientists began to study ecosystem changes in the region directly from the beginning of the two thousandth years. This article presents an analysis of the observations of the ecosystem of the Tash-Kumyr coal mine over the past 50 years. The history of the deposit formation, its variability, characteristics of the ecosystem and the impact of coal production on its development are given. Examples of the biological cycle of substances in the conditions of steppe ecosystems of the Tash-Kumyr coal deposit are given, and methods for restoring degraded areas are proposed. The result of the present research is the conclusion that changes in biocenoses in the area of the Tash-Kumyr coal mine are local in nature. They are not critical for the general ecosystem of the region, unlike the threats to nearby ecosystems noted in other studies. With regard to the further exploitation of the Tash-Kumyr coal deposit, we adhere to the point of view of the possibility of its further use subject to compliance with legislation and best practices. One of the options and the most promising, practically feasible way of restoring natural landscapes in the territory of the dumps and quarries observed in the study are artificial plantings of endemic plant species resistant to local conditions, a bright representative of which are plants of the genus Tamarix (*Tamarix L.).*

Keywords: Kyrgyzstan, Tash-Kumyr, coal mining, mining technologies, mining operations, deposit, ecosystem, biochemical features of the biological cycle, environmental risks

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INTRODUCTION

Tash-Kumyr is located in the north-east of the Fergana Valley, in the Jalal-Abad region of Kyrgyzstan. In the north-east it shares common borders with the city of Kara-Kul, in the north-west - with the Aksy region. The eastern borders of the city run along the Nooken region. The first settlements here arose in the pre-revolutionary period.

Industrial coal mining began in the 1930s after the completion of the construction of the railway line in the direction of Tash-Kumyr - Andijan and the opening of a small coal basin. At the same time, a small mining settlement was established. In 1933, a mine administration was founded (Jumashova et al., 2021).

The territory of Tash-Kumyr occupies the right bank of the Naryn River of the Syr-Darya basin. The Bishkek-Osh highway runs nearby. On the Andijan-Namangan line, Tash-Kumyr is connected by a railway line to the Uch-Kurgan station (Figure 1). In the 60s of the twentieth century, with the beginning of the construction of the Uchkurgan hydroelectric power station, and then the Toktogul hydroelectric power station, Tash-Kumyr became a city not only of miners, but also of builders and power engineers (the city of Kara-Kul until 1968, as an urban-type settlement, was administratively subordinate to the city of Tash-Kumyr).

Currently, the city includes the settlements of Shamalduu-Sai, Kyzyl-Dzhar and the village of Tendik (Figure 2).

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The technology of coal mining at the Tash-Kumyr coal deposit has remained unchanged throughout all the years of its operation. Mining is carried out by open-pit mining with partial involvement of blasting operations. The peak of mining occurred in the 60s - 70s of the last century. During this same period, the main changes in the ecosystem of the Tash-Kumyr open-pit mine occurred. The systemic crisis that broke out after 1991 significantly changed the situation with coal mining. For some time, the open-pit mine simply stopped working (Jumashova et al., 2021).

Coal mining in the noughties of the 21st century was carried out by small mining companies.

However, already in the early 2010s, Chinese companies received the right to use some open-pit mines. Coal mining began to increase and has now become so successful that the Tash-Kumyr - Andijan railway line, which had been idle for more than 15 years, has started working again.

Figure 1. Location of the city of Tash-Kumyr and adjacent coal mines (Source: Google Earth 1:125000)

Figure 2. General view of the northern part of Tash-Kumyr from the left bank of the Naryn River, Jalal-Abad region (Source: Authors, 2021)

The socio-political and subsequent physical changes in the region have entailed changes in all local biocenoses. These changes have common trends previously noted in other geographical coal-mining regions (Goswami, 2015; Beketova et al., 2019; Xiao et al., 2020; Zhang et al., 2022) and are directly related to changes in the biodiversity of local ecosystems. First of all, this concerns changes in the plant species composition. It has been established that changes in the ecological environment are the result of a combination of various factors (Doley, 2012), which determines the need for a differentiated approach to assessing their impact on specific ecosystems (Xiao, 2020). Considering the importance of a differentiated approach to assessing the impact of the coal mining industry on changes in the environmental situation, noted by previous studies in this area (Zhang, 2022), our observations focused on the general state of species diversity in the Tash-Kumyr region in order to determine the criticality of its change. In addition, special attention was paid to methods of reclamation of lands exposed to unfavorable factors as a result of anthropogenic impact.

METHOD

The following methods and techniques of ecological assessment of the territory were used to assess the species change of ecosystems and to form prognostic conclusions: visual observations and descriptive methods of territory assessment; comparative methods of territory assessment; botanical method of territory assessment; key site method (The key area method is a method of assessing various characteristics of an area (e.g. vegetation cover, raw material reserves, etc.) by studying small, representative areas of the area under study and then generalizing the results to the entire area); route method (The route method, or routing, is the process of selecting the best path between two points in a network) (Figure 3). The objects of observation were two sites on the territory of coal mines, located on both sides of the Naryn River. The first site (Figure 1) was located on the left bank of the Naryn River in a circle with a radius of 1 km with the center at the point $41^0 22' 28.34''$ and $72^0 15' 36.22''$. The second site (Figure 1) occupied the same area on the right bank of the Naryn River with the center at the point $41^0 22' 28.11''$ and $72^0 12' 51.77''$.

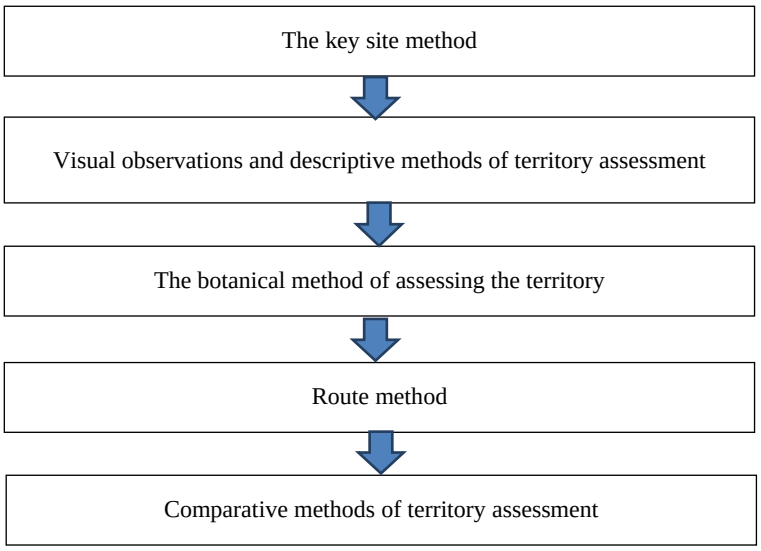

Figure 3. Stages of application of research methods

The information basis was the floristic descriptions contained in the materials of observations and experimental studies of the employees of the Research Institute Botanical Garden named after E. Gareev of the National Academy of Sciences of the Kyrgyz Republic, Kyrgyz National University named after J. Balasagyn and scientific experts. From the observational approaches, traditionally used ground data and field photographs were selected. The calculations used data from the National Statistical Committee of the Kyrgyz Republic. The basis of the proposed methods for solving the described problems was the database of regulatory legal acts of the Kyrgyz Republic.

RESULTS AND INTERPRETATION

Land use and climate are the most important factors in changes in vegetation composition and biodiversity (Treshkin, 2011; Sala, 2000). The geography, climate conditions and mining and technical characteristics of the Tash-Kumyr open-pit coal mine have had an impact on the environment of the region for the last 100 years.

This impact has been most intense over the last 50 years. In Tash-Kumyr, coal is mined in an open way, which leaves plots of land that are almost impossible to use. In this case, the existing species composition of vegetation is completely or partially destroyed, the genetic profile of the soil is destroyed (Figure 4).

Changes in habitat lead to the displacement or destruction of wild animals, deterioration of air quality, and changes in the land use process. The general profile of the earth's surface also changes (Figure 5). In place of previously existing natural landscapes, new structures (dumps) are formed, representing a catastrophic succession of natural geosystems, where the overgrowing of the disturbed surface occurs without human intervention. Previous studies have shown that the degree and speed of natural overgrowing of the soil cover with vegetation depend on the quality of overburden rocks (Chibrik et

al., 2022). The presence of toxic components in waste dumps significantly slows down or completely blocks the overgrowing process. In addition, climate, namely the water regime of the territory, has a significant impact.

The reduction in plant species diversity in the open-pit coal mine, in addition to changing the food supply of wild animals and displacing them from their usual habitat, entails a change in the biogeocenosis. The disruption of the relationships between individual components of the natural environment - between organisms, the atmosphere, water, soil and rocks - entails a change in the entire ecosystem (Mursaliev & Ernazarova, 2017; Carrick & Forsythe, 2020).

Figure 4. Dumps of unused rock cover hundreds of hectares of natural land surface North-Eastern quarry in the area of the first landfill, (Source: Author's, 2016)

Figure 5. The cut sites look like scars on the Earth - Northwest quarry in the area of the second testing ground (Source: Authors, 2021)

The overburden rocks of the Tash-Kumyr open pit are non-toxic and are represented by argillites, siltstones, sandstones and quaternary cover loams of varying thickness. The rocks of the dumps have high water permeability due to the rubble-stony fractions of argillites and fine earth of clay rocks. In combination with a small annual amount of precipitation (154.31 mm), hot summers and cold winters, quite difficult conditions are formed for the intensive development of natural vegetation. The depth and nature of the distribution of the plant root system are of great importance in the formation of the geochemical profile of the biogeocenosis. The bulk of the roots of most herbaceous plants, especially annuals, extend to a depth of 1.0–9.0 cm. The roots of some perennials (wormwood, astragalus, etc.) can reach a depth of 5.0–10 meters or more. The roots of some desert and steppe shrubs of the Kyzyl-Dzhar tract (*Caraganaleucophloea-Pyrovskia abrotanoides, Spireahypericifolia, Convolvulus pseudocantabrica, Halimodendronhalodendron, Cerasustianschanica, etc.*) deepen to 12 meters or more. The depth of distribution of the roots of most shrub plants of the desert and steppe zone of the Tegene River basin is within 3.0–8.0 meters (Mursaliev & Ernazarova, 2015; 2017).

Figure 6. Restoration of vegetation on the slopes of dumps of northwestern coal mines (Source: Authors, 2021)

The root and above-ground masses of plants are very large even in herbaceous annuals. In the horizons of maximum distribution of fine roots, the most intensive biological absorption of some elements and the release of others into the environment occurs. With the mass backfill of natural landscapes with rock, the vertical amplitude of the biological cycle of substances is significantly reduced or stops altogether, locally changing the ecosystem. The process of restoration of natural plant landscapes takes tens of years. Observations of vegetation directly in the dump zones showed that complete destruction of species does not occur. Beyond the dump territory, the species diversity of plant life noted before the development of the Tash-Kumyr coal basin is actually preserved.

At present, partial restoration of natural flora is observed in the areas of 50-60 year-old dumps. The main pioneers of the dump slopes are the following herbaceous plants: *Festucavalesiaca* – Valaisian fescue, *Poarilaxa* – narrow-leaved bluegrass, *Stipacaucasica (capillata)* – Caucasian feather grass, *Tanacetumvulgare* – common tansy, *Kochiaprostrata (L) Schrad* – prostrate kochia, *Artemisiatianschanica Krasch* – Tian Shan wormwood (Figure 6).

Among the tree species that actively inhabit waste dump areas and other previously degraded areas, it is necessary to note some species of perennial shrub plants of the genus Tamarix (*Tamarix L.*) (Barvinok et al., 2021) (Figure 7).

As for invasive plant species, which, according to some scientists, actively populate the territories of coal dumps (Goswami, 2015), we have noted the appearance of woody plants of the genus Ailanthus (*Ailánthus altíssima*) (Figure 8). However, the appearance of this plant species has been noted throughout the territory of Kyrgyzstan over the past 50 years.

Figure 7. Tamarix growth in the floodplain, tributary of the Naryn River, Jalal-Abad region (Source: Authors, 2021)

Figure 8. Ailanthus (*Ailánthus altíssima*) (right bank of the Kara-Unkur river) (Source: Authors, 2021)

It is known that, compared to underground coal mining, opencast coal mining disrupts regional land use and landscape patterns, as well as biological habitats, to a greater extent, which leads to serious changes in the functions of ecosystem services in the coal mining area and seriously hampers regional economic and social sustainable development and the well-being of residents (Caillault et al., 2012; Donbaeva & Shamshiev, 2013; Narynbek, 2022; Safarov et al., 2024).

Figure 9. Flowering Tamaix plant (southern shore of the Toktogul reservoir (Source: Authors, 2021)

Figure 10. Population of desert floodplain areas with Tamarix plants in the suburbs of Jalal-Abad (Source: Authors, 2021)

However, in the Tash-Kumyr opencast area, we cannot confirm such a trend due to the fact that the dump areas are semi-steppe, turning into semi-desert landscapes, unsuitable even for pastures. In addition to coal mining, anthropogenic

impact on the environment of the Tash-Kumyr region is also manifested in the uncontrolled development of clay quarries. During clay mining, depression funnels are formed, the area of which can reach hundreds of square kilometers. There is a shallowing or complete disappearance of nearby rivers and streams, flooding or swamping of developed areas, dehydration, salinization of the soil layer, resulting in damage to land and water resources.

Also, in the vicinity of the city of Tash-Kumyr, unlicensed mining of sand and gravel materials is carried out. The result of this is the disruption of river beds, water erosion, gully formation, which ultimately leads to possible loss of land. Observations of the vegetation of clay and sand quarries demonstrate the presence of the above-mentioned species in their species composition, but with some bias towards Tamarix. In conditions of periodic (regularly once every 2-3 years) mudflows, herbaceous vegetation takes root worse than this unpretentious shrub. Coal mining production is one of the most powerful factors of environmental destruction. The exploitation of the Tash-Kumyr coal deposit, where huge coal reserves are concentrated in a limited area, determines the inevitable transformation of natural landscapes into man-made ones, caused by subsidence of the earth's surface, extraction of minerals from the depths, formation of quarries and formation of mountains of waste dumps on an area of several hundred hectares.

CONCLUSION

Existing coal mining technologies lead to the destruction of the main components of the biosphere - the soil and vegetation cover of the earth, the upper layers of the lithosphere and hydrological conditions over large areas.

However, changes in biocenoses in the Tash-Kumyr coal mine area are local in nature. They are not critical for the overall ecosystem of the region, unlike threats to nearby ecosystems noted by other studies (Donbaeva et al., 2024). With regard to the continued exploitation of the Tash-Kumyr coal deposit, we adhere to the point of view of researchers who believe that "It is our opinion that the interest of the mining industry is better pro-tected by enshrining best practice in legislation rather than opposing it" (Amezaga & Younger, 2004:10). We also support advocates for the development of multidimensional, collaborative solutions that are based on broad participation of different social segments and take into account the diverse needs of communities (Sutrisno et al., 2024). One of the options and the most promising, practical way to restore natural landscapes on the territory of dumps and quarries are artificial plantings of endemic plant species resistant to local conditions, a bright representative of which are plants of the genus Tamarix (*Tamarix L.*) (Figure 9).

Representatives of the genus *Tamarix* are dominant in all encountered zones of tugai ecosystems in Kyrgyzstan, both degrading and newly formed (Figure 10). Tamarix is a pioneer in the colonization of various quarries, mudflow routes and alluvial floodplain deposits, which allows us to recommend its use to solve the problem of widespread degradation of tugai forests in modern rapidly changing environmental conditions.

The use of this plant species is also of great importance in the landscape construction of settlements located on sites with poor irrigation or on frankly waste lands (Barvinok et al., 2023).

Author Contributions: Conceptualization, D.G. and B.Y.; methodology, D.G., B.Y. and N.U.K.; software, B.Y.; validation, D.G.; formal analysis, B.Y., T.R. and N.U.K.; investigation, D.G., B.Y., T.R., N.U.K. and K.A.; data curation, D.G. and B.Y.; writing - original draft preparation, D.G. and B.Y.; writing - review and editing, D.G., B.Y. and N.U.K.; visualization, D.G. and B.Y.; supervision, B.Y. and N.U.K.; project administration, D.G. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 15.03.2025 Revised: 16.07.2025 Accepted: 12.08.2025 Available online: 09.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198
Year XVIII, vol. 61, no. 3, 2025, p.1783-1791
DOI 10.30892/gtg.61337-1547

RESEARCH ASPECTS OF BALNEOLOGICAL TREATMENT OF MUSCULOSKELETAL DISORDERS - REGIONAL DIFFERENCES AND CARE PATHWAYS IN HUNGARY

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Citation: Helmeczi, G., & Láczay, M. (2025). Research aspects of balneological treatment of musculoskeletal disorders - regional differences and care pathways in Hungary. *Geojournal of Tourism and Geosites*, 61(3), 1783–1791. https://doi.org/10.30892/gtg.61337-1547

Abstract: Musculoskeletal disorders (MSDs) pose a growing public health and economic challenge in Hungary, particularly in light of demographic aging and the rising prevalence of chronic diseases. These disorders significantly impair quality of life and workforce productivity. Hungary's rich balneotherapy resources offer unique opportunities for both prevention and treatment. However, access to spa treatments remains uneven across regions. The aim of this study is to explore the prevalence and regional distribution of musculoskeletal disorders and to assess the utilization of publicly subsidized spa treatments. The research seeks to map care pathways and highlight systemic inequalities in access to musculoskeletal care services. Data from three key sources—the Central Statistical Office (HCSO), the National Health Insurance Fund (NEAK), and spa service providers—were analyzed. The study uses longitudinal (1999–2023) and regional comparative methods to assess GP-reported MSD cases, rheumatology specialist visits, and subsidized balneological treatments. The number of MSD patients has tripled over two decades, reflecting both an aging population and increased disease awareness. GP and specialist records show growing demand, but spa utilization has declined in several regions, with stark territorial disparities. Budapest and the Northern Great Plain region dominate in service usage, likely due to historical infrastructure and service availability. The data indicate a systemic mismatch between need and access, especially in peripheral regions such as Szabolcs-Szatmár-Bereg County. While spas are essential to the treatment of MSDs, limited accessibility hinders equitable care. To reduce regional disparities, targeted health policy measures are needed. These include infrastructure development, expansion of publicly funded treatments, and prevention campaigns promoting physical activity. Improving equitable access to spa treatments may contribute to healthier aging and sustained labor market participation. Future research should investigate the effectiveness of spa treatments by patient group and explore ways to integrate balneotherapy more firmly into national prevention strategies.

Keywords: labour market activity, civilisation diseases, balneotherapy, health tourism, medical tourism

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INTRODUCTION

Since the 20th century, global fertility rates have been declining while life expectancy has increased, resulting in the rapid aging of populations worldwide (Zhang, 2025). In recent years, Europe's demographic situation has been described briefly as a "demographic winter[1]", we see an ageing and declining population in parallel. According to the European Commission (2023), approximately one-fifth of the population is currently aged 65 or older, and this proportion is expected to approach 30% by 2050. WHO (2024) highlights that nations face growing pressure to adapt their health and social care infrastructures to demographic shifts, particularly as aging is often accompanied by worsening health and a rising incidence of disability, which together strain the capacity to sustain quality of life and increase demands on healthcare systems (Stuck & Masud, 2022; Liotta, 2018; Xi, 2025). International data from OECD27 countries in 2021 indicate that Japan, Switzerland, and Korea had the highest average life expectancy at birth, exceeding 80 years. In contrast, countries such as the United States reported values ranging from 75 to 80 years, while the lowest life expectancy—below 75 years—was observed in Latvia, Lithuania, Hungary, and the Slovak Republic (OECD, 2023).

Changes in age structure have a significant impact on society (Bényi et al., 2021) including the labour market, as some sectors, such as health and education, have a significantly higher proportion of older workers (WHO, 2014; Csejk, 2017). Demographic changes in European societies with an ageing trend, including Hungary, have made it particularly important for workers to be in better and more balanced health, so that they can continue to work reliably and to a high standard for as long as possible. In addition to an ageing population, society is increasingly challenged by lifestyle-related civilisation diseases. Not only are these diseases becoming more common (Szakály, 2017), but they are also affecting younger and younger age groups, especially in more developed and middle developed countries (Győrffy, 2019; Szatmári, 2018; Papp, 2017; Rajovic, 2024).

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[1] The term demographic winter describes the process of population decline and ageing.

According to the WHO, nearly 80% of non-communicable diseases are preventable through four key lifestyle changes: healthy diet, regular physical activity, avoiding smoking, and limiting alcohol consumption. There are significant differences in the prevalence of these habits between European countries. According to an OECD study (2023), the proportion of adults who smoke daily was highest in Bulgaria in 2021, at nearly 29%. Hungary ranked fifth with 25%. In the same year, a report by the European Society of Cardiology (2022) showed that in Portugal, Germany, Malta, Italy and Hungary, more than 38% of the population had insufficient physical activity. According to the European Health Interview Survey (2019), Hungary has the highest preventable mortality in the EU after Lithuania and Latvia, while it ranks at the bottom of the avoidable mortality ranking after Romania, Lithuania, Latvia and Bulgaria.

According to Szatmári (2018), the health status of a country's population is influenced by many historical, social, cultural and geographical factors, but is fundamentally determined by their lifestyle. Health is a key determinant of quality of life, which is why accessible, high-quality healthcare is of paramount importance at the societal level. A healthy population fosters both individual and collective development (Neira, 2025).

The health status of the Hungarian population is quite poor by international standards (Bényi et al., 2021), and we rank among the worst in Europe for lifestyle-related chronic diseases (HCSO, 2023), so it is of paramount importance to examine and address these problems (Śledzik et al., 2023). According to the results of the 2019 European Population Health Survey, 48% of the Hungarian population has a chronic disease, and the proportion of chronic patients increases with age. Around one fifth of young people (22%), almost half of middle-aged people (48%) and more than three quarters of older people (77%) report a chronic disease (HCSO, 2019). Among the chronic diseases, musculoskeletal disorders deserve special attention, as their prevalence has been increasing in Europe in recent decades (Péntek, 2021).

According to Statista (2023), musculoskeletal disorders have shown an increasing trend for both men and women between 1999 and 2019, per 100 000 inhabitants. The incidence of musculoskeletal disorders has shown a consistent upward trend, with 2019 data indicating rates of 6,509.7 per 100,000 women and 5,122.98 per 100,000 men. Within the European Union, approximately 100 million individuals are affected by musculoskeletal discomfort (Rajovic, 2024). Globally, more than 500 million people suffered from recurrent back pain in 2020, and this figure is expected to rise to 800 million by 2050 (Ferreira, 2023). Juliette's (2021) study presents the prevalence of musculoskeletal disorders in Europe in 2019, by country. Poland (6,736.63), Hungary (6,697.15), Croatia (6,679.48) and the Czech Republic (6,568.42) have higher prevalence rates, while the United Kingdom (5,820.79), France (5,035.25), the Netherlands (4,971.69) and Ireland (4,968.54) are at the bottom of the list. Musculoskeletal disorders[2] are the second highest chronic disease in Hungary, affecting a significant proportion of the population and placing a heavy burden on the health system (Ádány, 2011).

In addition to the healthcare system, the labour market is also affected, as chronic illnesses—especially musculoskeletal pain—negatively impact employees' quality of life and work performance, increasing long-term absenteeism. Specifically, neck and limb pain can diminish the quality of life among office workers, while lower back and hip pain may lead to decreased productivity and increased absenteeism (Gürses, 2025).

In Hungary, among the chronically ill, more than one-and-a-half times as many people were absent from work for health reasons compared to the rest of the surveyed population, and the average duration of absence over 12 months was nearly two-and-a-half times longer. Compared to the average for all chronic patients, 7 percentage points fewer individuals with hypertension and 3 percentage points more with musculoskeletal disorders took sick leave (HCSO, 2019). In order to get a comprehensive picture of the health status of the Hungarian population and the prevalence of lifestyle-related diseases, especially musculoskeletal diseases, it is essential to collect and analyse medical data. GP reports are an important resource for monitoring disease prevalence and trends. This data is not only used for health care planning, but also for developing prevention and treatment strategies. Statistical reports show the evolution of more than 30 chronic diseases in Hungary since 1999. According to a study by Bényi (2021), GP reports show that the total number of illnesses requiring care exceeded 15 million in 2019 among people aged 19 and over.

So, there are nearly 2 chronic diseases per adult person in our country. Musculoskeletal disorders could be effectively prevented (Betlejewski, 2007) at all three levels of prevention, as different levels contribute differently to health maintenance. The key to primary prevention is regular, daily exercise from an early age, maintaining a healthy weight, eating a healthy diet, avoiding smoking, keeping alcohol consumption in moderation and following health and safety regulations (Feith & Falus, 2019; Berkő, 2020). Age-related mandatory screening and targeted occupational health screening are important elements of secondary prevention (Ilyés, 2023). Tertiary prevention involves reducing pain and preventing deformities with physiotherapy and medication (Gősi et al., 2022).

Together, the levels ensure comprehensive prevention of musculoskeletal disorders, from prevention of disease onset to early detection and treatment of the problems that develop. If we want to examine how lifestyle elements at the primary prevention level appear in Hungarian society, it is worth drawing on the results of the Hungarian Statistical Office. In particular, I would like to highlight the proportion of people taking regular exercise: HCSO (2019) data show that only 56% of the adult population gets enough leisure-time physical activity of at least 150 minutes per week, as recommended by the WHO, and that the proportion of people who do not get enough exercise increases with aget. Physical activity for recreational purposes declines to almost zero in adulthood (Szatmári, 2018), even though individualised physical activity at any age and in any disease state (except febrile illnesses and bleeding disorders) significantly improves quality of life and extends life expectancy (Tóth, 2021).

[2] Musculoskeletal disorders included joint wear and tear, arthritis, lumbar or spinal problems, cervical spine problems and osteoporosis.

Direction and objective of the research

In conclusion, the deterioration of the health status of the European population, including the Hungarian population, poses significant challenges to society. The wide availability of different therapeutic options, such as physiotherapy, rehabilitation and medical services, is essential for effective treatment and prevention. Tourism activities have a significant impact on a country's economy, environment, community and visitors (Chin, 2025). Hungary is renowned for its spa tourism based on medicinal waters, which is also an integral part of healthcare for musculoskeletal patients. It is a dynamic sector where the image of the destination, the infrastructure and the professionalism of the service providers have a significant impact on the motivation and health tourism intentions of tourists (Satchapappichit, 2025). The importance of health tourism is becoming increasingly important today, especially due to the health problems of an ageing population, as the balneotherapy services of domestic health tourism offer an unique solution to musculoskeletal problems (Hojcska et al., 2024).

Health tourism focuses on patients with chronic diseases, with the main objectives of prevention, cure and rehabilitation. Typically based on natural healing factors and most services are available on prescription (Szabó, 2017; Hojcska, 2017b). In Hungary, research focuses on the role of spas in the treatment of musculoskeletal disorders and the use of spa treatments. The aim is to follow the care pathways of people with musculoskeletal complaints at different levels of the health system, from general practice to specialist rheumatology clinics and spa treatments.

MATERIALS AND METHODS

The research aims to follow the life course of people with musculoskeletal disease at different levels of health care. In this study we work with secondary data, which are reliable, collected from official sources. The most important data sources include statistics from the Hungarian Central Statistical Office (HCSO), which show national data on musculoskeletal disorders in total and in terms of their regional distribution and prevalence, and reports from general practitioners' practices, which provide insights into the number of patients presenting with musculoskeletal complaints.

In addition, I take into account data on attendance at rheumatology clinics from the statistics of the National Health Insurance Fund Management (NEAK), while data on spa treatments are collected from the STADAT tables of the Hungarian Central Statistical Office. In my research, I pay particular attention to tracking the different stages of the patient journey. The first step is to look at the stage from symptom onset to GP visits, using data reported by GPs to see how many people visit a health professional with musculoskeletal complaints. Data from the Information database of the HCSO were used. The database offers a choice of three main statistical themes: population and social statistics; economic statistics; environmental statistics and cross-cutting statistics. Data on musculoskeletal disorders in adult general medical practices can be found under the population and social statistics theme, under the health tab, and under the diseases and accidents sub-page. The next point of analysis is the number of cases seen in the rheumatology department, which shows the demand for specialist care. The data are available from the National Health Insurance Fund Management. Public information on outpatient care is available from separate yearly data tables. The tables include, in addition to the name and code of the outpatient specialty, the number of presentations, the number of interventions and the total score. The research was based on the case series of the profession of Rheumatology and Physiotherapy.

Finally, the third stage of the research is to examine the use of spa treatments. Using data from the KSH STADAT tables entitled Main characteristics of spas, turnover and services provided by spas, we analysed how the use of subsidised treatments has changed in recent years. The analysis was conducted at two main levels: at the national level, which aims to identify general trends and correlations, and at the regional level, which highlights regional differences. Descriptive statistical methods were used in the analysis, which includes a time-series analysis looking at changes in MSDs between 1999 and 2023. We also made regional comparisons, which allowed us to identify differences between different regions in Hungary. The study examines the prevalence of musculoskeletal disorders in an ageing society. It highlights the economic burden of MSDs on the health care system and social security expenditure.

RESULTS

Change in the number of musculoskeletal patients registered with a general practitioner

Diseases are coded according to the International Classification of Diseases, which classifies musculoskeletal diseases as M00-M99. Patients with symptoms of these conditions present first to their general practitioner, and the numbers of cases are recorded every two years on the basis of general practitioner reports.

As a first step, registered patients aged 19 years and older[3] registered with general practitioners for major musculoskeletal diseases {Seropositive and other rheumatoid arthritis (M05, M06); Juvenile arthritis (M08); Gout (M10); Deforming spinal deformities (M40-M43); Spondylopathies (M45-M49); Bone density and bone structure disorders (Osteoporosis) (M80-M85)}. When examining the data, several aspects should be taken into account, such as the dynamics of the change in the number of patients, growth trends, and the number of patients as a proportion of the population. The results (Table 1) show how the total number of musculoskeletal patients registered with a general practitioner has changed over the years at national level. In 1999, the number of patients was 1032304, which increased to 3205738 by 2023, a significant increase of more than three times. The growth rate is not uniform: the highest increases occurred in 2007 (+22.52%) and 2009 (+37.48%), while the last years have seen stagnation or decline.

[3] It is important to note that a person can only be included once in a report for a given disease, but more than one disease can be registered for a person.

Table 1. Change in the number of musculoskeletal patients registered with a general practitioner from 1999 to 2023 (Source: Based on Hungarian Central Statistical Office. (n.d.). Informative database, own editing)

	Total number of patients	Growth (persons)	Growth %	Population (persons)	Number of patients per population
1999	1 032 304			10 253 000	10.07%
2001	1 084 518	52 214	5.06%	10 200 298	10.63%
2003	1 095 218	10 700	0.99%	10 142 362	10.80%
2005	1 141 453	46 235	4.22%	10 097 549	11.30%
2007	1 398 507	257 054	22.52%	10 066 158	13.89%
2009	1 922 712	524 205	37.48%	10 030 975	19.17%
2011	2 261 288	338 576	17.61%	9 985 722	22.65%
2013	2 577 766	316 478	14.00%	9 895 250	26.05%
2015	2 952 411	374 645	14.53%	9 815 858	30.08%
2017	3 135 196	182 785	6.19%	9 739 857	32.19%
2019	3 236 056	100 860	3.22%	9 700 272	33.36%
2021	3 230 707	-5 349	-0.17%	9 651 461	33.47%
2023	3 205 738	-24 969	-0.77%	9 599 744	33.39%

Figure 1 clearly shows a significant increase in the number of patients over the period analysed. In particular, the growth dynamics accelerated between 2007 and 2015, which may reflect increased demand for medical care. Growth then slowed down, with a slight decline in the last few years. The R^2 value is 0.936, indicating that the trend line fits the data well and that the time factor strongly explains the increase.

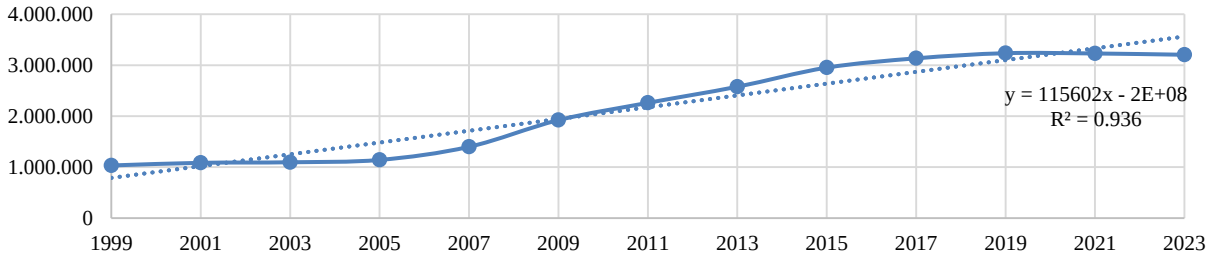

Figure 1. Change in patient numbers from 1999 to 2023 (Source: own editing)

Analysis of the data by region (Table 2) shows that all regions show an increase in the number of people with musculoskeletal disorders between 1999 and 2023. Regional differences can be observed. In Budapest there has been a significant increase, especially after 2007. In 1999, 204 651 persons were affected, while in 2023, 494 554 persons will be affected. This is more than double the increase. The regions of Western Transdanubia, Central Transdanubia, Southern Transdanubia and Northern Hungary show relatively smaller increases compared to other regions. The largest increase was in the Northern Great Plain region, where the number of patients rose from 156710 in 1999 to 60599 in 2023. The rate of growth seems to be slowing down in recent years in several regions between 2019 and 2023.

Table 2. Change in the number of musculoskeletal patients registered with a general practitioner from 1999 to 2023 by region (Source: Based on Hungarian Central Statistical Office. (n.d.). Informative database. own editing)

	Budapest	Pest	Central Transdanubia	Western Transdanubia	South Transdanubia	North Hungary	Northern Great Plain	Southern Great Plain
1999	204 651	101 851	96 009	89 663	99 474	124 096	156 710	159 850
2001	202 072	106 071	101 542	93 310	112 785	129 624	168 608	170 506
2003	191 130	110 914	105 734	95 294	122 016	128 784	170 447	170 899
2005	202 015	121 512	109 325	104 729	127 447	131 491	170 153	174 781
2007	237 238	155 472	132 337	136 931	161 764	146 190	209 492	219 083
2009	310 976	205 799	177 164	188 929	214 050	190 344	303 156	332 294
2011	324 429	242 923	204 667	225 151	261 277	258 216	371 857	372 768
2013	418 982	282 707	218 325	237 639	278 558	270 216	447 087	424 252
2015	460 569	337 336	246 904	264 803	311 734	297 840	551 482	481 743
2017	487 294	362 191	258 890	283 766	322 592	307 124	598 593	514 746
2019	503 874	390 354	265 552	302 169	326 723	318 581	620 281	508 522
2021	493 289	393 767	266 749	303 492	323 950	317 225	626 204	506 031
2023	494 554	391 366	266 454	307 607	323 600	316 329	605 599	500 229

Change in the number of outpatient specialist rheumatology attendances

Outpatient statistics available on the website of the National Health Insurance Fund of Hungary show the number of outpatient visits to rheumatology specialties from 1999 to 2023. Appearance rates in the outpatient statistics published by National Health Insurance Fund of Hungary indicate the total number of visits to a given specialty in a given period. A patient may visit the same specialty clinic more than once, so the case numbers show the total number of presentations

rather than the number of individual patients. Table 3 shows the data retrieved every two years from 1999 to 2023. At the beginning of the period under review, from 1999 to 2005, the number of outpatient rheumatology cases and the population-based rate of outpatient cases showed a steady increase. In 2007, there was a significant drop of 23% in the number of cases, followed by a steady decline from 2011 to 2019. The population has also declined, but the decline in the number of cases per population has been even faster. The year 2021 saw an outlier low of only 1.44 million cases, a 30% decrease compared to the previous two years. By 2023, the number of cases had increased slightly to 1.7 million, a 17% increase compared to 2021.

Table 3. Outpatient statistics in rheumatology (Source: Based on National Health Insurance Fund of Hungary, own editing)

	Total number of patients	Growth (persons)	Growth %	Population (persons)	Number of patients per population
1999	2 793 511			10 253 000	27.25%
2001	3 140 058	346 547	12.41%	10 200 298	30.78%
2003	3 251 983	111 925	3.56%	10 142 362	32.06%
2005	3 384 719	132 736	4.08%	10 097 549	33.52%
2007	2 592 224	-792 495	-23.41%	10 066 158	25.75%
2009	2 721 269	129 045	4.98%	10 030 975	27.13%
2011	2 607 232	-114 037	-4.19%	9 985 722	26.11%
2013	2 475 530	-131 702	-5.05%	9 895 250	25.02%
2015	2 394 966	-80 564	-3.25%	9 815 858	24.40%
2017	2 197 894	-197 072	-8.23%	9 739 857	22.57%
2019	2 068 361	-129 533	-5.89%	9 700 272	21.32%
2021	1 444 590	-623 771	-30.16%	9 651 461	14.97%
2023	1 699 196	254 606	17.62%	9 599 744	17.70%

Interpreting the data observed in Figure 2 is important for several reasons. The value R^2=0.799 suggests that the trend line fits the data relatively well, but does not fully explain the change. This suggests that the decline is not just a trend over time, but that other factors, such as structural changes in the care system, socio-economic effects or changes in patient behaviour, may have contributed. The low point in 2021 may have been caused by the COVID-19 epidemic, which led to restrictions on health services and reduced patient access to care.

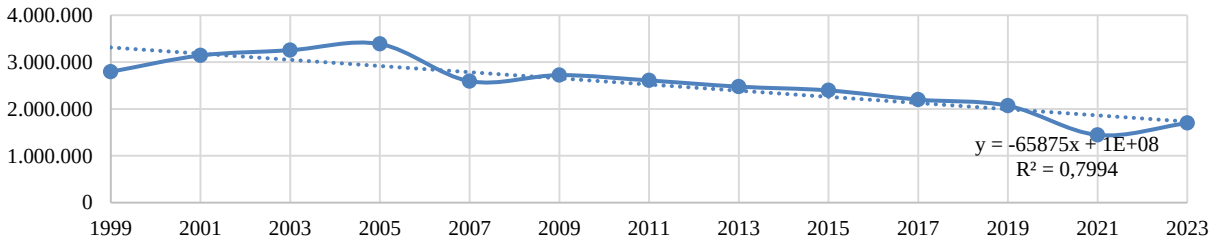

Figure 2. Change in the number of outpatient rheumatology consultations from 1999 to 2023
(Source: Based on National Health Insurance Fund of Hungary, own editing)

The data for the period analysed (Table 4) clearly show significant variations in the number of patients attending specialist rheumatology care in different regions of Hungary. The study shows that Budapest and the Northern Great Plain Region stand out in terms of patient numbers. Budapest always has the highest number of patients, which may be linked to the capital's population concentration and better access to health services. The Northern Great Plain region also shows consistently high rates, which may reflect the higher health needs of the population living there or the specificities of the care system. The data also show that the COVID-19 epidemic has had a severe impact on the care system in all regions, and although the situation is improving, the 2023 figures are not yet at pre-pandemic levels.

Table 4. Rheumatology outpatient statistics by region (Source: Vased on National Health Insurance Fund of Hungary, own editing)

	Budapest	Pest	Central Transdanubia	Western Transdanubia	South Transdanubia	North Hungary	Northern Great Plain	Southern Great Plain
1999	804 196	206 378	211 918	162 232	326 267	179 344	415 152	328 938
2001	996 677	228 394	213 760	168 479	369 108	171 834	442 217	340 592
2003	986 133	242 969	248 908	182 406	356 076	210 786	448 466	353 326
2005	974 047	264 827	269 508	233 957	390 098	234 107	436 098	392 067
2007	848 446	209 089	177 127	164 523	287 361	196 143	401 042	308 493
2009	868 847	225 302	213 424	184 281	316 642	173 167	435 249	304 357
2011	879 522	216 951	224 564	175 248	262 592	188 364	402 627	257 364
2013	837 584	224 029	232 171	183 781	216 614	201 053	333 809	250 922
2015	802 137	221 753	226 758	173 509	199 776	197 354	339 569	234 110
2017	679 121	191 362	215 810	164 996	189 603	200 003	334 769	222 230
2019	634 932	166 794	212 477	168 624	180 905	164 271	335 567	204 791
2021	486 411	102 710	157 743	116 529	123 238	101 033	223 760	133 166
2023	554 409	116 130	173 551	135 028	161 895	120 628	265 549	172 006

Change in the number of people receiving subsidised spa treatment

Spas and subsidised spa treatments play an important role in Hungary's health and tourism system. The analysis is based on the data published by the National Statistical Office (Table 5), which show changes in the number of spas, their turnover and the number of treatments subsidised by the National Health Insurance Fund of Hungary.

Table 5. Spa turnover, thousands of persons (Source: Based on HCSO, own editing)

	2011	2013	2015	2017	2019	2021	2023
Number of spas in Hungary	105	122	132	103	115	106	100
Number of persons in baths, thousands	32 023	38 394	40 241	41 363	42 051	22 413	33 762
Of which: National Health Insurance Fund of Hungary supported	2 309	2 454	2 371	2 186	2 119	973	1 262
Bath, where medical examination is available	85	105	115	103	102	86	72
Baths where medical treatment is available	108	137	146	137	141	121	114

Over the last decade, spa attendance has shown significant changes, especially in terms of persons assisted by National Health Insurance Fund of Hungary and total passenger traffic. The analysis of the period 2011-2019 (Figure 3) shows a positive picture of the evolution of the baths' turnover: during this period, the number of visitors has been increasing steadily. This growth is partly due to the modernisation of spas, the expansion of their services and the popularity of spa culture. Over the same period, the number of persons assisted by the National Health Insurance Fund of Hungary showed minor fluctuations, but overall showed a downward trend as a proportion of total passenger transport**.** This may suggest that spas are increasingly being used for tourism purposes, rather than exclusively for subsidised medical treatment.

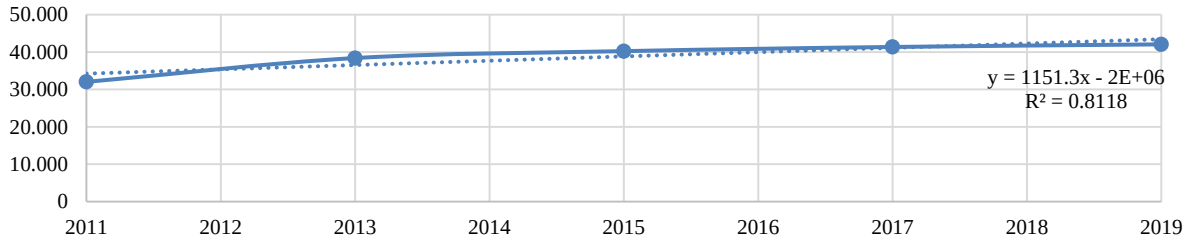

Figure 3. Baths in Hungary (2011-2019), thousands of visitors (Source: Based on HCSO, own editing)

In the following (Table 6), we examine the regional and temporal variation of National Health Insurance Fund of Hungary subsidised passenger flows of spas in Hungary, based on data collected every two years between 2011 and 2023. The analysis of the evolution of subsidised passenger transport provides an important picture of regional differences.

Table 6. Subsidised passenger flows of baths by region (Source: based on HCSO own editing)

	Budapest	Pest	Central Transdanubia	Western Transdanubia	South Transdanubia	North Hungary	Northern Great Plain	Southern Great Plain	Total
2011	520 000	24 000	50 000	575 000	110 000	162 000	438 000	432 000	2 311 000
2013	764 000	26 000	50 000	569 000	92 000	75 000	467 000	412 000	2 455 000
2015	446 000	5 000	125 000	539 000	224 000	77 000	522 000	434 000	2 372 000
2017	407 000	6 000	115 000	436 000	217 000	68 000	511 000	426 000	2 186 000
2019	358 000	28 000	99 000	490 000	200 000	56 000	513 000	375 000	2 119 000
2021	115 000	4 000	50 000	207 000	112 000	33 000	326 000	125 000	972 000
2023	198 000	45 000	62 000	245 000	136 000	30 000	317 000	230 000	1 263 000

Table 7. Musculoskeletal and rheumatological data in the Northern Great Plain Region, 2023
(Source: Based on biennial GP and National Health Insurance Fund of Hungary reports, own editing)

Data for 2023	Szabolcs-Szatmár-Bereg county	Jász-Nagykun-Szolnok county	Hajdú-Bihar county
Musculoskeletal disease data based on biennial general practitioner reports	247391	141326	216882
Published in rheumatology and physiotherapy	59 270	103 885	102 394
	23.96%	73.51%	47.21%

During the period under review, subsidised passenger transport fluctuated significantly. Budapest's prominent role is clearly visible from the data. In 2011, the capital recorded a subsidised passenger transport of 520,000 persons, which increased to 764,000 in 2013. However, this peak did not prove to be sustainable and after 2015, the number of passengers decreased steadily, reaching only 115,000 in 2021.

The Northern Great Plain has shown steadily higher figures between 2011 and 2019. In 2021, however, the Northern Great Plain also suffered a significant decline, with a drop to 326 000 visitors. The figures for 2023 (317 000 visitors) indicate that the region is only slowly recovering from the difficulties caused by the epidemic.

However, the number of patients registered by general practitioners and attending rheumatology and physiotherapy in the Northern Great Plain Region (Table 7) highlights the differences within the region. The question arises: what explains why in Szabolcs-Szatmár-Bereg county, where most patients are, only 23.96% of patients receive treatment?

DISCUSSION

The aim of this study is to follow the life course of people with musculoskeletal disorders at different levels of health care in Hungary. The research seeks to identify the specificities of patients' care pathways, from GP visits to specialist rheumatology care to spa treatments. At the same time, it explores regional differences in the care system that affect patients' access to the treatments they need. Ultimately, the research aims to contribute to reducing these gaps and to the implementation of a national strategy for the treatment and prevention of musculoskeletal disorders. Statistical studies clearly show that the prevalence of musculoskeletal disorders has increased significantly in recent years.

GP records show that the number of musculoskeletal patients nationally more than tripled between 1990 and 2023. The present research provides a detailed regional analysis within Hungary, revealing regional disparities and highlighting the role of Budapest and the Northern Great Plain in the provision of medical treatment.

This regional distribution is consistent with the findings of Hojcska (2019) that the geographical distribution of spas has a significant impact on access to care. The issue of territorial disparities has recently become a particularly topical and multidimensional problem. Láczay (2020) points out that people living in peripheral regions are increasingly feeling the threat of marginalisation. These problems are exacerbated by ethnic conflicts, border migration, a steady deterioration of the social situation, unemployment and the breakdown of educational institutions, which together create extremely difficult living conditions. Health inequalities are a major challenge in themselves.

Although medical advances have led to breakthroughs in the prevention and treatment of many diseases, disparities between different geographical areas and social groups remain significant. A minority of health inequalities are genetic or biological, but a larger proportion are the result of social and economic inequalities, as Uzzoli (2019) points out.

Territorial disparities in Hungary are not only evident in the health sector, but also in many other social and economic areas, such as unemployment and access to education. In the less developed regions of the country, uneven economic development and infrastructure deficiencies significantly limit the opportunities of those living there.

According to Fedor & Láczay (2021), generations may grow up in the border areas of the Northern Great Plain without the basic skills needed for employment due to underdevelopment. This can lead to persistent poverty, lack of social mobility and economic inactivity. Together, these contribute to a poorer quality of life, making it more difficult to lead a healthy lifestyle. Regional disparities in the prevalence of musculoskeletal disorders and related health care are a major challenge not only in Hungary but also at international level. The aim of the European Alliance of Associations for Rheumatology (EULAR) is to collect data and investigate the impact of rheumatic and musculoskeletal diseases on individuals, society and the health economy in EULAR member countries. Its strategy for 2024-2028 is guided by a vision of a world in which all rheumatic and musculoskeletal diseases are detected, diagnosed and ultimately cured or prevented (EULAR Strategy 2024 – 2028). According to the Global Burden of Disease Study (2019), an extensive assessment was conducted on 369 diseases and injuries across 204 countries spanning the years 1990 to 2019.

The results indicate that conditions such as low back pain and neck pain are major factors contributing to disability-adjusted life years (DALYs), emphasizing their relevance to global public health. The development of health care systems, economic situation and geographical location influence access to care. For example, the availability and popularity of balneotherapy treatments varies between countries and regions (Hojcska, 2024). Due to their high prevalence and shared risk factors, musculoskeletal disorders often co-occur with other chronic diseases (Rajovic, 2024).

Low back pain is a leading global cause of disability (Wu, 2020; Hoy, 2014; Chen, 2021), and its burden—both in terms of disability and cost—is expected to rise (Hartvigsen, 2018). Rajovic (2024) highlights the need for prevention through physical activity, healthy nutrition, and improved functional capacity, supported by targeted public health interventions.

CONCLUSIONS

The change in the number of musculoskeletal patients registered with a general practitioner shows that the prevalence of musculoskeletal disorders has increased significantly over the last two decades, especially between 2007 and 2015. Although there has been a slight decline in the number of spa treatments in recent years, the number of patients as a proportion of the population remains high, which may be a consequence of an ageing population and lifestyle factors, but further research is needed to investigate the age distribution of patients, particularly for prevention purposes. This raises the importance of prevention and timely treatment, on the one hand, and the strategic development of the range of services and the care system, on the other. The number of specialist rheumatology attendances is on a downward trend, especially during the COVID-19 epidemic. The data suggest that there is a need to improve the availability of specialist services and to motivate patients to actively participate.

The number of people using spas has also shown a fluctuating trend in recent years. The decrease in the number of subsidised treatments may indicate that not all patients are accessing this treatment option. It would be important to improve regional access to spa treatments. Further analysis is needed to increase the number of subsidised treatments and to bring their availability closer to eligible people. However, this requires not only the development of balneological products, but also the development of health tourism service products. The data show significant regional disparities due to differences in the availability of health services. The high figures for Budapest and the Northern Great Plain reflect

concentrated provision, as they have a long tradition of spas, while other regions show lower concentrations. Targeted new types of development are needed to reduce regional disparities.

Limitations

One of the main limitations of the study is that the data come from different sources (HCSO, National Health Insurance Fund of Hungary) and their methodologies may differ. Differences between GP (number of patients) and specialist care statistics (number of presentations) affect the accurate interpretation of the results. In addition, the number of musculoskeletal patients registered with a general practitioner includes only patients aged 19 years and over, while the population-based caseload is calculated for the total population. This methodological peculiarity may bias the results, as the population studied is actually smaller than the total population to which the data were compared.

A further challenge is the lack of reliable data on medical and health tourism in Hungary, as noted by the Hungarian Tourism Development Strategy. The absence of systematic data collection, limited scientific output from spas and universities, and the lack of coordinated research hinder both marketing and service development. Additionally, balneological research lacks institutional support in Hungary (Hungarian Tourist Agency, 2021).

Author Contributions: Conceptualization, G.H. and M.L.; methodology, G.H. and M.L..; software, G.H. and M.L.; validation, G.H. and M.L.; formal analysis, G.H. and M.L.; investigation, G.H. and M.L.; data curation, G.H. and M.L.; writing - original draft preparation, G.H. and M.L.; writing - review and editing, G.H. and M.L.; visualization, G.H. and M.L.; supervision, G.H. and M.L.; project administration, G.H. and M.L. All authors have read and agreed to the published version of the manuscript.

Funding: The research was partially funded by the Open Access publication fee support of the University of Debrecen

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: This contribution presents the results of the authors' independent research. The authors would like to thank the anonymous reviewer for their thoughtful suggestions and constructive comments that helped improve the manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 17.04.2025 Revised: 17.07.2025 Accepted: 14.08.2025 Available online: 09.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1792-1803
DOI 10.30892/gtg.61338-1548

GREEN TECHNOLOGY AS A MARKETING STRATEGY IN IMPROVING COMPETITIVE ADVANTAGES OF COMMUNITY-BASED TOURISM MSMES IN INDONESIA (SUSTAINABILITY OF CMC PANTAI TIGA WARNA)

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Citation: Kurniawati, E., & Kohar, U.H.A. (2025). Green technology as a marketing strategy in improving competitive advantages of community-based tourism msmes in Indonesia (Sustainability of CMC Pantai Tiga Warna). *Geojournal of Tourism and Geosites*, 61(3), 1792–1803. https://doi.org/10.30892/gtg.61338-1548

Abstract: Information technology advancements have occurred in the government sector, tourism-supporting industry, and the community-based economy, including digital-based tourism marketing. The digital-based marketing approach helps managers of tourism objects to innovate their promotional activities. This study aims to: (1) examine the types of digital branding media used to promote CMC Pantai Tiga Warna; (2) analyze trends in visitor numbers following the implementation of digital media in site management; (3) assess the origins of visitors; (4) evaluate the site's accessibility; and (5) assess visitor satisfaction after their visit. This study employed a mixed-methods design, combining both quantitative and qualitative approaches. Quantitative data included visitor statistics from 2022 to 2024, including the number and origin of visitors, collected through documentation and interviews with site managers. Information on the use of digital media for promotion and communication was also obtained from interviews with management. Visitor satisfaction data were gathered through structured interviews with visitors and supporting documentation. The findings confirm that CMC Pantai Tiga Warna effectively utilizes digital platforms such as an e-commerce website, Instagram (@cmctigawarna), WhatsApp, and Facebook, contributing to a steady increase in visitors from 2022 to 2024. Visitors come from Malang, other regions of Indonesia, and abroad, particularly those interested in coastal ecosystem management and mangrove conservation. The site is easily accessible by both private and rented vehicles. Visitors express high satisfaction with the range of ecotourism activities offered, including mangrove nursery programs, mangrove planting, snorkeling, diving, canoeing, and eco-brick production. A key feature is the waste management policy, which requires visitors to manage their own waste, reinforcing the site's commitment to sustainability. The study concludes that high visitor satisfaction is strongly linked to a higher likelihood of return visits to CMC Pantai Tiga Warna. Managed by the Sendang Biru community under Green Technology Marketing, the site integrates environmental sustainability with digital innovation. This community-based approach has given the site a competitive edge, making it a leading example of sustainable ecotourism in South Malang.

Keywords: competitive advantage, community-based, green technology marketing, tourism management, digital media

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INTRODUCTION

Tourism plays a significant role in improving the economy and welfare of the people. Tourism development can sustainably elevate the people's economy, and its strength in improving the economy has been proven at the national level (Ferreira et al., 2020; Zhang et al., 2020). Indonesia is one of the countries where tourism has become a central pillar of economic improvement (Sumarmi et al., 2022). Indonesia offers many tourism opportunities, and one of the most attractive tourist sites is the coastal area because 2/3 of the country is made up of the sea (Marlina et al., 2020). Most of Indonesia's coastal areas are located in rural areas, so coastal tourism development will positively affect the economy of rural people (Zamzami et al., 2025). Pantai Tiga Warna is a beach located in the southern region of Malang, within the Clungup Mangrove Conservation (CMC) area in Tambakrejo Village, Sumbermanjing Wetan District, Malang Regency (Islamiyah, 2020). Situated approximately 50 kilometers from Malang City, it is now easily accessible due to the development of the Jalur Lintas Selatan Malang, a roadway connecting Pantai Sendang Biru and Pantai Modangan. Although situated within a conservation zone, Pantai Tiga Warna has been developed as a site for tourism, recreation, and environmental education. The management model integrates ecotourism with nature conservation education (Sumarmi et al., 2022). The beach belongs to the area of rehabilitation and conservation of mangroves, coral reefs, and protected forests of Sitiarjo Village, Sumber Manjing Wetan District, Malang Regency.

Pantai Tiga Warna is managed as an ecotourism destination by the local community of Sendang Biru Village through the Yayasan Bhakti Alam Sendang Biru (Sumarmi et al., 2020). Historically, many local residents were involved in environmentally harmful practices, including forest encroachment and unsustainable fishing, which led to marine pollution.

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Through educational initiatives on environmental conservation, these communities underwent behavioral change (Marlina et al., 2020). Today, local residents are actively involved in tourism-related roles such as tour guides and coast guards. The management of the beach is based on ecological, social, and economic sustainability. As a sustainable tourism destination, Pantai Tiga Warna offers activities such as banana boating, canoeing, snorkeling, diving, and mangrove planting. The destination employs both direct and indirect communication strategies to build its brand image, involving visitors as part of its promotional efforts (Christou, 2015; Godey et al., 2016).

As an ecotourism site, Pantai Tiga Warna combines mangrove forests with underwater landscape conservation. Visitors to the CMC area experience a sense of safety and connection to nature, while also enjoying opportunities for social gatherings. In addition, tourists are encouraged to engage with local guides involved in coastal conservation, allowing them to gain educational insights into environmental preservation alongside leisure activities (Islamiyah, 2020). Designated as a Marine Protected Area (MPA), Pantai Tiga Warna enforces strict environmental regulations. Daily visitation is limited to 100 people, and all visitors are subject to inspection upon entry. Littering is prohibited, and tourists must take all their belongings and waste with them upon departure. Violators are subject to fines. Recreational activities include swimming, snorkeling, diving, boating through mangrove areas, visiting floating houses, and participating in conservation efforts such as mangrove planting, baby turtle release, and artificial coral cultivation (Sumarmi et al., 2022; Zamzami et al., 2025).

Environmental preservation is central to the site's management approach. Tourists are required to report their belongings at designated checkpoints to monitor potential waste generation (Sumarmi et al., 2022). The route to the beach offers scenic views and fresh air, reflecting the area's well-maintained environment. The beach operates daily, except on Thursdays and religious holidays, to allow for ecological recovery. Visitors are typically given approximately two hours to enjoy the site, which helps limit overcrowding and enhances the visitor experience. Pantai Tiga Warna is named for its distinctive three-colored seawater—red, green, and blue. The red hue results from sunlight penetrating water up to 20 meters deep; green arises from a mix of silt and plankton; and blue signifies deeper waters. The interplay of these colors with the brownish sand creates a striking visual effect. Facing Sempu Island, the beach benefits from calm waves, ideal for snorkeling and swimming. Visitors can also enjoy banana boat rides and scenic views from a nearby hilltop observation post, which offers panoramic views of neighboring beaches and the grandeur of Sempu Island.

The surrounding protected forest is managed collaboratively by Yayasan Bhakti Alam and the local community (Sumarmi et al., 2020). Pantai Tiga Warna lies south of Pantai Sendang Biru, the main access point to the Sempu Nature Reserve and surrounding conservation areas. The area's long coastline makes it a desirable destination for relaxation and eco-friendly tourism. Tourism development at Pantai Tiga Warna includes: (1) enhancing tourism attractions, (2) improving facilities and infrastructure, (3) marketing and promotion (Kohli et al., 2015), and (4) human resource development. These efforts emphasize environmental beauty while ensuring visitor comfort and service quality.

Indonesia is home to many coastal areas with high ecological and economic value. The development strategies used at CMC Pantai Tiga Warna align with broader community-based tourism initiatives across the country. The CMC area comprises Pantai Clungup, Pantai Gatra, Pantai Mini, Pantai Batu Pecah, and Pantai Tiga Warna. By promoting ecological sustainability, the area offers long-term environmental and economic benefits (Sumarmi et al., 2021). To ensure continued balance between tourism and conservation, a community-based management model supported by green technology and environmentally responsible marketing is essential. The Malang coastal area, particularly CMC Pantai Tiga Warna, features a diverse range of attractions, including coral reefs, rich marine ecosystems, mangrove forests, and natural landscapes. These elements appeal to both domestic and international tourists. Given its ecological richness, tourism in the region follows an ecotourism framework that emphasizes environmental sustainability (Darmansyah et al., 2021).

Development efforts within the CMC area are site-specific: Pantai Clungup focuses on mangrove education through nurseries and planting; Pantai Gatra emphasizes beach conservation and canoeing; Pantai Mini and Pantai Batu Pecah are dedicated to coastal preservation; and Pantai Tiga Warna specializes in coral reef conservation, snorkeling, and photography. All activities are coordinated by the Sendang Biru community under the oversight of Yayasan Bhakti Alam Sendangg (Sumarmi et al., 2022). Yayasan Bhakti Alam Sendang represents a Micro, Small, and Medium Enterprise (MSME) engaged in tourism management and is therefore required to implement innovative strategies to support sustainable tourism development (Abed, 2020; Ahmed, 2020; Ioannides & Gyimóthy, 2020). One such innovation is the application of Green Technology marketing, which plays a significant role in fostering sustainable business practices (Al Hadwer et al., 2021; Awa et al., 2016; Sulistyo, 2021). Strategies based on Green Technology offer several advantages, including the preservation of environmental sustainability within local communities (Dewailly, 1999; Tzoulis et al., 2018; Vázquez Loaiza et al., 2019). Tourism site managers must continuously innovate (Dearing, 2009) and seek opportunities to create and promote sustainable tourism (Brouder, 2020). Green Technology-based approaches not only enhance the visitor experience but also contribute to the long-term sustainability of tourism destinations (Cranmer et al., 2020).

Furthermore, Green Technology marketing provides an engaging way for tourism managers to offer unique experiences that encourage repeat visits (Pratika & Sutikno, 2017). The use of technology facilitates the rapid dissemination of information, including details about CMC Pantai Tiga Warna (Sanjaya, 2009). Strengthening destination branding through technological advancements and social media can significantly improve the visibility and reputation of CMC Pantai Tiga Warna. Additionally, marketing technologies such as e-commerce offer strategic solutions for tourism development and support the growth of associated MSMEs (Baker, 2012; Ramdani et al., 2013). Given the strict visitor regulations—limited to 100 individuals per day, with groups of up to 10 people allowed a maximum stay of two hours—e-commerce has become essential for business operations. Online booking systems prevent visitor dissatisfaction by ensuring that quotas are managed effectively (Raj & Jeyaraj, 2023). Moreover, e-commerce promotes transparency in managing tourist activities and services.

Tourism enterprises must remain responsive to environmental changes and leverage emerging Green Technologies to support sustainable production and consumption. These innovations aim to reduce environmental impacts while maximizing economic benefits (Thomassen et al., 2019). The adoption of environmentally friendly technologies is critical to achieving long-term positive outcomes for both tourism development and ecological preservation (Moosa & He, 2022).

MATERIALS AND METHODS

This study was conducted at CMC Pantai Tiga Warna, located in Tambakrejo Village, Sumbermanjing Wetan District, Malang Regency. A mixed-methods approach was employed, integrating both qualitative and quantitative methods (Ferreira et al., 2020; Sumarmi et al., 2022). Quantitative data included the number of visitors from 2022 to 2024 and their origin; data were collected through interviews with managers and documentation. Data on the digital media used came from managers of the site. Data on visitors' origins and satisfaction were collected using a Google form (Nguyen et al., 2022).

Quantitative data included the number and origin of visitors from 2022 to 2024. These data were obtained through interviews with site managers and through existing documentation. Information regarding the digital media used for promotional purposes was gathered from site managers. Additionally, visitor data related to origin and satisfaction were collected via an online Google Form. Data collection methods included observations, interviews, and documentation. Field observations were conducted to assess road access to the site. Semi-structured interviews were held with various stakeholders, including managers from Yayasan Bhakti Alam Sendang Biru, tour guides, checkpoint staff, mangrove planting assistants, local drivers, and visitors. Documentation comprised photographs, videos, and maps obtained through drone, camera, and satellite imagery. A Focus Group Discussion (FGD) was also conducted with site managers and members of the local community to gather deeper insights.

Quantitative data focused on elements such as branding media, visitor occupations, visitor numbers and origins, and estimated annual income. These data were analyzed using tabulations, percentages, and graphical representations (Low et al., 2022). For qualitative data analysis, Computer-Assisted Qualitative Data Analysis Software (CAQDAS) was employed, specifically MAXQDA 2020 and Gephi version 0.9. MAXQDA was used to analyze interview transcripts and descriptive responses collected via Google Forms. Gephi was utilized for generating interactive graphs and performing network analysis for data visualization (Priyanto & Farida, 2022). The qualitative results obtained through MAXQDA were subjected to further statistical analysis before being visualized using Gephi. To examine interrelations among the studied variables, data collection, processing, and visualization were undertaken. This analysis enabled the identification of connections between key influencing aspects related to sustainable ecotourism management at the study site (Zhang et al., 2020).

RESULTS AND DISCUSSION

Digital Branding Media Used for Tourism Promotion at CMC Pantai Tiga Warna

Strategies to increase the popularity of CMC Pantai Tiga Warna are crucial, as the tourism sector is a key pillar of Malang Regency's economy. Malang Regency boasts promising natural and cultural potential, with the local government planning to develop 1,000 beaches as new tourist destinations.

Technology—particularly e-commerce—has become a core component of the site's tourism marketing. A Participatory Rural Appraisal (PRA) approach was used to involve the community of Sendang Biru, while the AIDA model (Attention, Interest, Desire, Action) guided efforts to build public awareness around sustainable tourism and community-based empowerment. Branding and e-commerce initiatives, including an online reservation system, were strengthened based on empirical research findings (Baker, 2012; Gupta et al., 2022; Low et al., 2022; Nguyen et al., 2022).

While most tourism and economic activities in Malang Regency are still managed offline, CMC Pantai Tiga Warna has adopted digital technologies since 2020. The following strategies were implemented to optimize the use of digital branding media: (1) increasing the use of e-commerce technology as a supporting medium for tourism in CMC Pantai Tiga Warna; (2) enhancing operational knowledge and skills regarding e-commerce management for youth groups in CMC Pantai Tiga Warna; (3) empowering youth groups to have better knowledge and skills to manage e-commerce accounts according to research results (Raj & Jeyaraj, 2023; Ramdani et al., 2013). These initiatives have contributed significantly to the site's growing popularity. Online bookings are now mandatory for all visitors. Of the 75 respondents in the study, 70 reported making an online booking before their visit, while only five arrived without a prior reservation (Figure 1).

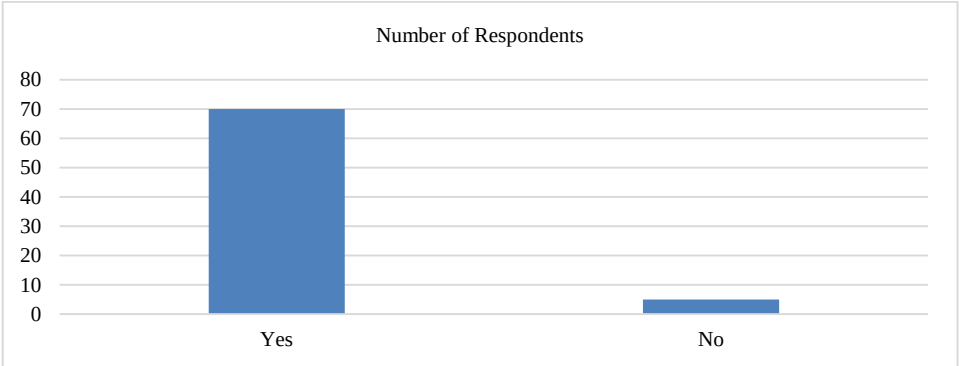


Figure 1. Digital Information-seeking Behavior Before Visiting CMC Pantai Tiga Warna

Survey data show that 90% of respondents (70 individuals) had previously visited CMC Pantai Tiga Warna and had sought information online before their trip. This underscores the critical role of digital media in tourism development. These findings align with the Technology-Organization-Environment (TOE) framework proposed by Baker (2012) and support the assertion by Kohli et al. (2015) that digital platforms are now essential for tourism marketing. This also corroborates Christou (2015) and Godey et al. (2016) who emphasized the influence of social media in shaping visitor perceptions and travel decisions. Furthermore, these results reflect Pratika & Sutikno's (2017) conclusion that digital engagement enhances pre-visit anticipation, ultimately motivating real-world visits. The findings are also consistent with Low et al. (2022) who argue that digitalization is key to the sustainability of conservation-oriented tourism destinations such as CMC Pantai Tiga Warna. Visitors used multiple platforms to access information about the site. These results are shown in Figure 2.

Respondents reported using various platforms—Facebook, official websites, WhatsApp, and Instagram—to find information. The website was the most utilized source (42 respondents or 56%), primarily due to its detailed information on travel routes, entrance fees, site regulations, and facilities. Instagram followed closely (40 respondents or 53%), appreciated for its visual content, such as real-time photos and videos of the destination. These results demonstrate the effectiveness of multi-platform digital branding in tourism development and support the application of Green Technology marketing at CMC Pantai Tiga Warna. The preference for websites—used by 42 respondents (56%)—aligns with Sanjaya's (2009) findings on the role of technology in disseminating detailed and reliable tourism information. Instagram was used by 40 respondents (53%), reinforcing the arguments of Christou (2015) and Godey et al. (2016) regarding the persuasive power of visual content in shaping travel behavior and enhancing destination appeal. The simultaneous use of multiple platforms, including Facebook and WhatsApp, aligns with Kohli et al. (2015) who emphasize the importance of integrated digital marketing ecosystems. Furthermore, the implementation of Green Technology marketing at CMC Pantai Tiga Warna illustrates the technological readiness framework proposed by Zhang et al. (2020) and the Technology-Organization-Environment (TOE) model introduced by Baker (2012), demonstrating how digital platforms facilitate sustainable tourism management. These results also echo the conclusions of Thomassen et al. (2019) and Al Hadwer et al. (2021) who highlight how digital innovations contribute to effective strategies such as visitor capacity control and transparent reservation systems.

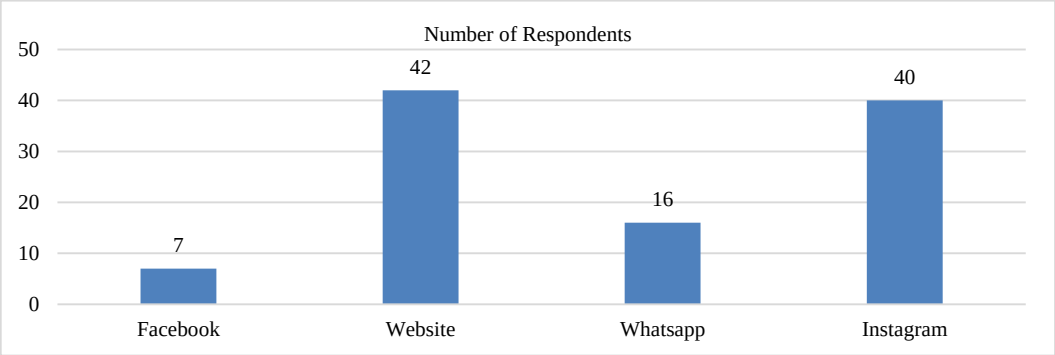


Figure 2. Digital Media Used to Look for Information Before Visiting CMC Pantai Tiga Warna

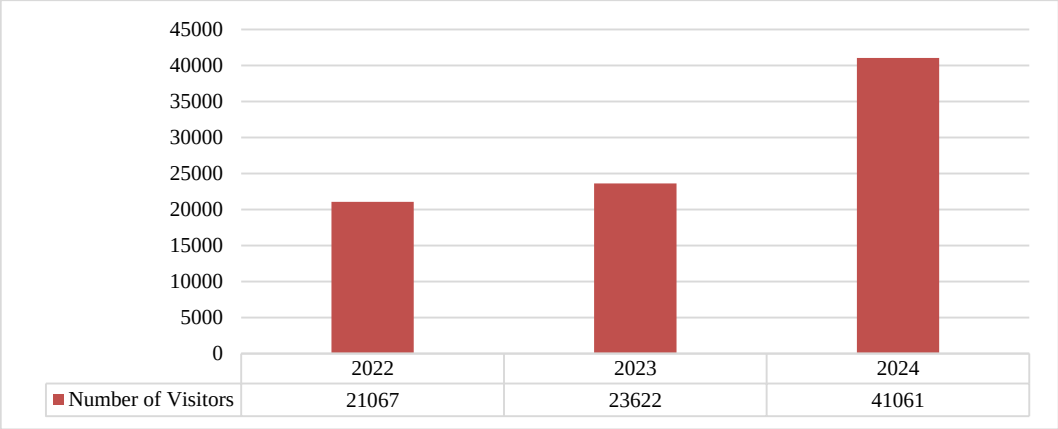


Figure 3. Total Visitors of CMC Pantai Tiga Warna from 2022 to 2024

Visitor Trends at CMC Pantai Tiga Warna Following the Implementation of Digital Media Strategies

CMC Pantai Tiga Warna is strategically located within a designated coral reef conservation area. To preserve its ecological integrity, visitor access is strictly regulated. Unlike mass tourism destinations, CMC Pantai Tiga Warna deliberately limits its visitor numbers to ensure sustainable use of natural resources. Entry is only permitted via advance online booking, and daily visitor quotas are enforced. Figure 3 presents the annual visitor numbers from 2022 to 2024, following the implementation of digital media in site management.Figure 3 shows a clear upward trend in annual visitation. In 2022, CMC Pantai Tiga Warna recorded 21,067 visitors, increasing to 23,622 in 2023—a 12.1% rise. The most notable

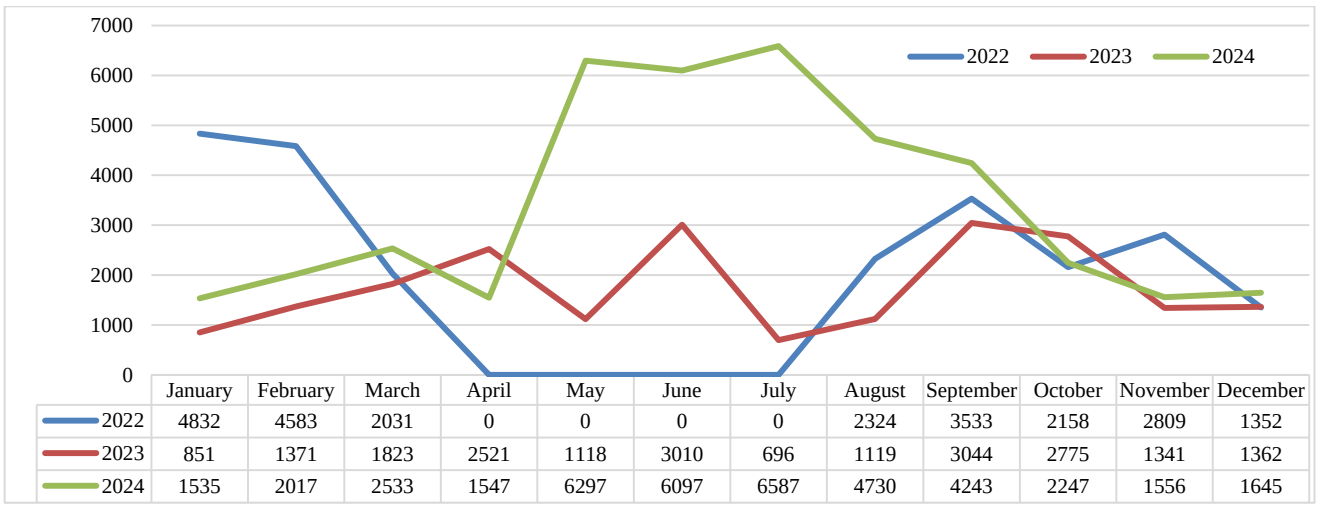
growth occurred in 2024, with 41,061 visitors, reflecting a 73.8% increase from the previous year. Over the three-year period, the total increase was 94.9%, nearly doubling the number of visitors. This growth suggests successful digital marketing efforts, improved site recognition, and enhanced visitor management practices.

These increases align with theoretical frameworks in sustainable tourism. The 94.9% growth from 2022 to 2024, especially the 73.8% surge in 2024, reflects the effective adoption of Green Technology marketing strategies Al Hadwer et al. (2021). The findings support Brouder (2020), who mentioned that conservation-based differentiation enhances destination appeal. The data also confirms Sumarmi et al. (2020), who concluded that restricted access may boost desirability by creating a sense of exclusivity. These results align with the Technology-Organization-Environment framework (Baker, 2012), illustrating how digital tools elevate the competitiveness of community-based tourism while maintaining ecological sustainability.Figure 4 illustrates the total revenue earned by CMC Pantai Tiga Warna from 2022 to 2024, corresponding with the increase in visitor numbers during this period.

	1	2	3
Year	2022	2023	2024
Revenue	Rp1.030.226.000,00	Rp1.297.690.200,00	Rp1.811.174.995,00

Figure 4. Total Revenue of CMC Pantai Tiga Warna from 2022 to 2024

The revenue growth parallels visitor numbers, confirming the economic benefit of integrating digital media with conservation strategies. Green Technology marketing has effectively conveyed CMC Pantai Tiga Warna's identity as a conservation-first destination. When visitor quotas are reached, the reservation system automatically closes, helping limit environmental strain. The beach is closed every Thursday and on religious holidays, including New Year's Day, to allow for natural ecosystem recovery. Figure 5 highlights monthly visitor fluctuations from 2022 to 2024



	January	February	March	April	May	June	July	August	September	October	November	December
2022	4832	4583	2031	0	0	0	0	2324	3533	2158	2809	1352
2023	851	1371	1823	2521	1118	3010	696	1119	3044	2775	1341	1362
2024	1535	2017	2533	1547	6297	6097	6587	4730	4243	2247	1556	1645

Figure 5. Number of Monthly Visitors from 2022 to 2024

The line graph (Figure 5) illustrates monthly visitor numbers at CMC Pantai Tiga Warna from 2022 to 2024, highlighting significant shifts in visitation patterns over the three-year period. In 2022 (blue line), visitation started strong in January and February with approximately 4,800 visitors, but ceased entirely from April through July. Activity resumed in August, with a secondary peak in September (3,533 visitors). In contrast, the 2023 data (orange line) show consistent year-round visitation, with moderate fluctuations and notable peaks in June (3,010 visitors) and September (3,044 visitors). By 2024 (gray line), a marked transformation occurred, characterized by significantly higher mid-year visitation. The peak was recorded in July, with 6,587 visitors—the highest monthly total across the entire three-year span. These evolving trends indicate a shift in peak seasonality from early in the year (2022) to mid-year (2024), suggesting changes in site management, promotional strategies, or broader external influences shaping visitor behavior. The transition from partial operations in 2022 to continuous service with concentrated peak seasons in 2024 reflects CMC Pantai Tiga Warna's

adaptive development as an ecotourism destination. These shifting visitation patterns underscore the successful application of adaptive management strategies within a conservation-based tourism framework. The progression from limited access and seasonal peaks to consistent, strategically managed operations is consistent with the framework of tourism transformation pathways by Brouder (2020). It also reflects the concept of strategic operational reconfiguration discussed by Ioannides & Gyimóthy (2020) aimed at maintaining sustainability while enhancing visitor experience.

The significant rise in visitors by 2024, especially the July peak, supports findings by Christou (2015) and Godey et al. (2016) regarding the role of digital branding in increasing destination appeal. This transformation illustrates the relevance of the Technology-Organization-Environment (TOE) framework described by Nguyen et al. (2022), emphasizing how digital technologies can improve visitor management. According to Zhang et al. (2020) technological readiness is essential for enabling green innovation in environmentally sensitive areas. The experience at CMC Pantai Tiga Warna reflects this, as the site continues to balance conservation objectives with growing tourist demand (Sumarmi et al., 2021; Thomassen et al., 2019).

Occupations and Origins of Tourists Visiting CMC Pantai Tiga Warna

Questionnaire results on the occupations and origins of people visiting CMC Pantai Tiga Warna are elaborated as follows. Questionnaire data collected from 75 respondents revealed a diverse visitor profile regarding occupation and origin. Most respondents were university students (30 individuals) and lecturers (28 individuals), highlighting a strong academic connection to the site. Other respondents included civil servants, private employees, teachers, and laboratory assistants. The prominence of students and lecturers is understandable given that Malang is widely known as a center of higher education, with numerous universities and academic institutions. This concentration of academic professionals suggests that CMC Pantai Tiga Warna is not only a recreational destination but also serves educational purposes, particularly in environmental studies and conservation awareness. Figure 6 shows that university students make up the largest group of visitors, totaling 30 people (39.5%), followed closely by lecturers at 28 people (36.8%). Civil servants accounted for 8 visitors (10.5%), while teachers represented 7 visitors (9.2%), and private employees comprised only 3 visitors (3.9%). Students and academic professionals collectively represented over three-quarters of all respondents (76.3%). This occupational profile indicates that CMC Pantai Tiga Warna is an informal learning environment, likely used for field studies, research, and environmental education activities. The low proportion of private-sector employees suggests that the site may have limited appeal to recreational tourists with no educational intent.

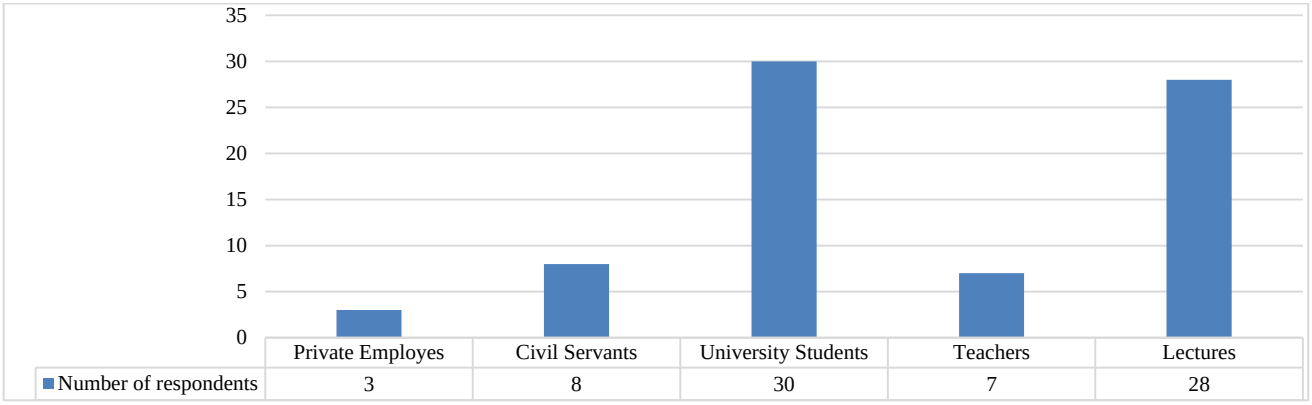


Figure 6. Occupations of Respondents Visiting CMC Pantai Tiga Warna (Source: Research Data, 2024)

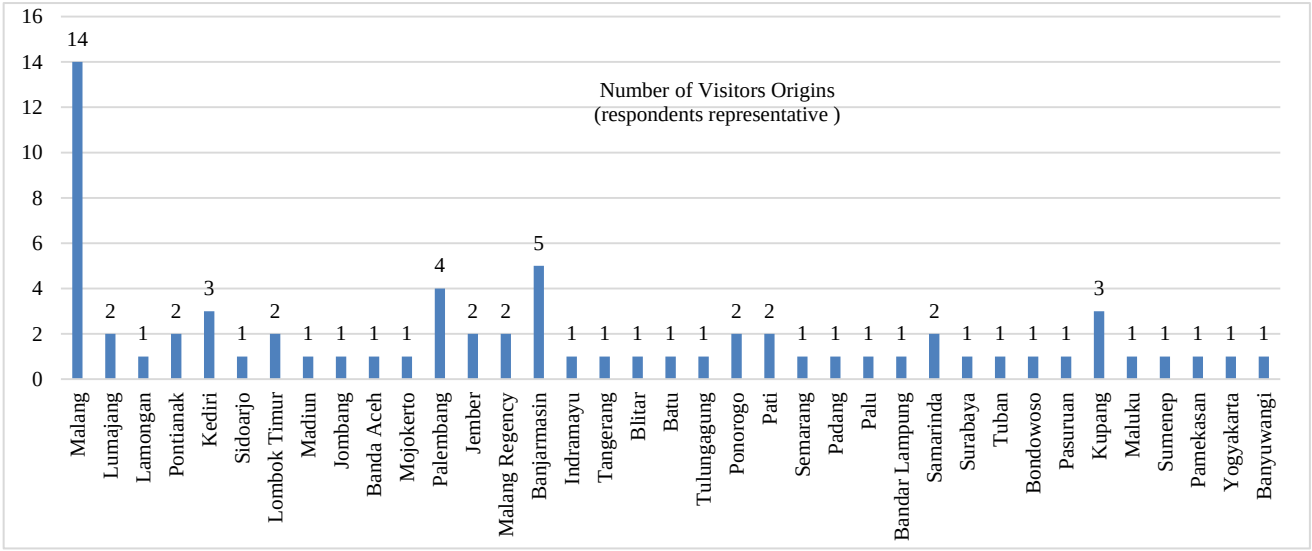


Figure 7. The Origin of Respondents Visiting CMC Pantai Tiga Warna (Source: Research Data, 2024)

As shown in Figure 7, most respondents to CMC Pantai Tiga Warna came from Malang, consistent with the city's role as a regional education hub. However, respondents also reported coming from other areas across Indonesia, including West Kalimantan, East Kalimantan, South Kalimantan, Aceh, Palembang, Palu, and East Nusa Tenggara. One respondent indicated they were visiting from Malaysia, highlighting the site's growing international visibility. Many of these non-local respondents visiting the site were likely students studying in Malang, further emphasizing the educational function of the site.

These findings suggest a clear opportunity for strategic marketing to reach wider regional and international audiences. Digital media and online branding platforms can play a pivotal role in promoting the site's dual identity, as both a conservation area and an educational destination, thereby attracting a more diverse visitor base in the future.

Visitors' Satisfaction with Accessibility at CMC Pantai Tiga Warna

Visitor satisfaction is a crucial indicator of a tourist site's long-term appeal. Based on survey responses, the majority of respondents expressed high satisfaction with their experience at CMC Pantai Tiga Warna (Figure 8).

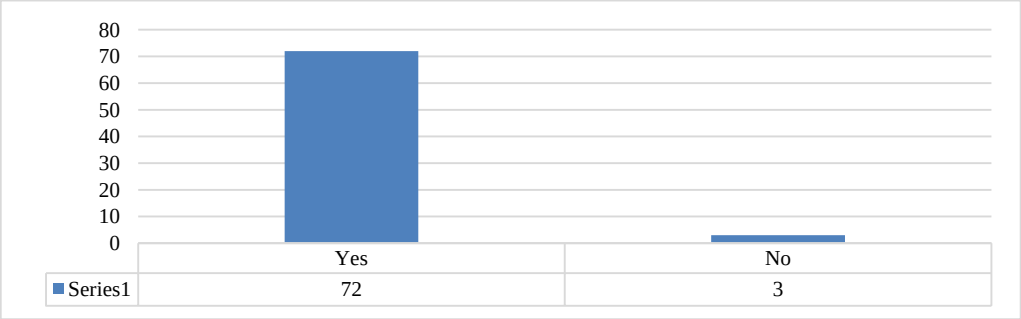


Figure 8. Respondents' Opinions on Accessibility of CMC Pantai Tiga Warna

Figure 8 presents respondents' responses to the question: "Did you have a good time while visiting?" Out of 75 respondents, 72 (96%) answered "Yes," while only 3 (4%) responded "No." This overwhelming majority reflects exceptionally high satisfaction levels, suggesting the site consistently meets their expectations. The minimal negative feedback implies that while some aspects may require improvement, any issues are likely minor and not widespread.

Accessibility remains a key area of concern to ensure continued satisfaction, especially since ease of access affects the overall experience. Table 1 summarizes visitors' feedback on various accessibility aspects. This table offers a detailed view of respondents' perspectives on accessibility. The most frequently cited positive feature was the availability of a spacious parking lot (16.38%), followed by easy access to the site and the option to take a boat from Sendang Biru (both 12.07%). These three features accounted for over 40% of the responses, underscoring their importance in shaping the visitor experience.

Table 1. Accessibility of CMC Pantai Tiga Warna (Source: Primary Data by Maxqda (Source: Research Data, 2024)

	Segments	**Percentage**
There is a spacious parking lot	19	16.38
The site has an easy access	14	12.07
We can take a boat from the parking lot in Sendang Biru	14	12.07
It is easy to reach the site by private vehicle	9	7.76
We have to walk rather far from the parking lot	9	7.76
The route of *Jalur Lintas Selatan* (JLS) is available	9	7.76
The roads to the site are good	7	6.03
Guides are available to show directions	7	6.03
The site is accessible through google maps	6	5.17
There are several damaged roads to the beach	6	5.17
It is only a tiny entrance to the parking lot	5	4.31
There are lots of directional signs	4	3.45
There are precise tourist itineraries	3	2.59
There is no public transport	2	1.72
It is easy to reach the site by using a rental car	2	1.72
TOTAL	116	100.00

The ease of reaching CMC Pantai Tiga Warna by private vehicle (7.76%) and the availability of the Jalur Lintas Selatan (JLS) route (7.76%) are important factors that enhance the site's accessibility. However, respondents also identified several challenges. These include the need to walk a relatively long distance from the parking area to the beach (7.76%), damaged road sections along the route (5.17%), and a narrow entrance to the parking area (4.31%).

The lack of public transportation (1.72%) is another obstacle, particularly for those without private vehicles. On the positive side, supporting features such as clear directional signage (3.45%), the presence of local guides (6.03%), and access through Google Maps (5.17%) help improve the visitor experience. These insights are valuable for site managers in identifying priorities for improving infrastructure and ensuring more convenient access to the destination. The specific factors influencing accessibility are further illustrated in Figure 10.

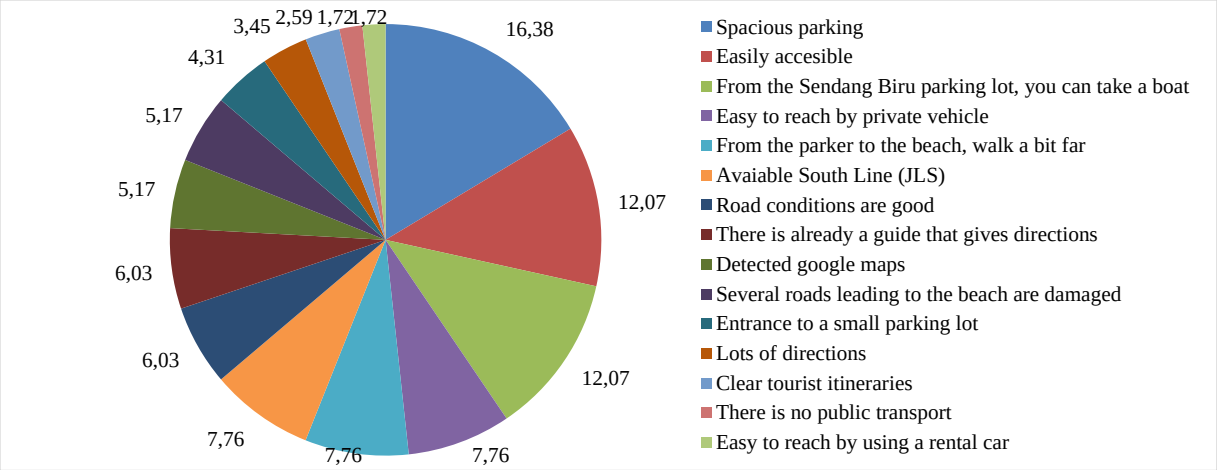


Figure 9. Subcodes Statistics on Accessibility to CMC Pantai Tiga Warna (Source: Primary Data by Maxqda; Research Data, 2024)

Figure 9 presents a detailed breakdown of accessibility features at CMC Pantai Tiga Warna based on respondents' perceptions. The visualization categorizes the various factors that shape the site's accessibility profile. The most prominent feature identified is the availability of spacious parking facilities, cited by 16.4% of respondents. This is followed by two equally significant factors: ease of access (12.1%) and the option to take a boat from the Sendang Biru parking lot (12.1%). Together, these three key elements account for over 40% of all accessibility-related responses, underscoring their importance in shaping the visitor experience. Three additional factors—easy access by private vehicle, the need to walk from the parking area to the beach, and the availability of the South Line (JLS) route—each received 7.8% of responses. Road conditions and the availability of guides were noted by 6.0% of respondents, indicating a moderate level of importance. Digital navigation via Google Maps and concerns about damaged road conditions were each mentioned by 5.2% of respondents. Less frequently mentioned but still relevant features include the small parking lot entrance (4.3%), directional signs (3.4%), clear tourist itineraries (2.6%), lack of public transportation (1.7%), and accessibility via rental cars (1.7%). This distribution indicates that while CMC Pantai Tiga Warna offers several strengths in terms of accessibility, particularly regarding parking capacity and transportation options, areas such as road infrastructure, public transport availability, and directional signs require further attention. These findings provide valuable input for strategic planning aimed at improving overall visitor accessibility to this coastal destination. Figure 11 shows detailed insights into visitor satisfaction.

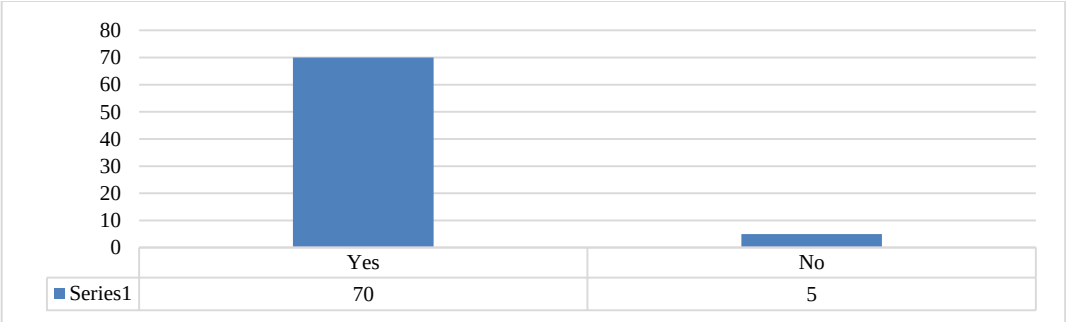


Figure 10. Respondents' Satisfaction after Visiting CMC Pantai Tiga Warna (Source: Research Data, 2024)

Figure 10 illustrates the levels of visitor satisfaction at CMC Pantai Tiga Warna, based on responses to the direct question: "Are you satisfied after visiting CMC Pantai Tiga Warna?" The survey collected feedback from 75 respondents. An overwhelming majority—70 respondents (93.3%)—indicated satisfaction by answering "Yes," while only 5 respondents (6.7%) expressed dissatisfaction by responding "No." This highly positive distribution suggests that CMC Pantai Tiga Warna is largely successful in meeting visitor expectations across multiple dimensions of the tourism experience. The exceptionally high satisfaction rate serves as a strong indicator of effective site management and service provision. The minimal level of dissatisfaction, representing fewer than 7% of responses, likely reflects isolated concerns rather than widespread issues affecting the overall experience. These results are consistent with findings in contemporary tourism research, which indicate that high visitor satisfaction is closely associated with increased likelihood of repeat visits and favorable word-of-mouth recommendations, both of which are essential for the sustainable development of coastal tourism destinations. Table 2 presents further details regarding the factors influencing visitor satisfaction. Table 2 provides a detailed analysis of the key factors contributing to visitor satisfaction at CMC Pantai Tiga Warna, offering a nuanced understanding of the elements that shape the overall visitor experience. Among the various satisfaction drivers, the site's natural beauty is the most significant, cited by 20.86% of respondents. This is closely followed by cleanliness (19.42%), which respondents attributed to the site's policy requiring visitors to manage their own waste. Combined, these two factors—both related to environmental quality—account for over 40% of responses, highlighting the central role of nature and cleanliness in shaping positive visitor experiences.

Table 2. Satisfaction after Visiting CMC Pantai Tiga Warna (Source: Primary Data by Maxqda (Source: Research Data, 2024)

	Segments	Percentage
Nature is beautiful	29	20.86
The site is clean because visitors are required to clean their trash	27	19.42
The management is very good with an excellent service	16	11.51
The guides are very competent	16	11.51
There are environmental conservation activities, such as planting mangroves	11	7.91
It is for educational and recreational tourism	9	6.47
The atmosphere is very comfortable because of the limited number of daily visitors	8	5.76
The site has complete facilities	5	3.60
There must be reservations to limit the number of visitors	4	2.88
Tourist attractions are available	4	2.88
There are many choices for objects to visit	3	2.16
It has lots of photo spots	3	2.16
The managers are friendly	1	0.72
Interesting tracking is available	1	0.72
It costs little to visit	1	0.72
The information is clearly presented on boards or signs	1	0.72
TOTAL	139	100.00

Service-related aspects also feature prominently. Both effective site management and the competence of guides were each mentioned by 11.51% of respondents. Environmental conservation activities, particularly mangrove planting, contributed 7.91% to overall satisfaction, while the site's dual function as both an educational and recreational destination accounted for 6.47%. Controlled visitor management—specifically the limitation on daily visitor numbers—was identified by 5.76% of respondents as enhancing comfort and overall enjoyment. This strategy is supported by the reservation system, which accounted for 2.88% of satisfaction-related responses. In terms of infrastructure and amenities, factors such as the availability of complete facilities (3.60%), diverse attractions (2.88%), a variety of sites to explore (2.16%), and numerous photo spots (2.16%) together make up approximately 11% of satisfaction responses. Overall, the data suggest that visitor satisfaction at CMC Pantai Tiga Warna is primarily driven by its natural environment and effective management practices, particularly those related to environmental cleanliness and conservation. In contrast, built infrastructure and conventional tourism amenities play a secondary role. A visual representation of these contributing factors is provided in Figure 11.

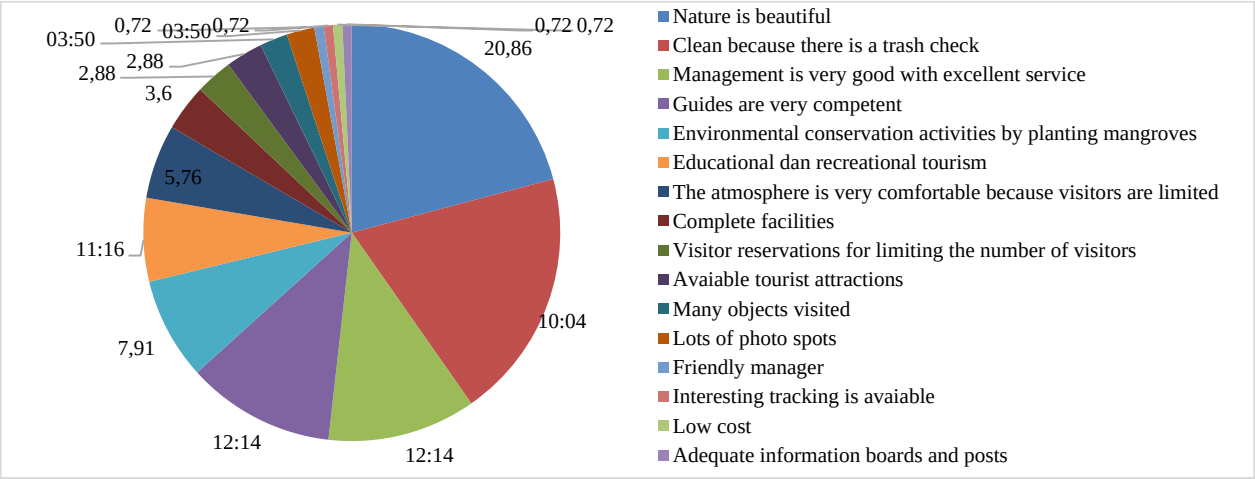


Figure 11. Subcodes statistics on satisfaction after visiting CMC Pantai Tiga Warna (Source: Primary data by Maxqda Maxqda; research data, 2024)

Figure 11 presents a detailed breakdown of the factors contributing to visitor satisfaction at CMC Pantai Tiga Warna. The visualization effectively categorizes the key elements that collectively shape the visitor experience. Natural beauty emerges as the most significant factor, cited by 20.9% of respondents. This is closely followed by cleanliness (19.4%), which respondents specifically linked to the site's trash check policy. Together, these two environmentally focused factors account for over 40% of all satisfaction-related responses, highlighting the critical importance of environmental quality in shaping positive visitor experiences. Service quality also plays a prominent role, with both effective site management and the competence of guides each mentioned by 11.5% of respondents. Environmental conservation efforts, particularly mangrove planting activities, contribute an additional 7.9%, while the site's dual function as an educational and recreational tourism destination accounts for 6.5%. Visitor management strategies, including limits on daily visitors, were noted by 5.8% of respondents as enhancing comfort and experience, a system further supported by the reservation policy (2.9%). Infrastructure- and amenity-related factors played a less dominant role, with complete facilities (3.6%), the availability of tourist attractions (2.9%), diversity of visitable sites (2.2%), and photography opportunities (2.2%) making modest contributions to satisfaction. Several additional elements, though less frequently mentioned, still registered as relevant contributors: approachable and courteous management (0.7%), engaging trekking routes (0.7%), affordability

(0.7%), and clear informational signage (0.7%).Overall, the findings indicate that visitor satisfaction at CMC Pantai Tiga Warna is primarily driven by its natural environment and effective site management, particularly concerning cleanliness and conservation, rather than traditional infrastructure or standard tourism amenities.

Social Analysis of Network Accessibility and Visitor Satisfaction at CMC Pantai Tiga Warna

Figure 12 presents a concept map or network diagram that visualizes the interconnections among various factors contributing to the visitor experience at CMC Pantai Tiga Warna. The diagram highlights the relationships between key elements such as trekking routes, parking, cleanliness, the trash check policy, guide services, and other related components. These interconnected factors collectively shape both accessibility and visitor satisfaction, offering a comprehensive view of how site management strategies and physical features work together to influence the overall visitor experience.

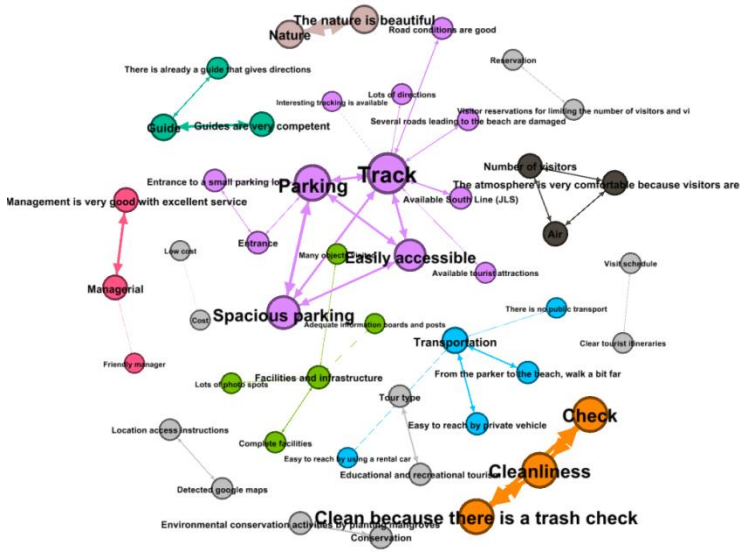


Figure 12. Factors Influencing Visitor Satisfaction at CMC Pantai Tiga Warna (Source: Research Data, 2024)

The questionnaire results confirm that the majority of respondents enjoyed their experience at CMC Pantai Tiga Warna, with 72 out of 75 individuals (96%) stating that they were satisfied with their visit. Visitors particularly appreciated the site's natural beauty and the management approach that prioritizes environmental preservation through limited daily access. This strategy fosters a peaceful atmosphere, allowing visitors to fully enjoy their time at the destination.

As an ecotourism site, Pantai Tiga Warna offers a unique combination of mangrove forests and underwater landscape conservation. These characteristics not only promote a sense of safety and harmony with nature but also support meaningful experiences for visitors, including private gatherings in a serene environment. The site is managed by 107 members of the local community. Notably, many of these individuals previously worked as forest encroachers or practiced unsustainable fishing methods that contributed to marine pollution. Through sustained environmental education initiatives, significant behavioral changes have been observed within the surrounding community. Today, local residents actively contribute to tourism operations as tour guides, coastal guards, and other support roles. The management of CMC Pantai Tiga Warna is guided by three core principles: ecological sustainability, social inclusion, and economic empowerment. In recognition of its commitment to sustainable tourism, the Ministry of Tourism and Creative Economy designated the site as part of the *Towards Climate Positive Tourism through Decarbonization and Ecotourism* program, which was officially launched on July 6, 2022. The program seeks to promote environmentally friendly tourism practices to mitigate global warming.

While many organizations pursue green innovations in support of sustainable development, not all initiatives achieve success. Drawing on the Technology–Organization–Environment (TOE) framework, this study examines the readiness of businesses, including micro, small, and medium-sized enterprises (MSMEs), to adopt green innovations in terms of technological, organizational, and environmental preparedness (Zhang et al., 2020). The framework suggests that necessary and sufficient conditions within each dimension facilitate the successful implementation of green innovation, thereby contributing to competitive advantage and improved environmental and organizational performance.

In alignment with this framework, we adopted a general model incorporating specific technological, organizational, and environmental factors to examine the adoption of green technologies by businesses in various contexts (Aboelmaged, 2018; Chege & Wang, 2020; Ferreira et al., 2020; Hue, 2019). Unlike traditional technology adoption, green innovation is a long-term process that involves substantial changes and associated risks. Organizations that are well-prepared in terms of technological capacity and internal and external environments are more likely to manage these risks effectively.

As reflected in feedback from respondents, the visit to CMC Pantai Tiga Warna reinforces the importance of environmental conservation. Visitors widely agree that nature must be protected and that individuals are responsible for managing their own waste during and after their visit.Based on the analysis and discussion, it can be concluded that tourist motivation, destination image, and ecotourism experience are significant predictors of revisit intention. A more favorable image of CMC Pantai Tiga Warna, combined with a positive ecotourism experience, increases the likelihood that visitors will return. Moreover, the ecotourism experience and visitors' environmental concerns serve as mediating factors between

motivation and revisit intention. The most influential factor in this study was the direct relationship between ecotourism experience and revisit intention. However, the mediating effect of environmental concern suggests that tourist motivation can also enhance revisit intention when supported by memorable and meaningful ecotourism experiences.

These findings further support the Theory of Planned Behavior (Huang & Liu, 2017), which posits that while environmental concern may not be the primary reason tourists choose ecotourism destinations, it plays a crucial mediating role between motivation and behavioral intention in such contexts.

CONCLUSION

The findings of this study confirm that CMC Pantai Tiga Warna has effectively utilized a range of promotional and marketing platforms, including an e-commerce-based website, Instagram (@cmctigawarna), WhatsApp, and Facebook. Visitor numbers have shown a notable increase from 2022 to 2024, attracting not only tourists from Malang but also from other regions of Indonesia and abroad—particularly individuals interested in coastal environmental management and mangrove conservation. Questionnaire responses indicate that the destination is easily accessible by private or rented vehicles. Respondents expressed high satisfaction with their visit, citing various engaging activities such as mangrove nursery and planting programs, snorkeling, diving, canoeing, eco-brick demonstrations, and opportunities for relaxation. One distinctive feature of the site is its policy requiring visitors to manage their own waste, reinforcing environmental responsibility as part of the ecotourism experience. The high satisfaction levels reported by respondents suggest a strong likelihood of repeat visits. The local community of Sendang Biru manages CMC Pantai Tiga Warna under a Green Technology Marketing framework, which has given it a competitive advantage over other beaches in the South Malang region. The successful implementation of this strategy has significantly contributed to increased visitor numbers and enhanced satisfaction, particularly through effective digital media engagement.

These findings underscore the potential of community-based tourism destinations to achieve sustainable competitive advantage by integrating environmental conservation with high-quality visitor experiences. The case of CMC Pantai Tiga Warna demonstrates that a balanced approach—grounded in local participation, digital innovation, and ecological responsibility—can drive both tourism development and long-term sustainability.

Author Contributions: Conceptualization, E.K., and U.H.A.K.; methodology, E.K., and U.H.A.K.; software, E.K., and U.H.A.K.; validation, E.K., formal analysis, E.K.; investigation, E.K.; data curation, E.K.; writing - original draft preparation, E.K.; writing - review and editing, E.K., and U.H.A.K.; visualization, E.K.; supervision, U.H.A.K.; project administration, E.K. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Informed Consent Declaration: All participants have verified the information they provided and have authorized its use for public purposes.

Acknowledgements: We extend our sincere appreciation to the management team of CMC Pantai Tiga Warna, particularly *Yayasan Bhakti Alam Sendang Biru*, for granting access to their facilities and generously sharing insights into their green technology marketing strategies. We are also grateful to the local government stakeholders of Tambakrejo Village and Sumber Manjing Wetan District for their time, cooperation, and valuable support throughout the field research process. Special thanks are due to all survey respondents and interview participants who provided meaningful reflections on their experiences and perceptions of CMC Pantai Tiga Warna. Lastly, we acknowledge the constructive feedback and academic input from colleagues at Universiti Teknologi Malaysia and Universitas Negeri Malang, which significantly contributed to the refinement and overall quality of this research.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 23.03.2025 Revised: 18.07.2025 Accepted: 15.08.2025 Available online: 15.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1804-1813
DOI 10.30892/gtg.61339-1549

GIS-BASED ASSESSMENT OF THE TRANSPORT ACCESSIBILITY OF THE MATERIAL ANTHROPOGENIC TOURIST RESOURCES IN SOFIA, BULGARIA

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Citation: Stoyanova, V., Kazakov, B., Ravnachka, A., Patarchanova, E., Roukova, P., & Gartsiyanova, K. (2025). GIS-based assessment of the transport accessibility of the material anthropogenic tourist resources in Sofia, Bulgaria. *Geojournal of Tourism and Geosites*, 61(3), 1804–1813. https://doi.org/10.30892/gtg.61339-1549

Abstract: The study aims to present a GIS-based assessment of the transport accessibility of the material anthropogenic tourist resources (historical, architectural, religious, and cultural-institutional) in the city of Sofia, Bulgaria. The method used in the study in order to achieve the objective is measuring the walking distance with the use of the ORC tool in QGIS. A vector point layer of all public transport stops was initially added, where the points (bus/tram/trolley stops) served as a starting point for walking distance measurement. The analysis of the pedestrian and transport accessibility to the anthropogenic tourist resources in Sofia Municipality has been conducted using data from the Ministry of Tourism's National Tourism Register, the Integrated Development Plan of Sofia Municipality 2021-2027, and the National Statistical Institute. The results show that the vast majority of the studied sites are concentrated in the historical and modern center of the city, which facilitates their accessibility by public transport. However, most of the sites fall within the hourly-paid, so-called Blue and Green parking zones, which hampers the accessibility by own vehicles, thus signifying the public transport importance for easy access to the tourist sites in discussion. Of the 50 sites examined, only 5 fall in neither the Blue, nor the Green Zone. The situation is further complicated by two services that additionally reduce the number of parking spaces for both city residents and visitors: 1) official subscription and 2) residential parking. Of the 50 sites studied, less than half (23) are suitable for people with disabilities. The analysis of the existing accessibility to cultural and historical sites is the basis for alternative proposals for accessibility improvement. In conclusion, the effect of tourist sites' accessibility on the development of tourism in Sofia Municipality has been determined.

Keywords: transport accessibility, museum, gallery, National History Museum, National History Museum, St. Alexander Nevsky Patriarchal Cathedral

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INTRODUCTION

Tourism is of structural importance for the economic development of the country at national and regional scale. According to Loulanski (2023), the effects of tourism on the economy are divided into three groups: direct, secondary, and induced. Direct effects are expressed by the revenue from consumed tourist products and services (accommodation, food, transport, and additional services), the secondary effects - by the revenue from other tourism-related economic sectors, such as construction, retail sales, financial services, agriculture and many others. The attracted effects represent revenue realized as a result of the strong influence of tourism on the structure, parameters and business characteristics of the regions (additional employment, attraction of additional foreign investments, increased real estate prices and rents, improved infrastructure and living environment, increased opportunities for family planning, career development and active consumer behavior (Loulanski, 2023). Regardless of the differences in their nature, all of these effects reveal the increasing importance of tourism for the socio-economic development of the country. The effects of tourism are even more significant for the regional development of small municipalities and settlements in Bulgaria, the economy of which is highly dependent on the development of tourism as a leading economic activity (Karadzhov et al., 2024). In 2024, Bulgaria was visited by 13,249,456 foreign citizens, which was an increase of 621,909 people compared to 2023, and by 2,361,504 compared to 2022. In 2024, most tourists were from Romania (2,332,357), followed by those from Turkey (2,286,711), Ukraine (1,278,753), Greece (1,190,898), Germany (920,368), Serbia (728,980), etc. (NSI – Visits of foreign citizens to Bulgaria by months and countries).

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The city of Sofia is one of the leading tourist destinations for both Bulgarian and foreign tourists. In 2024, the city was visited by nearly 1.27 million tourists (61%, or some 778 thousand of them - foreign tourists), according to data from the Unified Tourist Information System (USTI) of the Ministry of Tourism. One of the most important prerequisites for visiting a given destination is the tourist sites with their attractiveness (Vodenska & Asenova, 2011; Petrov, 2018). In Sofia, there are many tourist attractions and sites of different nature - natural and anthropogenic (historical, architectural, religious, and cultural-cognitive). Another very important factor is the transport accessibility to the tourist sites (Petrov, 2018). The location of the majority of anthropogenic tourist resources in the central part of Sofia predetermines the relatively good transport accessibility using urban public transport, on foot, or by bicycle.

That is not the case with the other main means of transportation for tourists - in groups by bus, and individually, by car (Marinov et al., 2013; Petrov, 2018). Organized group visits of tourists are of greatest importance for tourism in the capital city, which is why the problem of reaching the tourist sites and the related problems of stopping, staying, and parking buses near them are important (Petrov, 2018). This is especially true for tourists from the so-called "65+" age group, who need to be transported to the very site itself (Petrov, 2018). The present study, therefore, aims to make a GIS-based assessment of the anthropogenic resources for the development of tourism in the city of Sofia in the context of their transport accessibility by various types of transport (cars, buses, and public transport).

LITERATURE REVIEW

Research in the field of tourism in Bulgaria covers various topics. The problems and prospects of tourist regions in the country are discussed in the publications of Petrov et al. (2010) and Marinov et al. (2017). Dogramadjieva (2024) studies cultural heritage in the context of tourism in Bulgaria. Vasileva et al. (2024) assess the tourist functions of protected areas in the Shumen Plateau Nature Park. In 2024, Cholakova & Dogramadjieva conducted an online survey of tourist attendance and behavior in a protected area - the Urdini Lakes sample area in Rila National Park. The problems of recreational tourism have also been studied (Naumov et al., 2024; Varadzhakova & Naydenov, 2024; Raykova et al., 2023), as well as cultural ecosystem services in tourism (Prodanova & Varadzhakova, 2022).

Mikova (2024) studies the tourism infrastructure of rural areas in Bulgaria. The topic of COVID-19's impact on tourism has also been widely discussed (Nekova, 2023; Varadzhakova & Genchev, 2022; Varadzhakova et al., 2022; Varadzhakova & Raykova, 2022; Raykova & Naydenov, 2024; Raykova & Poleganova, 2024).

Another important research issue is the classification of anthropogenic resources, considered in numerous publications (Vasileva & Kabakchieva, 2020). Anthropogenic tourism resources are interpreted as objects and events of a non-natural nature, forming motivation for tourism consumption (Vasileva & Kabakchieva, 2020). Carlos & Karadzhov (2025) emphasize integrated tourism packages as a way of improving the image of urban tourist destinations (case study of Blagoevgrad, Bulgaria). The spatial combination of natural and anthropogenic tourist resources in rural and mountainous areas in Bulgaria - as determinants for the development of specialized types of tourism - is the focus of research by Patarchanova (2006), Patarchanov (2012), Nikolova (2015), Patarchanova & Patarchanov (2018).

In scientific literature, great attention is paid to the relationship between tourism and transport, and the role of transport in tourists' satisfaction (Orbasli & Shaw, 2007). The issues of transport access to tourist attractions in the central parts of cities (Popova, 2002), and parking opportunities near tourist attractions, are most often considered in the general context of settlements' transport schemes, and the creation of intelligent parking systems (Álvarez-García et al., 2017; Petrov, 2018). Dimitrova (2019) studies the image of Sofia as a tourist destination. Only a small number of publications, however, examine the transport accessibility of tourist sites in the city of Sofia, while none of those examine the accessibility of tourist sites by car, bus, and public transport. Mitova (2018) examines the tourist accessibility and capacity of the transport system of the Vitosha National Park in the context of challenges to the sustainable development of tourism. Petrov (2018; 2022) studies the transport accessibility by car to anthropogenic tourist sites in the central urban area of Sofia.

MATERIALS AND METHODS

The present study is based on the typology of anthropogenic tourism resources developed by Vasileva & Kabakchieva (2020). According to that typology, anthropogenic tourism resources are divided into tangible and intangible (special events). The tangible ones, in turn, are divided into inherited (archaeological and ethnographic), mixed (religious, architectural, commemorative, cultural-institutional, and economic), and contemporary (sports, entertainment, and business). The intangible tourism resources include bank holidays, festivals, performances, concerts, exhibitions, fairs, sports events, business events, carnivals, processions, reenactments, open-air events, etc.

The research object of the present study is tangible mixed (religious, architectural, and cultural-institutional) anthropogenic resources only. *Religious tourism resources* are a set of significant cultural and historical sites and monuments related to confession and religion, together with the associated religious practices of the population in a given territory, arising from a given confession: archaeological sites (ruins of temples and sanctuaries); modern architectural sites (churches, cathedrals, monasteries, bell towers, synagogues, mosques); religious monuments and memorial sites (cemeteries, crypts, statues, monuments); church museums and collections; secular buildings and sites related to a particular religion (Vasileva & Kabakchieva, 2020). *Architectural tourism resources* encompass various spatial elements of the environment inhabited by humanity throughout the centuries of its civilization.

These resources are of high artistic value and directly related to the history, culture, and way of life of different peoples – buildings, streets, squares, fortresses, towers, bridges, aqueducts, fountains, etc. Regarding architectural tourism resources as a separate group is rather conditional, since architectural artifacts are a basic manifestation and a

prerequisite for all anthropogenic tourist resources. Architectural tourism resources are directly related to and interact equally with archaeological, ethnographic, religious, historical, cultural-cognitive, and other types of resources (Vasileva & Kabakchieva, 2020). *Cultural-institutional tourist resources* regulate the distribution and access to various significant testimonies from the past, artifacts, and creative achievements.

The material base in the field of culture (museums, galleries, libraries, theaters, etc.), its presence or absence, is evidence, above all, of the level of spiritual and creative development of a given society, of its values and its care for what was inherited from its ancestors (Vasileva & Kabakchieva, 2020). In this study, the ArcGIS software (ArcMap 10.6.1) was used to compile the maps: the Buffer and the Near tools were used for measuring the distance of anthropogenic tourist sites from the public transport stops in the city of Sofia.

Study area

The study area of this research is the city of Sofia, which is located in the Sofia Plain, between parts of Western Stara Planina Mountain (Murgash, Sofia Mountain, and Tri Ushi ridges) to the north, and the Lyulin, Vitosha, Plana and Lozenska mountains - parts of the Srednogorska mountain system - to the south (Todorov & Todorova, 2023). The city falls within the borders of the Sofia tourist region. The city of Sofia is rich in religious, architectural, and cultural-institutional tourist resources, which are the basis for the development of tourism in the city.

This study examines a small part of the anthropogenic tourist resources (50 sites) by groups, which are of great importance for the development of tourism in the capital city of Bulgaria (Figure 1).

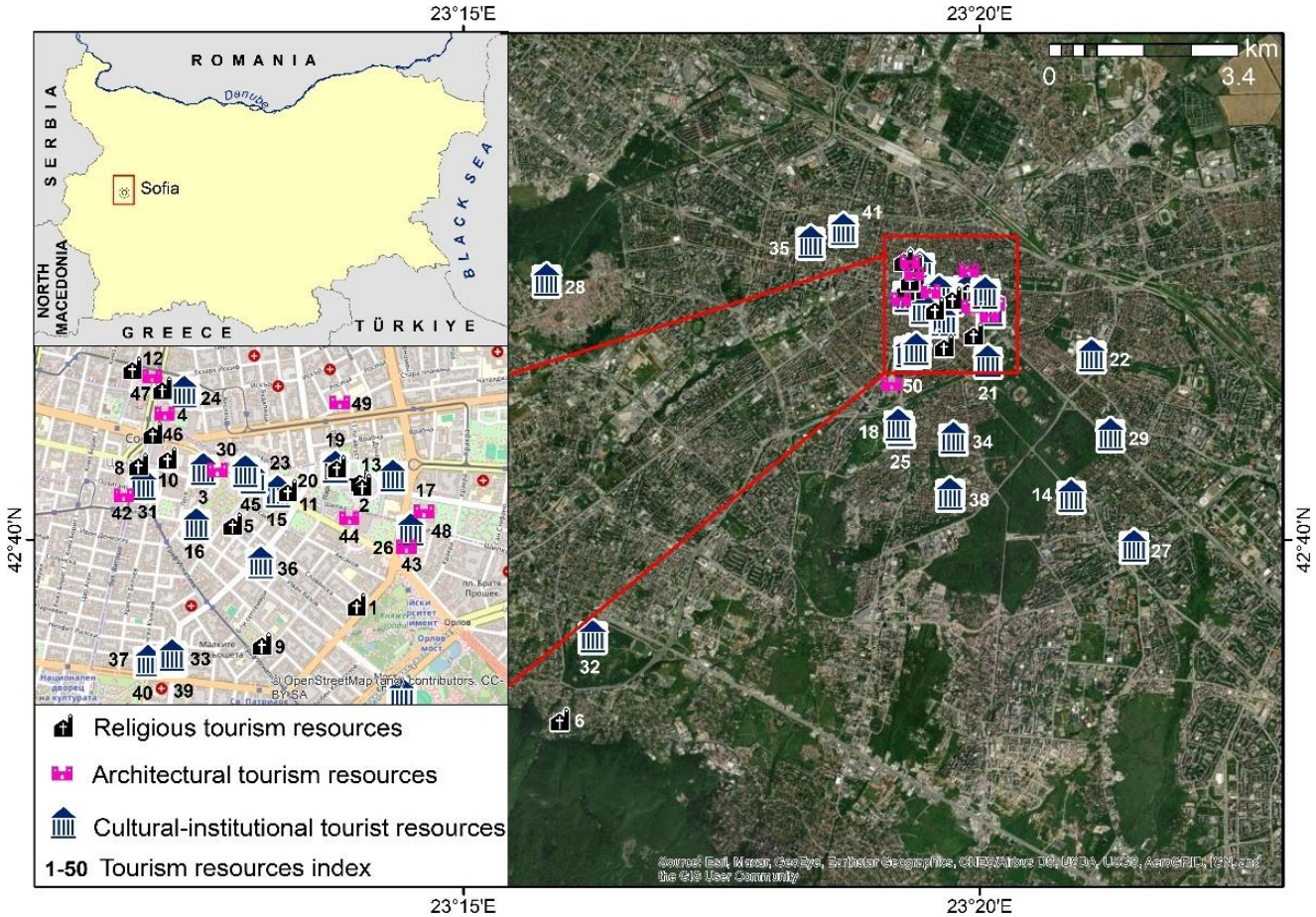

Figure 1. Study area. Anthropogenic tourist resources: 1. Mausoleum-tomb of Prince Alexander Battenberg; 2. St. Alexander Nevsky Patriarchal Cathedral; 3. St. George's Rotunda; 4. Banya Bashi Mosque; 5. Ivan Vazov National Theater; 6. Boyana Church; 7. St. Sophia Church; 8. St. Nedelya Church; 9. St. Sedmochislenitsi Church; 10. St. Petka Church; 11. Russian Temple of St. Nicholas; 12. Sofia Synagogue and Historical Museum; 13. Crypt of St. Alexander Nevsky Patriarchal Cathedral - Branch of the National Museum of Bulgarian Fine Art; 14. "Dechko Uzunov" Gallery-Museum; 15. National Art Gallery; 16. Sofia City Art Gallery; 17. "Square 500" National Gallery; 18. "Earth and People" National Museum; 19. Archaeological Level of St. Sophia Basilica; 20. National Museum of Natural History at the Bulgarian Academy of Sciences; 21. National Museum of Sports; 22. National Military History Museum; 23. National Ethnographic Museum; 24. Sofia History Museum; 25. Museum of Contemporary Art; 26. Museum of Mineralogy, Petrology and Mineral Resources; 27. Museum of Socialist Art; 28. National Agricultural Museum; 29. National Anthropological Museum; 30. National Archaeological Institute and Museum; 31. National Church Museum of History and Archaeology of the Holy Synod; 32. National History Museum; 33. National Literature Museum; 34. "Dimitar Dimov" House Museum; 35. "Hristo Smirnenski" House Museum; 36. "Ivan Vazov" House Museum; 37. "Nikola Vaptsarov" House Museum; 38. "Pancho Vladigerov" House Museum; 39. "Petko and Pencho Slaveykov" House Museum; 40. "Peyo Yavorov" House Museum; 41. National Polytechnic Museum; 42. Courthouse; 43. Sofia University "St. Kliment Ohridski"; 44. Bulgarian Academy of Sciences; 45. Bulgarian National Bank; 46. Central Department Store; 47. Central Sofia Market Hall; 48. National Library; 49. National Opera and Ballet, and 50. National Palace of Culture – NPC (Source: Authors)

Sofia is the largest city in the country with a population of 1,183,334 inhabitants (NSI, 2022). The city is characterized by the best educational structure of the population in Bulgaria: 57.3% of the city's population between 25 and 64 years old is of higher education, 38.7% of secondary education, and 4% of primary or lower education (Raikova et al., 2024). Evidence of the settlement's existence where Sofia's current city dates back to the Neolithic period – 6th -5th centuries BC, then known as Serdika (after the Thracian tribe "Serdi"). After the Liberation (1878), in 1879, Sofia was declared the capital of the Principality of Bulgaria by the first Constituent National Assembly. The city underwent rapid development only a decade after the Liberation under Mayor Dimitar Petkov and gradually became a city with a modern European appearance. A new urban plan was developed by the German architect and urbanist Adolph Muesmann (the "Muesmann" plan). The main goal of this plan was to transform Sofia into a modern and "green city", with clearly separated residential and industrial zones, developed transport infrastructure, etc. (Poleganova, 2025). In the 1920-1934 period, the population of Sofia almost doubled, increasing from 154,000 to 287,000 inhabitants (Tsvetkov, 2025).

In 1957, a new urban development plan for Sofia was created by Prof. Lyuben Tonev, replacing the unimplemented Muesmann plan. The appearance of numerous monuments typical of communist ideology characterized that period. Another typical feature of that period was the extremely rapid population increase due to industrialization. In the period after 1957, the densification of the old city parts and the construction of new residential complexes with panel apartment buildings (Mladost, Lyulin, Nadezhda, Druzhba neighborhoods, etc.) began (Poleganova, 2025; Tsvetkov, 2025).

For the first time in the history of the capital, the idea of building an underground was discussed (Poleganova, 2025). The period after 1989 is characterized by the fragmentation of the urban space and the appearance of new elements in urban planning, accompanied by the intensification of the processes of suburbanization and spatial expansion of the city. The city's development is featured by three simultaneously occurring processes – suburbanization, transition to a market economy, and fragmentation of the urban space. Suburbanization has been accelerating in the surrounding municipalities, and is particularly intense after the end of the COVID-19 pandemic (Tsvetkov, 2025; Poleganova, 2025).

RESULTS AND DISCUSSION

Assessment of transport accessibility by cars and tourist buses

The Ordinance regulates street parking in Sofia on the organization of traffic on the territory of Sofia Municipality. The documents provide that an hourly-paid parking regime is introduced on streets, boulevards, squares, and parking lots, which represent public municipal property, per the location and spatial scope schemes adopted by the Sofia Municipal Council, by order of the Mayor of Sofia Municipality. An hourly-paid parking regime is introduced for vehicles with a maximum permissible mass of up to 2.5 tons, and for minibuses and buses of up to 12 passenger seats. The price for an hour of parking in the so-called Blue Parking Zone is 2 BGN, where the maximum stay is up to 2 (two) hours. The zone operates on weekdays and Saturdays, from 8:30 to 20:00 (Figure 2).

Figure 2. Blue Parking Zone in the central part of Sofia: A – Vasil Levski Blvd.;
B – Graf Ignatiev Str.; C – General Skobelev Blvd.; D – Tsar Kaloyan Str (Source: Authors)

The so-called Green Parking Zone (Figure 3) operates on weekdays from Monday to Friday, from 8:30 to 19:30, and from 10:00 to 18:00 on Saturdays. The maximum allowed parking time is 4 (four) hours, and the price is 1 BGN per hour (Sofia Municipality, https://www.sofia.bg/parking).

Figure 3. Green Parking Zone in the city of Sofia: A – Plachkovitsa Str.; B – Galichitse Str. (Source: Authors)

Of the 50 sites examined, only 5 fall in neither the Blue or the Green Zone (14 – "Dechko Uzunov" Gallery-Museum; 27 – Museum of Socialist Art; 28 – National Agricultural Museum; 29 – National Anthropological Museum, and 32 – National History Museum); 7 sites fall into the Green Parking Zone (18 – "Earth and People" National Museum; 22 – National Military History Museum; 25 – Museum of Contemporary Art; 34 – "Dimitar Dimov" House Museum; 35 – "Hristo Smirnenski" House Museum; 38 – "Pancho Vladigerov" House Museum, and 41 – National Polytechnic Museum), while the remaining 38 sites fall into the Blue Parking Zone (Figure 4).

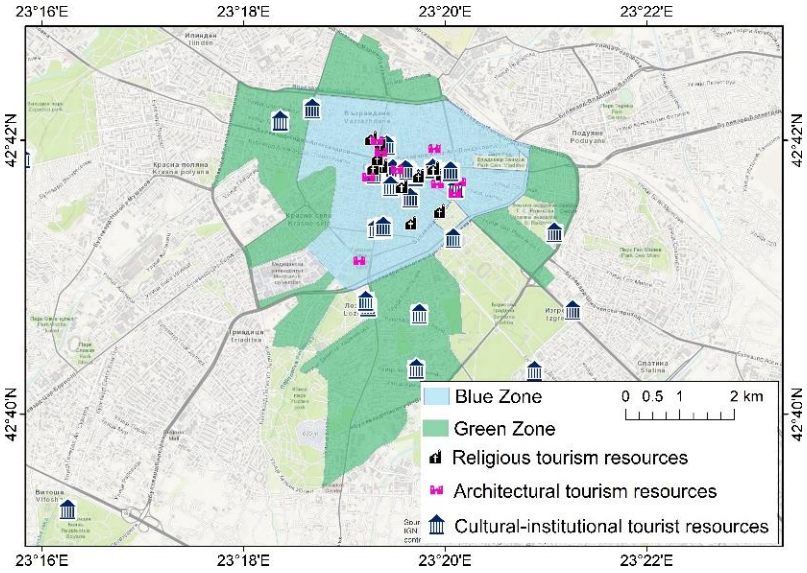

Figure 4. Spatial scope for hourly-paid parking in the Blue and Green zones in Sofia, Decision No. 704 under Protocol No. 42 of 28.10.2021, in force since 1.12.2021 (Source: Authors)

As it can be seen from Figure 2, the possibilities for parking vehicles in the center of Sofia around anthropogenic tourist sites are severely limited due to both time limits and limited parking spaces. The situation, especially in the central part of the city, is further complicated by two services that additionally reduce the number of parking spaces for both city residents and visitors: 1) official subscription and 2) residential parking. The first service applies to streets and squares, parking lots, and other parts of the road infrastructure, providing specially designated places for subscribers only. The regime is divided into day and night. The day regime covers both the Blue and the Green zone, and the night regime only applies to the Blue zone. The second service is for residents within the spatial scope of hourly-paid parking zones, who have preferences for issuing a vignette sticker, which, however, does not guarantee a parking space (Petrov, 2022). For easier parking, municipal buffer parking lots have been created at metro stations, which are managed by the Urban Mobility Center EAD. There are five operating parking lots at metro stations: Vasil Levski Stadium (193 spaces); Beli Dunav - Nadezhda (349 spaces); Tsarigradsko Shosse (1253 spaces); James Boucher (577 spaces); Beli Dunav - Vrabnitsa (118 spaces). These five parking spaces have a total of 2490 parking spaces.

The Ordinance on the organization of traffic on the territory of Sofia Municipality regulates the stopping, staying, and parking of tourist buses. Article 42 of the Ordinance states that "Occasional transport of passengers for tourist visits and tourist tours of the city of Sofia is carried out according to schemes approved by the Transport Directorate of Sofia Municipality, which indicate the route of the bus and the places for staying and parking". The stopping, stay, and parking regime of tourist buses has been changed several times over the last 10 years. Tourist buses can be parked for a long stay at: The southern local lane of "Knyaginya Maria-Luiza" Blvd., opposite the Central Railway Station - up to 2 hours of stay; parking between "Knyaz Boris I" Str., "Bratya Miladinovi" Str., the southern local lane of "Knyaginya Maria-Luiza" Blvd., and "Struga" Str. - up to 4 hours of stay (Petrov, 2022). Regarding the new organization of parking and stay at "Vasil Levski" Airport - Sofia, free access to Terminal 2, bus parking lot P8, has been agreed for the entire winter season 2024/2025 for tour operator buses and coaches (Ministry of Tourism of the Republic of Bulgaria). In addition to free access until the end of the winter period, an extension of the free stay time for tour operator buses and coaches from 15 to 30 minutes, up to three times a day, has also been agreed, after the end of the grace period in March.

Assessment of transport accessibility to tourist sites from public transport stops

A joint-stock company of Sofia Municipality - Urban Mobility Center EAD - carries out the organization of public transport in Sofia. There are four types of public transport in the city: underground, trams, trolleybuses, and buses.

The Sofia underground is the only underground in Bulgaria. It was put into operation on January 28, 1998. The underground system has 52 km of railway with 47 metro stations (as of 2025), operating along 4 routes: Line M1 - Slivnitsa - Business Park (Lyulin - Mladost) was opened in 1998, and has a length of 17.6 km, and 16 stations (13 in common with M4); Line M2 - Obelya - Vitosha (Nadezhda - Lozenets) was opened in 2012 with a length of 11.7 km, and 12 stations; Line M3 - Hadzhi Dimitar - Gorna Banya (Hadzhi Dimitar - Ovcha Kupel) was opened in 2020 and has a length of 11.2 km, and 12 stations; Line M4 - Obelya - Sofia Airport was opened in 2020, and has 20 stations (13 in common with M1) (Figure 5).

Figure 5. Metro stations in the city of Sofia (Source: Authors)

The first tram in Sofia was put into operation on January 1, 1901. The total length of tram routes in Sofia today is 286 km. Two types of lines are used: narrow gauge (1009 mm) and standard gauge (1435 mm). As of April 6, 2025, 17 tram lines operate on the territory of Sofia (Figure 6). The first trolleybus in Sofia was put into operation on February 14, 1941. The length of trolleybus routes in Sofia today is 112.5 km. As of April 6, 2025, trolleybuses operate on a total of 10 lines (Figure 7). Bus transport in Sofia began operating on April 20, 1935. As of April 6, 2025, 102 bus lines operate in Sofia.

Figure 6. Tram lines in the city of Sofia (Source: Authors)

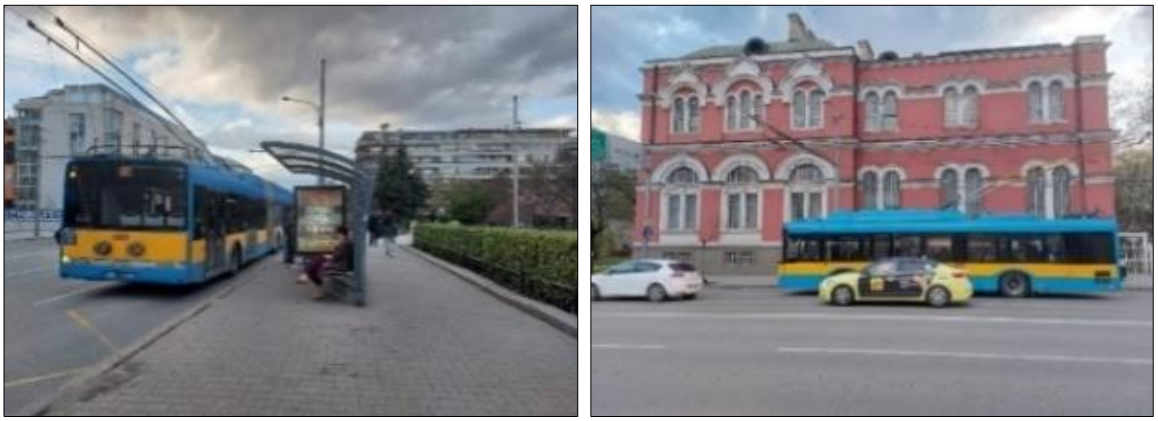

Figure 7. Trolleybus lines in the city of Sofia (Source: Authors)

Figure 8. Bus lines in the city of Sofia (Source: Authors)

Maps were created with a 100 m buffer around the stops, while the exact distance between the stops and the tourist sites was calculated in ArcGIS Desktop (Figure 9).

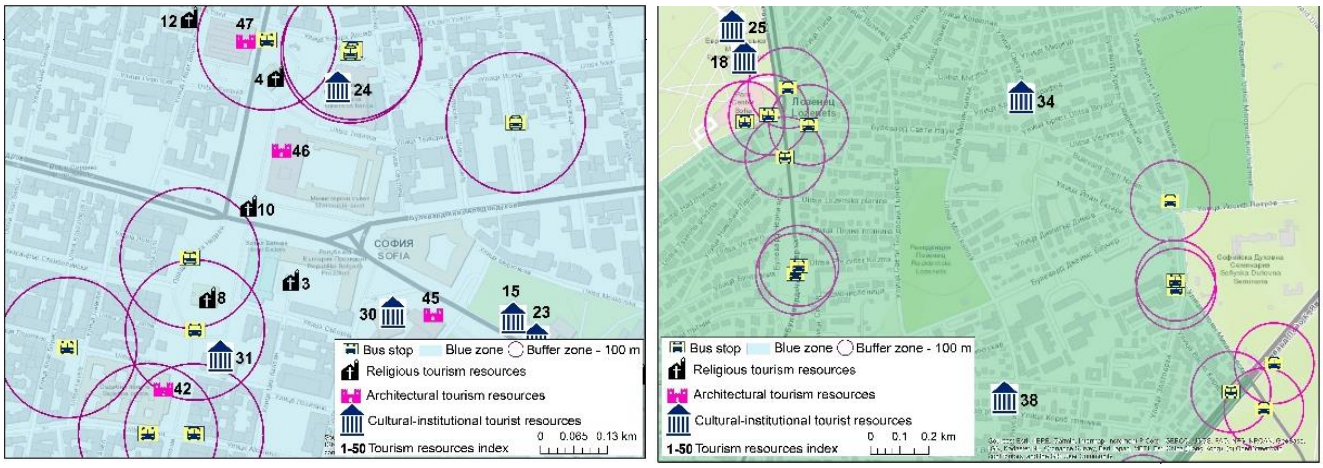

Figure 9. 100 m buffer around the public transport stops in the city of Sofia (Source: Authors)

Figure 10 presents the distance of anthropogenic tourist resources from public transport stops. Fifteen of the resources are within 100 m, nineteen from 100-200 m, thirteen from 200-300 m, 1 from 300-400 m, and 2 over 400 m. All fifteen sites (less than 100 m) fall into the "Blue Zone" for parking.

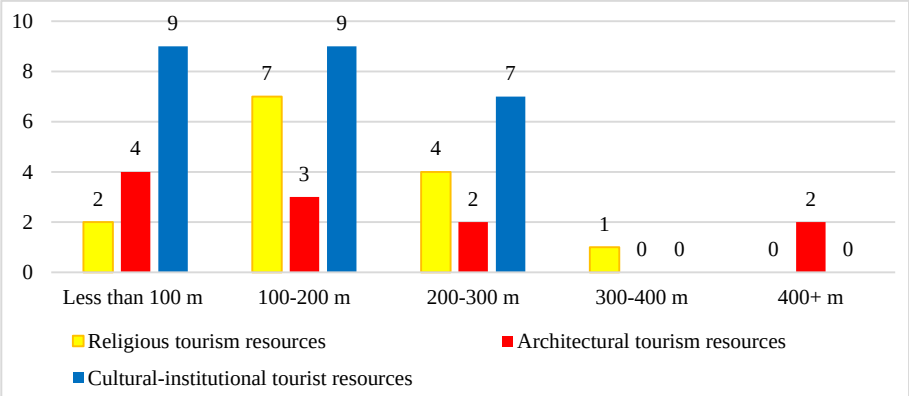

Figure 10. Grouping of material anthropogenic resources, according from the nearest public transport stop in the city of Sofia (Source: Authors)

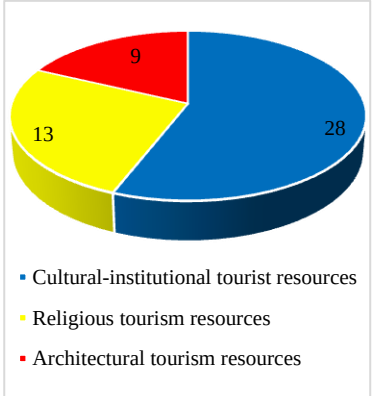

Figure 11. Number of considered material anthropogenic tourist resources by groups in the city of Sofia

Summarized assessment of transport accessibility to selected material anthropogenic resources

Figure 11 presents the number of considered material anthropogenic tourist resources by groups. Religious tourist resources:*"St. Alexander Nevsky" Patriarchal Cathedral* (object No. 2 on the map) is in the center of Sofia, on "St. Alexander Nevsky" Square. It is the second-largest Orthodox church on the entire Balkan Peninsula. The foundation stone of "St. Alexander Nevsky" Patriarchal Cathedral was laid on February 19, 1882. The official consecration of the church, however, only took place in September 1924. "St. Alexander Nevsky" Patriarchal Cathedral is characterized by very good transport and pedestrian accessibility. It is located in the central part of the city, within the Blue Parking Zone, just a 2-minute walk from the nearest public transport stop. It is located 600 m, or about an 8-minute walk, from the Sofia University metro station (Figure 12). Banya Bashi Mosque (object number 4 on the map) is in the center of Sofia on Princess Maria Luisa Blvd. It is the only surviving functioning medieval mosque in the city. It was built by the famous Ottoman architect Sinan, who designed over 300 buildings, including the Suleiman Mosque in Istanbul and the Selimiye Mosque in Edirne. The mosque is only a 1-minute walk from the nearest public transport tram stop and from Serdika metro station, which is 70 m away (Figure 13).

Figure 12. "St. Alexander Nevsky" Patriarchal Cathedral, St. Alexander Nevsky Square (Source: Authors)

Figure 13. Banya Bashi Mosque, 18 "Princess Maria Luisa" Blvd. (Source: Authors)

Figure 14. The Sofia Synagogue, 16 Exarch Yosif Street (Source: Authors)

The Sofia Synagogue (object No. 12 on the map) is also located in the center of Sofia, at 16 Ekzarh Yosif Street. It was built in 1909 according to a design by the famous Austrian architect Friedrich Grünanger, who used the old Leopoldstadt Synagogue as a model. In 1956, the Sofia Synagogue was declared a cultural monument of national importance. The synagogue is 200 m, or a 3-minute walk, from the nearest public transport stop - Serdika metro station (Figure 14).

Architectural tourist resources: Sofia University "St. Kliment Ohridski" (object No. 43 on the map) is located in the center of Sofia, on Tsar Osvoboditel Blvd. It is the oldest and largest higher education institution in Bulgaria. The university was established on October 1, 1888, as the Higher Pedagogical Course. The university is just a 1-minute walk from the nearest public transport stop. It is located 50 m from the Sofia University metro station (Figure 15). The Bulgarian Academy of Sciences (BAS) (object No. 44 on the map) is located in the central part of Sofia, on Fifteenth of November Street. The BAS building is an architectural and artistic cultural monument of national importance, designed by architects Ovcharov and Yordanov. It is located 300 m (about a 4-minute walk) from Sofia University metro station (Figure 16).

Figure 15. Sofia University "St. Kliment Ohridski", 15 Tsar Osvoboditel Blvd. (Source: Authors)

Figure 16. Bulgarian Academy of Sciences (BAS), Fifteenth of November Street (Source: Authors)

Cultural-institutional tourist resources

The National History Museum (site No. 32 on the map) is located outside the city center of Sofia, in the Boyana district, on Vitoshko Lale Street. Despite being outside the city center, the transport accessibility of the museum is good, both by car and public transport. A large parking lot has been built in front of the museum, convenient for tourist buses. The National History Museum was established on May 5, 1973. Through over 10,000 exhibits on an area of about 6,000 m², the history of today's Bulgarian lands is presented there (from the 7th millennium BC to the mid-20th century).

CONCLUSION

The research can be valuable for both Bulgarian and foreign travel agencies and visitors to Sofia. The study presents a GIS-based assessment of the transport accessibility of the 50 material anthropogenic tourist resources in the city of Sofia, Bulgaria. An analysis of the pedestrian and transport accessibility to anthropogenic tourist resources in Sofia Municipality. The present study is based on the typology of anthropogenic tourism resources developed by Vasileva & Kabakchieva (2020): Religious tourist resources (13 pieces), Architectural tourist resources (9 pieces), and Cultural-institutional tourist resources (28 pieces).

Several conclusions can be drawn from the study:

1. Anthropogenic tourist resources are territorially concentrated in the historical and modern center of the city of Sofia, which facilitates their accessibility by public transport.

2. Only five of the tourist sites, or 10% of those covered in this study, are located outside the Blue and Green parking zones. For the remaining 90% of the sites, the Blue and Green parking zones hurt the organization of tourist visits, regardless of their nature, group, or individual.

3. Of the 50 sites studied, only 23 are suitable for people with disabilities. Therefore, it is necessary to improve the accessibility of those sites for visitors with special needs.

4. Anthropogenic tourist resources play a pivotal role in the formation of tourist attractiveness and are of paramount importance for Sofia's function as a tourist destination. Those resources are important for the overall development of the Sofia region. The research exhibits limitations related to the lack of data (sociological survey) regarding the correlation between transport accessibility on the one hand, and number of visitors, on the other, i.e. – to what degree the number of visitors is dependent on public transport accessibility – if at all.

Author Contributions: Conceptualization, V.S. and B.K.; methodology, V.S. and A.R.; software, V.S. and K.G.; validation, V.S. and E.P. and B.K; formal analysis, B.K. and A.R. and E.P.; investigation, V.S. and B.K. and A.R.; data curation, V.S. and B.K. and A.R and P.R.; writing - original draft preparation, V.S. and B.K.; writing - review and editing, P.R. and E.P. and A.R. and K.G.; visualization, V.S. and B.K.; supervision, P.R. and E.P. and K.G. and B.K.; project administration, V.S. and A.R. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 22.04.2025 Revised: 21.07.2025 Accepted: 18.08.2025 Available online: 15.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1814-1821
DOI 10.30892/gtg.61340-1550

DIGITAL NOMADISM ASPECTS AT THE CURRENT TOURISM MARKET OF SLOVAKIA

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Citation: Šaffová, I., Matušíková, D., & Vargová, T.D. (2025). Digital nomadism aspects at the current tourism market of Slovakia. *Geojournal of Tourism and Geosites*, 61(3), 1814–1821. https://doi.org/10.30892/gtg.61340-1550

Abstract: Changes in labor market trends have become increasingly evident under the influence of numerous local and global factors. Among these, the long-term effects of the Covid-19 pandemic have significantly accelerated the transformation of working conditions, shifting many professional activities into the digital environment. This digital transition, initially driven by the need to reduce social contact, promoted the broader adoption of remote work and contributed to the rise of digital nomadism – an existing phenomenon that gained renewed momentum during the pandemic. The phenomenon, once limited to a niche group of freelancers and tech professionals, has now expanded across various sectors and professions, reshaping traditional work-life boundaries. The aim of this study is to analyze the current state, significant trends, and key issues of digital nomadism within Slovakia's tourism sector. Special attention is given to the demographic profile, orientation, and perceived needs of digital nomads, as well as to the preparedness of the Slovak tourism infrastructure to meet the demands of this emerging segment. The study further explores how local businesses and service providers perceive and respond to this growing group, including their adaptability and openness to innovation. The research is based on quantitative data collected through a questionnaire survey conducted on a representative sample of the Slovak population. Findings indicate a growing openness toward alternative work and travel models, with the pandemic acting as a major catalyst for more flexible lifestyles and attitudes toward mobility. Respondents revealed an increased interest in blending work with travel, especially among younger age groups and those employed in digital professions. The study also contrasts selected findings with trends observed in other European destinations, aiming to highlight Slovakia's specific opportunities and challenges in attracting digital nomads. These insights are intended to inform tourism stakeholders, policymakers, and destination managers about the potential for adapting services and long-term strategies to accommodate remote workers. As digital nomadism continues to expand globally, understanding local readiness becomes crucial for competitive positioning. The findings offer a foundation for strategic planning and future research into sustainable tourism development in the context of remote work and the digital economy.

Keywords: tourism, digital nomadism, nomadic tourist, workplace change, post-pandemic trends, travel behavior, digital economy

* * * * * *

INTRODUCTION

Identification of digital nomadism aspects at the tourism market after pandemic influence. Nomadicity in the age of the internet is fashionable today as a cool lifestyle and a way of disrupting the traditional work settings. Digital nomadism is not just becoming a way of life trend but also becoming a response to Labour Market adjustments because of technological advancements and, more recently, the Covid-19 pandemic. Park et al. (2019) research article examines seasonal nomadic travelers seeking employment as a fascinating social phenomenon in Tokyo, Japan in the spring.

The global disruption era has spurred the utilization of remote labor, and many have started a journey in search of location independence, combining work and travel previously unheard of (Hajli et al., 2023; Mohn & Nemes, 2023). In this respect, digital nomadism influences tourism by generating new mobility styles of travel, consumption, and extended stays, diverting the focus from short-term tourism towards experience and hybrid forms of travel (Lamers et al., 2022). Cities and countries compete with one another more and more to entice remote workers and digital nomads through granting targeted visas, co-working residential areas, and infrastructural facilities (Schlagwein & Reimer, 2022; Duignan & Simons, 2023).

This finding resonates with current discussions on digital nomadism, where flexibility and technological support are essential, yet the desire for authentic and socially grounded experiences remains strong (Bujdosó et al., 2024).

Theoretical background of the digital nomadism as a reaction to the market changes

Digital nomadism is rooted in the convergence of a variety of theoretical strands that resonate more broadly with transformation in society, work, and mobility. One such theoretical strand is network society theory (Castells, 1996), which highlights the way global information and communication networks shape individual agency and spatial practice. Here, digital nomads are hyper-connected workers who utilize digital technologies to unbundling work from particular physical settings (Schlagwein & Reimer, 2022). A very close concept is boundaryless work that focuses on flexibility of

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space, time, and roles in post-industrial working conditions. With conventional boundaries like office attendance and regular working hours crumbling, new patterns of flexibility and autonomy arise (Parker et al., 2022; Sánchez-Fernández & Flores, 2023). Digital nomads are capturing this shift with the working being blurred into individual traveller habits and adapting to on-ground conditions but being virtually attached to work communities.

Lifestyle migration concept (Benson & O'Reilly, 2009) is also a good method of describing the allure of digital nomadism. Individuals these days seek locations that are professionally apt but personally fulfilling, culturally fulfilling, and environmentally pleasant. The lifestyle of being a nomad is presented as a solution to urban stress, scepticism about company culture, and the allure of experiential living (McElroy & Hu, 2023; Chatzipanagiotou et al., 2022). In tourism theory, digital nomads upset the short-term consumption-oriented models of tourism. Instead, they represent longer-stay tourists that mark the boundary between tourist, expatriate, and temporary resident. This has huge implications for local economic development, infrastructure planning, and destination management. The existence of digital nomads will tend to create off-seasonal tourism, local-level economic diversification, and peripheral or small destinations' internationalization (Femenia-Serra & Neuhofer, 2022; Hajli et al., 2023; Zimmerman & Wolfe, 2023).

Alternatively, they are also likely to bring about gentrification, higher living costs, and a strain on the residential market, particularly in low-resourced areas. This double existence raises questions about the very foundations of sustainable development, cultural integration, and mobility governance (Lamers et al., 2022). New models of sustainable tourism should therefore take into account new forms of tourists who stay longer, consume differently in terms of local services, and who possibly have a larger socio-economic impact. Technological determinism is also one of the major characteristics of digital nomadism. Were it not for universal access to quick internet, digital platforms, secure payment tools, and communication applications (Bačík et al., 2017), this kind of mobility would be impossible. The technological reliance is a kind of "techno-mobility infrastructure" (Milasi et al., 2022), so that digital access becomes the precondition to economic participation in faraway areas. The establishment of "digital nomad visas"—legal instruments for facilitating extended stay for remote workers—is proof of how policy and governance have evolved to respond to this new mobility class. Governments in Europe, Asia, and Latin America are seeing the economic value that digital nomads bring and are adjusting immigration, taxation, and housing policies to attract this group (Zimmerman & Wolfe, 2023; Frolova et al., 2022). Finally, the Covid-19 crisis served to fuel these trends by forcing remote working to become the new standard in every industry. As companies became conscious of the potential for digital collaboration, workers found that they had greater bargaining leverage to determine where they would work. Not only did the pandemic reshape requirements for flexibility, but it assisted in helping towards a shift in ambition for lifestyle—gaining popularity for digital nomadism as a productive substitute for desk work (Hajli et al., 2023; Sánchez-Fernández & Flores, 2023).

In the last few decades, the digital nomad phenomenon has been of great interest to academics, particularly in connection with the diffusion of distant labor after the COVID-19 pandemic. Digital nomads are no longer perceived as lifestyle tourists but as wandering knowledge workers who interact with local economies, infrastructures, and societies.

In Chang & Kim (2024), mobility in the digital age is becoming the hallmark of professional life for the majority of young professionals, who prioritize flexibility, autonomy, and experience-based consumption. Their work highlights how hybrid spaces have reshaped the presumptions of travel, accommodation, and connectivity. Liu & Tsai (2023) point out the increasing importance of second-tier cities to digital nomads, due to affordability, local culture, and improved infrastructure. According to their research, less expensive cities with reliable internet connectivity are attracting more nomadic employees seeking to escape congested major cities. Within Central and Eastern Europe, Popescu (2025) discusses the impact of digital nomads on smaller economies such as Slovakia and Romania.

He finds there to be positive economic impacts in the coworking and accommodation sectors, but also reports increased pressures on the real estate sector as well as social integration challenges. Although there is a growing number of studies on digital nomadism, several limitations come with current research. Most are largely qualitative in nature and founded on interviews, tiny samples of surveys or very restricted geographic scope surveys. Thus, their findings are difficult to generalize, especially when they are to be applied across diverse regional or national settings.

For example, Hajli et al. (2023) studied motivations of individual digital nomads but did not quantify how these play out as real impacts for host communities. Similarly, Mohn & Nemes (2023) clarified social integration issues but did not provide field-level guidelines to help local destination management. There is also a perceived lack of comparative analysis between global digital nomad hubs (such as Lisbon, Chiang Mai, or Tulum) and emerging regions in Central and Eastern Europe, such as Slovakia. With these comparisons missing, one cannot accurately ascertain whether policy recommendations or infrastructure-driven solutions are viable. In addition, empirical evidence of the economic, social, and ecological impacts of digital nomadism remains scarce. Sustainability concerns, housing market forces, and digital infrastructure are consistently noted but not continuously explored.

Future research should:

- employ mixed-method approaches combining qualitative insight with quantitative confirmation,
- include stakeholder perspectives (municipalities, tourist industry, coworking spaces, residents),
- develop assessment frameworks for the long-term benefits and drawbacks of digital nomadism on local and regional levels.

Similar examples of effective collaboration among various stakeholders and the utilization of unique natural and cultural resources in tourism can be found in the development model of Ulytau Nature Park in Kazakhstan, where emphasis is placed on sustainability, nature conservation, and active participation of the local community (Seidualin et al., 2025).

Such research is essential to understand better the potential for digital nomadism not as a lifestyle choice for individuals but as a structural phenomenon with planning and regional development implications.

For this reason, the aim of the study was to find out through research questions:

RQ1: Is the domestic public considering changes in their place of work in terms of digital nomadism?

RQ2: Is the decision-making of the public influenced by the Covid-19 pandemic situation, which has brought significant changes to the labour market?

RQ3: What tourism destinations will they consider if they are interested in digital nomadism?

RQ4: Is the possibility of digital nomadism perceived differently based on selected characteristics of the public?

MATERIALS AND METHODS

The aim of this study is to analyze the current state, significant trends, and issues of digital nomadism within Slovakia's tourism sector. The research focuses on the demographic situation, orientation, and perceived needs of digital nomads and on the readiness of Slovak tourist infrastructure to serve this new segment. The study also contrasts selected results to trends at other European destinations to determine particular opportunities and challenges in the Slovak situation.

To address these research questions, a quantitative research design was applied, with a questionnaire survey serving as the primary method of data collection. The main objective of the survey was to obtain structured data reflecting the Slovak public's views on digital nomadism as a flexible form of work and lifestyle, particularly in relation to post-pandemic shifts in the labour market and travel behaviour. The questionnaire was distributed between October 2024 and February 2025 via both online platforms and in-person methods, ensuring diversity in respondent demographics. To capture attitudes and perceptions, the survey employed scaled questions using a 5-point Likert scale (wording of the 5-point scale: definitely agree; rather agree; neither agree nor disagree; rather disagree; definitely disagree). This allowed respondents to express the intensity of their agreement or disagreement with the statements presented. For data analysis, a combination of descriptive and inferential statistical methods was used. The Shapiro-Wilk test was applied to assess the normality of data distribution.

Additionally, the Wilcoxon Signed-Rank Test was used to compare paired differences in responses, as the data did not meet the assumptions of normality required for parametric tests. This non-parametric test was chosen because it is ideal for evaluating differences in ordinal data or non-normally distributed interval data. The descriptive statistics (such as mean, median, standard deviation) provided an overview of the data distribution and central tendency. The data were initially processed using Microsoft Excel, while advanced statistical analyses were performed in the R programming environment, ensuring methodological rigor and replicability (Figure 1 for the methodological progression).

For the purpose of the study, 4 main hypotheses and several sub-hypotheses were stated:

H1: There is an assumption that the Covid-19 pandemic has significantly influenced the decision-making of the public regarding the possibility of becoming a digital nomad.

H2: There is an assumption that there exists a tendency among the domestic public to consider a change in the place of work in the context of digital nomadism.

H3: There is an assumption that the public prefers to practice digital nomadism in domestic destinations.

H4: There is an assumption that the public prefers to practice digital nomadism in foreign destinations.

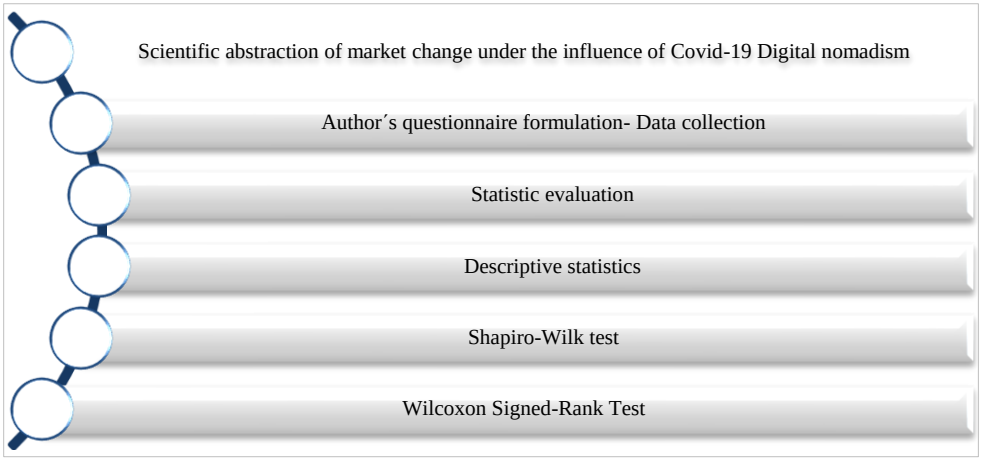

Figure 1. Display of methodological progression (Source: own processing)

RESULTS AND DISCUSSION

Interest in digital nomadic tourism activities was analyzed using data collected through a questionnaire. Five questions were selected specifically to address the study's core objectives. The sample consisted of 204 respondents, divided by gender and place of residence. The data were categorized into two main variables: gender and place of residence. Of the total respondents, 68 (33.33 %) were men and 136 (66.67 %) were women. The respondents were further classified according to their place of residence. Among the respondents from urban areas, 53 men (34.64 %) and 100 women (65.36 %) participated. In rural areas, 15 men (29.41 %) and 36 women (70.59 %) were surveyed (Table 1).

For the analysis of age, the mean age of the respondents was calculated as 38.97 years, with a standard deviation of 8.25 years. This indicates a moderate variability in the ages of the respondents, with most participants being within a

similar age range. The data were also analysed for cumulative frequency and relative frequency to provide a clearer understanding of the distribution of responses by gender and place of residence.

Table 1. Respondents distribution according to the gender, place of residence and level of education (Source: own processing)

Variable	Frequency	Cumulative Frequency	Relative frequency %	Cumulative relative frequency %
Gender				
Men	68	68	33.33%	33.33%
Women	136	136	66.67%	100%
Residence				
City				
Men	53	63	34.64%	34.64%
Women	100	153	65.36%	100%
Countryside				
Men	15	15	29.41%	29.41%
Women	36	51	70.59%	100%

	Frequency	Relative frequency
men	**68**	**33.33 %**
city	**53**	**25.98 %**
secondary education	16	7.84 %
I.st university degree	6	2.94 %
II.nd university degree	28	13.73 %
III. rd university degree	3	1.47 %
countryside	**15**	**7.35 %**
secondary education	9	4.41 %
II.nd university degree	6	2.94 %
women	**136**	**66.67 %**
city	**100**	**49.02 %**
secondary education	29	14.22 %
I.st university degree	13	6.37 %
II.nd university degree	51	25.00 %
III. rd university degree	7	3.43 %
countryside	**36**	**17.65 %**
secondary education	11	5.39 %
I.st university degree	4	1.96 %
II.nd university degree	17	8.33 %
III. rd university degree	4	1.96 %

In addition to age, gender, and place of residence, the educational level of respondents was also assessed. Among male respondents living in urban areas, 16 (7.84 %) had completed secondary education, 6 (2.94 %) held a first-level university degree, 28 (13.73 %) held a second-level university degree, and 3 (1.47 %) had completed a third-level university degree. In rural areas, 9 men (4.41 %) had secondary education, and 6 (2.94 %) had a second-level university degree.

Among female respondents living in urban areas, 29 (14.22 %) had secondary education, 13 (6.37 %) held a first-level university degree, 51 (25.00 %) held a second-level university degree, and 7 (3.43 %) held a third-level university degree. From the rural female group, 11 (5.39 %) had completed secondary education, 4 (1.96 %) had a first-level university degree, 17 (8.33 %) had a second-level university degree, and 4 (1.96 %) had a third-level university degree. These educational characteristics provide additional insight into the demographic profile of the digital nomadic tourism participants surveyed. The vertical axis represents the number of respondents and the horizontal axis shows the age frequency (Figure 2).

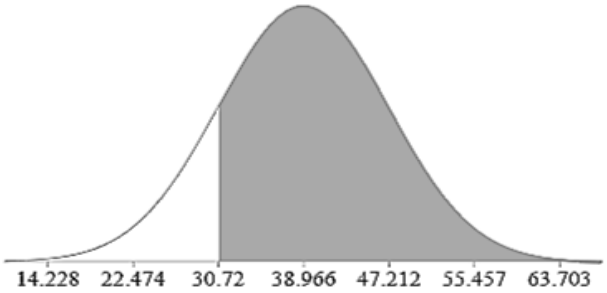

Figure 2. Normal distribution of the research sample according to the age of respondent (Source: own processing)

Question 1 Is your motivation of possible change of workplace to digital nomadism influenced by Covid-19 pandemic impacts and related emerging trends?

Descriptive statistics for responses to this question are presented in Table 2. The table shows the frequency and relative distribution of responses, broken down by gender. A notable proportion of both men and women (14.71 % of men and 33.33 % of women) reported that the pandemic had an influence on their motivation to switch to digital nomadism,

indicating a significant trend toward remote work. A smaller percentage, particularly men (4.41 %), felt that the pandemic had strongly influenced their decision ("definitely yes"). A considerable number of respondents, especially women, were undecided or neutral on the issue, with 10.78 % of men and 10.78 % of women choosing "neither yes nor no."

A minority of respondents, both men (10.78 %) and women (12.75 %), reported that the pandemic did not influence their decision to adopt a digital nomadic lifestyle ("no" or "definitely no"). The sample consisted of 204 respondents with an average motivation score of 3.75 (median = 4). The Shapiro-Wilk test indicated a significant deviation from normality ($p < 0.001$), suggesting that the data were not normally distributed. Given this, a non-parametric Wilcoxon signed-rank test was used instead of a t-test. The Wilcoxon test revealed a significant result ($T = 2699.0$, $p < 0.001$), confirming that the motivation scores significantly differed from the neutral value of 3. Detailed results are presented in Table 3.

The results support H1, indicating that the Covid-19 pandemic has significantly influenced individuals' motivation to consider digital nomadism. The significant difference in motivation scores shows that the pandemic has led to a higher likelihood of individuals considering a transition to a digital nomad lifestyle. Therefore, **H1 is confirmed**.

Table 2. Change of workplace interest motivation in relation with pandemics Covid-19 (Source: own processing)

	Frequency	**Cumulative frequency**	**Relative frequency**	**Cumulative relative frequency**
men	**68**		**33.33 %**	
definitely yes	9	9	4.41 %	4.41 %
yes	30	39	14.71 %	19.12 %
neither yes nor no	6	45	2.94ˇ %	22.06 %
no	22	67	10.78 %	32.84 %
definitely no	1	68	0.49 %	**33.33 %**
women	**136**		**66,67 %**	
definitely yes	15	15	7.35 %	7.35 %
yes	68	83	33.33 %	40.68 %
neither yes nor no	22	105	10.78 %	51.46 %
no	26	131	12.75 %	64.21 %
definitely no	5	136	2.46 %	**66.67 %**

Table 3. Analysis of the impact of Covid-19 on motivation for transitioning to digital nomadism (Source: own processing)

N	204
Average	3.75
Median	4.00
Sum	766
Standard Deviation	1.05
Minimum	1
Maximum	5
Shapiro-Wilk W	0.839
Shapiro-Wilk p-value	< 0.001
Wilcoxon Signed-Rank Test (T)	2699.0
Wilcoxon p-value	< 0.001

Question 2 If there was a potential for your work to be held online, would you consider changing your work environment and practicing digital nomadism?

The second question examined whether respondents would consider transitioning to digital nomadism if their work could be done online. Of the 204 respondents, 68 were men (33.33 %) and 136 were women (66.67 %).

Among men, 11.27 % expressed strong interest, and 13.73 % were somewhat interested. In contrast, 16.18 % of women strongly favoured the idea, with 30.39 % expressing moderate interest. A portion of both men and women remained neutral or disinterested. The results show (Table 4) that a significant number of respondents, particularly women, are open to digital nomadism if their work could be performed remotely.

These findings suggest that flexible work opportunities influence the decision to pursue a digital nomad lifestyle.

Table 4. Change of workplace interest to digital nomadism (Source: own processing)

	Frequency	**Cumulative frequency**	**Relative frequency**	**Cumulative relative frequency**
men	**68**		**33.33 %**	
definitely yes	23	23	11.27 %	11.27 %
yes	28	51	13.73 %	25.00 %
neither yes nor no	11	62	5.39 %	30.39 %
no	5	67	2.45 %	32.84 %
definitely no	1	68	0.49 %	**33.33 %**
women	**136**		**66,67 %**	
definitely yes	33	33	16.18 %	16.18 %
yes	62	95	30.39 %	46.57 %
neither yes nor no	18	113	8.82 %	55.39 %
no	18	131	8.82 %	64.21 %
definitely no	5	136	2.46 %	**66.67 %**

The sample consisted of 204 respondents who evaluated their inclination to consider changing their workplace in the context of digital nomadism. The average score was 3.82 (median = 4.0), indicating a moderate to high tendency.

The distribution of responses deviated significantly from normality, as shown by the Shapiro-Wilk test ($W = 0.846$, $p < 0.001$). Therefore, a non-parametric Wilcoxon Signed-Rank Test was conducted to test whether the responses significantly differed from the neutral value of 3. The test revealed a statistically significant result ($T = 2178.0$, $p < 0.001$), suggesting a strong tendency among the domestic public to consider digital nomadism.

Detailed statistics are presented in Table 5. The results support H2, indicating that there exists a significant tendency among the domestic public to consider a change in the place of work in the context of digital nomadism. The significant difference in scores compared to the neutral value of 3 demonstrates that respondents are more inclined to explore the possibility of transitioning to a digital nomad lifestyle. Therefore, **H2 is confirmed**.

Table 5 Analysis of the tendency to consider digital nomadism (Source: own processing)

N	204
Average	3.82
Median	4.00
Sum	779
Standard Deviation	1.05
Minimum	1
Maximum	5
Shapiro-Wilk W	0.846
Shapiro-Wilk p-value	< 0.001
Wilcoxon Signed-Rank Test (T)	2178.0
Wilcoxon p-value	< 0.001

Question 3 If you were considering changing your place of work in terms of digital nomadism, would you consider your domestic destination and its options?

As part of the third research question, respondents were asked whether they would consider domestic destinations and their potential if they were to change their workplace in the context of digital nomadism. The results indicate a notable level of interest, particularly among women. Out of 136 female respondents, 41.67 % answered "yes" and 4.90 % "definitely yes," suggesting a strong inclination toward domestic options. In contrast, among 68 male respondents, 17.16 % responded "yes" and 4.90 % "definitely yes." This indicates that while both groups show some interest, women display a significantly higher tendency to consider domestic destinations as part of a potential digital nomad lifestyle. The findings suggest that domestic tourism could play a relevant role in shaping digital nomadism trends, particularly among female respondents.

Detailed frequencies are provided in Table 6. The results support H3, indicating that individuals interested in digital nomadism show a significant tendency to consider specific tourism destinations within their domestic country. The Wilcoxon signed-rank test revealed a statistically significant difference from the neutral midpoint ($T = 1245.0$, $p < 0.001$), suggesting a clear preference for domestic options. Detailed statistical results are presented in Table 7. Therefore, **H3 is confirmed**.

Table 6. Change of workplace interest to digital nomadism within domestic tourism destination (Source: own processing)

	Frequency	**Cumulative frequency**	**Relative frequency**	**Cumulative relative frequency**
men	**68**			
definitely yes	10	10	4.90 %	4.90 %
yes	35	45	17.16 %	22.06 %
neither yes nor no	8	53	3.92 %	25.98 %
no	11	64	5.39 %	31.37 %
definitely no	4	68	1.96 %	**33.33 %**
women	**136**			
definitely yes	10	10	4.90 %	4.90 %
yes	85	95	41.67 %	46.57 %
neither yes nor no	15	110	7.35 %	53.92 %
no	20	130	9.80 %	63.72 %
definitely no	6	136	2.95 %	**66.67 %**

Table 7. Analysis of consideration of domestic destinations for digital nomadism (Source: own processing)

N	204
Average	3.53
Median	4.00
Sum	721
Standard Deviation	1.02
Minimum	1
Maximum	5
Shapiro-Wilk W	0.794
Shapiro-Wilk p-value	<0.001
Wilcoxon Signed-Rank Test (T)	1245.0
Wilcoxon p-value	< 0.001

Question 4 If you were considering changing your place of work in terms of digital nomadism, would you consider your foreign destination and its options?

The analysis of responses regarding the consideration of foreign tourism destinations in the context of digital nomadism revealed a notable interest among participants. Among men, the majority responded with either "definitely yes" (12.75 %) or "yes" (15.69 %), resulting in a cumulative affirmative rate of 28.44 %.

In contrast, negative responses were minimal, with only 1.96 % answering "no" and none selecting "definitely no".

Among women, interest was even more pronounced, with 12.25 % choosing "definitely yes" and 40.20 % "yes", culminating in a cumulative affirmative response rate of 52.45 %. Neutral responses ("neither yes nor no") remained relatively low in both groups (2.94 % for men, 7.84 % for women). These findings suggest that both men and women express a strong inclination to consider relocating their workplace abroad in the context of digital nomadism, with women showing a particularly high level of interest. For a full overview of the response frequencies, see Table 8.

Table 8. Change of workplace interest to digital nomadism within foreign tourism destination (Source: own processing)

Q4	Frequency	Cumulative frequency	Relative frequency	Cumulative relative frequency
men	**68**			
definitely yes	26	26	12.75 %	12.75 %
yes	32	58	15.69 %	28.44 %
neither yes nor no	6	64	2.94 %	31.38 %
no	4	68	1.96 %	**33.34 %**
definitely no	0	68	0 %	
women	**136**			
definitely yes	25	25	12.25 %	12.25 %
yes	82	107	40.20 %	52.45 %
neither yes nor no	16	123	7.84 %	60.29 %
no	8	131	3.92 %	64.21 %
definitely no	5	136	2.45 %	**66.66 %**

The analysis of respondents' preferences regarding foreign destinations for digital nomadism revealed an average response of 3.95 (SD = 0.90), with a median of 4.00. The Shapiro-Wilk test showed significant non-normality ($W = 0.790$, $p < 0.001$). The Wilcoxon Signed-Rank Test confirmed a statistically significant difference ($T = 1511.5$, $p < 0.001$), indicating a preference for foreign destinations. Based on these findings (Table 9), H4, which proposed that the public prefers to practice digital nomadism in foreign destinations, **is confirmed**.

Table 9. Analysis of consideration of foreign destinations for digital nomadism (Source: own processing)

N	204
Average	3.95
Median	4.00
Sum	806
Standard Deviation	0.90
Minimum	1
Maximum	5
Shapiro-Wilk W	0.790
Shapiro-Wilk p-value	<0.001
Wilcoxon Signed-Rank Test (T)	1511.5
Wilcoxon p-value	<0.001

Limitations of the study

When identifying limits and opportunities for research, one can agree with the opinion of the authors of Nash et al. (2018), who mentioned in their study that despite the fact that nomadic travel has become a very popular trend, there has been very little incisive empirical research on the lifestyle's characteristics, its implications for the future of work, or on the technology, which supports it. Despite the fact that their study dates back to 2018 and this trend has been strengthened under the influence of the pandemic period, there have been few significant scientific studies.

CONCLUSIONS

The conducted research confirmed that the Covid-19 pandemic significantly influenced individuals' motivation to consider digital nomadism. The findings indicate a noticeable shift in public attitudes toward remote work, with a strong inclination, especially among women, to explore location-independent lifestyles. Respondents expressed interest in both domestic and foreign destinations, with slightly higher preferences for foreign options. These results emphasize the growing relevance of digital nomadism in the context of tourism development and labour market flexibility.

he study thus contributes to understanding how pandemic-related changes have reshaped work and travel behaviour and offers implications for tourism policy, infrastructure planning, and future research in the area of mobile work.

In conclusion it can be stated, that digital nomadicity has gained popularity and is perceived as a fashionable lifestyle and as a way of challenging traditional work contexts.

Author Contributions: Conceptualization, D.M., I. Š. and T.D.V; methodology, D.M.; software, T.D.V. and D.M.; validation, I. Š., T.D.V. and D.M.; formal analysis, T.D.V. and I.Š.; investigation, T.D.V., D.M. and I. Š.; data curation, D.M. and T.D.V; writing - original draft preparation, T.D.V. and D.M.; writing - review and editing, T.D.V , D.M. and. I.Š. visualization, T.D.V., D.M.; supervision, T.D.V.; project administration, T.D.V. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: „Funded by the EU NextGenerationEU through the Recovery and Resilience Plan for Slovakia under the project No. 09I03-03-V05-00006".

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 23.04.2025 Revised: 22.07.2025 Accepted: 19.08.2025 Available online: 15.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1822-1835
DOI 10.30892/gtg.61341-1551

DEVELOPMENT OF COASTAL TOURISM THROUGH THE TRADITIONAL CULTURE OF THE MANDAR VILLAGE COMMUNITY IN BANYUWANGI REGENCY INDONESIA

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Citation: Fattah, M., Hakim, L., Soemarno, S., & Purwanti, P. (2025). Development of coastal tourism through the traditional culture of the Mandar village community in Banyuwangi regency Indonesia. *Geojournal of Tourism and Geosites*, 61(3), 1822–1835. https://doi.org/10.30892/gtg.61341-1551

Abstract: This project aims to formulate a strategy for enhancing coastal tourist attractions by leveraging the local culture of the Mandar Village population in Banyuwangi Regency Indonesia. The research methodology employed is ethnography with a purposive sampling technique, specifically involving customary leaders, customary executors, religious leaders, tourism officials, and villagers from Mandar. The data analysis employed historical analysis, SES analysis using RStudio software, and SWOT analysis. The Mandar tribe plays a significant role in assisting the Blambangan Kingdom. The existence of the Mandar tribe in Banyuwangi has preserved the authenticity of their culture, which continues to be practiced today under the identity of Mandarwangi. This local culture can serve as a conduit for tourism, facilitating the preservation of cultural heritage while bolstering the economy of the surrounding community sustainably. Kampung Mandar is an ancient settlement situated in the eastern extremity of Java Island, along the banks of the Kalilo River. The Mandar customs with potential for tourism development includes ethnic food practices, saulak, and slametan laut. The Mandarwangi tribe continues to consume traditional foods and beverages such as janda cake, buras, cotto makasar, pallumara, barongko, and sarabba. Saulak is performed by the Mandarese indigenous community during marriages, seven-month celebrations, and circumcisions as a means of warding off misfortune. Slametan laut is a Mandar customs practice begun in the late 1700s, including the offering of crops to the ocean as an expression of gratitude towards fisherman. The development strategy that customary managers can implement is S-O or aggressive, which includes: enhancing the management of customary organizations, augmenting tourism management collaboration, developing tourist attractions, executing physical development with traditional elements, and improving the dissemination of information regarding customs.

Keywords: ethnic food, Mandarwangi, Mandar customs, saulak, slametan laut

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INTRODUCTION

Indonesia is an archipelago of several tribes and ethnic groups. Every tribe in Indonesia possesses a distinct culture (Harsana et al., 2019). This culture is transmitted over generations, becoming the indigenous knowledge of the tribe or ethnicity (Syamsuri, 2023). Tourism activities significantly impact a country's economy, environment, community, and visitors (Chin et al., 2025). Cultural tourism should be conserved as it provides future generations with an opportunity to engage with local customs and culture amidst rapid technology advancements (Choirunnisa & Karmilah, 2021).

Local wisdom is a distinctive attribute of each location that have the capacity to facilitate local development. The potential of culture and local wisdom in tourism development represents a manifestation of human creativity with economic significance. One initiative to cultivate tourism based on culture and local wisdom is the organization of festivals that showcase local culture (Sugiyarto & Amaruli, 2018). The issue of Indonesian tourism is a high concentration of activities in the most developed provinces, such as Jakarta, Bali, Yogyakarta, and several places in North Sumatra, North Sulawesi and South Sulawesi. These facts show that there are still many other provinces which have a tourism resources and unique traditional culture but have not been utilized properly. Tourism objects, such as heritage tourisms, traditional small town, down-town and the coastal cities and water front cities, natural landscapes and wildlife flora and fauna are scattered throughout the country (Butarbutar & Soemarno, 2013). Natural attractions in a region serve as an enticement and enhance cultural tourism. This indicates that natural tourism attractions and cultural attractions can be integrated into a singular travel itinerary for tourist destionations. A region may also provide additional attractions, like educational tourism, convention tourism, sport tourism, and culinary tourism (Sari et al., 2022).

A systematic and intentional strategy for shaping the destination image, based on the territory's identity primarily derived from indigenous cultural elements, attracts residents, tourists, and investors, thereby positively influencing overall

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development and quality of life (Matlovičova, 2024). Activities focused on transforming the image of negatively perceived communities are particularly relevant. Changing their reputation to a good one is a challenging process, requiring an active approach and the use of a well-thought-out branding strategy through the involvement and activation of the whole spectrum of local stakeholders. Aligning their actions and activities so that they contribute to a common goal is a major challenge even for established tourist destinations with a strong brand (Matlovičova, 2024; Herman et al., 2022; Herman et al., 2020). The Banyuwangi government facilitates the enhancement of tourist visits (O1), establishing Banyuwangi as The Sunrise of Java, the easternmost region of the island, characterized by its distinctive cultural and natural diversity and attractions. The cultural diversity of Banyuwangi is bolstered by the presence of the Osing, Madurese, Javanese, Mandar, Bugis, Makassarese, Balinese, Arab, and Chinese ethnic groups. The Tourism Department employs social media technology to disseminate tourism activities via the Banyuwangi Festival platform (O2), featuring 79 festivals in 2024 (Figure 1). Banyuwangi conducted festival activities as the premier tourist destination in 2020, featuring 120 events. The absence of formal registration of Mandar traditional events in B-Fest diminishes their appeal and interest to tourist (O3). Nevertheless, concurrent festival activities can provide challenges for organizers, government officials, and tourist (T1).

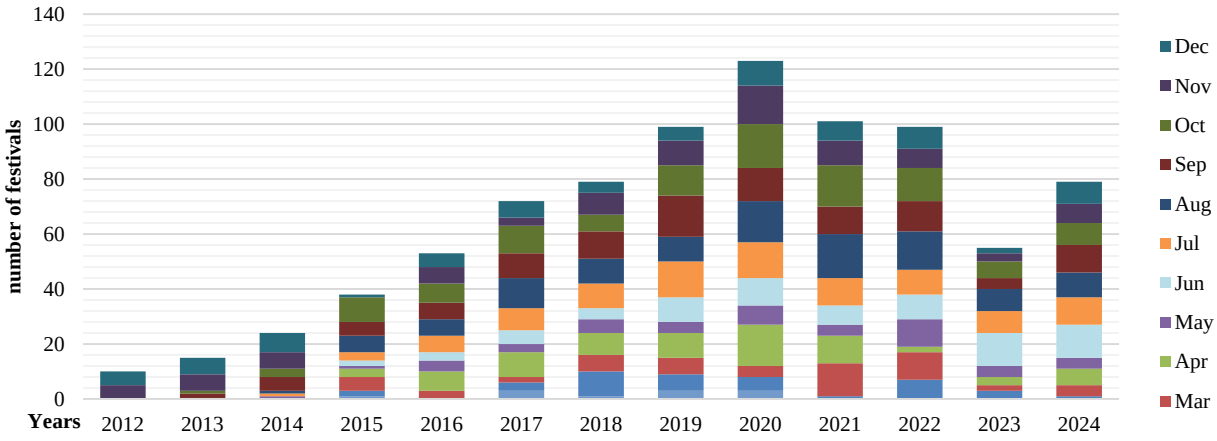

Figure 1. Increasing number of festivals in Banyuwangi (Source: Data analysis by the researchers, 2025)

The Mandar tribe migrated to Banyuwangi at the behest of the King of Blambangan due to its favorable relations with the kingdoms in Sulawesi around the 16th century. Datuk Karaeng Puang Daeng Kapitan Galak, his younger sibling Datuk Karaeng Puang Daeng Macan, together with family and troops, traveled by sea to Java. Datuk Karaeng Puang Daeng Macan, together with several relatives and troops, established residence in the Pasuruan region, presently known as Mandaranharjo. Datuk Karaeng Puang Daeng Kapitan Galak proceeded to Banyuwangi and acquired the coastal area provisions granted by the Blambangan Kingdom. The territorial expanse of the Mandar tribe at that time commenced from Mandar village as the reference point, extending 7 km to the north and 7 km to the south, encompassing the cape region to Pakis. The Mandar tribe's role in the Blambangan Kingdom is to assist in combating the Mataram Kingdom, the Dutch, and the proliferation of Islam. The majority of the inhibitants of Mandar Village are Bugis-Mandar ancestry. Nonetheless, the evolution of the Mandar lineage involved intermarriages with other ethnic groups in Banyuwangi, specifically: Arabs, Chinese, Madurese, and Osing. The presence of the Mandar tribe represents a prospective enhancement of tourism attractions in Banyuwangi. This aligns with studies (Wijayanthi et al., 2023), indicating that traditional villages provide as a solution to the demand for housing and communal living spaces. The Manggarai, particularly the Todo, have demonstrated that their architecture embodies the integration of spiritual life values and their customary practices. The conventional village configuration, architectural style, spatial arrangement, and the design of accessories and life processions are seamlessly merged into the physical built environment, creating an illusion of no distinction between the physical and the spiritual. Their forebears constructed their customary dwellings and settlements with the technology and architectural practices of their day.

Cultural tourism is a form of tourism that utilizes cultural resources as the primary asset in tourist destinations. Cultural tourism offers travelers the chance to engage directly with local individuals possessing specialized expertise about a historical object. This sort of tourism offers comprehensive insights into culture, encompassing performing arts, festivals, traditional cuisine, fine arts, history, prior experiences, and various lifestyles (Hartaman et al., 2021). The development of cultural heritage in the context of sustainable tourism, dividing it into three aspects based on literary reviews: (1) cultural heritage, (2) cultural artifacts, and (3) the protection of cultural assets (Ginting et al., 2024). Tourism attractiveness comprises a multifaceted synergy of various factors and conditions, collectively ensuring sustained tourist interest and, consequently, the competitiveness of a tourist destination or specific site (Kadyrbekova et al., 2024). The concurrent effects of polycrisis are not solely environmental; they also encompass social, economic, health, geopolitical, political, and technological dimensions, which may inhibit tourism development (Matlovič & Matlovičová, 2024). This necessitates a modification in the management strategy at the local level. Due to the multidisciplinary nature of the issues at hand, further involvement of specialists is required (Herman et al., 2020). Cultural tourism management systems have a varied influence on social and economic processes, seamlessly integrating into the realm of varied social geographies. This study closes by emphasizing the advantages of tourism and the necessity to mitigate the increasing regional differences in landscape development, which can play a crucial role in urban development planning and stakeholder collaboration (Szabó et al.,

2023). A region can have a competitive edge in the global tourism market by offering specialized services that utilize authentic experiences in cultural tourism (Matlovičová & Husárová, 2017).

The government and the indigenous population of Banyuwangi endeavor to preserve the current cultural diversity from the adverse effects of foreign cultures (T2). Furthermore, the Banyuwangi Government effectively transformed the community's negative opinion of Mandar Village, which was previously seen as a slum village characterized by violence, into a clean and welcoming destination for tourists (O4). The frequency of social media usage remains minimal among conventional activists and tourism managers (W1) for promoting tourist destinations accessible to visitors. Changes in tourist preferences (T3) necessitate that traditional stakeholders and tourism management enhance tourist attractions to remain competitive with other regional destinations, such as Bali and Lombok (T4). This study aims to formulate a strategy for enhancing coastal tourist attractions by leveraging the local culture of the Mandar Village population in Banyuwangi Regency.

MATERIALS AND METHODS

This study employs ethnographic research conducted from August 2024 to January 2025 in Mandar Village, Banyuwangi Regency, Indonesia (Figure 1). The sampling method employed was purposive sampling, specifically involving customary leaders, customary executors, religious leaders, Department of Culture and Tourism, and the Head of Mandar Village. Methods of data collection include interviews, observation, and documenting. This study's data analysis includes historical analysis, social ecology system (SES) analysis using RStudio software, and SWOT analysis. Historical study serves as a method for identifying SES in culturally-based coastal tourism. Historical analysis is conducted systematically in five stages (Kuntowijoyo, 2005): (1) topic determination; (2) heuristics; (3) verification; (4) interpretation; and (5) historiography.

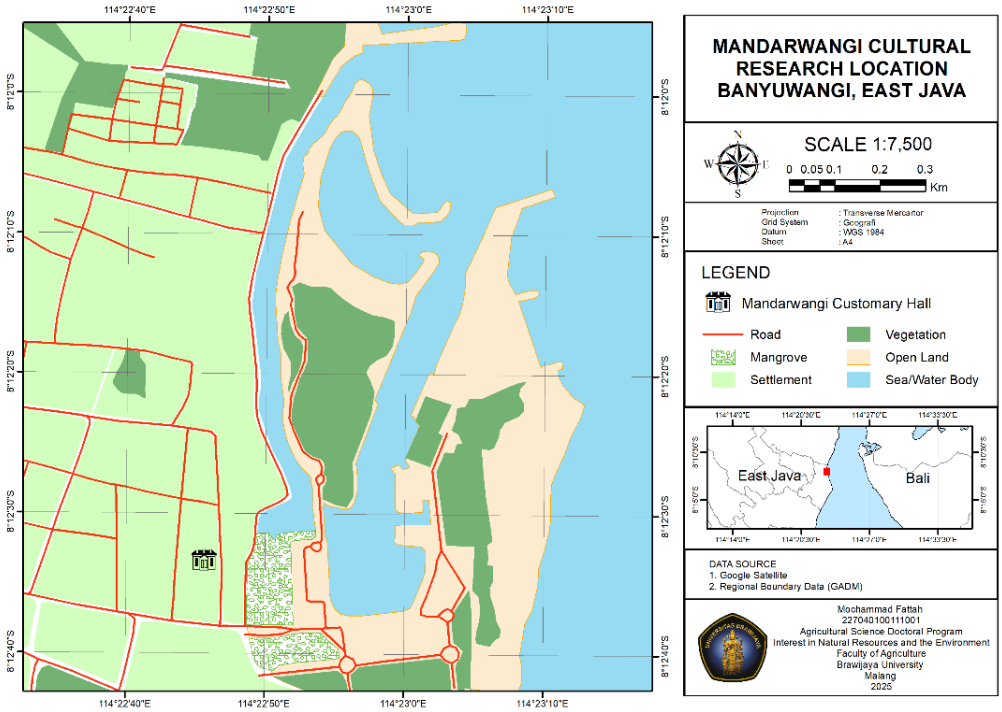

Figure 2. Research Location

The SES examination of coastal tourism based on local culture includes the following:

Degree Centrality: The centrality measure indicates that a node with a greater number of direct connections would exhibit more dominance than a node with fewer or no connections. Consequently, degree centrality (DC) refers to the degree of each individual node. The degree of a node refers to the quantity of connections it possesses with other nodes (Luke, 2015). The equation for degree centrality is as follows (Borgatti et al., 2013):

$$C_D(n_i) = \frac{\sum_1^j eij}{N-1}$$

Where: C_D(ni): centrality degree (ni) in the network (degree); N : total number of nodes in the system;
eij : the edge between node (i) and node (j)

Betweenness Centrality (BC) quantifies the extent to which a node lies on the shortest paths connecting other nodes within a network. Consequently, nodes with elevated connectedness are modre influential as they may monitor or regulate the information flow inside the network (Luke, 2015). The equation of betweenness centrality is as follows (Borgatti et al., 2013):

$$C_B(n_i) = \sum_{j<k} g_{jk}(n_i) / g_{jk}$$

Where: $C_B(n_i)$: betweenness cetrality (ni) in the network (betweenness); g_{jk}: the geodesic between nodes j and k;
$g_{jk}(n_i)$: the number of geodesics between nodes j and k that contain node i;

Cluster Centrality (Cc), or community detection, is a method for assessing the centrality value inside a social network, emphasizing the proximity of an actor to all other actors. Cc will compute the centrality weight of a node by aggregating the shortest distances between node i and other nodes (Lestari et al., 2023). Community detection is assessed with the subsequent formula (Borgatti et al., 2013):

$$C_C = \frac{N-1}{\sum_{j\neq i}^{n} d(ni,nj)}$$

Where: Cc: cluster centrality in the network; d (ni,nj): distance between nodes (ni) and (nj); N: the number of nodes in the network

The SWOT analysis for development strategies (Purwanti et al., 2017) has multiple stages, including:

1. Assess the organization's internal and external environment.
2. Assessing the scores of strengths, weaknesses, opportunities, and threats to determine the quadrant position: I. Agressive, II. Diversification, III. Turn Around, and IV. Defensive.
3. Formulate a coastline tourism development strategy based on local culture.

Research methodology steps are illustrated in Figure 3.

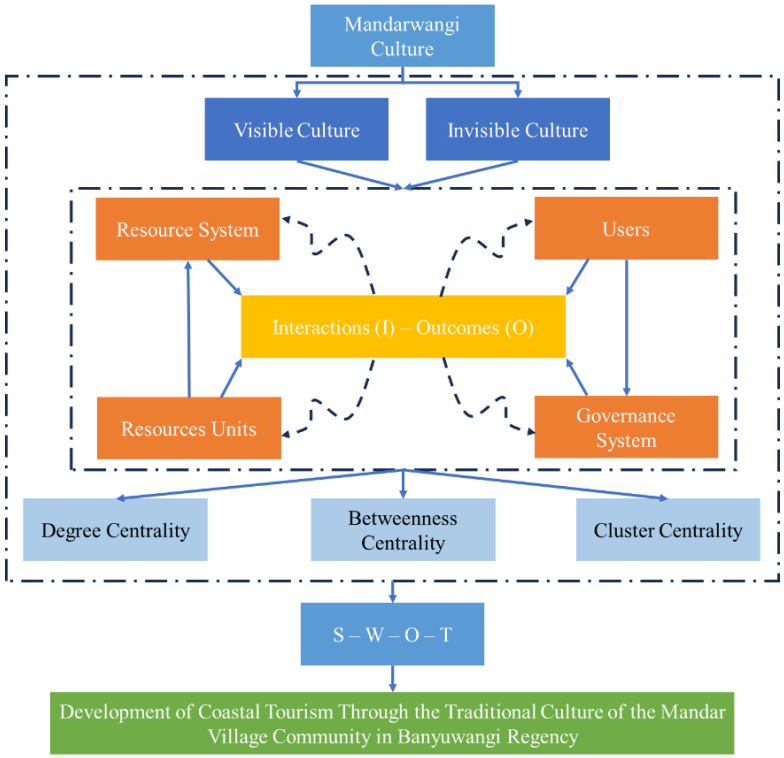

Figure 3. Research methodology steps

RESULTS AND DISCUSSION

Local Culture of Mandar Village Community

The interaction of socio-ecological systems in coastal communities frequently results in issues, including decreasing ecological quality and social conflict. Coastal villages face a multitude of complicated issues arising from both social and ecological systems. The ecological system's complexity can undergo dynamics both naturally and as a result of human activities. System-ecological issues grow more intricate when the relationship between social-ecological systems is established discordantly between villages (Muliani et al., 2018). The Socio-Ecological System (SES) is a concept developed to comprehend the interactions between human and ecological systems, characterized by interrelated and interdependent components (Manik et al., 2024). The Social-Ecological Systems (SES) concept was initially presented by Ostrom in 2007, titled Sustainable Social-Ecological Systems: An Impossibility? The SES framework comprises the Resource System (RS), Resource Unit (RU), Governance System (GS), Actor (A), Interactions (I), External (E), and Outcome (O) (Mcginnis & Ostrom, 2014). Coastal tourism based on local culture in Mandar Village, Banyuwangi, operates within a social-ecological system. The Mandar tribe residing in Banyuwangi continues to practice their local culture from Sulawesi, despite being geographically distant from their ancestral homeland.

This is underpinned by a robust conviction in the myth of the Mandar crocodile, indicating that *saulak* must continue to be performed by residents of Mandar Village, irrespective of socioeconomic class. This appears to have become the identity of not only the original Mandar people but encompasses the entire population of Mandar Village, transmitted from generation to generation (Wijaya & Sartini, 2020). The Mandarese community people believe that their ancestors assist them in life by bestowing prosperity and offering safety to themselves and their descendants (Anggraini et al., 2022). The Mandarese community continues to practices Mandar Customs (S1) through ethnic food, *saulak*, and *slametan laut*.

a) Mandar Ethnic Food

The various roles played by the stakeholders involved are as implementers, coordinators, facilitators, policy makers, and accelerators. On the basisof mutual confidence and support, their varied roles should be able to collaborate on the management of gastronomic tourism. However, stakeholders must engage in binding cooperation, synchronization, and coordination in order for tourist managementto be conducted in an integrated and well-programmed manner (Yuwafi et al., 2023). Food constitutes a tradition, as it originally serves a purpose in several rituals and ceremonial practices, having been prepared across centuries. In food production, both techniques and raw materials are perpetually transmitted over generations. Food serves not merely as sustenance, but as a conduit for creating connections among humans, the divine or ancestral spirits, other individuals, and the natural environment. Cuisine can be perceived as a fusion of multiple cultures. Moreover, traditional foods refer to the dishes and beverages typically consumed by specific communities, characterized by unique flavors that are embraced by these groups. The significance of culture in the preparation of traditional cuisine is paramoung, encompassing expertise, creativity, artistic expression, tradition, and flavor. A community's cultural sophistication correlates with a greater diversity of food types, more intricate preparation methods, and more elaborate presentations (Harsana et al., 2019). Culinary practices are a significant indicator of community cultural development (Rijal et al., 2020). Mandar ethnic food refers to the traditional food and beverages prepared using specific methods and ingredients unique to the Mandar tribe. The Mandar tribe's traditional foods and beverages still consumed by the Mandarwangi tribe include *janda* cake, *buras*, *cotto* Makassar, *pallumara*, *barongko*, dan *sarabba*. Ethnic food practices in Mandar Village are conducted during traditional events to honor guests through the use of "atur panjang". *Atur panjang* is a group dining behavior conducted at a single long table to enhance unity and peace.

Janda cake (Figure 4a) is a traditional cake from South Sulawesi, composed of bananas encased in green or red flour dough. *Buras* (Figure 4b) is a dish composed of rice, coconut milk, and salt, encased in meticulously bound banana leaves. The philosophical significance of Buras is to establish a profound connection of unity among handal taulan or to engage in mutual sharing. Buras are typically offered at celebrations like as feasts, marriages, circumcisions, and other significant occasions. *Cotto* Makassar (Figure 4c) is a quintessential South Sulawesi dish composed of beef and cow offal, simmered with a distinctive mixture of spices. It is accompanied by ketupat or buras. A specialty from the Mandar-Bugis-Makassar tribe of Sulawesi, composed of bananas, coconut milk, and eggs, it yields a sweet flavor and a soft texture. *Pallumara* (Figure 4d) refers to a dish prepared with fresh fish in a thin yellow sauce, characterized by its sour flavor.

Barongko (Figure 4e) represents my personal goods that I have encased, embodying a philosophical connotation of integrity. This traditional cake was formerly presented as a treat to the royalty. In 2017, the Ministry of Education and Culture signed Regulation Number 60128/MPK.E/KB/2017 to designate *barongko* as an intangible cultural heritage, thereby preventing its appropriation by other nations. According to Pradiati et al., 2023, barongko is a food that must be provided at proposals, weddings, celebrations, aqiqah, and other festivities. For many esteemed and wealthy households, Barongko is consistently accessible at home to be presented to guests upon their arrival. Historically, *barongko* was a distinctive dish in the kingdom, presented to honor esteemed guests and royalty. *Sarabba* (Figure 4f) is a quintessential beverage from Sulawesi, made up of ginger, lemongrass, brown sugar, milk, and various spices. Masyudi et al. (2022) explained that *sarabba* is a beverage often transported by sailors from Makassar as a warming drink during voyages. *Sarabba* serves as a treatment for colds or influenza and may be used as an energy-boosting beverage.

4a. *Janda* cake 4b. *Buras* 4c. *Cotto* Makasar

4d. *Pallumara* 4e. *Barongko* 4f. *Sarabba*

Figure 4. Traditional Food and Drink of the Mandar Tribe (Source: The researchers, 2024)

b) *Saulak*

Traditional ceremonies represent a manifestation of a community's distinct cultural identity. The *Saulak* ceremony is a ritual performed by those of Mandar heritage to prevent misfortune during marriages or events presided over by the tribal head (Anggraini et al., 2022). *Saulak* is a cultural practice conducted by Mandar descendants and residents of Mandar Village, based on the concept that its absence may lead to difficulties in their life. *Saulak* can be conducted if there exists a communal desire manifested through marriage, seven-month pregnancy, and circumcision. The *Saulak* ceremony may be conducted at the *pissili* home or at the residence of the individual with a wish. The phases of marriage rituals conducted by the Mandarese people in Banyuwangi consist of:

1. The Preparation of *Uborampe Saulak*

Uborampe is essential equipment required for traditional rites. *Uborampe* for wedding (Figure 5) prepared in the *Saulak* ritual consists of: mandar oil, coconut fruit, flowers, rice, yellow rice or bore (rice soaked, finely ground, and mixed with turmeric), sugar cane, chicken eggs, *colok* (bamboo wrapped in cotton and crushed candlenut), waru leaves, small glasses, five-colored rice cones, incense/perapen, black umbrellas, spears, *keris*, weaving tools, and udeng cloth.

Figure 5. Uborampe Saulak for Wedding (Source: The researchers, 2024)

2. The Execution of Saulak

The *saulak* ritual is a ceremonial practice established by the Mandar ethnic community historically as an expression of gratitude, a plea for protection, and recognition of ancestral spirits represented by crocodiles. The *Saulak* ritual seeks to secure protection and prevent disasters through the mediation of a *passili* (Wijaya & Sartini, 2020). *Passili* is a person who leads over the traditional ceremonial of mandarwangi. The *Saulak* ritual for wedding (Figure 6) begins with the application of mandar oil using egg medium to specific locations on the bride-to-be's body (forehead, neck, hands, feet, and stomach). The bridal family assembles in a circle to perform a sequence of three clockwise rotations. Initially, The *Uborampe* rotates the bride-to-be's clothes on a tray, followed by the rotation of flowers, rice with a plug, and a tray containing five-colored rice, coconut, sugar cane, cantilever flower, ylang-ylang, banana, and a plug, while maintaining a continuous flame during the rotation. The last *Uborampe* is alternatively positioned on the bride-to-be's stomach, accompanied by the contact of two cupss and the unfurling of a black umbrella. Afterwards, one of the families of the bride and groom adjusts the *Uborampe* from the stomach of the couple; if the initial individual is unable to move it, they alternate until they identify someone capable of moving the *Uborampe*. The final phase of the the bride-to-be is being bathed with *passili* while clutching a coconut fruit. The bathing materials for the bride-to-be include areca nut cup, *waru* leaves, banana leaves, *andong* leaves, gold-gold leaves, chicken eggs, a fistful of rice, yellow rice flour, weaving tools, coconuts, flower water, and wick ropes (particularly for bridal *saulak*). Furthermore, the attendees are sprayed with water by *passili* and apply bore (yellow rice) on their faces, an event known as "mandi-mandian". The difference between the wedding *Saulak* and the seven-month pregnancy Saulak lies in the inclusion of seven cloths in the latter, with no supplementary wedding clothes utilized. The circumcision *Saulak* is not performed during the procession of bathing the circumcised kid. Upon the completion of the *Saulak* rite, the traditional leader floats the *Uborampe* while reciting a safety prayer and awaiting its submersion.

Figure 6. The Wedding Saulak (Source: The researchers, 2024)

c) Slametan Laut

Slametan laut is a Mandar customs practice initiated in the late 1700s, including the casting of harvests into the ocean. The *slametan laut* practice starts with fishermen's intention to express gratitude (Sykr) to Allah SWT for bountiful fish harvests. Fishermen from Mandar Village engage in the Joint Business Group (KUB) (S4), which includes net fishermen, rod fishermen, and lamp service fishermen, to express their intentions to the traditional leader of *Mandarwangi*, Puang Faisal Daeng Galak, who facilitates the *slametan laut* ritual. The religious leader (S5) who facilitated this activity was Gus Dandi Mukti. It is asserted that choosing not to carry out the *Petik Laut* tradition in Muncar Banyuwangi will lead to disaster. The residents of Muncar consistently attend it. The Petik Laut tradition requires extensive planning for its series of activities. A multitude of vessels will proceed to the Sembulungan Peninsula. The elder fishermen are prepared to cast the offerings into the ocean. Following the sailing, numerous fisherman typically plunge into the water to retrieve offerings, such as fruits, in pursuit of blessings (Anggraini & Nurullita, 2023). The phases of the Slametan laut activity in Mandar Village are as follows:

1) Pilgrimage to the Tomb of the Ancestors of the Mandar tribe

The preliminary activity preceding the *slametan laut* is a food pilgrimage to the ancestors of the Mandar tribe, namely to the graves of Datuk Karaeng Puang Daeng Kapitan Galak and other forebars. Activities conducted during the journey encompass: draping new white fabric over the tombstones, scattering flowers, and offering prayers for the ancestors (Figure 7).

2) The Preparation of *Uborampe Slametan Laut*

The *slametan laut* rite involves the ceremonial slaughtering of a cow as an expression of thanks from fisherman, with the meat distributed to the impoverished, widows, and orphans, while the cow's head serves as a symbol of charity to marine life. The *uborampe slametan laut* is organized by the traditional facilitators of Mandarwangi, specifically Puang Dahliana Daeng Kebo. The phases of preparation for the *uborampe slametan laut* include:

Authentically slaughtering a single cow, although typically purchasing only the cow's head based on the fisherman's capacity. The acquired cow's head is cleaned and dyed yellow. The criterion is that the cow's head has a predominantly white or black coloration. The head is subsequently treated with a preservative and secured with a white towel (Figrue 8).

Figure 7. Ancestral Grave Pilgrimage (Source: The researchers, 2024)

Figure 8. Cleaning and Squeezing the Cow's Head

The prepared cow's head is positioned on the *ancak* (Figure 9) resembling a fishing boat (authentically rectangular), accompanied by seven portions of the cow's internal organs, each weighing approximately 100 grams, encased in banana leaf packages and treated with preservatives, mandar oil (a specialized oil essential for maritime activities), yellow rice, white rice, *colok*, coconut, five-color tumpeng rice, flowers, and sugar cane. *Uborampe*, a must, is a live white or black chicken. The cow's head is protected until morning by the burning of incense/ *perapen*.

Figure 9. Uborampe Slametan Laut (Source: The researchers, 2024)

Figure 10. Recitation and Prayer

3) Recitation and Prayer

The predominant religious affiliation among the Mandarese is Islam; hence, the subsequent Slametan practice, following the fabrication of Uborampe and cow skulls, involves collective recitation and prayer (Figure 10). This behavior is conducted to seek the grace of Allah SWT for the Slametan laut event. The ceremony was attended by the Commander of the Indonesian Navy Base (*Danlanal*), the Commander of Korem (*Danrem*), the Chief of Police (*Kapolres*), Head of

Vocational and Productivity Training Center (BVPV), sub-district heads, village chiefs, religious leaders, community leaders, and representatives from universities.

4) *Gandrung* Dance

The most popular art form in Banyuwangi, which has promoted the name Banyuwangi internationally, is *Gandrung*. *Gandrung* is the esteemed art of Banyuwangi, so the term Banyuwangi is frequently referred to as the city of *Gandrung* (Mursidi, 2018). The *Gandrung* Dance has experienced a change in its significance, evolving from a sacred ritual expressing communal gratitude for the harvest to a commercialized performance art intended for entertainment on theatrical stages (Clairine et al., 2024). The traditional hall showcases a Mandar dance prior to the *Gandrung* Dance. The *Gandrung* Dance (Figure 11) is an Osing cultural expression incorporated into the *slametan laut* rite, serving as a gesture of reverence from the Mandar tribe towards the indigenous tribes of Banyuwangi. The dance is executed "throughout the night (*semalam suntuk*)" following the recitation and prayer activities.

Figure 11. The Gandrung Dance (Source: The researchers, 2024)

Figure 12. Slametan laut Cultural Parade

5) Cultural Parade

The cow's head in the morning prior to the procession and larung is adorned with gold on the nostrils. The cow's head from the traditional house is ceremoniously carried to the shore alongside the usual leader, executor, and individuals from the Mandar, Osing, Madura, Javanese, Chinese, and Arab ethnic groups, all adorned in their own traditional attire (Figure 12). The procession features the reciting of *shalawat*, the use of hadrah musical instruments, and the sprinkling of yellow rice by Banyuwangi regional officials at the welcoming site, alongside performance of the *Gandrung* and *Jaran Goyang* Dances, concluding with a prayer. The cow's head is subsequently returned to the fishing vessel in preparation of the barging.

6) *Melarung* Tradition

The vessel containing the *uborampe* (cow's head) is occupied by traditional performers, *Gandrung* dancers, Mandar dancers, religious leaders, *hadrah* musicians, members of the Mandar community, and security personnel (Figure 13).

Afterwards, numerous fishing vessels escort the *pelarung* ship into the sea. During the procession, the recital of shalawat is incessantly sung alongside *hadrah*, while religious authorities provide Islamic prayers and ancestral invocations of the Mandar tribe. Prior to the cow's head being floated, the call to prayer is proclaimed to signify that the float is not intended for supernatural entities. The gold placed on the cow's head will be contested by the fishermen or everyone else once the cow's head has submerged.

Figure 13. The Larung of Cow's Head in Slametan Laut (Source: The researchers, 2024)

Figure 14. Bathing Event "Mandi-mandian"

The *slametan laut* activity concludes with bathing and the application of bore to the face, performed by the Mandarese traditional community to prevent illness (Figure 14). This activity is conducted to demonstrate that it has been finished and that the expected objectives have been achieved.

Tourists are primarily motivated in cultural tourism by the desire to explore and understand local culture through both authentic and fabricated cultural activities, whereas museums preserve the majority of a nation's dynamic cultural legacy (Herman et al., 2023). The traditional hall offers educational insights into Mandarwangi culture through an exhibition of Mandar archives (Figure 15) for the general public and students (S6). This archival exhibition features ancient objects including stilt house support stones, spear guns, *keris* and *badik*, commando sticks, jars, teapots, looms, headbands, scarves,

sarongs, Mandar script, photographs of buildings, ships, rituals, and ancestors. Nonetheless, the advancement of Mandar customary cultural tourism considers the area's carrying capacity (W2), accessibility to the constricted traditional hall (W3), insufficient tourist parking facilities (W4), and the inadequacy of Mandar customary physical structures (W5), which results in adverse effects on tourist interest during bad weather (T5). The location of the traditional hall in the coastal region occasionally faces challenges from natural disasters (tidal floods, tsunamis, tornadoes), which impact tourism activities (T6).

Figure 15. Mandar Tribe Archives Exhibition (Source: The researchers, 2024)

The advancement of cultural tourism is essential for raising awareness of a region's existence and for the preservation of its cultural heritage. Moreover, culture can serve as a tourist attraction to enhance revenue and generate employment for the community (Patabang et al., 2023). Tourism generates economic advantages by establishing employment opportunities for local communities (tour guides, homestay management, food sellers) and enhancing income (Fattah et al., 2023) through the diversification of tourism offerings, thereby transforming them into attractions (Tjahjono et al., 2022). Fishermen enhance the *slametan laut* activities by adorning the boats with ornaments (Figure 16). The community also establishes traditional and non-traditional food mart stalls. The Banyuwangi regional administration additionally promotes tourism growth by enhancing infrastructure and supporting facilities (O5). Moreover, travel agencies and the Indonesian Tour Guide Association (HPI) (O6) also facilitate tourism operations in Banyuwangi. Nonetheless, the issues persisting in the Mandar Village river estuary involve the influx of plastic and organic trash (W6). Saputra et al., 2021 indicated that the challenges in developing this tourist village encompass awareness, technology, transportation, road access, and reliance on specific entities for tourism promotion, resulting in limited recognition of this attraction among the broader public.

Aprilia et al. (2023), highlighted that, conversely, tourism villages have challenges due to a scarcity of experienced Human Resources (HR) in the tourism sector, inhibiting the successful running of tourism operations. This results in minimal understanding among the local community about the significance of tourism development in their region.

Figure 16. Decorative Fisherman's Boat (Source: The researchers, 2024)

Social network theory is increasingly important in social research, with the centrality measure supporting this developing theory (Zhang & Luo, 2017). Centrality in social ecological networks is quantified through degree centrality, betweenness centrality, and clustering centrality. The degree refers to the quantity of connections associated with a point, as well as the magnitude or number of weighted linkages pertaining to that point. Considering merely one of the two indications does not guarantee the accuracy of the node's centrality value. Communication between nodes is seen as the strength or influence of the node (Yustiawan et al., 2015). The Mandar custom (Adt_Mandar) exhibited the highest Degree Centrality at 10 degrees (Figure 17), indicating its significant influence on other nodes. The Mandar ritual in Banyuwangi can serve as a tourist attraction while preserving its holy significance. The traditional leader, Joint Business Group (KUB), and customary leaders play a pivotal role in the advancement of cultural tourism, which has been operating at a consistent level of 8 degrees. The customary leader is an individual who oversees Mandar customs to ensure alignment with ancestral beliefs. KUB is a community organization in Mandar Village primarily engaged in fishing. The existence of fishermen in Mandar Village adheres to established customs, whereby a substantial fish catch (Jml_Tngkp) prompts fishermen to consult the traditional leader to conduct a Slametan laut. Moreover, fishermen engage in the *saulak* culture (Slak) and continue to partake in the ethnic food (Etn_Klnr) characteristics of Mandar customs.

Customary leaders in Banyuwangi play a crucial role in preserving harmony among ethnic groups and upholding the traditional values of each community. The fishing operations (Aktv_Pngkpn) conducted by Mandar fisherman exert an influence on the third position, with a node degree of 7. The fish catch is affected by the fishing trip (Trip_Pnkpn) and the vehicle feet (Armd), resulting in a catch per unit effort (CPUE). Moreover, the Department of Culture and Tourism (Disbudpar) plays a crucial role in the advancement of tourism in Banyuwangi. Purwanti et al. (2021), confirmed that, the role of good governance, policy integration mechanisms are required in terms of vertical and horizontal coordination; local communities can access transparent public consultation and the involvement of sustainable management.

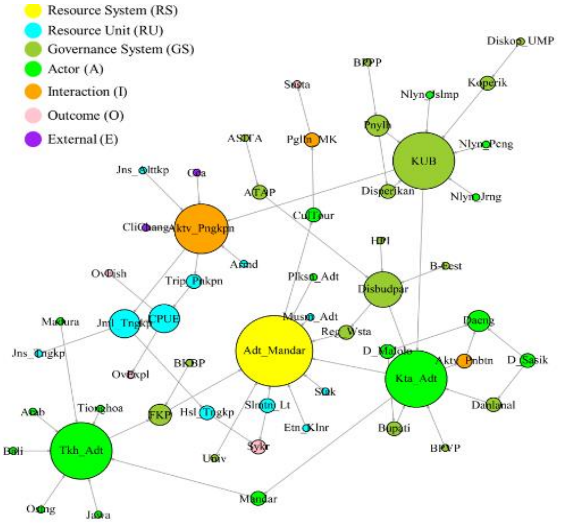

Figure 17. Coastal Tourism Degree based on Local Culture (Source: Data analysis by the researchers, 2025)

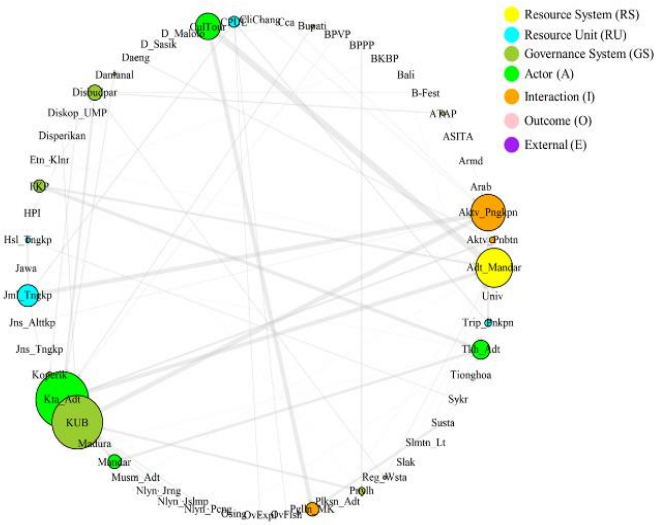

Figure 18. Betwenness Coastal Tourism based on Local Culture (Source: Data analysis by the researchers, 2025)

Betweenness quantifies the centrality of a node within a network, typically computed as the ratio of the shortest paths connecting node pairs that cross the node in question. Betweenness is, in a certain regard, an indicator of a node's influence on the dissemination of information within the network (Newman, 2005). Betweenness Centrality indicates a node that serves as an intermediary between two other nodes in a network, hence influencing the positioning of other nodes. The primary node, determined by betweenness, is the traditional leader associated with the Mandar custom, exhibiting values of 159 and 111, followed by the KUB node linked to fishing activities, which has values of 152 and 104. The actor nodes yielding the highest values are the customary leader and KUB, both of which are pivotal actors in coastal tourism in Mandar Village, based on local culture (Figure 18). The traditional leader is a pivotal figure in preserving and enforcing culture in alignment with ancestral ideals. KUB is a pivotal entity in the community that engages in fishing activities to satisfy the demands of culinary tourism in Mandar Village and other consumers.

Clustering (Figure 19) is a way to group nodes that have similarities as a binding force in a community. Local culture-based coastal tourism in Mandar Village is divided into 7 clusters:

a) Cluster 1 is a Slametan laut, the largest event in Mandar Village, involving numerous stakeholders. Fishermen, through KUB, express their intention to conduct a Slametan laut to the Mandar traditional authority. Moreover, the Slametan laut events are organized and executed in accordance with ancient traditions.

b) Cluster 2 refers to tourist regulation; the management of cultural tourism necessitates adherence to established processes and regulations to prevent societal issues. Anggara et al. (2024), assert that tourism necessitates robust laws to guarantee sustainable practices at the location. Robust regulations and an enhanced comprehension of quality tourism services are essential for effectively serving clients. Moreover, the promotion of quality regulations and services is essential for tour guides to effectively execute these standards for tourists to the location.

c) Cluster 3 includes Mandar customs, where the attraction of cultural tourism lies in the preservation of original traditions, spesifically: ethnoculinary practices, Saulak, and Slametan laut. Utami (2023), said that the Government offers optimal resources to community groups to revitalize local culture for potential tourism appeal.

d) Cluster 4 refers to cultural tourism, wherein the sustainability of local culture in Mandar Village can be preserved through cultural tourist initiatives. Nugraheni & Aliyah (2020), highlighted that the development of cultural tourism aligns with the interests of both domestic and international tourists, while also enhancing promotional efforts.

e) Cluster 5 refers to the Mandar traditional chief, whose role demonstrates the everlasting originality of local culture in Mandar Village.

f) Cluster 6 includes KUB, with fisherman serving as providers of seafood for consumers. The plentiful catch prompts fishermen to convey their thanks to the Creator through traditional ceremonies.

g) Cluster 7 includes traditional figures; the Banyuwangi administration facilitates a platform for these characters to maintain their customs while promoting tolerance. Hasan et al. (2023), explain that the importance of traditional figures and their communities, who consistently uphold the culture of their ancestors, is the primary determinant in the persistence of their culture. The culture that exist includes livelihood, beliefs, society, culture, science, and art.

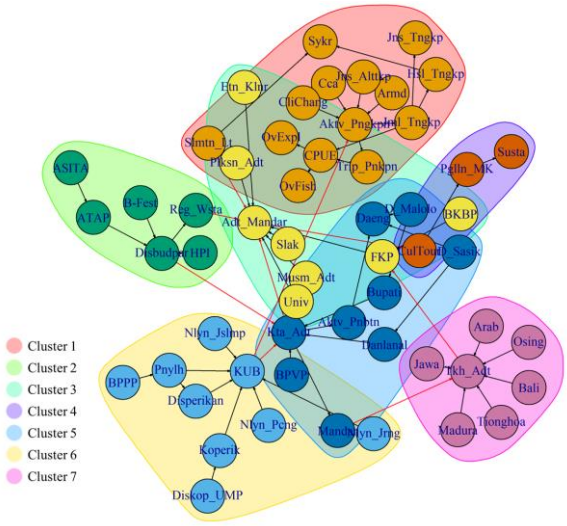

Figure 19. Cluster of Coastal Tourism based on Local Culture (Source: Data analysis by the researchers, 2025)

Coastal Tourism Development through Local Culture of Mandar Village Community

The cultural tourism sector can enhance the development of Indonesian culture, as cultural-based tourist attractions indirectly showcase indigenous arts and practices, attracting both domestic and international visitors. This sort of cultural tourism offers extensive knowledge to visitors, encompassing performing arts, traditional cuisine, festivals, history, fine arts, customs, and lifestyle practices (Utami, 2023). Historical tourism products are created based on themes that align with the ambitions of the local community and current trends in tourist interests, particularly specialized subjects that can attract both domestic and international visitors (Renold et al., 2020). Identification of internal and external environmental variables related to ecology, economy, and social aspects within the culture conducted by the Mandar Village community led to strengths, weaknesses, opportunities, and threats (Table 1).

Table 1. Identification and Assessment of Strengths, Weaknesses, Opportunities, and Threats (Source: Data analysis by the researchers, 2025)

No	Strengths	Code	Weight	Rating	Score	Opportunities	Code	Weight	Rating	Score
1	Mandar Customs	S1	0.098	4	0.39	Government Support	O1	0.075	3	0.23
2	Fish Production	S2	0.073	3	0.22	B-Fest	O2	0.075	3	0.23
3	Fishermen's Gratitude	S3	0.098	4	0.39	Number of Tourist Visits	O3	0.1	3	0.30
4	Joint Business Group (KUB)	S4	0.073	2	0.15	Tourist Perception of Clean and Friendly Environment	O4	0.1	3	0.30
5	Religious Leaders	S5	0.073	4	0.29	Infrastructure and Supporting Facilities for Tourism	O5	0.075	4	0.30
6	Cultural Education	S6	0.073	3	0.22	Travel Agencies and HPI	O6	0.075	2	0.15
	Number of Strengths				1.66	Number of Opportunities				1.50
	Weaknesses					**Threats**				
1	Utilization of Social Media	W1	0.098	4	0.39	Other Tourism Attractions Occuring at the same time	T1	0.075	2	0.15
2	Carrying Capacity of the Traditional Hall Area	W2	0.098	3	0.29	Influence of Foreign Culture	T2	0.075	2	0.15
3	Road Access to the Traditional Hall	W3	0.073	3	0.22	Changes in Tourist Preference	T3	0.1	3	0.30
4	Parking Area for Tourists at the Traditional Hall	W4	0.098	3	0.29	Competitiveness of Tourist Destinations Outside Banyuwangi	T4	0.1	4	0.40
5	Characteristics of the Physical Buildings of the Mandar tradition	W5	0.073	3	0.22	Weather (rain)	T5	0.075	3	0.23
6	Rivers are still polluted by plastic and organic waste	W6	0.073	2	0.15	Potential of Natural Disasters	T6	0.075	2	0.15
	Number of Weaknesses		1		1.56	**Number of Threats**		1		1.38
	Total of IFE				3.22	**Total of EFE**				2.88
	X Coordinate				0.10	**Y Coordinate**				0.13

The internal environment of the Mandar indigenous group delivers a strength score that surpasses the weakness score, indicating that the strengths inherent in Mandar customs can mitigate existing imperfections. The external environment of the Mandar indigenous people delivers a higher opportunity score than the existing threats, allowing for the mitigation of threats through taking advantage of opportunities. Although the entire internal environment surpasses the external environment, this indicates that indigenous people can optimize the internal environment to enhance cultural tourism. The disparity between the strength and weakness scores results an X coordinate of 0.10 (positive value), but the disparity between the opportunity and threat scores results in a Y coordinate of 0.13 (positive value) (Figure 20).

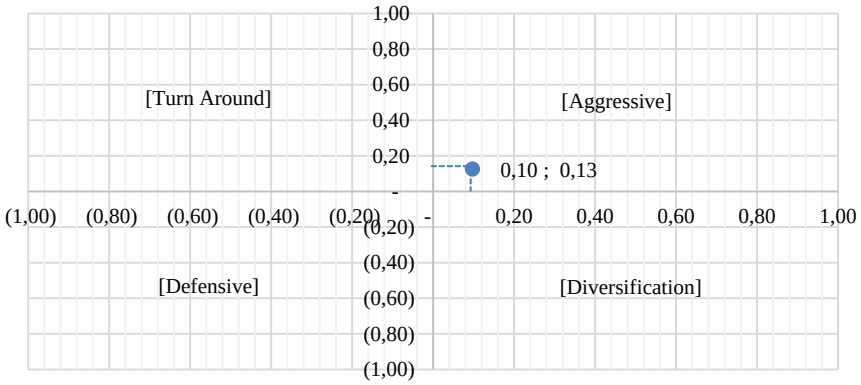

Figure 20. Quadrant Position of Coastal Tourism Development Strategy based on Local Culture (Source: Data analysis by the researchers, 2025)

The strategy adopted by the Mandar regular administrators is S-O (Strengths-Opportinities), indicating that they may leverage their strengths to capitalize on available opportunities. Strategies that the Mandar traditional administrators can implement include:

1. Improvement of the Mandar traditional organizational structure, wherein Mandar traditional organization is formally documented and utilized as a foundation for achieving common goals.
2. Establishing written regulations for internal organizational management; these written rules serve as instructions or directions for operating the organization.
3. Establishment of heritage-based tourism awareness groups (*Pokdarwis*), which serve as a platform for enhancing tourist attractions that preserve local cultural values and respond to market demands.
4. Establishment of processing and marketing groups (*Poklahsar*) to support Mandar ethnic food. This group serves as a platform for the development of local culture-based products that align with market demand and facilitate the daily sale of products through live social media, thereby promoting the presence of local culture-based products.
5. The construction of traditional dwellings serves as a platform for the advancement of *Mandarwangi* culture and education on cultural heritage, the development of roads and sites in Mandar Village to establish a heritage ambiance, and the building of permanent gates as a unique characteristic connecting to the traditional hall.
6. The development of tourism packages focused on local culture: a) integration of ethnic food experiences through research trips, educational program, and traditional events as tour package; b) regular scheduling of *saulak* to disseminate tour package information; c) utilization of fishing boats during the *slametan laut* for tourist engagement; d) offering tour packages that includes the entirety of the *slametan laut* event, from the beginning to closing (bathing).
7. Enhancing collaboration with travel agencies might elevate travelers' excitement for the attractions offered by the management.
8. Enhancing collaboration with the Department of Culture and Tourism to propose the presence of the Mandar *slametan laut* in the 2025 festival, enabling the government to assist in promoting the *slametan laut* as a festival or tourism attraction to visitors. *Petik laut* Muncar and *petik laut* Pancer have participated in the Banyuwangi Festival (B-Fest). Furthermore, Mandar traditional activists can get human resource development facilitated by the Department of Culture and Tourism.
9. Enhance collaboration with educational institutions as a platform for local cultural education; traditional education through experiential activities can directly demonstrate that cultural presence fosters positive character development in students.
10. Enhance the utilization of social media to promote Mandar traditional culture; managers should more frequently upload Mandar traditional activities or provide concise appraisals of the artifacts housed in the Mandar Hall archives.

CONCLUSION

The cultural activities of the Mandar tribe have not been effectively leveraged for cultural tourism, resulting in an unoptimized economic impact on the community land, in particular, the customary managers. The Mandar customary community in Banyuwangi continues to practice ethnic food traditions, *saulak*, and *slametan laut*. Improved management of this culture can enhance its economic influence on the local community. Ethnic food practices typically occur during traditional ceremonies and specific festivals; Saulak is conducted for weddings, seven-month pregnancy, and circumcisions, whilst the *slametan laut* takes place around November. Nodes significantly impacting the evolution of coastal tourism, based on local culture and assessed by degree centrality, include the Mandar custom, traditional leaders, KUB, cultural leaders, fishing activities, and the Department of Culture and Tourism. The most important mediators between nodes are the traditional leader and KUB. The findings of the categorization based on node similarity are categorized into seven clusters. The development strategy that the Mandar customary management can implement is S-O or aggressive.

The advancement of cultural tourism serves not only to showcase the abundance of local culture but also significantly contributes to its preservation. By exhibiting local traditions, arts, cuisine, and knowledge to tourists, local communities are motivated to persist in practicing and preserving their ancestral legacy. This cultivates pride in one's cultural identity and enhances awareness of its preservation's significance. Nonetheless, while striving to preserve the distinctiveness of local culture, the advancement of cultural tourism must be conducted with the principles of mutual respect and appreciation for diversity. Consequently, exchanges between tourists and local populations not only enhance cultural experiences but also cultivate harmonious discussion, promote tolerance, and encourage respect for diversity as a shared asset.

The involvement of stakeholders is crucial in the advancement of culture-based tourism, as cooperation across diverse entities dictates the sector's success and sustainability. The government is involved in policy formulation, infrastructure provision, and the promotion of cultural destinations. Establishments, including hotels, restaurants, and travel agencies, play a vital role in delivering services that enhance the tourism experience. Local communities are the primary agents in safeguarding regional traditions, arts, and knowledge, while simultaneously reaping economic benefits from tourism. Scholars and non-governmental organizations contribute to research, training, and the formulation of sustainable policies. Simultaneously, tourists function as consumers who stimulate demand for cultural products. The collaboration among stakeholders enhances the economy while safeguarding cultural treasures for future generations through culture-based tourism. This study recommends enhancing customary organizations, enhancing collaboration, developing tourist attractions, implementing physical improvements of traditionally things, and establishing community groups.

Author Contributions: Conceptualization, M.F. and S.S.; methodology, M.F. and L.H.; software, M.F. and P.P.; validation, M.F. and L.H.; formal analysis, M.F. and S.S.; investigation, M.F. and L.H.; data curation, M.F. and L.H.; writing—original draft preparation, M.F. and P.P.; writing—review and editing, M.F. and S.S.; visualization, M.F. and L.H.; supervision, M.F. and P.P.; project administration, M.F. All authors have read and agreed to the published version of the manuscript.

Funding: BPI (the Indonesian Education Scholarship), PPAPT (Center for Higher Education Funding and Assessment), and LPDP (Indonesian Endowment Fund for Education)

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The author expresses gratitude to BPI (Indonesian Education Scholarship), PPAPT (Center for Higher Education Funding and Assessment), LPDP (Indonesian Endowment Fund for Education), the Mandar indigenous community, Department of Culture and Tourism (*Dibudpar*), and the Journal Manager for their assistance in the publication of the article.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 12.04.2025 Revised: 23.07.2025 Accepted: 20.08.2025 Available online: 17.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1836-1844
DOI 10.30892/gtg.61342-1552

TOURIST ENHANCEMENT USING PLATFORM FEATURES OF MY TRIPS AND RECOMMENDATION ROUTES

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Citation: Trakulmaykee, N., Pratan, T., Hnucheck, K., & Dittavichai, R. (2025). Tourist enhancement using platform features of my trips and recommendation routes. *Geojournal of Tourism and Geosites*, 61(3), 1836–1844. https://doi.org/10.30892/gtg.61342-1552

Abstract: This study aimed to (1) evaluate the levels of the satisfied features in 'My Trips' and 'Recommendation Routes', and level of tourist enhancement; (2) compare the tourist' satisfaction in terms of tour website 'My Trips,' 'Recommendation Routes' and tourist enhancement between experience and non-experience groups; (3) investigate the impact of the 'My Trips' and 'Recommendation Routes' features on tourist enhancement; and (4) investigate the moderating role of tour-website experiences on the relationships between 'My Trips' and tourist enhancement, and 'Recommendation Routes' and tourist enhancement. Data were collected from 151 tourists using convenient sampling techniques. The research instrument was a survey questionnaire with 5 Likert-scale items. This study used SPSS and SmartPLS as the analyzed tools. The satisfied results show no significant differences between experienced and non-experienced users as all p-values exceed 0.05 in terms of tourist enhancement, 'My Trips' and 'Recommendation Routes.' Path analysis results confirm that 'My Trips' and 'Recommendation Routes' significantly contribute to tourist enhancement. However, the moderating effects of tour-website experience were not significant in both relationships between 'My Trips' and tourist enhancement and 'Recommendation Routes' and tourist enhancement at the significant level of 0.05. These findings underscore the importance of personalized travel features in digital tourism and provide insights for improving user engagement in travel platforms. From a theoretical perspective, it advances digital tourism studies by illustrating the role of route recommendations in enhancing tourist engagement. On the practical side, travel platforms are encouraged to focus on improving usability to better serve all users. Future research should explore additional factors influencing tourist engagement with digital travel tools.

Keywords: digital tourism, my trips, recommendation routes, tourist enhancement, tour-website experience

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INTRODUCTION

Tourism plays a vital role in the global economy, contributing significantly to cultural exchange, economic growth, and local development (Apriyanti, 2024; Hossain et al., 2024; Son et al., 2023). However, tourists often face challenges in planning their trips, navigating unfamiliar destinations, and optimizing their travel experiences. The integration of digital technology in tourism has revolutionized the way travelers explore new places, with mobile websites and recommendation systems becoming essential tools for enhancing tourist engagement (Angkananon et al., 2024; Shatnawi et al., 2024; Xiong & Zhang, 2024). Moliner-Tena et al. (2024) and Chia et al. (2024) highlighted in their studies that the destination image can directly affect tourist engagement. Furthermore, the awareness of attractions can increase tourist satisfaction (Goeltom & Hurriyati, 2024; Sugiama et al., 2024; Tarmizi et al., 2025).

Therefore, this study bridges the gap between technology and tourism, offering a seamless, user-friendly platform that improves travel planning and exploration. To do this, the study focuses on tourist enhancement using 'My Trips' and 'Recommendation Routes'", leveraging a mobile website to provide personalized travel experiences. The mobile website enhances accessibility and convenience, allowing users to interact with the platform on the go without the need for additional app installations. By integrating 'My Trips' into a functionality, tourists can customize their travel plans, save destinations of interest, and receive dynamic recommendations based on their interactions.

In addition, 'Recommended Routes' provide optimized travel paths, considering factors such as location preferences, time constraints, new attractions, and popular attractions. This not only enriches the travel experience but also benefits local businesses by guiding tourists to recommended attractions, restaurants, and cultural sites.

However, while previous studies have explored the role of recommendation systems and itinerary management tools in tourism (Matyusupov et al., 2024; Soltani Nejad et al., 2024; Trakulmaykee et al., 2024), limited research has examined

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their impact on tourist enhancement. Moreover, little attention has been given to the moderating role of website experience in this context. Therefore, this study addresses these gaps by analyzing the effectiveness of 'My Trips' and 'Recommendation Routes' on tourist enhancement and investigating how website experience for travel influences their impact. Research objectives of this study are:

- To assess satisfaction levels with the 'My Trips' and 'Recommendation Routes' functionalities, as well as tourist enhancement.
- To examine differences in tourist satisfaction regarding the 'My Trips' and 'Recommendation Routes' features and tourist enhancement between experienced and non-experienced website users.
- To analyze the influence of 'My Trips' and 'Recommendation Routes' on tourist enhancement.
- To explore how prior tour-website experience moderates the relationships between these platform features ('My Trips' and 'Recommendation Routes') and tourist enhancement.

LITERATURE REVIEWS

The digital transformation of the tourism industry has revolutionized the way travelers plan and experience their trips. Mobile applications, web-based platforms, and recommendation systems have become essential tools in enhancing tourist experiences (Akpinar & Atak, 2025; Najlaoui & Ammari, 2024; Shi & Sun, 2024). Studies suggested that integrating smart technologies such as geolocation and interactive services can significantly improve the efficiency and personalization of travel services (Duan, 2025; Liang & Wei, 2024; Nitu et al., 2021). Mobile-friendly platforms provide real-time assistance, reducing travel-related stress and ensuring a seamless experience for tourists (Amaro et al., 2025; Hien & Trang, 2024; Yudhistira et al., 2025). Literature underscored the significance of tourist enhancement through technological advancements, tourist behaviors, and mobile accessibility. By leveraging smart tourism solutions such as 'Recommendation Routes' and 'My Trips,' can provide an enriched and seamless experience for travelers.

Previous studies have found that if travel technology included features of navigation, trip planning, and route recommendations; then most tourists will be satisfied and intend to use the technology (Jung et al., 2021; Ruko et al., 2024; Zeng et al., 2022). However, most studies often focus on one feature or technology in isolation. They did not combine 'My Trips,' 'Recommendation Routes' and tourist enhancements as this study. Therefore, H1, H2, H3 are provided a holistic evaluation as the following hypotheses:

H1: The tourists' satisfaction level of 'My Trips' is high.

H2: The tourists' satisfaction level of 'Recommendation Routes' is high.

H3: The level of tourist enhancement is high.

Personalization played a crucial role in tourist enhancement, and previouse researchers found the technological experience of tourists related to their satisfaction and intention to use technology (Jung et al., 2021; Yang & Huang, 2025; Yudhistira et al., 2025). However, most studies do not distinguish between experienced and non-experienced users of tour-websites, though user familiarity may significantly alter satisfaction and usability perceptions. To address this gap, this study assumes the following hypotheses to proof and confirm the previous studies in the context of our website:

H4: Tourist satisfaction in 'My Trips' between two groups of tour-website experiences is different.

H5: Tourist satisfaction in 'Recommendation Routes' between two groups of tour-website experiences is different.

H6: Tourist enhancement between two groups of tour-website experiences is different.

Providing route based on Google Map and user behavior analysis helped in suggesting travel routes, activities, and attractions, improving overall tourist satisfaction (Al Beruni et al., 2025; Inmor et al., 2025; Niu, 2023; Yudhistira et al., 2025). Studies have shown that 'Recommendation Routes' not only enhance tourists to travel but also optimize time management and resource utilization, benefiting both tourists and local businesses (Lee et al., 2024; Makhdomi & Gillani, 2023; Zhao et al., 2025). Unlike standalone applications, mobile websites provide seamless access to travel planning tools without requiring downloads, making them more accessible to a broader audience. Features such as 'My Trips' allowed tourists to create, save, and modify itineraries, while 'Recommendation Routes' assisted in real-time navigation and exploration. These technologies helped tourists make informed decisions by offering real-time information, location-based services, and interactive content (Beruni et al., 2025; Tavichaiyuth et al., 2022; Yachulawetkunakorn et al., 2025). In addition, previous studies highlighted that 'My Trips' and 'Recommendation Routes' related to tourist enhancements (Chia et al., 2024; Moliner-Tena et al., 2024; Xiong & Zhang, 2024). Consequently, this study provides H7 and H8 to prove the influences of 'My Trips' and 'Recommendation Routes' on tourist enhancement in the context of our mobile website.

H7: 'My Trips' positively influence on tourist enhancement.

H8: 'Recommendation Routes' positively influence on tourist enhancement.

Yang & Huang (2025), Jung et al. (2021) and Yuksel et al. (2024) stated that tourist experiences can impact their satisfaction and enhancement. With the increasing reliance on digital devices, mobile websites have become a vital tool for enhancing tourism experiences. Modern travelers seek customized experiences that align with their interests, preferences, and real-time needs (Aarabe et al., 2025; Iswanto et al., 2024; Lee et al., 2024).

However, tourist experience at technological features may be different between experience and non-experience groups. The prior work does not differentiate between first-time and experienced users in the context of tour-website which focused on 'Recommendation Routes' and 'My Trips.' Additionally, these studies rarely examined the effect of tour-website as moderator variable. To address this gap, the study proposes in H9 and H10 as follows:

H9: Tour-website experiences impact on the relationship between 'Recommendation Routes' and tourist enhancement as a moderator.

H10: Tour-website experiences impact on the relationship between 'My Trips' and tourist enhancement as a moderator.

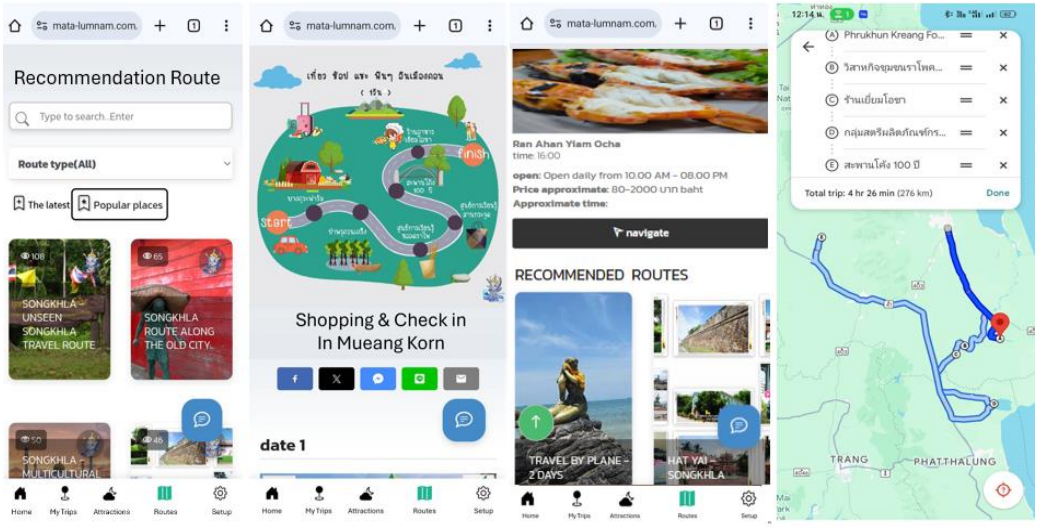
RESEARCH METHODOLOGY

1. Recommended Routes and 'My Trips'

The website is a technology to evaluate the tourist enhancement, namely "Mata- LumNam.com." This study focuses on 'Recommendattion Routes' and 'My Trips' which are the advantages of trip planning and travel. 'Recommendation Routes' can enhance travel convenience by providing smart, flexible, and well-organized route suggestions, ensuring an optimal tourist experience. Figure 1 (a) shows the 'Recommendation Routes' that tourists can browse to match their interests.

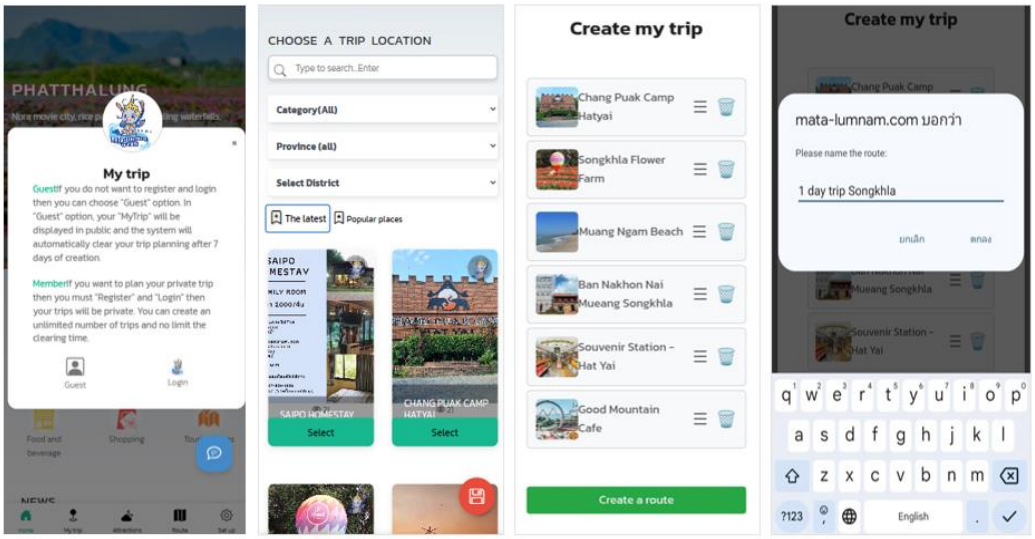
Furthermore, the system allows tourists to choose from different categories of 'Recommendation Routes' based on their preferences such as 1 day trip, 2 days trip, 3 days trip. In addition, they can choose to display routes in two ways such as newest or most popular routes. After selecting a preferred route, the website displays a list of tourist attractions included in that route. If the route spans multiple days, attractions will be categorized by date (e.g., date 1, date 2, …) for better organization as presents in Figure 1 (b). In this screen, tourists can share selected routes with friends or family members via various social media platforms such as Facebook, Twitter, Facebook Messenger, Line, and Email, allowing for collaborative trip planning. For more information or images of a specific attraction, they can click the "Detail" button next to that attraction to access comprehensive information. At the bottom of the list, after the last attraction in the route, there is a "Navigate" button that links directly to Google Maps as presents in Figure 1 (c). In Google Maps as presents in Figure 1 (d), the selected recommendation route will be displayed on Google Maps with attractions labeled in alphabetical order (A, B, C, ...). Tourists can rearrange the order of the destinations, and remove the unwanted attractions from the route for customization.

'My Trips' allow tourists to personalize their travel plans by selecting destinations, arranging their itinerary, and saving the trip for future reference. They can either register for a private trip plan or use the guest mode for temporary trip planning as presents in Figure 2 (a). If they use guest mode to create their trips, then the trips will auto-delete after seven days. In Figure 2 (b), tourists can browse and choose attractions for their trip from categorized recommendations, such as natural sites, foods and drinks, accommodations, and shopping sites.



(a) (b) (c) (d)

Figure 1. Example screenshots of 'Recommendation Routes' (Source: personal original data)



(a) (b) (c) (d)

Figure 2. Example screenshots of creating 'My Trips' (Source: personal original data)

Furthermore, they can filter cities and districts. Additionally, the attractions can order by the latest and popular places. For trip creating, tourists mark the selected destinations for inclusion in the itinerary. After creating a trip itinerary, the selected destinations will appear in a sortable list as presents in Figure 2 (c). Tourists can arrange the order of visits by pressing the three-line icon and dragging them to the other positioning. Moreover, they can remove places by selecting basket icons after unwanted attractions. After pressing the "Create a route" button, the tourists must input the name of their trip route as presents in Figure 2 (d), and the trip will be saved for reference, future modifications and sharing.

For travel, tourists can use their 'My Trips' by searching and selecting route image as presents in Figure 3 (a), then the trip details will be presents as Figure 3 (b). They can see more details in each place. If the selected place is accommodation, then they can book accommodation by links of third party such as Agoda.com, Booking.com, Traveloka.com, Trip.com. The number of links depends on the relationship between accommodation and the third party as presents in Figure 3 (c). In Google Maps as presents in Figure 3 (d), the points of attractions in 'My Trips' will display in alphabetical order (A, B, C, ...) and tourists can rearrange the order of the destinations, or remove the unwanted attractions from the route for customization.

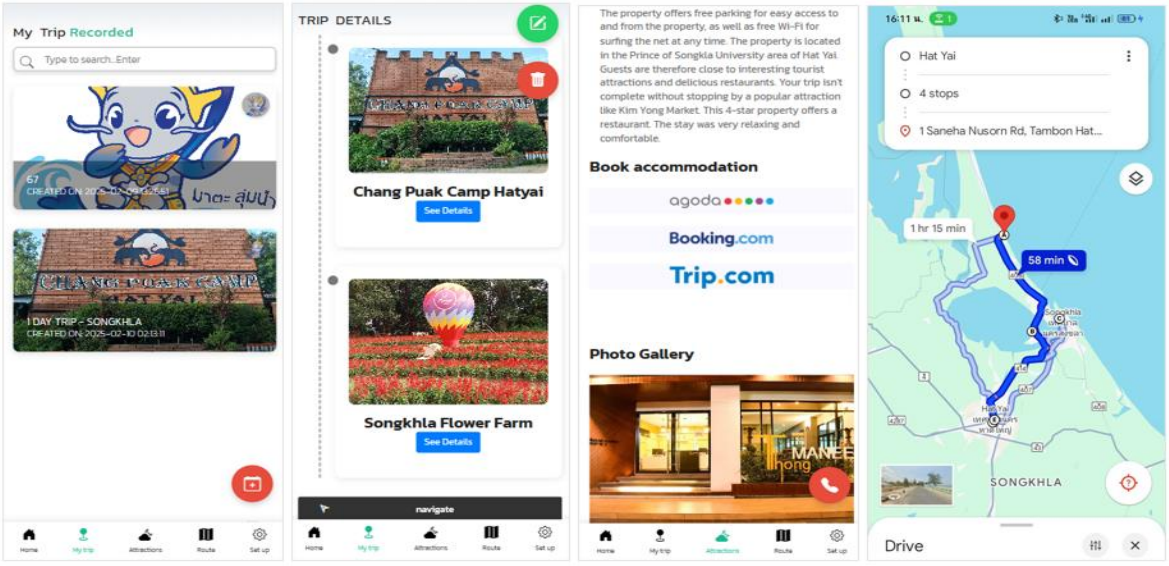


Figure 3. Example screenshot of using 'My Trips' for travel (Source: personal original data)

2. Research Design

This study used a survey questionnaire, it includes three parts; (1) Personal profiles including gender, age, married status, website experiences for tour management; (2) A 5-point Likert scale was used to evaluate tourist satisfaction in terms of 'Recommendation Routes' and 'My Trips'. All questionnaire items were adapted from various contextual studies and refined to better fit the tourism context. A pilot test involving 30 tourists was conducted to assess content reliability and validity before proceeding with full-scale data collection. For content reliability, Cronbach's Alpha scores (>0.7) were utilized to evaluate reliability statistics (Hair et al., 2014). In Table 1, all variables exceeded the established thresholds, confirming their reliability. Regarding content validity, some items were further revised and refined based on feedback from pilot test participants to improve clarity. Ultimately, the full-scale data collection was carried out using convenient sampling with 151 tourists at the Lagoonal Travel Fair in Thailand between 31/02/2025 and 03/03/2025. Based on Tabachnick & Fidell (2019), the recommended sample size for a model with two predictors is 66, following the rule of thumb: 50 + 8m (where m represents the number of independent variables). Therefore, the sample size in this study was sufficient for analyzing the predictors.

Table 1. Survey Measurement and Pivot Testing

Variable	Items	Pivot Alpha
My Trips (MT)	MT1: 'My Trips' are easy and convenient to create my route planning. MT2: 'My Trips' are beneficial for travel planning. MT3: 'My Trips' help me to estimate the travel expenses such as fuel costs. MT4: 'My Trips' help me to estimate the travel time.	0.872
Recommendation Routes (RR)	RR1: I like the suggestion of nearby 'Recommendation Routes'. RR2: 'Recommendation Routes' can reduce the time required for travel planning. RR3: Navigation between destinations in the Recommended Routes helps me save travel time. RR4: 'Recommendation Routes' are convenient to use. RR5: The five-nearby attractions in 'Recommendation Routes' can reduce my expenses during travel. RR6: 'Recommendation Routes' are easy to use.	0.913
Tourist enhancement (TE)	TE1: Information about tourist attractions is interesting and encourages travel. TE2: It makes searching for information more convenient. TE3: It can reduce the time needed to search for tourist attraction information. TE4: It provides a variety of tourist attractions supporting my needs. TE5: The categorization of tourist attractions is appropriate and interesting.	0.825

RESULTS

1. Demographic Analysis

For demographic analysis, the survey data from 151 tourists analyzed the descriptive analysis by SPSS and illustrated in Figure 4; such as gender, age, marital status, and website experiences in travel. Most respondents identified as male (46.36%), followed by female (52.98%) and gender diversity (0.66%). Respondents were classified into six age groups and their proportions were a little different excluding the other group. Among respondents, 44.37% were single, while 47.68% were married. A small fraction of 7.95% belonged to other marital status categories. Most respondents, 54.30%, reported having used the tour websites before, while 45.70% had never used any tour website.

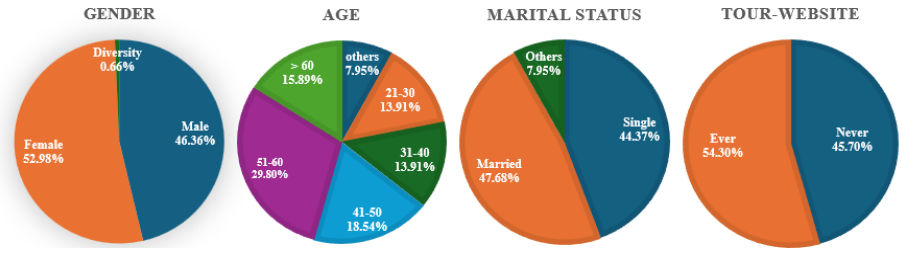


Figure 4. Results of demographics analysis

2. Reliability and Validity Analysis

The results in Table 2 demonstrate good reliability and validity. Notably, all variables exhibited high factor loadings exceeding 0.70, indicating robust relationships between items and constructs. Additionally, the reliability across all constructs was strong, as reflected by Cronbach's Alpha and Composite Reliability (CR) values exceeding 0.70. Furthermore, the Average Variance Explained (AVE) values surpassed the 0.50 threshold, indicating that each construct effectively explains a substantial portion of variance in its respective items. Finally, Variance Inflation Factor (VIF) values were below 5, suggesting that the predictors in the model do not exhibit significant overlaps or multicollinearity issues (Hair et al., 2014).

Table 2. Results of reliability and validity analysis

Variables	Item	Loading	VIF	Cronbach's Alpha	CR	AVE
'My Trips' (MTs)	MTs1	.785	1.739	.874	.882	.729
	MTs2	.893	3.119			
	MTs3	.818	2.046			
	MTs4	.912	3.624			
'Recommendation Routes' (RR)	RR1	.805	2.199	.923	.930	.725
	RR2	.720	1.679			
	RR3	.881	3.606			
	RR4	.894	3.806			
	RR5	.902	4.042			
	RR6	.892	3.801			
Tourist enhancement (TE)	TE1	.866	2.616	.880	.885	.679
	TE2	.897	3.047			
	TE3	.751	1.774			
	TE4	.778	1.872			
	TE5	.818	2.029			

Hypothesis Testing

For the 1st hypothesis testing, the independent sample T-test was conducted to compare tourist satisfaction regarding the 'My Trips' feature between two groups: those who had used 'My Trips' ("Ever", n=82) and those who had never used it ("Never", n=69). Across all items, no statistically significant differences are found between the two groups ($p>0.05$) as presented in Table 3, indicating that both experienced and non-experienced users satisfied 'My Trips' similarly in terms of convenience, benefits, and estimation of expenses and travel time. Therefore, H4 is not supported. Additionally, all items of 'My Trips' are higher than 4.36, indicating the level of tourist satisfaction on 'My Trips' is high, thus H1 is supported.

Table 3. Results of T-test analysis in part of 'My Trips' (n=151)

Items	Group	Mean	SD.	T-test
MT1: 'My Trips' are easy and convenient to create my route planning.	Ever	4.37	0.66	- 0.877
	Never	4.47	0.62	
MT2: 'My Trips' are beneficial for travel planning.	Ever	4.48	0.59	- 0.826
	Never	4.57	0.62	
MT3: 'My Trips' help me to estimate the travel expenses such as fuel costs.	Ever	4.36	0.71	- 1.232
	Never	4.50	0.62	
MT4: 'My Trips' help me to estimate the travel time.	Ever	4.51	0.59	- 0.249
	Never	4.53	0.70	

Table 4 shows no statistically significant differences were found between the two groups across all six measured aspects ($p>0.05$), indicating that both experienced and non-experienced users perceived 'Recommendation Routes'

similarly in terms of valuable tools for route planning, navigation, and travel cost reduction. This suggests that prior experience with 'Recommendation Routes' does not significantly affect tourist satisfaction, thus H5 is not supported.

In addition, the mean satisfaction scores for 'Recommendation Routes' range from 4.33 to 4.58, indicating a generally high level of satisfaction among tourists. Therefore, H2 is supported.

Table 4. Results of T-test analysis in part of 'Recommendation Routes' (n=151)

Items	Group	Mean	SD.	T-test
RR1: I like the suggestion of nearby 'Recommendation Routes'.	Ever	4.33	0.67	- 1.718
	Never	4.53	0.70	
RR2: 'Recommendation Routes' can reduce the time required for travel planning.	Ever	4.53	0.63	- 0.491
	Never	4.58	0.62	
RR3: Navigation between destinations in the Recommended Routes helps me save travel time.	Ever	4.51	0.59	- 0.416
	Never	4.55	0.65	
RR4: 'Recommendation Routes' are convenient to use.	Ever	4.49	0.63	- 0.693
	Never	4.57	0.59	
RR5: The five-nearby attractions in 'Recommendation Routes' can reduce my expenses during travel.	Ever	4.47	0.59	- 0.928
	Never	4.57	0.65	
RR6: 'Recommendation Routes' are easy to use.	Ever	4.42	0.65	- 1.220
	Never	4.55	0.59	

In Table 5, the T-test results show no significant differences in tourist enhancement between the "Ever" and "Never" groups, as all p-values exceed 0.05, indicating that both experienced and non-experienced users perceived tourist enhancement similarly in terms of information accessibility, time efficiency, and attraction variety. Therefore, H6 is not supported. Furthermore, the mean satisfaction scores for all tourist enhancement attributes range from 4.31 to 4.58, indicating a generally high level of perceived tourist enhancement among respondents, H3 is supported.

Table 5. Results of t-test analysis in part of tourist enhancement (n=151)

Items	Group	Mean	SD.	T-test
TE1: Information about tourist attractions is interesting and encourages travel.	Ever	4.31	0.65	- 0.447
	Never	4.36	0.67	
TE2: It makes searching for information more convenient.	Ever	4.47	0.61	- 0.288
	Never	4.50	0.65	
TE3: It can reduce the time needed to search for tourist attraction information.	Ever	4.46	0.61	- 1.255
	Never	4.58	0.56	
TE4: It provides a variety of tourist attractions supporting my needs.	Ever	4.45	0.65	0.496
	Never	4.39	0.66	
TE5: The categorization of tourist attractions is appropriate and interesting.	Ever	4.31	0.68	- 0.506
	Never	4.37	0.72	

For path analysis, the data was analyzed by SmartPLS as presented in Figure 5. The R-square is 0.818, indicating the model provides a strong explanatory power, and the factors 'Recommendation Routes' and 'My Trips' significantly contribute to explain the changes in tourist enhancement. In addition, the path analysis results illustrate the relationships between 'Recommendation Routes' or 'My Trips', and tourist enhancement. The path coefficient of *'My* Trips' is 0.232 with a p-value of 0.044, showing a weaker but still statistically significant positive effect, thus H7 is supported. The results also reveal the strong and significant positive relationship between 'Recommendation Routes' and tourist enhancement (H8: $\beta = 0.689$, $p < 0.001$), hence H8 is supported. These results suggest that both 'Recommendation Routes' and 'My Trips' positively impact tourist enhancement, with 'Recommendation Routes' having a stronger effect than 'My Trips'.

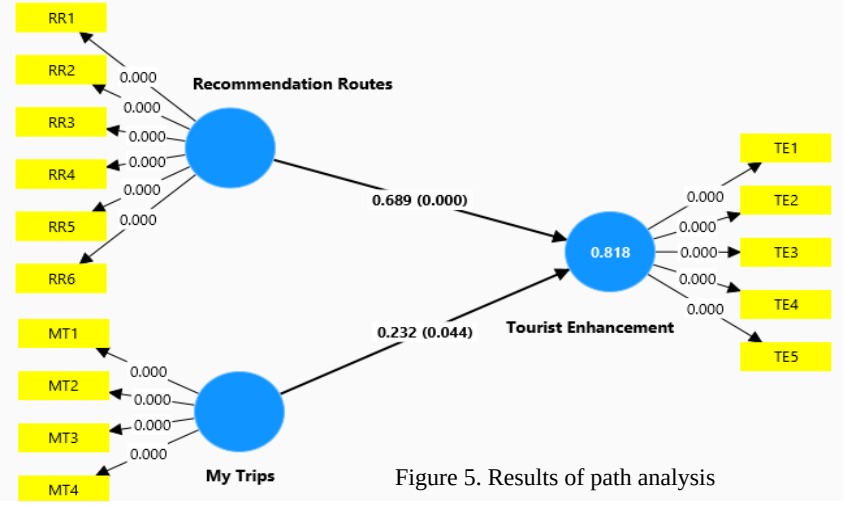


Figure 5. Results of path analysis

In Figure 6, the path analysis results incorporate website experience as a moderator in the relationships between 'Recommendation Routes' or 'My Trips', and tourist enhancement. The key findings show interesting results.

First, the path coefficient (RR→TE) is 0.552 with a p-value of 0.005, indicating a statistically significant positive effect, though weaker compared to Figure 5. Second, the path coefficient (MM→TE) is 0.391 with a p-value of 0.035, showing a statistically significant positive impact. Third, the interaction effect (WE×RR→TE) has a path coefficient of 0.258 with a p-value of 0.141, which is not statistically significant. This suggests that website experience does not significantly moderate the effect of RR on TE, indicating H9 is not supported.

Finally, the interaction (WE×MT→TE) effect has a path coefficient of -0.305 with a p-value of 0.098, which is also not statistically significant. This suggests that website experience does not significantly moderate the effect of MT on TE, indicating H10 is not supported. These findings suggest that while 'Recommendation Routes' and 'My Trips' significantly contribute to tourist enhancement, their effects are not moderated by prior website experience.

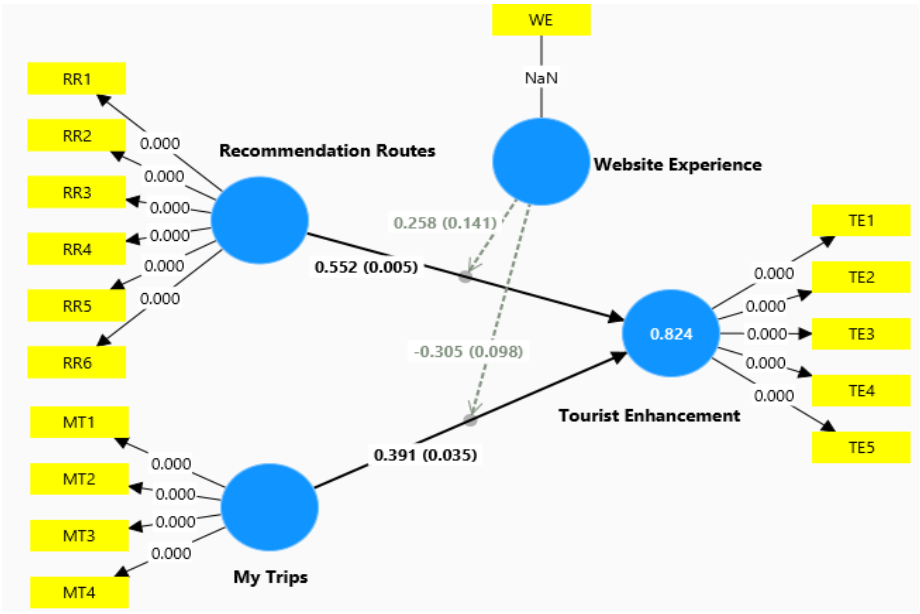


Figure 6. Path analysis of research model including website experience as moderator

DISCUSSION

This study aimed to investigate the impact of the 'My Trips' and 'Recommendation Routes' features on tourist enhancement while considering the moderating role of website experiences for travel. The findings provide insightful contributions to tourism technology research and user experience enhancement. First, the results indicate that both 'My Trips' and 'Recommendation Routes' significantly enhance tourist engagement (H7 and H8).

The significant path coefficients in the structural model suggest that these features contribute to a more seamless and enriched tourist enhancement. This finding is consistent with prior research indicating that interactive route recommendations improve the efficiency of trip planning and enhance travel satisfaction (Xiong & Zhang, 2024). The findings reinforce the notion that recommendation systems and personalized itinerary management are crucial components in digital tourism platforms. Second, the T-test analysis confirms that tourist satisfaction levels with 'My Trips' (H1) and 'Recommendation Routes' (H2) are significantly high, further validating the effectiveness of these features (Jung et al., 2021). However, no significant differences were found between the two groups of website experience for travel in terms of satisfaction (H4 and H5). These findings are contrast from the study of Jung et al. (2021) that highlight the influences of tourist experience on tourist satisfaction.

Additionally, our findings are contrasting to the study of Any et al. (2024) which found a significant difference in the level of satisfaction between users who have experience and no-experience to use technology. Third, the moderation analysis reveals that website experiences for travel did not significantly moderate the relationship between 'My Trips' and tourist enhancement (H10), as well as between 'Recommendation Routes' and tourist enhancement (H9). In contrast, the previous studies (Jung et al., 2021; Yuksel et al., 2024) demonstrate the relationship between tourist experience and interactive navigation, and the impact of tourist experience on tourist satisfaction. Possibly, is that the navigation flow and interactive features based on minimum viable product (MVP) and good user experience (UX) design can increase tourist enhancement as the mention of Tavichaiyuth et al. (2022).

Therefore, the tourist experience is not a moderator variable in this context. These finding highlights that the good user-interface design in platform can easily support among familiar tourists in both website experience groups. Lastly, the findings indicate that the level of tourist enhancement is high (H3), supporting the effectiveness of these platform features in enriching the overall tourist travel (Ruko et al., 2024; Zeng et al., 2021).

However, there is no significant difference in tourist enhancement between different experience levels (H6), suggesting in our website context that the value of these features is consistent across different user backgrounds.

CONCLUSION

This study provides several theoretical and practical implications. Theoretically, it contributes to digital tourism research by demonstrating how interactive itinerary management and recommendation routes improve tourist engagement. Practically, the study highlights that travel platforms should prioritize feature optimization and usability improvements to enhance their effectiveness for all users, especially the developers should focus on 'My Trips' and 'Recommendation Routes' for enhancing tourist's experiences. Despite offering valuable theoretical and practical insights, this study is subject to several limitations that should be acknowledged.

First, the dataset is limited to Thai tourists, which may restrict the generalizability of the findings to other cultural or demographic contexts. Future research should consider broader and more diverse populations to enhance cross-cultural applicability. Second, the study primarily employs quantitative methods, which, while robust in statistical analysis, may not fully capture the underlying motivations and perceptions of tourists. Incorporating qualitative approaches, such as in-depth interviews or focus groups, could provide richer insights into user experiences.

Third, although the model highlights the effectiveness of interactive itinerary management and recommendation routes, it does not account for other potentially influential variables such as travel purpose, digital literacy, or platform familiarity. Exploring these moderating or mediating factors in future studies may yield a more comprehensive understanding of user engagement in digital tourism platforms. Addressing these limitations can pave the way for more nuanced and globally relevant research in the field of smart tourism.

Author Contributions: Conceptualization, N.T.; methodology, N.T.; software, N.T.; validation, N.T.; formal analysis, N.T. and T.P.; investigation, N.T.; data collection, N.T. and T.P. and K.H. and R.D.; writing - original draft preparation, N.T.; writing - review and editing, N.T.; visualization, N.T.; supervision, N.T. and T.P.; project administration, N.T. and T.P. All authors have read and agreed to the published version of the manuscript.

Funding: Program Management Unit for Competitiveness (PMUC).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: Thanks to the Program Management Unit for Competitiveness (PMUC) for research funding (Grant No. C06F660230); experts who guided the completion of this research; participants for information and opinions in doing the research; the research team who helped to make this research work successful.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 29.04.2025 Revised: 24.07.2025 Accepted: 21.08.2025 Available online: 17.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1845-1858
DOI 10.30892/gtg.61343-1553

INVESTIGATING THE IMPACT OF ONLINE REVIEWS, VIRTUAL REALITY, AND AI CHATBOTS ON FIRST-TIME HOTEL BOOKINGS IN RURAL DESTINATIONS: THE ROLE OF SENSE OF PRESENCE AND TRUST

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Citation: Pham, T.N. (2025). Investigating the impact of online reviews, virtual reality, and ai chatbots on first-time hotel bookings in rural destinations: The role of sense of presence and trust. *Geojournal of Tourism and Geosites*, 61(3), 1845–1858. https://doi.org/10.30892/gtg.61343-1553

Abstract: This study investigates how modern technologies, specifically online reviews, virtual reality (VR), and AI-powered chatbots, influence tourists' intentions to book rural accommodations and their willingness to pay a deposit in Vietnam, where over 60% of the population resides in rural areas. Despite growing interest in rural tourism, destinations often face challenges related to low digital engagement, information asymmetry, and limited trust from potential visitors. Addressing these barriers, the study applies the Stimulus-Organism-Response (SOR) theoretical framework to examine how these technologies act as external stimuli that enhance internal psychological states, namely tourists' sense of presence and trust, which in turn drive behavioral outcomes. A quantitative survey was conducted with 425 first-time Vietnamese tourists who had considered rural tourism in their future destinations. Using SPSS and AMOS for data analysis, the study tested a structural model to investigate individual technology use in booking behaviors. The findings confirm that sense of presence and trust significantly mediate the relationship between technological stimuli and tourists' behavioral intentions. Online reviews emerged as the strongest driver of trust, underlining the importance of user-generated content in reducing perceived risk. VR technology was found to be particularly effective in generating a strong sense of presence, allowing tourists to visualize and emotionally connect with rural destinations before visiting. AI chatbots supported both presence and trust by offering real-time assistance, personalized information, and interactive engagement, enhancing users' overall experience. The study contributes to tourism literature by validating the SOR model in a rural context and demonstrating the differentiated effects of digital tools on psychological and behavioral responses. From a managerial perspective, the findings provide actionable insights for rural accommodation providers and tourism marketers. Strategic implementation of immersive and interactive technologies can not only increase tourists' trust and emotional engagement but also improve reservation rates and revenue predictability through deposit commitments. For emerging economies like Vietnam, embracing digital transformation in rural tourism offers a viable pathway to enhance destination appeal, attract first-time visitors, and foster sustainable tourism development.

Keywords: online review, virtual reality, AI chatbots, first-time travelers, rural destination, sense of presence, trust, willingness to pay a deposit

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INTRODUCTION

Tourism is a vital sector in the global economy, contributing nearly 10% of the world's GDP and ranking as the third largest export industry, following only fuels and chemicals (Rasoolet al., 2021). It plays a pivotal role in national development by generating employment, enhancing living standards, increasing foreign exchange reserves, and fostering broader socio-economic growth (Thommandru et al., 2023). The World Tourism Day 2015 campaign, themed "One Billion Tourists, One Billion Opportunities," underscored the transformative potential of tourism for countries at all stages of development (Rasoolet al., 2021). In recent years, developing countries have emerged as active participants in the global tourism market, as governments increasingly recognize the sector's developmental benefits. Consequently, there has been continuous expansion across various tourism forms, including luxury, heritage, urban, and rural tourism (Bazargani & Kiliç, 2021).

Rural tourism represents a niche segment that has been gaining increasing attention in recent years, primarily due to its appeal among tourists seeking authentic and immersive experiences (Rosalina et al., 2021). It has also emerged as a strategic tool within national development agendas, particularly in revitalizing rural economies through the promotion of localized tourism activities (Chen et al., 2023). Despite its growing relevance, the definition of rural tourism remains a subject of scholarly debate, largely due to differing criteria used to classify rural areas (Nair et al., 2015). According to the World Tourism Organization (WTO), rural tourism is characterized by personalized interactions and engagement with the physical and cultural landscapes of the countryside, allowing travelers to participate in local traditions, activities, and lifestyles (Aref & Gill, 2009). However, the development of rural tourism remains limited and inconsistent, hindered by underdeveloped infrastructure and supporting services such as transportation, food and beverage offerings, accommodations, and tourist attractions, particularly for first-time travelers. Tourists often hesitate to book hotels at rural

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destinations due to perceptions of poor service quality, lack of professionalism, and concerns about service reliability. Therefore, there is a pressing need for research that explores strategies to enhance tourists' booking intentions and willingness to commit financially to rural travel, thereby supporting the sustainable growth of the tourism sector in these areas.

Recent advancements in innovative technologies have significantly transformed the tourism and hospitality industries by enhancing the overall consumer experience (Zhong et al., 2024; Ahmad et al., 2025). The integration of state-of-the-art technologies is not only empowering tourists in their decision-making processes but also creating new opportunities for rural destinations to position themselves as attractive tourism markets. Technologies such as online reviews, virtual reality (VR), and AI-powered chatbots have been increasingly adopted by tourism operators to foster psychological engagement and influence tourist behavior (Wang, 2022; Salem et al., 2024). Online reviews offer credible and user-generated evaluations from past travelers, VR provides immersive simulations that allow users to virtually experience a destination, and AI chatbots facilitate continuous and responsive interactions with potential tourists. These tools contribute to enhanced tourist experiences by increasing trust, engagement, and satisfaction, particularly in hotel selection and booking processes. However, their effectiveness in the context of rural hotels remains underexplored, especially given the slower pace of technological adoption in these areas (Li, 2025). Moreover, the influence of such technologies on first-time travelers' booking intentions and willingness to make financial commitments, such as deposits, remains unclear, particularly when tourists face information gaps in evaluating rural destinations (Xie & He, 2022).

Tourism is often referred to as a "smokeless industry" and is considered a priority sector for economic development in Vietnam. Contributing approximately 6.5% to the national GDP, the country possesses significant potential to diversify and expand its tourism offerings (Statista, 2025). In alignment with this vision, Decision No. 147/QĐ-TTg approved by the Prime Minister as part of the Vietnam Tourism Development Strategy to 2030, has encouraged localities to implement initiatives that promote rural tourism in conjunction with the national rural development program (Trang, 2022). Despite the fact that over 60% of Vietnam's population resides in rural areas and numerous policy-driven efforts have been introduced, the development of rural tourism has not met expectations (Nhandan, 2023). A systematic review of the literature identifies key challenges hindering progress, including inadequate social and technical infrastructure and limited tourist engagement (Rosalina et al., 2021). As contemporary tourists become increasingly information-driven and experience-oriented, the integration of digital technologies offers promising opportunities to transform rural tourism (Lapuz, 2023). However, limited research exists on the impact of such technologies on tourist behavior in rural Vietnam, especially among first-time travelers who often lack prior experience and reliable information to support decision-making (Van Tran et al., 2023). Furthermore, it remains unclear whether the use of multiple modern technologies in combination exerts a complementary effect or leads to trade-offs in shaping tourists' booking behaviors (Quang et al., 2024). These research gaps underscore the need for empirical studies that can guide hoteliers in making informed investments in innovative technologies, particularly in rural areas where informational asymmetries often persist.

Building on the aforementioned context, this study aims to: (1) investigate the influence of modern technologies on tourists' perceived sense of presence, trust, booking intention, and willingness to place a deposit at hotels in rural areas of Vietnam; and (2) examine the specific impacts of online reviews, virtual reality, and AI chatbots on the behavioral intentions of Vietnamese first-time travelers to rural destinations. Accordingly, the study addresses the following research questions: (1) How do modern technologies shape tourists' perceptions and behavioral intentions toward hotels in rural Vietnam? and (2) In what ways do online reviews, virtual reality, and AI chatbots enhance the booking intention and deposit willingness of Vietnamese first-time travelers to rural destinations? The findings are expected to contribute both theoretically and practically advancing academic understanding of rural tourism in the digital age while providing valuable insights for policymakers and tourism businesses seeking to foster growth in Vietnam's rural hospitality sector.

LITERATURE REVIEW

1. Rural tourism in Vietnam

Rural tourism has evolved over time, with its roots traceable to case studies from the nineteenth century and continuing its development into the present day (Gao & Wu, 2017). Initially, rural tourism was broadly defined as tourism activities that occur in rural areas (Lane, 1994). In essence, it encompasses tourist experiences in countryside or non-urban settings, where visitors engage with rural life, landscapes, and local cultures. Rural tourism is distinguished by several appealing characteristics, including natural scenery, low tourist density, minimal pollution, affordability, and opportunities for direct interaction with local communities. However, due to the diverse criteria used to define "rural" and the heterogeneity of rural environments across countries, the definition of rural tourism remains a subject of scholarly debate and lacks universal consensus. To address this, Nair et al. (2015) proposed a more comprehensive definition that captures the true essence and purpose of rural tourism: *"Rural tourism is functionally rural and provides the opportunity for tourists to directly involve, experience, enjoy, and learn the unique cultural, natural, and historical attractions and activities provided by the local communities in rural areas, with cooperation from the government and businesses in order to provide socio-economic benefits without exploiting the environment."*

This definition highlights the importance of sustainability in rural tourism development, aligning it with broader trends in the tourism industry that emphasize sustainable practices (Hu et al., 2021). Thus, when we refer to rural tourism today, it is often within the framework of sustainable rural tourism. Scholars argue that the adoption of modern technologies is essential to fully realize the potential of rural tourism and ensure its sustainability (Kumar & Shekhar, 2020). Emerging technologies, such as big data and artificial intelligence (AI), not only provide reliable information to assist tourist decision-making but also enable businesses to craft effective marketing strategies that can drive tourist interest and visitation (Xie & He, 2022).

Rural tourism has been formally recognized in Malaysia as a strategic national development initiative under the Malaysia Plan, aimed at enhancing rural livelihoods and promoting economic diversification in local communities (Chin et al., 2018). The program has proven successful, with rural tourism contributing significantly to the country's GDP (Nair et al., 2015). Vietnam shares many similarities with Malaysia in terms of economic structure and geographic features, positioning it favorably for rural tourism development. With over 60% of the population residing in rural areas, along with its rich natural landscapes, diverse regional cultures, and deeply rooted traditions, Vietnam holds substantial competitive advantages in this sector (Long & Nguyen, 2018). Rural tourism is a national priority in Vietnam, as reflected in Decision No. 147/QĐ-TTg, which outlines the Prime Minister's approval of the Vietnam Tourism Development Strategy to 2030. The ongoing digital transformation of the tourism industry has further enhanced service quality, improved tourist experiences, and encouraged visitation. Significant investments have been made in upgrading technical infrastructure and digital connectivity to support the national digital transformation agenda aligned with the Fourth Industrial Revolution. Notably, in the 2024 United Nations E-Government Development Index (EGDI), Vietnam climbed 15 positions to rank 71st out of 193 countries, marking its first inclusion in the "Very High" EGDI group (Vietnamnet, 2024). These developments indicate that the adoption of digital technologies in rural tourism is both timely and essential for unlocking its full potential (Dinh et al., 2023).

2. Theoretical background

2.1. Booking intention

The intention is understood as the willingness stored in the human brain and will result in an actual action at an appropriate time (Ajzen, 2015). Intention is also described as a motivation that drives behavior. Thus, the stronger the intention, the higher the probability that the motivation will lead to an action. However, the relationship is also subjected to other factors and time takes place between intention and behavior (Cha, 2020). Regardless of the extent of variation, scholars confirm that intention is a powerful and reliable predictor of actual behavior, thereby, still gaining high interest in consumer behaviors (Wang & Li, 2022). In this study, it is referred to the probability that a tourist would like to book at a certain hotel (Tussyadiah et al., 2018).

2.2. Willingness to pay a deposit

Willingness to pay a deposit is understood as the readiness that consumers will accept to pay a deposit in order to secure a reservation (Yoon et al., 2021; Winarko et al., 2024). The concept of willingness to pay a deposit is slightly different from the concept of willingness to pay even though they both share the readiness of a consumer the former refers to the willingness of the consumer to think that they will pay a ratio amount of the total receipt while the later refers to the willingness consumer thinks that they will pay for the total receipt (Noh et al., 2024). In the context of hotel booking, willingness to pay a deposit refers to the assumption the tourist has in the pre-purchase stage while the willingness to pay refers to the assumption the tourist has after the service is delivered. Kim et al. (2017) found that tourists were willing to pay a deposit at hotels and they gained higher trust when searching for information.

2.3. Trust

Trust is referred to as a human psychological feeling that reflects the positive belief that risks are not concerns (Nuttavuthisit & Thøgersen, 2017). Trust can be understood as an expectation that a person has toward an object based on positive beliefs and previous experiences (D'Souza et al., 2021). Trust requires time to build and accumulates through time through various contacts. Trust will lead to stronger emotional reactions and positive behaviors from a consumer (Wang et al., 2014; Zhang et al., 2019). In this study, trust describes the extent of a tourist's confidence in a certain hotel. Higher trust in a hotel means tourists feel more secure toward that hotel and will increase their intention to advocate for that hotel (Lata & Kumar, 2021).

2.4. Sense of presence

Sense of presence refers to the psychological state in which individuals become so absorbed in a mediated environment that they feel as though they are located somewhere other than their physical surroundings (Tussyadiah et al., 2017). This is a subjective feeling, a product of the mind, and simply describes the feeling of being there different from the actual environment (Beck et al., 2019). Kim & Biocca (1997) conceptualize presence as comprising two dimensions: (1) arrival, referring to the sensation of being situated within a mediated environment, and (2) departure, referring to the sense of detachment from the physical environment (Bogicevic et al., 2019). Latest technologies provoke imagination, and thus likely lead to the sense of presence in an alternative virtual environment (McLean & Barhorst, 2022).

The more innovative technologies together with modern devices allow tourists to feel a sense of presence in a hotel or a resort and consequently generate positive intentions and willingness in their booking (Slevitch et al., 2022).

2.5. Online reviews

Online reviews are understood as information generated by users about their experiences, attitudes, and opinions (Ahn & Lee, 2024). The widespread of social media and mobile networks makes online reviews become easier and more available. This form of communication facilitates discussion and interaction among users who generate, share, and evaluate information prior to the purchase of a product or service in an online setting (Ventre & Kolbe, 2020). Online review is an important source for consumer decision-making during their purchasing of products and services (Park & Lee, 2009). Zhao et al. (2020) indicated that online reviews become a key information source for tourists to book hotels, particularly with booking hotels that tourists have not experienced before. Given the fact that tourists are concerned about the credibility of online reviews when manipulations have been found and recognized, it is regarded as more reliable as they are coming from real tourists with actual experiences (Saha & Biswas, 2025). Online reviews about a hotel can be seen on various

online platforms such as the hotel website and fanpage, online travel agents, or community groups on social media. Regardless of its extent, online reviews will influence tourists' evaluations and intentions, and thereby hoteliers should manage their online reviews to actively respond to issues raised by tourists (Shukla & Mishra, 2023).

2.6. Virtual reality

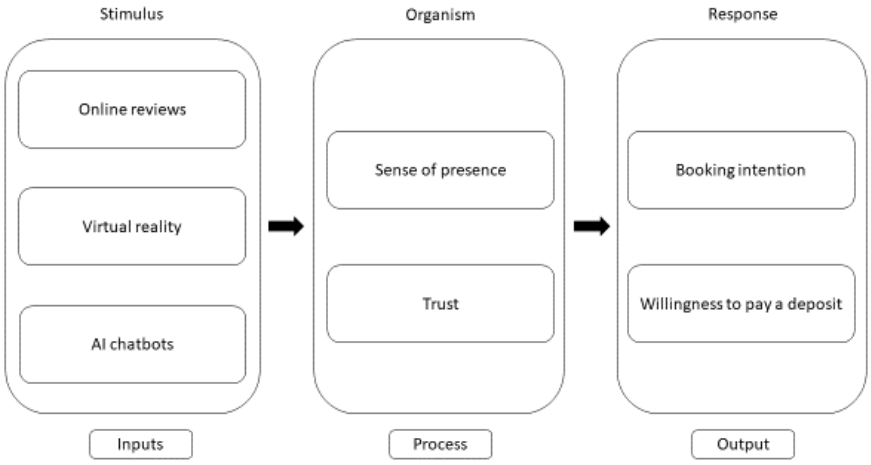
Recent advancements in tourism technology have focused on the study and implementation of state-of-the-art tools such as virtual reality and augmented reality (Han et al., 2019). While both technologies aim to enhance the perception of reality through digital means, virtual reality offers full immersion into a completely virtual environment, whereas AR overlays digital information onto the physical world without altering the real-world setting (Wei, 2019). Virtual reality has the capacity to evoke a sense of presence, defined as the psychological state in which an individual perceives themselves as "actually being there" within a computer-mediated environment, or the extent to which one feels "physically" situated within the virtual setting (Lin et al., 2020; Alyahya & McLean, 2022). Virtual reality is adopted in accommodations as a fully visual image of hotels and resorts as a way to guarantee their service quality (Slevitch et al., 2022). Virtual reality is actually helpful with first-time travelers when they lack reliable information to book or pay a deposit (Guttentag, 2010; Lim et al., 2024).

2.7. AI chatbots

Chatbots are software agents designed to mimic an entity with which users can engage in conversation (Adam et al., 2021). An AI-based chatbot is a specialized type of chatbot developed to engage in turn-by-turn conversations with human users through text input and can interact through texts or voices (Parmar et al., 2019). Simply, an AI chatbot is programmed with intelligent backend systems and can have infinite interactions with end-users (Luo et al., 2019). The AI chatbot is an automated but intelligent software that is widely adopted in various industries for handling inquiries and giving suggestions (Wüst & Bremser, 2025). The AI chatbot outperforms personnel in its availability 24/24 and time-saving. In the tourism sector, AI chatbots are being used to support and replace humans in customer service and booking systems because they can work endlessly and thus adapt to the customer requirements in this industry (Tussyadiah et al., 2020). Recent studies found that AI chatbots provided revenue opportunities and cost reduction, thereby improving business performance (Wüst & Bremser, 2025). Previous research indicated that tourists were willing to accept AI chatbots in their inquiries since it helped tourists complete their tourism-related decisions (Pillai & Sivathanu, 2020; Maharaj et al., 2025).

3 Underlying theory

In the field of consumer behavior, the Stimulus-Organism-Response (S-O-R) framework is a well-established and widely applied model used to examine how external stimuli influence individuals' internal states and subsequent behavioral responses (Suparno, 2020). Originally introduced by Mehrabian & Russell (1974), the S-O-R model conceptualizes the process by which environmental cues (stimuli) affect a person's cognitive and emotional states (organism), which in turn shape behavioral outcomes (responses). The framework has been empirically validated in communication and marketing research, where stimuli are strategically employed to influence consumer behavior in ways that benefit businesses (Tak & Gupta, 2021). Nonetheless, scholars emphasize that the effective application of the S-O-R model requires a thorough review of existing literature to appropriately identify which psychological or emotional states are most likely to be triggered by specific stimuli, and which behavioral outcomes are most relevant in a given context. Despite these challenges, the S-O-R framework remains a valuable tool for modeling the interaction between external factors and internal processes at the individual level (Jiang & Lyu, 2024). Its flexibility and robustness also allow for the examination of multiple stimuli and their influence on a variety of consumer responses, thereby offering a more comprehensive understanding of behavior in real-world environments (Zhu et al., 2021). In this study, the S-O-R framework is employed to explore the relationship between modern technological applications in hotels and their impact on tourist perceptions and behaviors, particularly in rural contexts. Specifically, online reviews, virtual reality, and AI chatbots are conceptualized as external stimuli; trust and sense of presence represent the internal organismic states; and booking intention along with willingness to place a deposit are modeled as the resulting behavioral responses. Figure 1 provides the conceptual model.



Firgure 1. The conceptual model

4. Previous related studies

Recent studies on technology adoption in tourism have affirmed that technological innovations enhance tourists' overall experiences and foster more positive behavioral intentions (Jafar et al., 2024). However, scholars emphasize that the effects of such technologies vary across different types of tourism, suggesting that research should adopt a case-by-case approach. For instance, the impact of technology in sport tourism may differ significantly from that in rural tourism (Buhalis et al., 2023). In a study conducted by Torabi et al. (2023) on the influence of smart tourism technologies on tourists' revisit intentions and word-of-mouth behavior in rural destinations in Iran, findings indicated that smart technologies contribute to memorable experiences and positively influence revisit intentions and recommendations. Nevertheless, the study primarily assessed the general attributes of smart technologies, such as accessibility, informativeness, interactivity, and personalization, without examining the specific functionalities of individual technologies.

Similarly, Bilynets et al. (2024) explored factors influencing the adoption of virtual tourism, including tourist participation and willingness to pay. While the study revealed a strong intention among tourists to engage with virtual tourism, it also found a reluctance to pay for such experiences. Despite these valuable insights, the research was limited to virtual reality, excluding other potentially impactful technologies that could further enhance tourist experiences and payment willingness. In another study, Kapri & Sharma (2024) investigated the effects of digital marketing tools, such as online travel agencies, online reviews, social media, and web GIS, on tourists' booking intentions in rural India. Their findings underscored the significance of these tools in increasing homestay bookings. However, the study focused on the mediating role of destination image rather than exploring tourists' perceptions and evaluations of the technologies themselves. Given these limitations in the existing literature on rural tourism, the present study aims to examine a broader range of innovative technologies adopted by hoteliers and their influence on tourists' booking intentions and willingness to pay a deposit. This investigation will focus on the mediating roles of tourists' sense of presence and trust in the technologies employed.

RESEARCH HYPOTHESIS DEVELOPMENT

1. The relationship between online review and sense of presence, and trust

Social media and online platforms have significantly transformed consumer behavior by enabling users to access vast amounts of information and engage in discussions about their consumption experiences. Online reviews, as a form of electronic word-of-mouth (eWOM), serve as informal communication channels through which consumers can share their evaluations, emotional reactions, and personal experiences, while also interacting with others regarding various products and services (Belarmino et al., 2021). In the digital age, consumers, especially those with no prior experience, often rely on online reviews to inform their purchase decisions (Ventre & Kolbe, 2020; Shukla & Mishra, 2023).

Zeng et al. (2020) found that online reviews are particularly valuable for first-time travelers, as they enhance the ability to visualize the hotel and increase trust in the service provider. Saha & Biswas (2025) assert that online reviews from previous guests provide authentic, experience-based insights that assist travelers in evaluating hotel quality and verifying promotional claims, thereby enhancing perceptions of credibility and familiarity. Nevertheless, rural hotels frequently face challenges related to limited online visibility and a scarcity of reviews, largely attributable to lower tourist footfall and reduced representation on digital platforms (Innerhofer et al., 2024). While prior research has emphasized the critical influence of online reviews on tourist decision-making, there remains a gap in understanding the information-seeking behavior of first-time travelers to rural destinations, particularly those who invest considerable time in gathering relevant information. Given the importance of user-generated content in shaping perceptions and reducing uncertainty, this study proposes that online reviews contribute to enhancing tourists' sense of presence and trust in hotels, particularly in rural destinations. Thus, the following hypotheses are proposed:

H1a: Online reviews have a positive relationship with tourists' sense of presence.

H1b: Online reviews have a positive relationship with tourists' trust.

2. The relationship between virtual reality and sense of presence, and trust

Virtual reality technology offers prospective guests a "try-before-you-buy" experience by enabling them to explore realistic, immersive simulations of hotel environments prior to making a booking decision (Tussyadiah et al., 2018). This form of experiential preview enhances decision-making by fostering a greater sense of control, confidence, and familiarity with the service environment (Ansari & Singh, 2023). The immersive nature of virtual reality has been widely recognized as an effective tool for enhancing travelers' understanding of hospitality services, while also strengthening brand awareness and boosting consumer confidence (Alyahya & McLean, 2022).

One of virtual reality's most notable contributions to tourism marketing is its ability to elicit a strong sense of presence, the psychological sensation of "being there" in the simulated environment. Visual and auditory representations of hotel rooms, facilities, and other key servicescapes have been found particularly influential in supporting consumers' cognitive and emotional evaluations during the pre-purchase stage (Bogicevic et al., 2017). Augmented and virtual reality technologies have been shown to enhance hotel booking experiences (Lim et al., 2024; Wu et al., 2025). However, limited research has examined the specific impact of virtual reality on tourists' booking intentions through the mediating roles of sense of presence and trust. For first-time travelers who possess minimal prior knowledge or experience, virtual reality can facilitate the formation of vivid mental representations of the hotel and foster trust by offering realistic and immersive environmental cues. Thus, the following hypotheses are proposed:

H2a: Virtual reality has a positive relationship with tourists' sense of presence.

H2b: Virtual reality has a positive relationship with tourists' trust.

3. The relationship between AI chatbots and sense of presence, and trust

AI chatbots serve as intelligent digital assistants capable of providing detailed and contextually relevant information about products and services in response to user inquiries. Powered by artificial intelligence, these chatbots can deliver comprehensive descriptions of service attributes, visual content, and even user-generated insights from previous customers. In the hospitality context, AI chatbots are believed to enhance both the sense of presence and trust during the pre-experience stage by offering timely, consistent, and informative responses to tourists' questions (Vashishth et al., 2024).

Vashishth et al. (2025) found that AI chatbots significantly enhance the overall user experience, while Shahzad et al. (2024) highlighted their pivotal role in fostering consumer trust. This is particularly pertinent for first-time travelers, who often encounter uncertainty and require comprehensive information before committing to a booking. Unlike human staff, who may be unavailable or delayed in their responses, AI chatbots provide immediate, around-the-clock assistance, effectively addressing tourists' inquiries and mitigating perceived risks (Pillai & Sivathanu, 2020; Vashishth et al., 2024). Despite growing interest in AI chatbot applications, limited research has explored their potential to influence first-time tourists' sense of presence through the delivery of visual content such as images and videos of the hotel. By streamlining the information acquisition process, AI chatbots may strengthen users' trust and enhance their perceived sense of presence within the hotel environment. Thus, the following hypotheses are proposed:

H3a: AI chatbots have a positive relationship with tourists' sense of presence.

H3b: AI chatbots have a positive relationship with tourists' trust.

4. The relationship between sense of presence and intention to book and willingness to pay a deposit

A key challenge for hoteliers, particularly in rural areas, is effectively marketing the intangible nature of their services to tourists, especially first-time travelers (Rosalina et al., 2021). Innovative technologies can address this challenge by providing immersive opportunities to enhance tourist experience, using tools such as images, text, and virtual reality (Bretos et al., 2024). Bigne & Maturana (2023) confirmed that presenting hotels through virtual reality enhances tourists' intention to book by fostering a stronger sense of presence. Scholars have generally conceptualized sense of presence as a psychological state that facilitates consumer decision-making during the pre-purchase phase. When consumers feel "present" in the environment, they are better able to assess the service and make more informed decisions (Ben Saad, 2024).

Ongsakul et al. (2021) highlighted the role of sense of presence in strengthening tourists' booking intentions, while Kim et al. (2022) demonstrated its positive influence on tourists' willingness to pay deposits in advance, particularly when immersive hotel environments were presented through virtual reality. This effect is especially relevant for first-time travelers, who often lack prior experience with the destination and are more inclined to depend on presence and trust to alleviate the perceived risks of booking accommodations in rural areas. However, recent research has been limited in investigating the relationship between sense of presence and specific behavioral outcomes, such as booking intention and deposit willingness within rural contexts, where hotels often face constraints in adopting advanced technologies due to limited resources (Sharma & Sharma, 2024). Thus, the following hypotheses are proposed:

H4a: Sense of presence has a positive relationship with tourists' intention to book a hotel.

H4b: Sense of presence has a positive relationship with tourists' willingness to pay a deposit at a hotel.

5. The relationship between trust and intention to book and willingness to pay a deposit

Trust is a critical psychological state that businesses aim to foster in consumers, as it serves to reduce perceived risks and encourage positive behavioral responses (Lata & Kumar, 2021). Building trust typically requires time and is shaped through various sources, such as prior experiences, social influence, and informational cues. In the tourism and hospitality context, consumers actively seek information that can strengthen their trust in the services they intend to use, especially when the service is unfamiliar or intangible (Ponnapureddy et al., 2019; Saha & Biswas, 2025). The newer or less familiar the offering, the more cautious consumers become, requiring more reassurance before making a decision (Ioannidis & Kontis, 2023).

In response to increasing uncertainty among travelers, particularly first-time visitors, hoteliers are progressively adopting advanced technologies to enhance perceived trust. Shukla & Mishra (2023) found that trust significantly influenced Chinese tourists' hotel booking intentions, while Augusto et al. (2020) demonstrated its critical role in increasing consumers' willingness to pay for digital streaming services. Despite the well-established importance of trust in shaping consumer behavior, limited research has specifically examined the trust-building process among first-time travelers to rural destinations. These travelers often face heightened perceived risks when booking accommodations or paying deposits, especially in rural areas where service quality may be inconsistent and online visibility is limited. As a result, tourists are more inclined to engage with hotels that appear more trustworthy and secure. Thus, the following hypotheses are proposed:

H5a: Trust has a positive relationship with tourists' intention to book a hotel.

H5b: Trust has a positive relationship with tourists' willingness to pay a deposit at a hotel.

In summary, grounded in the S-O-R framework and supported by prior research, this study proposes a conceptual model in which online reviews, virtual reality, and AI chatbots serve as stimuli; sense of presence and trust function as organismic states; and booking intention and willingness to pay a deposit represent the responses. Within this framework, sense of presence and trust are posited as mediating variables that connect the influence of innovative technologies to tourists' behavioral intentions. Given the study's objective is to examine how recently adopted technologies in hotel settings, including online reviews, virtual reality, and AI chatbots, affect booking intention and willingness to pay a deposit among first-time travelers to rural destinations in Vietnam through the roles of presence and trust, the proposed research model is considered theoretically appropriate and well-aligned with the study's aims. Figure 2 shows the research model with research hypotheses.

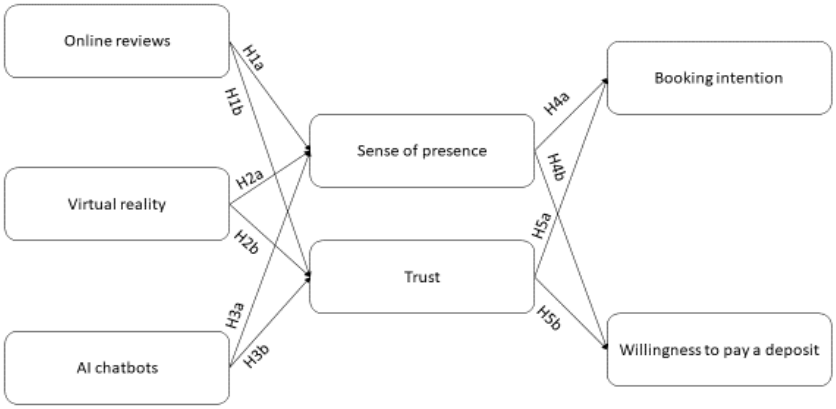


Figure 2. The research model

RESEARCH METHODOLOGY

1. Data collection

A survey was designed to collect quantitative data from the respondents. There were composed of two parts in a questionnaire for a respondent to give his/her answers. The first part was evaluative criteria, which included seven constructs. Reflective measurement scales were adapted to measure the constructs, especially: (1) online review with four items from Park & Lee (2009); (2) virtual reality with four items from Guttentag (2010) and Lin et al. (2020); (3) AI chatbot with four items from Tussyadiah et al. (2020) and Maharaj et al. (2025); (4) sense of presence with five items from Kim & Biocca (1997) and Bogicevic et al. (2019); (5) trust with three items from Zhang et al. (2019); (6) intention to book with three items from Tussyadiah et al. (2018); and (7) willingness to pay a deposit with three items from Laroche et al., (2001), as cited in Yoon et al. (2021). Table 1 provides the constructs instruments. A 5-point Likert scale was employed to evaluate the level of agreeableness on each indicator ranging from 1 as "strongly disagree" to 5 as "strongly agree".

The second part was demographic information such as gender, age, education level, and income level. The closed-end questions with multiple choices were applied for this part. First-time Vietnamese travelers were the main target of the study. To ensure this criteria, the form had detailed guidelines for respondents before taking the survey.

Table 1. The construct measurement items

Node	Measurement scale	Adapted sources
Online review		
ONL1	Online consumer reviews are useful to me.	Park & Lee (2009)
ONL2	Online consumer reviews make booking easier.	
ONL3	Online consumer reviews make me a smarter traveler.	
ONL4	Online consumer reviews are very beneficial to me.	
Virtual reality		
VR1	I could clearly see the lobby of the hotel.	Guttentag (2010); Lin, Huang, & Ho (2020)
VR2	It seemed like I was moving in the hotel.	
VR3	I seemed to walk around places inside the hotel.	
VR4	I could clearly see the room of the hotel.	
AI chatbots		
AI1	AI chatbots help in providing personalized hotel recommendations.	Luo et al. (2019); Tussyadiah et al. (2020); Maharaj et al. (2025)
AI2	The AI-powered chatbots promptly answer my queries.	
AI3	AI chatbots enhance the efficiency of the booking process.	
AI4	I could easily interact with AI chatbots.	
Sense of presence		
SP1	When I finished the hotel preview, I felt like I came back to the "real hotek" after a journey.	Kim & Biocca (1997); Bogicevic et al. (2019)
SP2	The hotel preview created a new world for me, and the world suddenly disappeared when I finished the preview.	
SP3	The world generated by the hotel seemed to me like "somewhere I visited" rather than "something I saw".	
SP4	While I was previewing the hotel suite, I felt I was in the world of hotel.	
SP5	While I was previewing the hotel suite, I sometimes forgot that I was in the middle of an experiment.	
Trust		
TR1	I feel that the information about the hotel provided is honest and authentic.	Zhang et al. (2019)
TR2	I feel that the information about the hotel provided is reliable.	
TR3	I feel that the information about the hotel provided is trustworthy.	
Hotel booking intention		
BI1	I am willing to book the hotel when traveling.	Tussyadiah et al. (2018)
BI2	I plan to book the hotel when traveling.	
BI3	I will make an effort to book the hotel when traveling.	
Willingness to pay a deposit		Laroche et al., (2001), as cited in Yoon et al. (2021)
WTP1	I would pay a deposit for the hotel to reserve a room.	
WTP2	I am willing to pay a deposit in order to reserve a room.	
WTP3	I believe it is acceptable to pay a deposit to reserve a room	

The respondents were asked to think they were first-time travelers to a rural destination in Vietnam and were selecting hotels. The form gave examples about online reviews, AI chatbots in handling inquiries, and links for respondents trying virtual reality to make sure respondents knew those modern technologies before they gave their answers. The convenience sampling method was employed to approach the main respondents.

2. Data analysis

The quantitative data was analyzed by SPSS and AMOS. Cronbach's alpha and composite reliability were assessed to check the reliability of constructs in the research model. The confirmatory factor analysis (CFA) was performed to check the convergent and discriminant validity before the structural equation modeling (SEM) was performed to test the research hypotheses. The average variance extraction (AVE) was checked to check the convergent validity (AVE>0.5) and the discriminant validities of constructs were achieved when the square root of the AVE was greater than the correlation between the constructs or MSV (Maximum Shared Variance) < AVE and ASV (Average Shared Variance) < AVE. The model fit of both the CFA and SEM will be followed by the threshold values suggested by Hu and Bentler (1999). The hypotheses will be confirmed at a p-value of 0.05. Given the use of a convenience sampling method, common method bias (CMB) was assessed. Harman's single-factor test was conducted using exploratory factor analysis in SPSS. All items were loaded onto a single factor using the principal component method without rotation. The results indicated that the first factor accounted for 26.5% of the total variance, which is below the recommended threshold of 50% (Podsakoff et al., 2003). Therefore, it was concluded that common method bias was not a significant concern in this study.

DATA ANALYSIS AND RESULTS

1. Descriptive statistics

After six months, the survey collected 464 valid responses. Among the respondents, 186 were male (43.8%) and 239 were female (56.2%). In term of age, 204 participants were under 25 years old, 131 were between 26 and 35, 54 were between 36 and 45, and the remaining respondents were over 45. In terms of monthly income, 153 individuals earned less than 10 million VND, 178 earned between 10 and less than 20 million VND, 78 earned between 20 and less than 30 million VND, and the remaining earned more than 30 million VND. The descriptive statistic of the sample is presented in Table 2, and the graphical characteristics of the sample is shown in Figure 3.

Table 2. The descriptive statistics of the sample (Source: From this study's analysis)

Criteria		n	%
Gender	Male	186	43.8
	Female	239	56.2
Age range	<25	204	48
	26-35	131	30.8
	36-45	54	12.7
	>45	36	8.5
Income level	Less than 10 million VND	153	36
	Between 10- <20 million VND	178	41.9
	Between 20- <30 million VND	78	18.4
	Between 30-<50 million VND	16	3.8
Education level	High school or below	39	9.2
	Vocational	12	2.8
	Undergraduated	306	72
	Post-graduated	68	16

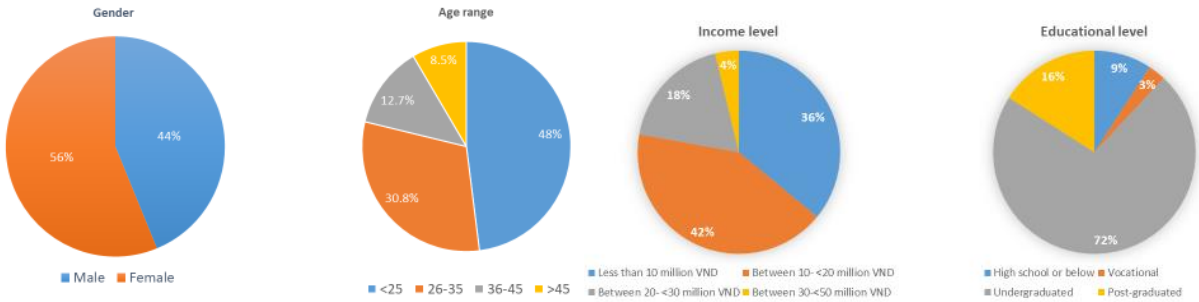


Figure 3. The graphical characteristics of sample

2. Reliability and validity

The internal consistency of the constructs was assessed using Cronbach's Alpha, with all constructs exhibiting values above the acceptable threshold of 0.7. Exploratory Factor Analysis (EFA) was then conducted to identify the underlying factor structure. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.85, exceeding the recommended minimum value of 0.6, and Bartlett's test of sphericity was statistically significant, indicating the suitability of the data for factor analysis. The EFA explored seven latent factors, which accounted for 61.5% of the total variance. Then the CFA was performed to

assess eight extracted factors in terms of their reliability and validity. The composite reliability (CR) of all constructs was higher than 0.6, while the average variance extracted was higher than 0.5, supporting the constructs' convergent validity. The discriminant validities of constructs were achieved when MSV > MSA. The model fit of CFA was satisfactory: (1) Cmin/df = 1.26; (2) CFI = 0.988; (3) PCFI = 0.816; and (4) RMSEA = 0.025. Table 3 provides the construct measurements.

Table 3. The constructs measurements (Source: From this study's analysis)

	CR	AVE	MSV	ASV	WTPa	ONLa	VRa	AIa	SPa	Tra	BIa
WTPa	0.870	0.690	0.208	0.147	0.831						
ONLa	0.847	0.581	0.203	0.106	0.395	0.762					
VRa	0.799	0.5	0.211	0.117	0.456	0.218	0.706				
AIa	0.809	0.586	0.072	0.029	0.269	-0.044	-0.120	0.766			
SPa	0.797	0.567	0.179	0.075	0.348	0.144	0.423	0.191	0.753		
TRa	0.830	0.620	0.203	0.089	0.349	0.451	0.208	0.100	0.078	0.787	
BIa	0.895	0.739	0.211	0.149	0.449	0.451	0.459	0.203	0.298	0.387	0.860

3. Hypotheses examination

All constructs demonstrated acceptable reliability and validity, allowing for the analysis of structural equation modeling (SEM) using AMOS. The model achieved a satisfactory fit to the data, as indicated by the following fit indices: (1) χ^2/df = 1.86, (2) Comparative Fit Index (CFI) = 0.96, (3) Parsimonious CFI (PCFI) = 0.82, and (4) Root Mean Square Error of Approximation (RMSEA) = 0.045. Table 4 presents the standardized path coefficients and the results of hypothesis testing.

Table 4. Standardized path estimates and hypotheses testing in the study (Source: From this study's analysis)

Structural paths	Standardized regression weight	p-value	Conclusion at p<0.05
H1-a: Online review → Sense of presence	0.08	ns	Rejected
H1-b: Online review → Trust	0.46	***	Supported
H2-a: Virtual reality → Sense of presence	0.48	***	Supported
H2-b: Virtual reality → Trust	0.15	**	Supported
H3-a: AI chatbot → Sense of presence	0.28	***	Supported
H3-b: AI chatbot → Trust	0.15	**	Supported
H4-a: Sense of presence → Booking intention	0.32	***	Supported
H4-b: Sense of presence → Willingness to pay a deposit	0.37	***	Supported
H5-a: Trust → Booking intention	0.4	***	Supported
H5-b: Trust → Willingness to pay a deposit	0.36	***	Supported

Note: ***: p-value < 0.001

H1-b is supported, which proposes that online review has a positive influence on tourists' trust in a hotel (β = 0.46***) while H1-a is rejected, which means that online reviews do not influence positively the sense of presence.

H2-a and H2-b are supported, which propose that virtual reality positively influences tourists' sense of presence and trust in a hotel. Virtual reality has a stronger impact on the sense of presence (β = 0.48***) and trust (β = 0.15**).

H3-a and H3-b are supported, which propose that AI chatbots positively influence tourists' sense of presence and trust in a hotel. AI chatbot has a more significant impact on the sense of presence (β = 0.28***) and trust (β = 0.15***).

H4-a and H4-b are supported, which propose that a tourist's sense of presence in a hotel will positively influence booking intention and willingness to pay a deposit. The influence levels are compatible with booking intention (β = 0.32***) and willingness to pay a deposit (β = 0.37***).

H5-a and H5-b are supported, which propose that tourists' trust in a hotel will positively influence booking intention and willingness to pay a deposit. The influence levels are also compatible with booking intention (β = 0.4***) and willingness to pay a deposit (β = 0.36***). Figure 4 provides the research model path analysis and the support of research hypotheses.

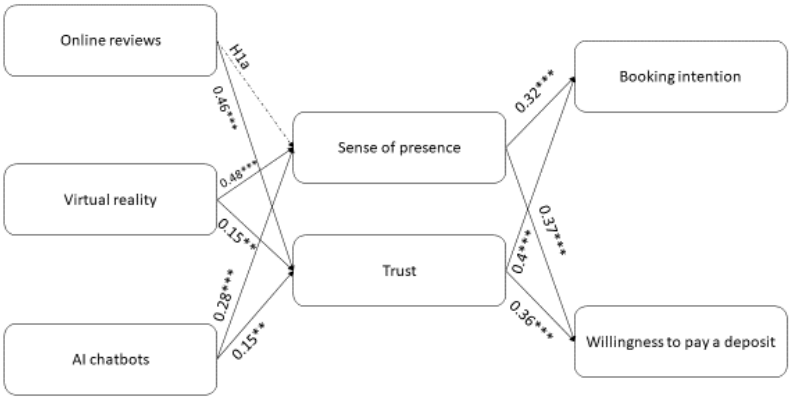


Figure 4. The research model path analysis

DISCUSSION AND IMPLICATION

1. Discussions on findings

Recent innovations in technology have been widely adopted in the tourism and hospitality industry, offering state-of-the-art solutions to enhance tourist engagement and influence decision-making. A growing body of research has confirmed that modern tools, such as online reviews, virtual reality, and AI chatbots significantly enhance tourist experiences and satisfaction, thereby increasing behavioral intentions and engagement (Tussyadiah et al., 2018; Pillai & Sivathanu, 2020; Ventre & Kolbe, 2020; Zeng et al., 2020; Liu et al., 2024; Shahzad et al., 2024). However, existing studies offer limited insight into how various technological tools jointly influence tourists' emotional reactions and decision-making processes. This is an important gap, as hoteliers often deploy multiple technologies simultaneously to promote their services. A more comprehensive understanding of how these technologies interact to shape tourist perceptions and behaviors is essential, particularly for underserved markets such as rural destinations. This study addresses three key areas of discussion, grounded in empirical evidence from Vietnamese tourists, with a particular focus on first-time travelers.

First, the findings confirm that online reviews, virtual reality, and AI chatbots serve as valuable tools for assisting tourists in evaluating hotel services. In line with prior research, both virtual reality and AI chatbots were found to significantly enhance tourists' sense of presence and trust toward hotels they had not previously experienced (Tussyadiah et al., 2018; Shahzad et al., 2024). Virtual reality offers immersive visualizations of hotel environments, while AI chatbots provide quick, accurate responses to inquiries, allowing tourists to experience a simulated version of being "there," which builds a sense of security and familiarity. Interestingly, the study finds that online reviews positively influence tourists' trust but do not significantly affect their sense of presence. This may be explained by the fact that user-generated reviews and peer interactions, though credible, lack the immersive quality necessary to evoke a psychological sense of being in the environment. This finding aligns with Book et al. (2018), who emphasized the role of online reviews as a form of social influence rather than an experiential simulation.

Second, the results confirm that both sense of presence and trust are essential psychological states that drive tourists' intention to book and willingness to pay a deposit. These findings support earlier work (Augusto et al., 2020; Kim et al., 2022) highlighting the critical role of internal cognitive and emotional processes in shaping behavioral intentions. The study aligns with the Stimulus-Organism-Response (S-O-R) framework, demonstrating how external stimuli, such as modern technologies, are internalized by consumers and subsequently influence their decision-making. Notably, both sense of presence and trust exert comparably strong effects on tourists' booking intentions and willingness to pay a deposit. This underscores the dual importance of cognitive-emotional reassurance for first-time travelers, who often lack prior experience and may struggle to differentiate between behavioral responses without adequate information.

Finally, this study contributes novel insights by examining the impact of these technologies in the unique context of rural tourism, where technical infrastructure and digital presence are often limited. Unlike previous research conducted in well-developed tourism destinations with experienced travelers (Yoon et al., 2021; McLean & Barhorst, 2022), this study focuses on first-time travelers evaluating accommodations in rural areas, where uncertainty and service quality concerns are higher. The findings reveal that online reviews, virtual reality, and AI chatbots effectively reduce the informational and psychological gaps that hinder booking behavior in such settings. These technologies help to mitigate perceived risks, build confidence, and ultimately bridge the gap between perception and intention, thereby encouraging first-time tourists to proceed with bookings and deposit payments.

2. Theoretical implications

This study offers several theoretical contributions to the literature in the hospitality and tourism industry. First, it provides empirical validation of the Stimulus–Organism–Response (S-O-R) framework in explaining how modern technologies influence tourists' behavioral intentions. Specifically, online reviews, virtual reality, and AI chatbots function as external stimuli that impact internal psychological states, namely, sense of presence and trust, which in turn shape behavioral responses such as the intention to book and the willingness to pay a deposit.

Second, the study extends the contextual application of the S-O-R framework by demonstrating its relevance in managing marketing information within the tourism and hospitality sector. It emphasizes the importance of understanding tourists' perceptual and emotional processes in shaping their evaluation and decision-making behavior, particularly in service environments characterized by intangibility and uncertainty.

Finally, this research contributes a methodological advancement by applying a quantitative approach to assess the impact of technology on tourists' booking behaviors. Through the use of self-reported questionnaires, respondents were asked to imagine their experiences with online reviews, virtual reality, and AI chatbots in the context of hotel booking decisions. This approach supports the robustness of the framework and offers a replicable method for future research in similar contexts.

3. Managerial implications

This study provides several managerial implications for hoteliers operating in rural areas of Vietnam. First, with the increasing availability and affordability of innovative technologies, hotel managers should strategically invest in tools that are both feasible and impactful. The study highlights that online reviews, virtual reality (VR), and AI chatbots significantly enhance tourists' sense of presence and trust, two key psychological states that influence booking behavior. Among these, virtual reality was found to exert the strongest effect on sense of presence, allowing prospective guests to engage in a "try-before-you-go" experience that helps them visualize and better understand the hotel environment. This is particularly beneficial in the rural context, where services are intangible and travelers, especially first-time visitors, often lack prior knowledge or experiences to inform their decisions. VR and AI chatbots activate tourists' sensory imagination and provide vivid visual cues, which can compensate for the absence of physical interaction and information.

For rural hoteliers, persuading first-time travelers is challenging due to limited visibility and infrastructure. Virtual reality and AI chatbots serve to bridge this gap by offering immersive previews and immediate, accurate responses to inquiries, thereby increasing tourists' confidence and reducing perceived risk. Alyahya & McLean (2022) emphasize that guests can begin forming emotional connections with a property even before the actual visit through such pre-experiential engagement. Supporting this, the current study affirms that hotel managers should utilize VR and AI chatbots not just as technological enhancements, but as critical marketing tools to provide realistic simulations and foster customer confidence. Aligning with Zeng et al. (2020), the study also suggests that virtual reality is more effective than online reviews in driving behavioral intentions, although AI chatbots can complement VR by delivering additional sensory and informational support.

Second, the study finds that all three technologies, VR, AI chatbots, and online reviews, significantly enhance tourists' trust in hotels. Notably, online reviews had the strongest impact on trust, even though they did not influence the sense of presence. This underscores the influential role of social proof in shaping perceptions, especially among first-time travelers. Hoteliers should actively manage their online reviews across platforms, including their own websites, online travel agencies, and social media. Since tourists often rely on peer-generated content to assess service quality and reliability, showcasing positive reviews and responding constructively to negative feedback can help build and maintain trust.

Third, the sense of presence and trust are found to be critical psychological drivers of booking intentions and willingness to pay a deposit. When tourists feel familiar with and confident in a hotel, they are more likely to proceed with their reservation and even commit financially in advance. Therefore, hoteliers in rural areas should prioritize enhancing these two psychological states through digital tools, recognizing them as precursors to actionable consumer behavior.

Finally, this study shows that technological interventions not only influence intention to book but also significantly increase tourists' willingness to pay a deposit, a behavior indicative of deeper commitment and higher conversion likelihood. Willingness to pay a deposit is a more profitable and reliable performance metric than intention alone, as it suggests a greater probability of actual check-in. Given the challenges rural hoteliers face in encouraging this behavior, they are advised to leverage modern technologies as persuasive tools that deliver compelling pre-experiences and build trust. Tourism marketers should collaborate with technology developers to ensure timely, rich, and personalized information is provided to prospective guests. By integrating multiple digital touchpoints, especially virtual reality, AI chatbots, and curated online reviews, hoteliers can effectively overcome information asymmetries and encourage bookings from first-time travelers.

4. Limitations and future directions

While this study offers valuable theoretical and practical implications, several limitations should be acknowledged to guide future research. First, the study focuses on intention and willingness rather than actual behaviors. Although intention is often positively correlated with behavior, the relationship is not always consistent (Wang et al., 2018). Future studies are encouraged to measure actual behaviors, such as decisions to book, to address this gap. Second, this study considers only three modern technologies including online review, virtual reality, and AI chatbots that influence tourist's sense of presence, trust, booking intention, and willingness to pay a deposit. However, other modern technologies and their joint effects were not examined. In addition, no moderating variables were included, despite the possibility that factors such as gender or education could lead to differential outcomes. Future research should explore other modern technologies and potential moderators to deepen the understanding of tourist behaviors. Third, the study does not account for differences across tourist segments, despite evidence suggesting such variation plays a key role in understanding touristic habits. For instance, Ozdemir-Guzel & Bas (2021) highlight that Generation Z travelers are more responsive to modern technologies. Future research should consider segmenting tourist groups to enhance the predictive power of the model and provide more nuanced insights. Finally, the use of convenience sampling may introduce bias and limit the generalizability of the findings. Future studies are recommended to employ more rigorous sampling techniques to improve the representativeness and validity of the results.

CONCLUSION

This study has explored how modern technologies affect tourists' behavioral intentions in the context of rural tourism in Vietnam. Using the Stimulus-Organism-Response (SOR) framework, the research demonstrates that these technologies serve as effective stimuli that enhance tourists' internal states, which, in turn, significantly influence their intention to book rural accommodations and their willingness to pay a deposit.

The findings confirm that different technologies impact psychological states in distinct ways. Online reviews emerged as the most influential factor in building trust, VR was effective in creating a sense of presence, and AI chatbots contributed meaningfully to both dimensions by improving information accessibility and customer interaction.

From a practical perspective, the study underscores the importance for rural tourism hoteliers to invest in digital tools for building trust and enhancing sense of presence among potential visitors. Employing interactive technologies not only increases tourists' decision-making experiences but also strengthens the emotional and cognitive connections with destinations, thereby increasing the likelihood of booking and financial commitment. In the context of emerging economies like Vietnam, such innovations are critical for improving the visibility and competitiveness of rural destinations.

Author Contributions: Conceptualization, T.N.P.; methodology, T.N.P.; software, T.N.P.; validation, T.N.P.; formal analysis, T.N.P.; investigation, T.N.P.; data curation, T.N.P.; writing - original draft preparation, T.N.P.; writing - review and editing, T.N.P.; visualization, T.N.P.; supervision, T.N.P.; project administration, T.N.P. The author has read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the scientific involvement of the author concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 26.04.2025 Revised: 25.07.2025 Accepted: 22.08.2025 Available online: 17.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1859-1874
DOI 10.30892/gtg.61344-1554

INFORMAL URBAN LIVELIHOODS AND ENVIRONMENTAL INEQUALITY: OCCUPATIONAL HEALTH RISKS AMONG WASTE PICKERS IN GHAZIABAD, INDIA

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Citation: Rani, U., Matlovicova, K., Pandey, B.W., Vaishnav, H.K., Saini, R., Dey, S.K., Gozner, M., Bujdoso, Z., & Mishra, P.K. (2025). Informal urban livelihoods and environmental inequality: Occupational health risks among waste pickers in Ghaziabad, India. *Geojournal of Tourism and Geosites*, 61(3), 1859–1874. https://doi.org/10.30892/gtg.61344-1554

Abstract: The present study seeks to examine the effects of hazardous working conditions at urban landfills on the health status of waste pickers in Ghaziabad, India. The study identifies the factors of resilience and health concerns experienced by scavengers at work. It also aims to understand the specific difficulties and health consequences they experience. Finally, the impact of selected socio-economic factors on the subjective well-being of the respondents is indirectly explored, as this can be considered an indication of their socio-economic status and perceived quality of life. Data were obtained via four primary surveys carried out in 2023. To determine the immediate health impact of waste pickers' occupations, the following biometric tests were conducted: BMI, oximeter readings, blood pressure, pulse rate, chronometer readings, body temperature and general well-being. Data were collected in several phases using standardised questionnaires and biometric tests. A series of in-depth interviews and group discussions were also conducted to gain insight into the daily rituals, working practices, and challenges faced by waste pickers. We also observed them directly at work in landfills to understand the factors enabling them to perform this health-risking work in the long term. In the statistical analysis, descriptive statistics, the chi-square test, and the two-proportion z-test were employed to assess the relationship between waste pickers and selected health indicators. Another level of statistical testing was also performed to determine whether the proportion of waste pickers is significantly higher than that of the control group (non-waste pickers) in terms of well-being, i.e. health and socio-economic indicators. The results revealed that the health status of the waste pickers was statistically significantly worse than that of the control group. This included a higher prevalence of skin, respiratory and musculoskeletal problems, as well as poorer dietary habits and higher alcohol and tobacco consumption. Key risk factors identified were low levels of education, low income and inadequate protective equipment at work. Our findings demonstrated a pronounced adverse effect of working and living conditions on the health of waste pickers. This highlights the need to introduce preventive measures, improve access to healthcare, and strengthen social protection for this marginalised group. These findings also could contribute to the planning of urban development in Indian cities, with the aim of improving living conditions by applying environmental justice principles.

Keywords: waste, landfills, waste pickers, environmental justice, informal urban livelihoods

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INTRODUCTION

In recent decades, the production of municipal solid waste (MSW) has grown at an unprecedented rate around the world, making it one of the most pressing global environmental issues. While its volume was 2.01 billion tonnes per year in 2016 (Kaza et al., 2018; Rajaeifar et al., 2017), the World Bank (UNEP, 2024) estimates that, at the current rate of production, the total volume will almost double to 3.4–3.8 billion tonnes per year by 2050. The negative environmental impacts of disproportionate waste production are closely intertwined with the dynamic processes of urbanisation and population growth, driven by industrial and commercial development (Chenn et al., 2019). In many parts of the world,

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particularly in the Global South, urbanisation processes have often been poorly managed and occurred rapidly, failing to match the needs of urban population growth. Consequently, large urban areas have emerged where a significant proportion of the population resides in slums and informal settlements lacking access to basic infrastructure (Kaza et al., 2018; Slevin et al., 2020; Uhunamure et al., 2021). However, the accumulation of mixed municipal waste in landfills poses both an opportunity and a threat to poor urban communities. The opportunity lies in the recyclable components that can be monetised to provide essential livelihoods for entire families. The challenge is that waste pickers are exposed to health risks when collecting and separating recyclable materials from toxic and hazardous substances without adequate protective equipment (Anand, 2010; Hoornweg & Bhada-Tata, 2012; Chenn et al., 2019).

The collection of recyclable waste in landfills thus represents a health-threatening livelihood for numerous groups of poor slum dwellers, which they (un) voluntarily undertake despite the obvious health risks because they have no other alternative. Despite the fact that the manual waste separation they carry out is a significant contribution to the circular economy (recycling), in most cases it remains without formal recognition and often without at least minimal material support, in the form of the provision of the necessary protective work equipment for this hazardous work in terms of its impact on their health. However, health risks are also faced by other residents (Noje et al., 2025; Meng, 2025) who inhabit areas located near landfills (especially illegal ones) or waste incinerators, or otherwise health-risk territories (dependent on contaminated water sources or soil, or areas with high concentrations of health-damaging air emissions).

As the above considerations suggest, environmental problems cannot be addressed in isolation; they must be considered alongside the wide range of social factors that contribute to them (Susilo et al., 2021; Klimovský et al., 2016). Indeed, deepening social disparities contribute to increased pressure on natural resources. Rising poverty and marginalisation rates force the poor to exploit natural resources directly and intensively, ensuring their survival in the short term but leading to ecosystem degradation and the depletion of non-renewable resources in the long term. Conversely, the disproportionate growth in wealth and the consumerist lifestyle promoted by the neoliberal economic model also contribute to the systematic depletion of non-renewable resources needed to continually stimulate growth in demand for products and services. Furthermore, social inequalities are disproportionately distributed, with vulnerable communities bearing the brunt of negative environmental impacts such as pollution, climate change and land degradation (Matlovič & Matlovičová, 2024).

These communities have the fewest resources for adaptation. The urban environment provides limited livelihood opportunities for marginalised communities. In this case, waste picking as part of the informal sector is often one of the few livelihood options available to large groups of people living in poverty in urban areas. Despite the health risks associated with this work, it is socially embedded. The risky livelihood strategy of urban communities dependent on waste picking contributes to their marginalisation due to their lack of access to education and information resources, and their minimal participation in decision-making processes (Demkova et al., 2022; Brunn et al., 2018; Matlovičova et al., 2022; 2016).

Without transforming social structures and systemic relationships, achieving sustainable solutions to current social and environmental challenges in cities seems unlikely for the time being.

Concept of Environmental Justice: A brief outline of the framework

The concept of environmental justice emerged as a critique of the tendency for environmental burdens, such as pollution, landfills and industrial zones, to be located near communities of low socioeconomic status and frequently ethnic or otherwise marginalised groups (Bullard, 1993; Schlosberg, 2007). In other words, environmental risks and their subsequent impacts on communities inhabiting such areas are not evenly distributed, but are systematically transferred to socially vulnerable groups. A specific example is the location of large landfills near slums, which are inhabited by poor communities for whom waste collection is often the only livelihood option. The essence of environmental injustice is that, while waste pickers contribute to sustainable waste management, they are exposed to unnecessarily high health risks due to a lack of access to adequate occupational protection and healthcare.

Environmental burdens, such as landfills, pollution and poor sanitation, are often located in areas inhabited by socially and economically disadvantaged groups (Bullard, 1993; Schlosberg, 2007). Thus, waste pickers face environmental injustice: on the one hand, they contribute to waste reduction by collecting and separating recyclable materials from mixed municipal waste landfills; on the other hand, they (un)voluntarily inhabit and work in environments that pose a risk to their health. Furthermore, they are unnecessarily exposed to a high level of risk, as they work without adequate protection, recognition or compensation. In this context, Schlosberg (2007) proposes a pluralistic environmental justice framework which, unlike traditional economic indicators, evaluates justice based on individuals' actual ability to live a dignified life (the *capabilities approach*). He argues that addressing only the distribution of environmental *'goods'* (e.g. clean air, access to a park) and *'burdens'* (e.g. landfills, pollution) is not enough, and that we also need to respect the multiple kinds of relationships people have with places, reflecting these in policy and environmental decisions. In this case, the emphasis is on *'capabilities'*, or the real choices of lifestyle that an individual values, and *'functionings'*, or the specific aspects of life that a person chooses and is able to do or be, reflecting their state of being and activities (e.g. being healthy, being educated, living in a safe environment, participating in social life or having simple freedom of movement; Schlosberg, 2007).

This opens up the debate on environmental justice, where not only human health is at stake, but also the health of natural ecosystems. It stresses that justice must include not only an equitable distribution of environmental benefits and burdens, but also inclusive decision-making and respect for different forms of place consciousness, both *natural*, i.e. the way individuals and communities are aware of their connection to the natural environment, and *social*, i.e. the way people are aware of the significance of place within their identities, histories and social relations. Such a capability-based approach

is a normative approach to human well-being (Matlovič & Matlovičova, 2020; 2025) focuses on individuals' actual ability to achieve a valued life, rather than merely having the right or freedom to do so. The *capabilities approach* emerged in the 1980s as an alternative to welfare economics. However, early work by Sen (1999; 1985) and Nussbaum (2000; 2006) considered it to be an approach aimed at creating conditions that enable people to live fulfilling lives, including maintaining meaningful connections with the natural and social environments.

Rakodi (2002: 2–22) builds on the considerations outlined above by *adopting an urban livelihoods approach*, which describes survival strategies in urban environments, emphasising the informal sector, access to assets, and adaptive capacity. The work of waste pickers is an example of an informal livelihood determined by economic marginalisation, a lack of alternative income, and limited access to basic assets such as healthcare, education and occupational safety. This activity takes place in an „*urban risk environment"*. The social vulnerability of waste pickers, when considered within the concept of *vulnerability* concept (Wisner et al., 2004; Turner, 2003), is determined by a combination of systemic inequalities and the individual capacity to cope with shocks and stresses. Waste pickers are vulnerable to environmental hazards, and their lack of access to healthcare, education, and financial resources makes them even more so. Resilience mechanisms such as religious beliefs, community cohesion are poor substitutes for inadequate institutional support.

Recent papers (Gemmiti et al., 2025; Chakraborty et al., 2025) also discuss the uneven distribution of environmental burdens among different social groups. For example, Gemmiti et al. (2025: 1-3) examine the spatial and socio-demographic dimensions of environmental injustice in Italy, specifically in the context of so-called *Sites of National Interest* (SNIs), i.e. sites identified by the Italian government as zones with severe environmental burdens due to high levels of soil, water and air contamination from industrial activities. The authors point out that residents living in SNIs are significantly more likely to experience socioeconomic disadvantage. Specifically, they describe lower household incomes, higher unemployment rates and lower levels of education, which limit awareness of environmental risks. They also note a higher proportion of elderly people, who are more vulnerable to the health impacts of contamination. In the context of the *capabilities approach* mentioned above, these findings demonstrate that living in a contaminated environment limits individuals' right to live with dignity and to enjoy good health without fear of physical or environmental threats. Other notable works include those of Chakraborty et al. (2025), who explored the concept of environmental justice in a broader context using selected Canadian metropolitan areas as case studies, specifically Ottawa-Gatineau and Montreal, where communities inhabiting seismically active zones were examined. Based on their research findings, the authors argue that environmental justice should be understood not only as the equitable distribution of environmental benefits and risks, but also as a means of exposing and mitigating the vulnerability of historically or systemically marginalised populations. They highlight that ethnic minorities, seniors and low-income households are more likely to reside in areas with higher risk levels (Chakraborty et al., 2025; Matlovič et al., 2020). By doing so, Chakraborty et al. (2025) extend the scope of environmental justice beyond toxic pollution to encompass natural hazards, which, despite their natural origin, have highly socially contingent impacts. In other words, the environmental risks we face are not the same for everyone: those who are least prepared for them are the most affected (Wisner et al., 2004: 4–5). These contexts allow us to define the essence of the principle of *environmental justice* as the pursuit of equality of access to natural resources and equality in bearing the burden of environmental risks.

The urban risk environment in Indian slums

The rapid pace of urbanisation and population growth are two of the major demographic challenges facing contemporary India. This trend accelerated significantly after the economic reforms of the 1990s, which generated growth but did not benefit everyone equally (Chen et al., 2019; Kaza et al., 2018). This has resulted in growing regional disparities and widening socioeconomic inequalities (Kostilnikova et al., 2022; Sumarmi, 2021). The current population of 1.46 billion people (estimated by Worldometer for 2025) has additionally resulted in substantial rural-to-urban migration, particularly toward major metropolitan centres such as Mumbai, Delhi and Kolkata. However, this migratory movement, fuelled by hopes of a better life and job opportunities, often runs up against the limits of urban infrastructure and the availability of housing, jobs and basic social services (Slevin et al., 2020). The result is the expansion of slums — informal, illegal settlements lacking adequate amenities such as electricity, water, sanitation and safety standards — in which approximately 40–50% of the urban population lives (Kaza et al., 2018; Uhunamure et al., 2021).

The emergence of slums in India cannot be understood as a consequence of poverty alone; rather, it is the result of a complex interplay of multiple factors. Important push factors that force rural populations to leave the countryside and seek livelihoods in cities include the climate crisis, among others. Climate change has led to a decline in rainfall, resulting in reduced agricultural yields due to drought, flooding or land depletion. This forces millions of people to leave the countryside. However, there are also cultural factors, such as caste and ethnic marginalisation. Indeed, India's slums are often inhabited by the poorest sections of society, such as Dalit members of the lowest caste or migrants from minority ethnic groups. Lastly, the lack of affordable housing forces migrants to settle on unused land or land with unclear or disputed ownership. In many cases, their proliferation is fostered by city governments' politically and economically motivated reluctance to legalise or integrate slums into urban plans. In some cases, this is exacerbated by corruption, clientelism and inadequate control mechanisms for public resources earmarked for social housing. Finally, structural unemployment also fuels their growth, as many urban newcomers are unable to find formal employment and consequently end up in the informal economy, whose activities are linked to the slums. These factors, alongside others, therefore drive the urban processes that enable slum formation in India, while simultaneously hindering their elimination or integration into formal urban spaces. Consequently, slums are becoming an increasingly common feature of the Indian urban environment, providing a space for the increased concentration of poor and socially excluded communities who depend on risky urban livelihoods.

The scarcity of formal income-generating opportunities and limited access to educational resources compels many slum residents to sustain their livelihoods through the collection, sorting, and recycling of waste, frequently undertaken directly at urban dumpsites or on city streets (Nuhu, 2016). Globally, it is estimated that over 15 million individuals are engaged in such activities as their primary source of livelihood (De Salvo et al., 2008). As this figure is from 2008, it is likely that the number is now several times higher. In India alone, it is estimated that between 1.5 and 4 million people make a living from waste collection, over 500,000 of whom are based in the capital city of Delhi (Noda, 2022).

The collection of recyclables and other items at municipal solid waste (MSW) landfills is usually carried out by people without adequate protective equipment. This can lead to both acute and chronic health problems, such as respiratory illnesses, infections and abnormal blood test results caused by prolonged exposure to toxic substances.

Several studies have investigated the effects of this work on the health of employees. For instance, Salve et al. (2017, 2020) examined the health of more than 300 waste pickers in Mumbai, India. They identified the presence of respiratory, eye, skin or nail diseases (or a combination of these) in almost half of them. Kumari & Kiran (2022) found high rates of accidents, falls, musculoskeletal problems and waterborne infections of nearly 40% in a similarly focused study in Ayodhya, Uttar Pradesh, India. Other studies (e.g. Van de Klundert & Lardinois, 1995; Hoozemans et al., 2004; Chokhandre et al., 2017; Akuressage & Dissanayake, 2017; Salve, 2020,) have confirmed that waste pickers experience a significantly higher prevalence of injuries, respiratory diseases, eye infections, and stomach problems. This is due not only to direct contact with toxic or noxious substances, but also to poor hygiene (a proximate cause of infectious diseases), improper waste management, and the use of toxic materials found in waste as fuel. Many other factors have also been identified as increasing health risks. Moreno-Sanchez et al. (2004) describe the overpopulation of disease-carrying insects as a consequence of poor sanitation in the cities of Hyderabad and Mysore. Improper waste management practices, inadequate drainage systems and the accumulation of solid waste, sewage and effluents also pose a direct threat to the health of India's slum-dwellers (Palakurthy & Kesari, 2021). The increased morbidity of waste pickers is thus a direct consequence of multiple deprivations, including a lack of basic necessities and unsuitable working and living conditions, in slums where proper sanitation facilities, clean drinking water and electricity are lacking (Slack et al., 2009; Water, 2019; Slack, 2009).

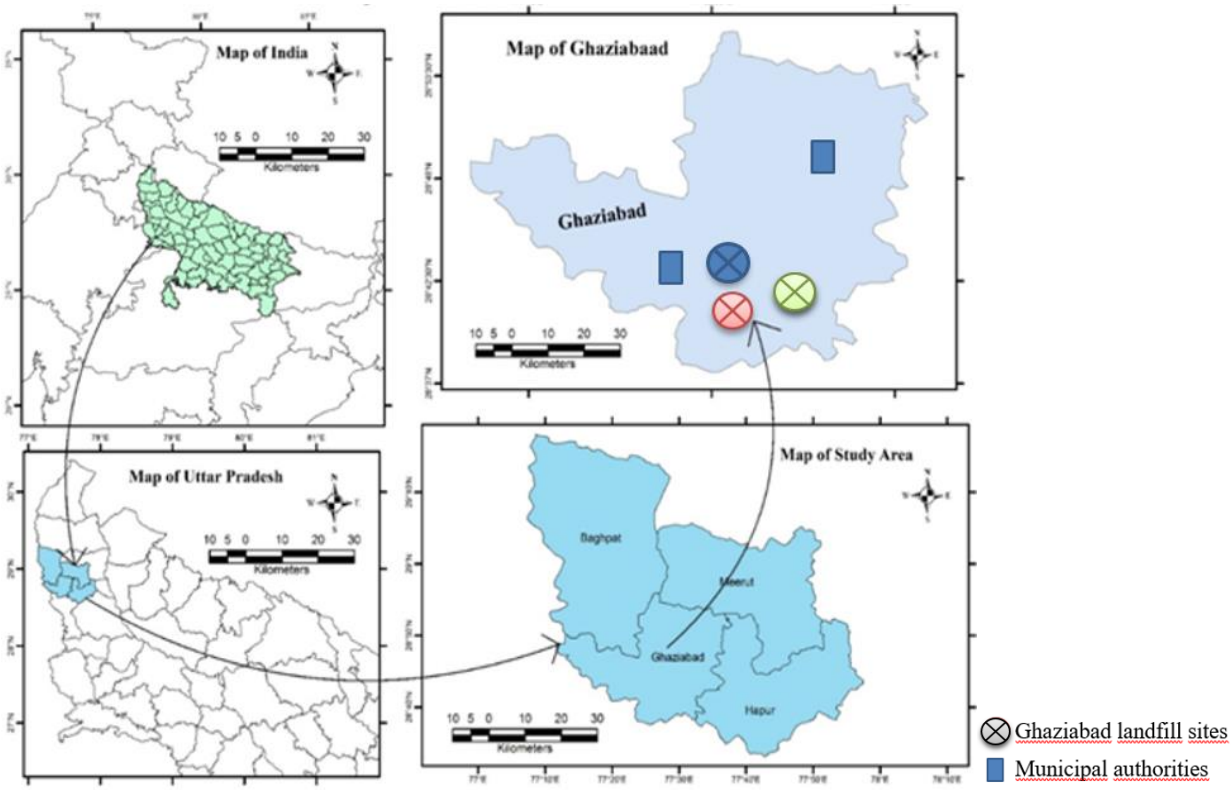
The studies underscore the pressing necessity to mitigate the environmental, social, and health consequences of waste management, enhance occupational conditions while safeguarding workers' health, and ensure systematic regulation alongside intervention by the competent local authorities. The studies also point to the need to raise awareness among waste pickers of health risks, and to promote inter-sectoral cooperation in order to protect their health rights and encourage the adoption of preventive measures. The National Urban Sanitation Policy (NUSP, 2020) was adopted by the Indian government in November 2008 in response to the inadequate sanitation conditions in Indian cities. By addressing urban sanitation problems holistically, the strategy seeks to improve both the environment and human health while lowering health risks that disproportionately impact underprivileged groups. The Indian Ministry of Urban Development's main objective under the NUSP is to fully sanitise cities and towns. To achieve this ambitious goal, a series of partial objectives and targets have been established. Specifically, there is a need to develop integrated, city-wide sanitation plans. These plans should include measures to strengthen institutional provision and raise awareness, particularly among poor communities, of the negative impact of environmental stresses and poor hygiene habits on human health. The aim is to encourage behavioural change and promote the implementation of low-cost or cost-effective technologies for the well disposal of waste, especially sewage and other noxious liquid waste (NUSP, 2020). A total of 120 cities were involved in preparing urban sanitation plans. The financial costs were covered by a government grant from the Indian Ministry of Urban Development, which allocated Rs. 13 million for this purpose, as well as by external funding from various agencies and NGOs (NUSP, 2020). In addition to financial support, the Government of India regularly monitors cities and awards the national 'Nirmal Shahar Puraskar' prize to those that achieve the best results in promoting urban sanitation and encouraging households to participate in improving urban living spaces and ensuring the safe collection, treatment and disposal of waste (NUSP, 2020).

Ghaziabad Case Study (Uttar Pradesh, India)

As mentioned above, the Government of India has captured many measures to improve the environment of urban communities by supporting various initiatives and investing in upgrading water infrastructure, public services, housing and education, as well as sanitation facilities. In this context, several initiatives have been put into action, including the 1954-launched India Sanitation Program. The Nirmal Bharat Abhiyan, the Central Rural Sanitation Programme (1986), and the Total Sanitation Campaign (1999). (2012), and the subsequent versions of the *Swachh Bharat Abhiyan* (SBA) (2014, 2019, 2020–21, 2024–25). Many other supporting initiatives have also been implemented (Sinha & Sinha, 2017; Novotný et al., 2018; Bhandare, 2014; Sengupta, 2020; Basumatary et al., 2022). However, rapid population growth in Indian cities poses a huge challenge, with population concentrations exceeding current infrastructure capacity. Although the situation is gradually improving thanks to the proactive approach of the Indian government, it is estimated that, by 2023, around 162 million people (mostly from communities with a low socioeconomic status) will still not have sanitation facilities in their homes (Jain et al., 2025). 71% of these people live in just six Indian states: *Bihar, Jharkhand Rajasthan, Madhya Pradesh, Uttar Pradesh, and Uttarakhand.* More than ten million people in each of these states lack a toilet (Jain et al., 2025). Ensuring acceptable hygiene conditions is particularly challenging in urban areas, where several million households lack sanitation facilities and over 30% of faeces produced are not adequately treated (NUSP, 2020).

In evaluations of Indian cities conducted under the National Urban Sanitation Policy (NUSP, 2020), the state of Uttar Pradesh has long been among the worst performers in terms of implementing measures to improve living conditions for slum

communities in urban areas. This is why we focused on it when looking for a suitable area in which to conduct our research. Specifically, we focused on *Ghaziabad*, a city in the state of Uttar Pradesh with a population of 1.6 million and a population density of 4,060 persons per km² (according to data from the 2011[1] Census of India). Situated in close proximity to the capital, Delhi, and between the Ganga and Yamuna rivers, it is an important rail hub for northern India. The city has a tropical to temperate climate, with summer highs of 43°C and winter lows of 3°C. These locational factors help to promote its growth. Today, *Ghaziabad* is one of the world's fastest-growing cities, having experienced a population growth rate of around 41% between 2001 and 2011 (Census of India, 2011). There are three large landfills of mixed municipal waste in the city (Figure 1). Approximately 10,000 to 12,000 people make their living from waste collection at these sites (Dev, 2020). Although waste pickers constitute a significant component of the city's waste management system, the health implications of their hazardous living and working conditions have thus far not been examined to a sufficient extent.



Fugure 1. Location of Ghaziabad in India

The city generates 1,400 tons of municipal solid waste per day on average (AM IST, 2023 estimate), but has the capacity to process only around 600 tons of this, converting it to compost. The categories of recyclables, inorganic or inert waste, biodegradable waste, and infectious waste were considered in this case. Ghaziabad Nagar Nigam (GNN), also known as Ghaziabad Municipal Corporation, has started construction of the Galand Waste to Energy Plant, which is planned to have the capacity to process 2,500 tonnes of waste and generate energy from it. The plant will be built on an area about four times larger than the current one. It was scheduled for commissioning in 2018 (Khandelwal, 2021). However, construction was suspended for four years following protests by local residents, after which the Ghaziabad Municipal Corporation abandoned the project. The corporation is currently looking for other plots of the same size so that it can process the city's collected waste into compost, at least temporarily. There are two landfills in the district of Ghaziabad. The National Green Tribunal is monitoring the sites and has directed agencies in Ghaziabad to clear all remaining waste from the site adjacent to residential areas. Around 1,200 metric tonnes of fresh solid waste has piled up at the Shakti Khand landfill (marked blue in Figure 1) in Indirapuram (marked red in Figure 1). The Galand site (35 acres) manages the areas administered by the GDA and the Ghaziabad Municipal Corporation's Pratap Vihar, Kavinagar and Vasundhara zones (Times of India, 2018). The Mohammadpur Amad Baghpat site (21 acres) covers Muradnagar, Modinagar and Mohan Nagar, addressing waste issues and curbing environmental contamination (Times of India, 2018). Residents are experiencing deteriorating living conditions due to decomposing waste and toxic smoke from fires polluting the air they breathe (Figure 2). Ghaziabad produces 1,200 to 1,400 tonnes of solid waste daily. Due to dumping close to urban areas, the city is at risk of environmental and health issues (Times of India, 2023). A planned landfill site will handle 30% of the non-recyclable waste, which is a significant portion of the city's daily waste production of 1,400 tonnes (data collected from

[1] The latest official census data is from 2011. The census originally planned for 2021 has been postponed indefinitely due to the complicated conditions of the ongoing pandemic. According to media reports, Prime Minister Narendra Modi's government plans to begin collecting population data across the country in March 2027.

a Hindustan Times Report, 2023). Previously, the city managed 150,000 tonnes of waste in Indirapuram and 491,000 tonnes in Pratap Vihar (shown in green on Figure 1). Currently, there are 122 places where waste is still not being managed properly.

In order to address waste issues, the Ghaziabad Municipal Corporation is seeking bioremediation for 287,000 tonnes of waste, particularly in the Bhikhanpur area. The Ghaziabad Development Authority (GDA) has identified Galand (35 acres) and Mohammadpur Amad in Baghpat (21 acres) as potential landfill sites with waste-to-energy plants, which would support the daily collection of 1,200 tonnes of waste (data collected from a Hindustan Times report,2023).

Figure 2. Waste pickers in Ghaziabad (Source: Authors fieldwork)

Research objectives and methodology

One of the main motivations behind the research was the National Urban Sanitation Policy (NUSP, 2020), which placed *Ghaziabad* city in the worst 'black' category in the 2009–10 sanitation assessment. The measures taken over the next ten years brought about some improvement. According to Times of India reports, Ghaziabad performed well in the 2022 Swachh Survekshan (an annual survey conducted by the Government of India to assess cleanliness and sanitation in urban and rural areas), placing first in Uttar Pradesh and 12th in India among large cities with populations of 10–40 lakh, up from 18th in 2021. Despite this improvement, many critical health issues were reported among waste pickers in this district, which require a comprehensive research study concerning the health risks. Such studies provide valuable data and information needed to design and optimise measures to improve the health and overall quality of life of poor urban communities who make a living from collecting waste from local dumpsites. In the context of the current challenges in achieving the global Sustainable Development Goals, their importance is growing. They contribute to solving the problem of reducing the growing volume of municipal waste by separating it for subsequent recycling, which indirectly improves the quality of life of poor urban communities that rely on waste collection for their livelihoods. In order to improve their health and socio-economic status, it is important to examine the hazardous working conditions that waste pickers face and their impact on both their health and their perceived quality of life.

This study aims to investigate the impact of the hazardous working conditions at urban landfills on the health of waste pickers in Ghaziabad, India. The study will identify the factors of resilience and health concerns experienced by scavengers at work. The study aims to understand the specific difficulties and health consequences they experience. The impact of selected socio-economic factors on the subjective well-being of the respondents is also indirectly explored, as this can be

considered a reflection of their socio-economic status and perceived quality of life. In other words, the paper aims to assess the extent to which hazards in the working environment impact the health and well-being of waste pickers in Ghaziabad, and to explore the strategies they use to cope with challenges at work. Methodologically, descriptive statistics, including percentages and statistically significant studies, were used to analyse the data. The analysis was carried out using a statistical package for the social sciences, SPSP 15.0 version. The Chi-Square test (Magnello, 2005; Pearson, 1900) and two proportion Z - Test (Montgomery & Runger, 2020) were used in the statistical analysis. First, to find the association between attributes *i.e.*, waste-pickers and health indicators, we defined null and alternative hypotheses as follows:

H_0: There is no statistically significant correlation between an individual's well-being and their health indicators

H_1: There is a statistically significant correlation between an individual's well-being and their health indicators (1)

Secondly, we defined another hypothesis to check the following association:

H_0: There is no statistically significant correlation between an individual's well-being and their socio-economic conditions

H_1: There is a statistically significant correlation between an individual's well-being and their socio-economic conditions. (2)

Test statistic is defined as: $$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i} \quad (3)$$

Break down the chi-square (χ^2) formula is as follows: χ^2 -Chi-square statistic); O_i -Observed frequency for category *I;* E_i (Expected frequency for category *i*);

$(O_i - E_i)^2$: The squared difference between observed and expected; Units: $(\text{counts})^2$.

$(O_i - E_i)^2 / E_i$: Normalized squared deviation for each category; Since numerator has units (counts^2) and denominator has units (counts), the result has units of counts; But in practice, because frequencies are counts, the ratio is treated as dimensionless (statistical measure, not physical units).

$\sum$ (Summation); Adds up the contributions of all categories (from *i = 1* to *n*). Final χ^2 is dimensionless.

Decision Rule: If corresponding $p - value < \alpha(0.05)$ for the test statistic then H_0 is rejected else fails to reject the null hypothesis (H_0). Following are the hypotheses which are being tested and their conclusions.

Next, another level of statistical test was performed to find whether waste-pickers' proportion is significantly high or not when the comparison is made with control group (non-waste-pickers) on their wellbeing *i.e.*, health, socio-economic indicators etc. $Z - test$ for two proportions was performed to test the following hypothesis:

H_0: $P_{\text{waste-picker}} = P_{\text{control group}}$ - There is **no significant difference** in proportions between waste-picker's well-being and non-waste picker's well-being.

H_1: $P_{\text{waste-pickers}} < P_{\text{control group}}$ – The proportion of individuals in non-waste pickers group demonstrate a statistically higher well-being than waste pickers group* (4)

*waste picker's well-being is low as compared to control group for proportion supposed to be high.

Test Statistic is defined as: $$Z = \frac{\hat{p}_{waste-pickers} - \hat{p}_{control\ group}}{\sqrt{p(1-p)\left(\frac{1}{n_{waste-pickers}} + \frac{1}{n_{control\ group}}\right)}}$$ *where,*

$\hat{p}_{\text{waste-pickers}}$ = Sample proportion from the waste-pickers group; $\hat{p}_{\text{control group}}$ = Sample proportion from the control group

$n_{\text{waste-pickers}}$ = Sample size of the waste − pickers group; $n_{\text{control group}}$ = Sample size of the control group

$$p = \frac{x_{waste-pickers} + x_{control\ group}}{n_{waste-piscker} + n_{control\ group}} \quad (5)\ \&\ (6)$$

Decision Rule: If corresponding $p - value < \alpha(0.05)$ for the test statistic, H_0 is rejected it fails to reject the null; hypothesis (H_0). Following are the hypotheses which are being tested and their conclusions.

Research design and primary data collection

This study adopts a cross-sectional research design and focuses on a highly socially vulnerable area: the largest garbage dump in Ghaziabad, a city in the Indian state of Uttar Pradesh (Figure 1). We adopted a multidimensional research protocol divided into four distinct phases to explore the conditions and health of the individuals examined in this context comprehensively. The first phase of the research aimed to identify and explore the feasibility of data gathering strategies. To ensure clarity and effectiveness in measuring health indicators, this phase included selecting participants from both waste-pickers and control group (non-waste-pickers), field-testing different questionnaires, and organising biometric assessment tests. Three critical actions were taken by the study team in the first phase:

(1) identification of subjects – the subjects of the study were selected from waste pickers at the landfill and communities not involved in waste picking activities;

(2) field testing – as a pilot test, 20 questionnaires were used to assess their usefulness and ensure question clarity;

(3) scheduling biometric assessment tests - biometric assessment tests, including measures linked to health indicators, were arranged for the selected participants.

The primary goal of the Survey Announcement phase was to inform participants about the upcoming study and encourage their engagement. This phase included notifying key members of the waste-picker and non-waste-picker communities (control group) about the survey, explaining the study's significance, establishing reception points for gathering participants in each community, and providing individual explanations to ensure clear understanding of the study's objectives. The phase consisted of two parts, the first of which aimed to inform participants about the study, while the second aimed to collect data from them: (1) announcement and (2) data collection.

(1) The study team informed both waste pickers and other community members about the upcoming poll, explaining its purpose and nature. Specifically, notices describing the study and its objectives were sent to prominent figures in both communities. Designated areas were set up in each community where respondents could gather to take part in the survey. People from the communities were then invited to participate in the survey, and researchers personally explained the study to each respondent to ensure they understood its objectives.

(2) The study was carried out with a sample size of 304 respondents. Of these, 203 were waste pickers and 101 were non-waste pickers in the control group (Table 1).

Data were obtained via four primary surveys, which were carried out in 2023. The primary purpose of the data collection phase was to gather as much information about the respondents as possible. Structured questionnaires were used to collect socio-demographic data, information on job habits, and perceptions of health conditions.

Table 1. Sample structure

	Variables	Waste-pickers respondents (%)	Control group(%)	Σ
Age groups (years)	20-29	39.41	19.80	100%
	30-39	35.47	41.58	
	40-49	22.17	25.74	
	50+	2.96	12.87	
Sex	Male	53.69	49.50	100%
	Female	46.31	50.50	
Levels of Education	Primary school	12.98	17.82	100%
	High school	5.29	21.78	
	University	3.37	8.91	
	Illiterate	77.83	51.49	
Medical history	chronic disease	45.32	20.79	100%
	Hypertension	23.65	7.92	
	Diabetes	2.96	11.88	
	Heart disease	7.88	2.97	
	No major problems		56.44	
Family history of CVD	No	40	64.36	100%
	Yes	60	35.64	
Income (INR per month)	(1) Below 2000	10.84	3.96	100%
	(2) 3000-5000	34.48	38.61	
	(3) 6000-8000	38.42	17.83	
	(3) 9000-11,000	11.82	29.70	
	(4) 12,000-15000	4.43	6.93	
	(6) 16000-20,000	0	1.98	
	(7) Above 20,000	0	0.99	

To determine the immediate health impact of waste pickers' occupations, the following biometric tests were conducted: BMI, oximeter readings, blood pressure, pulse rate, chronometer readings, body temperature, and general well-being. Participants were also provided with meals during this period. Data were collected using standardised questionnaires (Table 2) and biometric tests. Data collection actually took place in several phases.

Table 2. Survey content

Research areas	Variables
Occupation	Nature of work, waste-picking status, workplace, work duration, time of day, method of waste collection, tasks performed, what type of material collection, weight of waste collected per day/week in kg, money earned per kg of waste per day/week, type of transport used for reaching the site of work, distance travelled to reach the site of work in km,
Working Condition	Drinking water at the workplace, toilets at the worksite, special place for eating at the workplace, bathing status and frequency after work, and use of disinfectants in washing clothes, and hands. Availability and use of personal protective equipment (PPE), Covid-19 awareness etc.
Health Exposure	Physical, chemical and biological exposure
Occupational Health Hazards	Occupational injuries, accidents, animal bites, encounters with rotting waste, accidents reporting
Harassment and Abuse	Harassment by caretakers of the dumping site, by the public, police, exploitation by kabari, and physical, mental, and sexual abuse.
Ergonomics Hazards including Muscu-loskeletal Problems (physical health)	Prevalence of ergonomic exposures, pain, areas of pain, pain counts
General Health Problems	Chronic disease
Intestinal Health	Intestinal worms, leptospirosis, diarrhoea, dengue fever, Zika virus or chikungunya, hepatitis A, B, C?
Skin Problems	Infections, rashes
Eye Problems	Infections, redness
Cardiovascular diseases	Heart attack
Respiratory Diseases	Upper respiratory symptoms, lower respiratory symptoms (LRS), bronchitis, asthma, lung problems, tuberculosis problems, pneumonia
Sexually Transmitted Diseases	Hepatitis, Phyllis
Cancer	Various type of body cancer like skin, lungs, breast, prostate etc.
Use of Medicines	For what purpose like blood pressure, temperature, severity of disease

Healthcare Services	Vaccination, work training, health check-up camp, treatment facility,
Aspirations	
Mental Health	Anxiety, depression, work, other mental disorders, such as schizophrenia, bipolar disorder, psychosis, or obsessive-compulsive disorder (OCD)
Depression	Depression
BMI	Weight, height, BMI, lean body mass, protein, bone mass, water, BMT, fat, muscle, vs fat, and body age
Brontometer	Level-1, level 2, level 3 readings
Oximeter	Oxygen, pulse rate
Overall feelings of health	
Household Amenities and Assets	Address, origin state, house ownership, type and material of housing, number of dwelling rooms, household family size, household expenditure every month, source of drinking water, sewer system, access of household to latrine, and bathroom facility,
Eating Habits of Individuals	Meals/day, food preference, frequency of eating green vegetable/week, frequency of eating pulses/week, frequency of eating fruits/week
Lifestyle Habits	Tobacco/gutka chewing, betel nuts, smoking status, alcohol consumption, drugs consumption, drug addiction, status of physical activity
Socio-economic Profile of Individuals	Monthly income, education level
Identification questions	Name, place of residence, districts, locality, age, category/caste, sex, marital status

In order to gain insight into the daily rituals, working practices and challenges faced by waste pickers, as well as the factors enabling them to perform this health-risking work long term, we observed them directly at work in landfills. We also conducted a series of in-depth interviews to gain a more thorough understanding of their socioeconomic status and other relevant factors. Finally, group discussions were organised for those who did not wish to participate in the survey, to encourage their participation and also to gain information about the situation of the less open-minded waste pickers.

RESULTS AND DISCUSSION

Our survey results showed that the food habits, tobacco intake and alcohol consumption of waste pickers were significantly poorer than those of non-waste pickers in the control group. The relationship between engagement in waste picking and unfavourable dietary practices, along with elevated consumption of tobacco and alcohol, was subjected to statistical verification, as presented in Tables 3 and 4. The chi-square test and the two-sample test of proportions demonstrate a significant statistical association between waste picking and health-compromising behaviours, including suboptimal dietary intake (fewer than three meals per day: 78% of waste pickers versus 42% of non-waste pickers, $p = 0.002$), elevated tobacco use (51% versus 37%, $p = 0.024$), and increased alcohol consumption (67% versus 39%, $p = 0.004$). Results of Chi-Square test for food, tobacco intake, and regular drinking (alcohol consumption) habits of non-waste-pickers versus waste-pickers found a significantly low food intake and higher alcohol as well as tobacco in taking habits in the latter indicating a probable reason for their worse health issues (Table 3).

Table 3. Chi-Square test for food, tobacco intake, and drinking habits

	Selection	Waste-pickers (%)	Control group (%)	p-value	Decision
Food	3 or more meals/day	22%	58%	0.002	H_0 rejection
	<3 meals/day	78%	42%		
Tobacco	Yes	51%	37%	0.024	H_0 rejection
	No	49%	63%		
Alcohol consumption	Yes	67%	39%	0.004	H_0 rejection
	No	33%	61%		

Table 4. Z-test for food, tobacco intake, and drinking habits

	Selection	Waste-pickers (%)	Control group (%)	P-value	Decision
Food	3 or more meals/day	22%	58%	0.002	H_0 rejection
	<3 meals/day	78%	42%		
Tobacco	Yes	51%	37%	0.014	H_0 rejection
	No	49%	63%		
Drink (alcohol consumption)	Yes	67%	39%	0.012	H_0 rejection
	No	33%	61%		

Table 5. Chi-Square test for communicable and skin diseases

	Selection	Waste-pickers (%)	Control goup (%)	p-value	Decision
Itching	Yes	37%	9%	0.004	SH_0 rejection
	No	63%	91%		
Allergies	Yes	37%	9%	0.004	H_0 rejection
	No	63%	91%		
Upper respiratory symptoms (URS)	Yes	76%	61%	0.014	H_0 rejection
	No	24%	39%		
Eye Infection	Yes	26%	7%	0.021	H_0 rejection
	No	73.9%	93%		

The results of the proportional Z-test comparing the food, tobacco and alcohol consumption habits of non-waste pickers and waste pickers revealed that the latter had significantly lower food intake and higher alcohol and tobacco consumption, indicating a probable cause of their poorer health (Table 4).

The results of the chi-square test for communicable and skin diseases in non-waste pickers versus waste pickers revealed a significantly higher incidence in the latter, indicating a probable occupational risk of waste picking (Table 5).

Specifically, work-related morbidities encompassing dermatological and respiratory conditions—such as allergic reactions, pruritus, upper respiratory tract symptoms, and ocular infections—were analysed statistically, as presented in Tables 5 and 6. The chi-square test and the two-sample test of proportions demonstrate a significant association between waste picking and each of these morbidities: pruritus (37% of waste pickers versus 9% of non-waste pickers, $p = 0.004$), allergic manifestations (37% versus 9%, $p = 0.004$), upper respiratory tract syndrome (76% versus 61%, $p = 0.014$), and ocular infections (26% versus 7%, $p = 0.021$).

Table 6. Z-test for communicable and skin diseases

	Selection	Waste-pickers (%)	Control goup (%)	p-value	Decision
Itching	Yes	37%	9%	0.003	H_0 rejection
	No	63%	91%		
Allergies	Yes	37%	9	0.003	H_0 rejection
	No	63%	91%		
Upper respiratory symptoms (URS)	Yes	76%	61%	0.014	H_0 rejection
	No	24%	39%		
Eye Infection	Yes	26%	7%	0.021	H_0 rejection
	No	79%	93%		

Table 7. Chi-Square test for non-communicable diseases

	Selection	Waste-pickers (%)	Control goup (%)	p-value	Decision
Hypertension	Yes	24%	8%	0.005	H_0 rejection
	No	76%	92%		
Musculo skeletal issues	Yes	80%	66%	0.010	H_0 rejection
	No	20%	34%		
Fatigue in the last 3 months	Yes	57%	34%	0.001	H_0 rejection
	No	43%	66%		

Table 8. Proportional Z-test for non-communicable diseases

	Selection	Waste-pickers (%)	Control goup (%)	p-value	Decision
Hypertension	Yes	24%	8%	0.005	H_0 rejection
	No	76%	92%		
Musculoskeletal issues	Yes	80%	66%	0.011	H_0 rejection
	No	20%	34%		
Fatigue in the last 3 months	Yes	57%	34%	0.001	H_0 rejection
	No	43%	66%		

The results of the chi-square and proportional Z-tests indicate a significant relationship between waste pickers and certain non-communicable disorders, such as hypertension (affecting 24% of waste pickers versus 8% of non-waste pickers, p-value 0.005), musculoskeletal issues (80% of waste pickers versus 66% of non-waste pickers, p-value 0.010) and fatigue in the last three months (57% of waste pickers versus 34% of non-waste pickers, p-value 0.001), as shown in Tables 7 and 8. Thus, our research confirmed that non-communicable diseases (NCDs) occur at significantly higher rates among waste pickers than among non-waste pickers.The chi-square and proportional Z-tests' results indicate a significant relationship between waste-pickers and physical injuries (82% of waste-pickers versus 19% of non-waste-pickers, p-value 0.001), and physical discomfort in the last year (91% of waste pickers versus 81% of non-waste pickers, p-value 0.010).

However, non-waste pickers worked more than eight hours a day (39% of non-waste pickers versus 26% of waste pickers, p-value 0.020). The results of the chi-square and proportional Z-tests for the other parameters (injuries at work, physical discomfort in the last year, and longer working hours) showed a significantly higher occurrence among waste-pickers than non-waste-pickers, indicating a probable occupational risk of waste-picking (Tables 9 and 10).

Table 9. Chi-Square test for other parameters

	Selection	Waste-pickers (%)	Control group (%)	p-value	Decision
Injured while working	Yes	82%	19%	0.001	H_0 rejection
	No	18%	81%		
Physical Discomfort in 1 last year	Yes	91%	81%	0.010	H_0 rejection
	No	9%	19%		
Working hours	8 or <8 Hours/Day	74%	61%	0.020	H_0 rejection
	>8 Hours/Day	26%	39%		

Table 10. Proportional Z-test for other parameters

	Selection	Waste-pickers (%)	Control group (%)	p-value	Decision
Injured while working	Yes	82%	19%	0.001	H_0 rejection
	No	18%	81%		
Physical Discomfort in 1 last year	Yes	91%	81%	0.010	H_0 rejection
	No	9%	19%		
Musculoskeletal issues	Yes	80%	66%	0.010	H_0 rejection
	No	20%	34%		
Fatigue in last 3 months	Yes	57%	34%	0.001	H_0 rejection
	No	43%	66%		
Worm on the workplace	Yes	47%	37%	0.04	H_0 rejection
	No	53%	63%		

The application of chi-square and proportional Z-tests yielded evidence of a statistically significant association between engagement in waste picking and limited literacy attainment. Within the analytical framework of this study, literacy was operationalized as the demonstrated ability to read, write, and comprehend, whereas illiteracy denoted the absence of formal schooling or educational enrolment. Empirical results indicate that 78% of waste pickers across the three landfill sites were classified as illiterate, compared with 22% identified as literate.

By contrast, the distribution among non-waste pickers reflected 52% illiterate and 48% literate respondents. These disparities were statistically significant ($p < 0.005$; see Tables 11 and 12). Moreover, proportional Z-test outcomes revealed a significant association between waste picking and low-income status ($p = 0.003$), underscoring the role of economic marginality as a structural driver of participation in this occupation. Income stratification data further demonstrated that 44.5% of waste pickers earned between Rs. 501 and 1,000 per month, 36% between Rs. 1,001 and 1,500, 15% between Rs. 1,501 and 2,000 (below the poverty line), while only 4.43% exceeded Rs. 2,500 (above the poverty line). Patterns of labor force participation revealed that 46.5% of respondents had engaged in waste picking for one to three years, 24.6% for four to five years, and 28.9% for six years or longer. Work intensity was also substantial, with 36% engaged in daily labour, 34.2% reporting six days per week, 26.3% five days per week, 1.8% four days per week, and 0.9% two days per week; an additional 0.9% did not specify their working frequency. The results of the proportional Z-tests indicate a significant relationship between waste pickers and an unhealthy BMI (body mass index), with a p-value of 0.010. However, this relationship was not observed among non-waste pickers, as shown in Table 13.

Table 11. Chi-Square test for education

	Selection	Waste-pickers (%)	Control group (%)	p-value	Decision
Education	Illiterate	78%	51.5%	0.003	H_0 rejection
	Literate	22%	48.5%		

Table 12. Results of proportional Z-test for education

	Selection	Waste-pickers (%)	Control group (%)	p-value	Decision
Education	Illiterate	78%	51.5%	0.003	H_0 rejection
	Literate	22%	48.5%		
Income	BPL (Below poverty line)	95.55%	90%	0.030	H_0 rejection
	APL (Above poverty line)	4.43%	10%		

Table 13. Proportional Z-test for BMI

	Selection	Waste-pickers (%)	Control group (%)	p-value	Decision
BMI	Healthy	40%	42%	0.010	H_0 rejection
	Unhealthy	60%	58%		

CONCLUSIONS

The adverse health consequences faced by waste pickers in India have received limited scholarly and policy attention, a trend consistent with broader patterns observed across many low- and middle-income countries (Schenck et al., 2019). It is imperative that relevant stakeholders acknowledge and address the occupational hazards inherent to waste picking. This study, employing a triangulated approach that combined symptomatology, self-reported questionnaires, and records of clinical and hospital consultations, investigated the environmental and occupational health risks associated with waste picking in the Ghaziabad region of India. The findings indicate a markedly elevated likelihood of occupational morbidity among waste pickers. These results align with community health surveys that have documented diverse health problems arising from environmental exposure to landfill sites (de Araújo & Sato, 2018).

Empirical evidence links waste picking and landfill exposure to heightened prevalence of adverse health outcomes, including increased rates of self-reported morbidity, diminished self-rated health, and more frequent clinical consultations (Made et al., 2020). The present research corroborates associations between waste picking and both communicable and non-communicable disease burdens. Specific health impairments identified include musculoskeletal disorders, gastrointestinal and dermatological conditions, as well as ocular and auditory complications (Aminuddin &

Rahman, 2015). Furthermore, the study documented that approximately 50% of respondents across the three landfill sites reported tobacco use. Given well-established epidemiological evidence, such high prevalence of smoking represents an additional compounding risk factor, particularly for respiratory morbidity.

Tobacco use constitutes a major determinant of respiratory morbidity, with extensive epidemiological evidence substantiating its role in amplifying the prevalence of respiratory pathologies (Liu et al., 2015).

Its distribution is socioeconomically patterned, disproportionately concentrated among socially marginalized and economically precarious populations, including waste pickers (Burney et al., 2013). As highlighted by Hiscock et al. (2012), smoking often emerges as a maladaptive coping mechanism for the alleviation of psychosocial stressors and emotional distress. The present study further corroborates this association, demonstrating that individuals with a prior history of smoking displayed an elevated probability of experiencing respiratory complications. Importantly, tobacco consumption operates as a critical confounding variable in the nexus between occupational exposure to landfill environments and the manifestation of respiratory symptomatology (Liu et al., 2015).

Ethnographic observations across the three landfill sites revealed considerable heterogeneity in operational conditions, yet a pervasive absence of adequate occupational safeguards. While respondents generally expressed awareness of the necessity of personal protective equipment (PPE), its actual availability and utilization were grossly insufficient. Standardized protective devices—such as N95 respirators, dust masks, and protective eyewear—were conspicuously absent, thereby exacerbating inhalation risks associated with airborne particulates. In many cases, waste pickers substituted discarded clothing and footwear retrieved from landfill sites as improvised PPE (Made et al., 2020). Such practices, however, fall significantly short of occupational health standards and contribute to cumulative health vulnerabilities (Nyathi et al., 2018). Unsurprisingly, the majority of participants reported chronic respiratory complaints, findings that resonate with prior research attributing elevated rates of respiratory morbidity among waste pickers to sustained exposure to landfill-derived pollutants (Nyathi et al., 2018).

Airborne particulate matter, particularly visible dust generated during landfill operations—most prominently during the unloading of refuse from garbage trucks—represents a critical occupational hazard for waste pickers. The excavation and sorting of materials such as bricks, cardboard, cans, and wood inherently exacerbate particulate concentrations, thereby intensifying exposure risks to the respiratory tract and mucosal membranes (de Araújo & Sato, 2018). The absence of consistent use of appropriate personal protective equipment (PPE) substantially magnifies these vulnerabilities. Findings from this study underscore significant associations between waste picking and the manifestation of allergic and dermatological conditions. These observations are consistent with cross-sectional epidemiological evidence from Kota Bharu, Malaysia, where 65.5% of surveyed waste pickers reported gastrointestinal disorders and 70.3% reported dermatological symptoms (Aminuddin & Rahman, 2015).

Musculoskeletal morbidity also emerged as a salient occupational health concern. Statistical analyses revealed a significant correlation between waste picking and the prevalence of bodily pain across the three landfill sites. The task structure of waste picking—frequent kneeling during sorting and repetitive manual handling of waste materials—creates biomechanical stressors particularly affecting the lower extremities. Moreover, excessive lifting is associated with a spectrum of musculoskeletal disorders, including lumbar disc prolapse, tendon pathologies, overexertion-related pulmonary strain, and chronic shoulder and back pain (Da Silva et al., 2006). These results, while consistent in direction, differ in magnitude from those of Aminuddin and Rahman (2015), who reported musculoskeletal complaints among 94% of waste pickers in Kota Bharu. Ocular morbidity represents another domain of elevated occupational risk. The use of protective eyewear is recognized as an effective intervention to mitigate risks of lacerations and ocular trauma from sharp debris (e.g., broken glass), as well as exposure to infectious agents present in waste streams (Kuijer et al., 2010). However, field observations revealed that none of the waste pickers at the studied landfill sites utilized protective goggles. The lack of access to, and inconsistent use of, PPE such as eye protection reflects structural deficits in occupational health safeguards (Gutberlet et al., 2013). Consequently, waste pickers, regardless of prior history of infectious disease, remain persistently exposed to preventable occupational health hazards (Made et al., 2020)

A longitudinal cohort study conducted in India demonstrated that waste pickers who self-rated their health as poor exhibited a threefold increased risk of contracting infectious diseases. As Gutberlet et al. (2013) and Godfrey et al. (2017) note, waste pickers are routinely exposed to hazardous substances embedded in landfill waste streams. Such exposures encompass biological pathogens, toxic chemicals, and heavy metals, cumulatively generating a high-risk occupational milieu. The absence or inappropriate use of adequate personal protective equipment (PPE) further amplifies this vulnerability, intensifying both acute and chronic health risks (Made et al., 2020).

Findings from chi-square and proportional Z-tests provided empirical evidence of a statistically robust association between waste picking and infectious disease prevalence. After adjusting for potential confounders, individuals with a history of chronic illnesses were found to be twice as likely to report poor self-rated health compared to their counterparts without chronic conditions. This finding aligns with prior research establishing a strong linkage between chronic morbidity and diminished self-perceived health status (Uhunamure et al., 2021). Similarly, epidemiological evidence from Malaysia (Norsa'adah et al., 2020) underscores the health consequences of landfill exposure, revealing robust associations with non-communicable conditions such as diabetes mellitus and hypertension. Collectively, these findings highlight the intersection of occupational exposure, environmental toxicity, and the compounded burden of infectious and chronic diseases among waste pickers. By foregrounding both the adaptive resilience and the occupational health vulnerabilities of waste pickers in Ghaziabad, this study seeks to address a critical knowledge deficit and to contribute to evidence-based advocacy for this marginalized yet indispensable labor force.

Beyond documenting lived experiences, the research provides epidemiological validation of the multifaceted risks to which waste pickers are exposed within landfill environments, thereby establishing a reference framework for subsequent investigations into the health and social consequences of waste management practices in Ghaziabad.

Statistical analyses employing chi-square and proportional Z-tests revealed significant associations between waste picking and multiple markers of social and behavioral disadvantage. Specifically, waste pickers exhibited higher prevalence of suboptimal dietary intake ($p = 0.002$), household income deprivation ($p = 0.003$), and limited literacy ($p < 0.005$), when compared with non-waste pickers (Tables 3, 4, 11, and 12). The analysis further identified elevated burden of allergic and infection-related morbidities among waste pickers, including ocular infections ($p = 0.021$), upper respiratory tract illness ($p = 0.014$), general allergies ($p = 0.004$), and dermatological manifestations such as pruritus ($p = 0.004$) (Tables 5 and 6). In addition, the chi-square and proportional Z-tests underscored the disproportionate prevalence of non-communicable and chronic conditions within the waste picker cohort. These included occupational injuries ($p = 0.001$), musculoskeletal disorders ($p = 0.010$), fatigue within the preceding three months ($p = 0.001$), and hypertension ($p = 0.005$).

Comparative analysis also demonstrated that non-waste pickers were statistically more likely to report extended workdays exceeding eight hours ($p = 0.020$) (Tables 7–10). Taken together, these findings highlight the syndemic interaction of occupational exposure, socioeconomic deprivation, and health vulnerability, underscoring the structural risks inherent in waste picking as practiced at landfill sites in Ghaziabad. This study is intended to serve as a catalyst for provincial health authorities, district and municipal administrations, and other relevant stakeholders to strengthen public health responses targeted at the occupationally vulnerable population of waste pickers. Future large-scale, multi-site investigations encompassing landfill settings across additional provinces are strongly recommended. Longitudinal cohort studies, in particular, would provide a rigorous epidemiological framework for systematically tracking morbidity trajectories and elucidating the causal pathways through which landfill exposure contributes to adverse health outcomes. Parallel to this, environmental surveillance and risk assessment mechanisms are essential for generating robust empirical baselines that can be used to quantify the cumulative health burden attributable to landfill-related exposures.

The empirical evidence from this study underscores that occupational engagement in landfill environments exerts a profound impact on health status, with statistically significant associations identified between landfill exposure and heightened susceptibility to communicable and non-communicable diseases, alongside increased prevalence of mental health disorders. The findings further highlight the urgency of directing the attention of policymakers and institutional actors to the health risks faced by waste pickers. Given their structural vulnerability, continuous monitoring of both the socioeconomic and health profiles of waste pickers is required at local, regional, and national levels. Such monitoring should be accompanied by the design and implementation of evidence-based risk prevention strategies, informed by reliable epidemiological data and context-specific baseline indicators. Targeted health promotion and preventive measures are likewise imperative. Enhanced awareness campaigns could empower waste pickers to recognize early warning signs of illness, while structured training initiatives are needed to improve their capacity to safely handle hazardous materials encountered in landfill environments. Reducing infectious disease transmission requires both the provision of adequate and standardized personal protective equipment (PPE) and the promotion of hygienic practices.

The deployment of mobile health clinics proximal to landfill sites could provide a vital first point of care for this underserved population. At a structural level, however, the most sustainable intervention remains the implementation of effective, multi-tiered waste management systems across all levels of governance.

By foregrounding the occupational health vulnerabilities of waste pickers in Ghaziabad, this study makes a significant contribution to regional public health discourse. Through comprehensive health assessment and the identification of resilience factors, the research offers actionable insights for policymakers and institutional stakeholders seeking to develop targeted interventions, protective infrastructures, and support systems for this marginalized workforce (Brunn et al., 2018; Demková et al., 2022; Herman et al., 2022; Boros & Korcsmáros, 2024). Moreover, these findings hold relevance for broader waste governance agendas, with the potential to inform integrated policies that simultaneously advance waste pickers' well-being and promote sustainable, socially equitable waste management practices.

Research limitations

This study provides a preliminary appraisal of the occupational health risks to which waste disposal workers in Ghaziabad, India, are subjected. The evidence generated offers an enhanced understanding of the extent and specificity of waste pickers' exposure to occupational and environmental hazards. From an epidemiological standpoint, however, the robustness and generalizability of such findings necessitate a substantially larger sample frame - on the order of at least 1,000 respondents - to ensure adequate statistical power and external validity. It is important to perform biochemical analyses of physiological parameters, which will be carried out in the next phase of the study. Additionally, the cross-sectional study used a convenient sampling method, which did not allow for an accurate assessment of the entire waste picker community.

It must also be acknowledged that the validity of self-reported data may have been compromised by response bias. Waste pickers demonstrated hesitancy in addressing certain survey items, likely attributable to apprehensions regarding potential repercussions from landfill authorities, thereby raising the possibility of deliberate misreporting. Moreover, the reliance on self-assessed health histories introduces susceptibility to social desirability bias, wherein respondents may have systematically overstated their health status in order to project an appearance of physical well-being to data collectors. Such dynamics underscore the limitations inherent to self-report methodologies in marginalized populations, particularly in contexts characterized by heightened vulnerability, surveillance, and power asymmetries.

Ethical clearance: The Department of Research Ethics Committee at the Delhi School of Public Health and Institute of Eminence, University of Delhi with reference to IoE2022/037/257 approved this study. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional committee.

Author Contributions: Conceptualization, K.M.; methodology, S.K.D, R.Y., K.M. and H.K.V.; validation, P.K.M., M.G.; primary data collection, U.R.; statistical analysis S.K.D., B.W.P. and H.K.V.; writing - original draft preparation, U.R. and K.M; writing - review and editing, R.S., K.M., Z.B. and P.K.M.

Funding: The paper was supported by the Educational Grant Agency of the Slovak Republic under the contract No. KEGA Project No. 020EU-4/2024 and by Institution of Eminence, University of Delhi, India.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: This research is based on primary data. The data used to support the findings of the study are available from the corresponding author upon request.

Acknowledgement: The paper was supported by the he Cultural and Educational Grant Agency of the Slovak Republic under the contract No. KEGA Project No. 020EU-4/2024 and by Institution of Eminence, University of Delhi. The authors would like to acknowledge the support and resources provided by the Institution of Eminence, University of Delhi, and the guidance and support provided by their mentors and colleagues during the research process. The authors would also like to express sincere gratitude towards Professor Rameshwar Nath Koul Bamezai, the former director of DSPH, for his constant encouragement and support towards their research work. Additionally, the authors would like to acknowledge the present director of DSPH, Prof. Yogendra Singh, and co-director of DSPH, Prof Daman Saluja, IOE University of Delhi. SKD acknowledges financial and infrastructural supports from the University of Delhi (R&D and seed grants), and Dr. B. R. Ambedkar Center for Biomedical Research [ACBR] (start-up and research grants). SKD also acknowledges the Institution of Eminence grants (grant ID: IoE/2021-23/12/FRP) from the University of Delhi, India; and ICMR extramural grant (grant ID: 5/4/1-11/CVD/2022-NCD-I) for providing financial support for the current work. UR acknowledged the Maharshi Kanad Post- Doctoral Fellowship from the IoE. University of Delhi (grant ID: IoE/2021/MKPDF/DSCCS/139) to complete the current work.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 15.05.2025 Revised: 28.07.2025 Accepted: 25.08.2025 Available online: 19.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1875-1886
DOI 10.30892/gtg.61345-1555

THE CONCEPTUAL MODEL OF CLIMATE CHANGE IN THE REPUBLIC OF AZERBAIJAN

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Citation: Huseynov, N., Huseynov, J., & Guliyev, Z. (2025). The conceptual model of climate change in the republic of Azerbaijan. *Geojournal of Tourism and Geosites*, 61(3), 1875–1886. https://doi.org/10.30892/gtg.61345-1555

Abstract: The objective of the research is to develop a conceptual approach to the factors influencing the formation of climate change in the territory of Azerbaijan, its impact mechanisms, and the ecological crises they induce. Therefore, in the study, climate change is divided into several stages, with each stage being thoroughly explained using precise factual data. This study provides a comprehensive assessment of the interrelationships and impact mechanisms of ecological crises formed by climate change in the territory of the Republic of Azerbaijan. The results are evaluated using advanced cartographic and mathematical-statistical processing methods such as ArcGIS, SPSS, Stock Stat, and MS Excel. The air temperature, atmospheric precipitation, and physical characteristics of glaciers for the periods 1961-1990, 1991-2020, 1981-2010, and 2011-2023 were compared. The study examines the climate change process in the country's territory in three stages: formation, impact mechanisms, and outcomes. For the first time, a conceptual model of climate change specific to Azerbaijan was developed based on these features. An increase in the volume of exploited groundwater resources has been observed across the country. Under the influence of climate change, shifts in wind direction and average speeds have occurred. The scientific work presents a map delineating the approximate impact zones of warming effects. The air temperature increase of 0.8°C was accompanied by a 4% decrease in precipitation. Climate change has resulted in a 15-23% reduction in glaciers over the past seven years, an increase in drought, and an acceleration of desertification. Approximately 36.5% of the country's surface area is projected to be at risk of dangerous atmospheric processes.

Keywords: Climate change, temperature increase, lightning, hail, GIS technology, glaciers, landscape landslides, fluctuations in the Caspian Sea level

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INTRODUCTION

The South Caucasus region, where the Republic of Azerbaijan is located, has a complex physical-geographical position, making it possible to observe the multifaceted impacts of global warming (Mammadov et. al., 2009). Currently, under the influence of climate change, the number, frequency, and extent of ecological crises in the region, including the territory of Azerbaijan, are continuously increasing (Ismayilov & Suleymanov, 2024).

Modern warming shares both similar and distinct characteristics with climate change that occurred during geological eras. Climate changes during the Earth's geological eras were characterized by well-known glacial and interglacial periods (McGee, 2020). These periods have played a decisive role in shaping the Earth's climate history and driving the evolution of ecosystems up to the modern era (Imbrie & Imbrie, 1986). During glaciation (global dimming) periods, ice sheets expanded to continental scales, the physical parameters of glaciers in the Arctic and Antarctic increased rapidly, sea levels dropped (sometimes by as much as 120 meters), and global temperatures decreased by an average of 4-8°C (Lamb, 2011). In contrast, during warming periods, global temperatures rose, ice sheets melted, and sea levels increased, forming new coastlines (Driese et al., 2021). Warming was primarily associated with volcanic activity, increased carbon dioxide levels in the atmosphere, and solar activity. Examples of such warming periods include the Triassic-Jurassic and the Eocene thermal maximum (55 million years ago). *Such climate changes on Earth have occurred due to natural causes, influenced by Milankovitch cycles.* (McGee, 2020; Lamb, 2011). Such systematization of climate change significantly influences the determination of its development and consequences, as well as the formulation of mitigation and adaptation measures. However, in recent years, there have been considerable disagreements regarding the identification of anthropogenic factors and their impacts (Immerzeel et al., 2010). Modern climate change is manifested with distinct characteristics across various regions of the Earth. Their primary impacts are observed in mid-latitude regions, one of which is the South Caucasus (Tashilova et al., 2019; Abshaev et al., 2003). Azerbaijan, with its unique physical and geographical position within this region, stands out from other areas. Climate change occurring in this region and its impacts have not yet been modeled. Despite the existence of studies by several local and regional researchers in specific fields, this issue has not been consolidated into a concrete conceptual model to date.

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Objective

The aim of the research is to develop a conceptual model of the factors influencing the formation of climate change in Azerbaijan, their impact mechanisms, and the resulting ecological crises. Accordingly, the study divides the climate change process into several stages in alignment with the conceptual model, providing a detailed explanation of each stage with precise factual analysis.

MATERIALS AND METHODS

In this study, the impacts of climate change were analyzed using data from approximately 70 ground-based observation (hydrometeorological) stations of the National Hydrometeorology Service (https://eco.gov.az/az/hidrometeorologiya/fealiyyet-istiqametleri; https://neco.gov.az/ekoliji-fealiyyet-istiqametleri/hidrometeorologiya; https://www.stat.gov.az/source/environment/), and satellite-reanalysis datasets (https://power.larc.nasa.gov/data-access-viewer/). The initial observation data used in the analyses were collected from annual bulletins, periodic scientific publications, and electronic resources (https://climate.nasa.gov/vital-signs/global-temperature/?intent=121; https://www.ipcc.ch/library/; https://wmo.int/resources/documents). The results obtained from the analyses were evaluated using advanced statistical processing methods in SPSS, Stock Stat, and MS Excel. Mathematical-statistical and cartographic methods were applied in the analyses.

The map was processed using GIS technology (ArcGIS Pro 3.1.3). The DEM files used in GIS analyses have a resolution of 30 m and are based on Landsat and Sentinel satellite images (https://opentopography.org/). In glacier studies, DEM files with a resolution of 1.5 m from the Azersky satellite were utilized (https://azercosmos.az/az). The tables and graphs presented in the study were processed in MS Excel, while the maps were developed in ArcGIS software. For the first time, a conceptual model was created by systematizing the climate change processes in the territory of the Republic of Azerbaijan.

To identify the impacts of climate change, modern methods were employed in the study of a range of **meteorological** (temperature, precipitation, wind, radiation, albedo, drought, lightning, hail, etc.), **hydrological** (flash floods, water levels, floods, glaciers, etc.), and **physical** (landslides, landscape shifts, marsh formation, salinization, deforestation, etc.) elements. One such method is the 5-year moving average, which is frequently used due to its ability to mitigate the misleading effects of sharp outliers in the instantaneous time phase (various years) on the trend line for random variables with long-term series. In graphs, this metric ensures stable smoothing by accounting for the abrupt jumps of random variables, allowing for the determination of the dynamics of the examined random variable at any given time phase (Willemse, 2009). The moving average is calculated using the following formula:

$$X_{1i} = \frac{X_1+X_2+X_3 \ldots +X_5}{5},\ X_{2i} = \frac{X_2+X_3+X_4 \ldots +X_6}{5}, \ldots$$

Here, X_{1i}, X_{2i} represent the 5-year moving average smoothed values of the random variable for precipitation amounts. (X_1, X_2) etc., denote the year under consideration in the series and the limits of the preceding 5 years, including that year. The coefficient of the smoothed average for the year under consideration is equal to the average of the subsequent 5 years, including that year (Wilks, 2011). The next smoothed value is recalculated as the average of the precipitation amount for that year and the limits of the next 5 years. Thus, the series is completed to the end.

In the study, for determining the anomalies of air temperature (T) and precipitation (P) at various altitudes (h), the following formula can be used to calculate the mathematical mean of the annual average temperature and total annual precipitation for (n) meteorological stations (David, 2005):

$$T_h = \frac{1}{n}\sum_{i=1}^{n} T_i$$

Here, T_i represents the annual average temperature of each station, and n (is the total number of meteorological stations. The annual precipitation amount (P_h) at the considered altitude is calculated as follows (David, 2005):

$$P_h = \frac{1}{n}\sum_{i=1}^{n} P_i$$

There, Pi represents the average annual precipitation of each station (i=1, 2, …), h is the considered altitude, and n is the number of stations. In the study, the statistical homogeneity of time series for temperature and precipitation data across different altitudes (1981-2023) was verified using Fisher's and Student's criteria, and only data from statistically reliable stations were utilized. In Fisher's criterion, the series variance is evaluated, while in Student's criterion, the means of the series values are compared. For this research, the observation series from 70 stations for the years 1981–2022 (2023) were tested, and similar values for the observation series were assessed at 5 % and 10 % significance levels for both criteria. The Student's criterion for the observation series is determined using the following expression:

$$t = \frac{\bar{x}-\bar{y}}{\sqrt{n_1*\sigma_1^2+n_1*\sigma_2^2}} * \sqrt{\frac{n_1*n_2(n_1+n_2-2)}{n_1+n_2}}$$

There, $\bar{x}$ and $\bar{y}$ represent the mean values of the temperature series divided into two halves during the analysis, while n_1 and n_2 are the respective lengths of the series. σ_1 and σ_2 are the respective mean square deviations of the series. This expression compares the determined t-statistic with critical t-values at α-levels of confidence. If the calculated t-statistic is less than the critical value, the hypothesis of homogeneity of the series is accepted; otherwise, the hypothesis is rejected (Willemse, 2009; Wilks, 2011; David, 2005). The Fisher parameter is used to determine the ratio of the dispersion of the larger series to the smaller one (David, 2005): $F = \frac{\sigma_1^2}{\sigma_2^2}$

There, F represents the Fisher parameter, and σ_1 and σ_2 are the dispersions of the series. In the Fisher criterion, α is compared with critical values at different significance levels, and if the critical value is not exceeded, the hypothesis of homogeneity of the series is accepted. The homogeneity of temperature series has been assessed using both Fisher and Student criteria with 5 % and 10 % confidence levels. Although the dispersion of temperature series from different stations is relatively small, due to sharp differences in the average values over the entire period, the hypothesis of homogeneity is rejected in the case of the Student criterion.

RESULTS AND DISCUSSION

In the South Caucasus region, particularly in the territory of the Republic of Azerbaijan, which has a complex orography, the process of climate change can be divided into three stages: formation, impact mechanism, and outcomes. The causes or formation of climate change, its mechanisms of influence, and the resulting ecological crises should be considered as separate stages. In the initial stage, the greenhouse effect, which drives climate change, and the anthropogenic and natural factors that disrupt atmospheric gas concentrations are global-scale issues. Although the Republic of Azerbaijan's share of global carbon emissions is 0.13% (https://eco.gov.az/az/hidrometeorologiya/fealiyyet-istiqametleri; https://www.ipcc.ch/library/), atmospheric pollution, both globally and locally, remains a significant concern (Molina & Molina, 2012). The next stage involves the effects (impact mechanisms) manifested as a result of these factors. Specifically, global temperature increases, reductions in precipitation, and the acceleration of the spatiotemporal mutation of destructive natural events are observed.

The final stage encompasses the ecological crises and their consequences formed by the impacts of climate change. The effects and damages caused by climate change in the South Caucasus, including the territory of Azerbaijan, are particularly significant in this regard. In other words, while global warming manifests in mid-latitudes as rising temperatures, reduced precipitation, and an increased frequency of hazardous atmospheric phenomena, it is accompanied by rising sea levels in the world's oceans, territorial losses for small island states, and destructive monsoon-driven flooding in Southeast Asia (Taszarek et al., 2021; https://climate.nasa.gov/vital-signs/global-temperature/?intent=121).

The first and second stages of climate change formation exhibit similar characteristics at both local and global scales. This section will focus on the second stage (temperature anomalies) and the third stage (ecological crises) of climate change within the territory of the Republic of Azerbaijan. Azerbaijan, with its physical-geographical position in the South Caucasus, stands out from other regions and encompasses a vast area with complex orography. The region includes all the morphological units representing the South Caucasus as well as the influence of maritime factors (Museyibov, 1998).

Climate change in the country initially manifests through an increase in the average annual air temperature. According to historical data, the fluctuations in air temperature in the periods 1901-1930 (11.9°C), 1931-1960 (12.1°C), and 1961-1990 (12.2°C) are very small compared to previous base periods (30 years). However, compared to the 1961–1990 period, this indicator sharply increased by 0.8°C during 1991-2023 (Figure 1). Synoptic conditions play a significant role in this increase (Huseynov & Huseynov, 2022). The trend line shown in the graph is expressed by the formula y=0.0123x−11.741y = 0.0123x - 11.741. The statistical significance of the trend is represented by the following inequality (Safarov et al., 2024):

$$\frac{|R|}{\sigma_R} \geq t_{2\alpha}$$

There, σR represents the random standard quadratic error, and $t2\alpha$ is the two-tailed significance level. The quantile 2α, corresponding to a 97.5% two-tailed significance level, is calculated, and the values of $t_{2\alpha}$ are replaced with the predefined table values of the Student's criterion for different numbers of years. The random standard quadratic error (σR) is calculated using the following formula (Safarov et al., 2024):

$$\sigma_R = (1 - R^2)\sqrt{(n-1)}$$

There, n is the number of elements in the time series. At a significance level of 2a=0.05 (5%), $t_{2\alpha}$ has different values depending on the number of elements (n) in the time series. Calculations show that in the expression R^2=0.3257, the coefficient R is statistically significant. Additionally, based on the calculations, since the p-value is very small (p<0.05), the trend is statistically significant. This indicates that the observed increase in temperature values is not random.

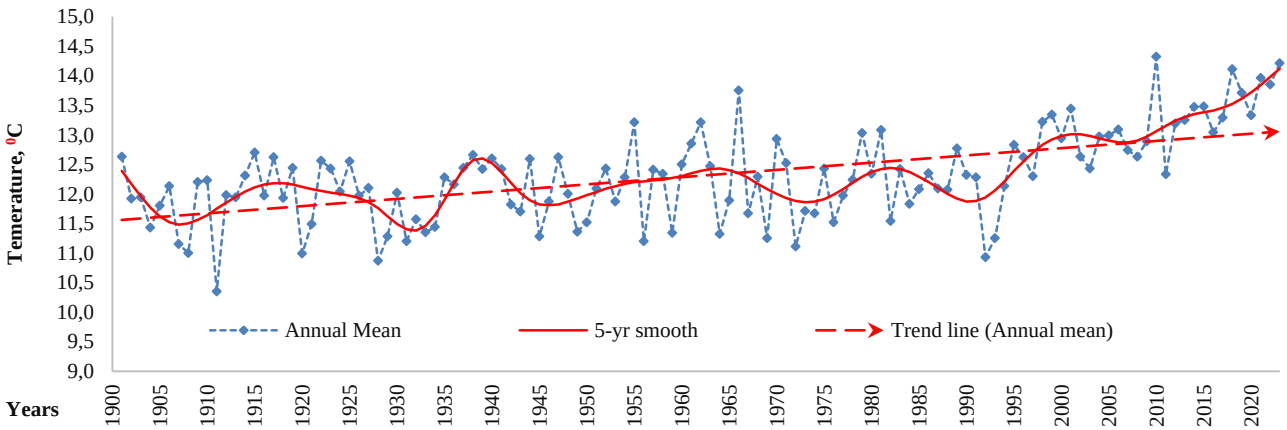

Figure 1. Dynamics of the average annual air temperature indicators in the territory of Azerbaijan (https://climateknowledgeportal.worldbank.org/country/azerbaijan/climate-data-historical)

Throughout the year, factors such as air masses affecting the country's territory, disruptions in surface cover, the albedo effect, the expansion of heat islands, and more are primary causes of the increase in air temperature. Throughout the year, southern cyclones entering Azerbaijan, Central Asian anticyclones, continental Arctic, maritime Arctic, "Azores high", tropical continental, and moderate latitude continental air masses change their initial meteorological characteristics, leading to significant changes in their trajectories (Voigt et al., 2021). In recent years, the inability of the Gulf Stream to reach northern Britain and its weakening in the Central Atlantic has occurred due to the impact of global warming (Ditlevsen & Ditlevsen, 2023). This directly indicates that in the region where the "Azores high" forms, the climatic impact of this current is being disrupted. Thus, as the Azores high has lost its initial conditions under the influence of global warming over the years, it distributes the "warming" effects to all regions. Other air masses have encountered such changes as well.

Winds are more frequent throughout the year in the Absheron Peninsula. This is due to the lack of large relief forms in the area. The majority of the recurring winds here are from the northwest (30%) and north (23%) directions. The intervention of winds from the southeast (10%) and south (16%) directions throughout the year is relatively high. The study of the impact of climate changes on wind patterns shows that, compared to the norm (1981-2010), there has been a change in wind directions between 2011 and 2023. Specifically, the recurrence of north winds decreased by 11%, while the recurrence of northwest winds increased by 15%. The difference for winds from other directions is minimal (1%) (Figure 2). The average speed of recurring winds throughout the year is 6.1 m/s. This indicator is 5-6 m/s in May, June, August, September, and October, and 6-7 m/s in the other months. The maximum wind speed in the Absheron Peninsula reaches 24 m/s throughout the year.

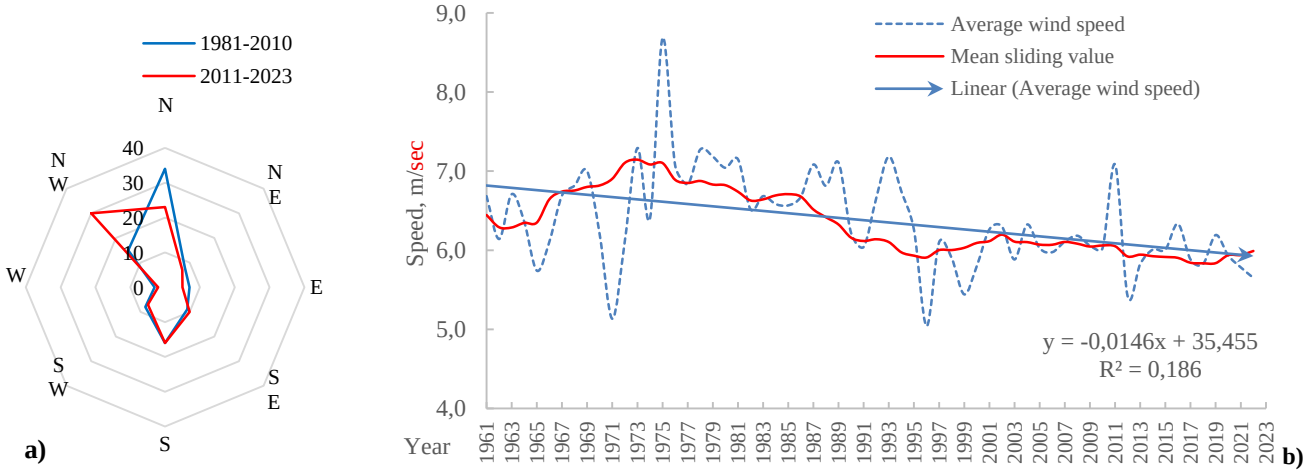

Figure 2. Interannual Variability of Mean Annual Wind Directions and Speeds in the Absheron Aquatory (Source: National Hydrometeorological Service)

An analysis of the multi-year trend in average wind speed reveals that while wind velocity showed an increasing trend until 1973, a steady decline in mean annual wind speed has been observed since 1974. Although intermittent fluctuations occurred in certain years, the decreasing trend has become particularly persistent since 2000. This phenomenon results from reduced pressure differentials between regions caused by rising air temperatures.

The increase in solar radiation reaching the surface plays a significant role in the formation of climate change and the rise in global temperature. In Azerbaijan, the role of radiation balance disruption in the formation of climate changes is significant as well. Recently, changes have been observed in shortwave solar radiation and albedo levels. Areas with rising long-term temperature indicators have also indicated an increase in albedo levels (Huseynov & Huseynov, 2024). In the slopes of the Greater and Lesser Caucasus mountains, the increase in albedo is due to deforestation, glacier melting, snow cover reduction, and the degradation of natural vegetation on pastures. This process leads to increased absorption of heat by the surface (Trlica et al., 2017). The albedo effect influencing the increase in air temperature is associated with the expansion of deforestation in the Greater Caucasus, Lesser Caucasus, and Talish mountains. There, the rapid development of eco, rural, historical, architectural, and adrenaline tourism infrastructure accelerates deforestation. Deforestation leads to changes in the proportion of absorbed and reflected solar energy at the surface. Our research conducted using GIS technology shows that 12.8% of the country's area (11071 km²) is at risk of deforestation. This area includes 47.4% in the Greater Caucasus, 31.6% in the Lesser Caucasus, 17% in Lankaran, 3.1% in the Kura lowland, and 0.8% in the Nakhchivan region.

Moreover, the reduction in the area of snow and ice cover in the high-altitude regions of the Greater and Lesser Caucasus mountains, the drying of green landscapes transforming into semi-desert and dry-steppe regions, and the unsustainable use of pastures have contributed to the formation of the albedo effect. It is more appropriate to systematize the phased explanation of climate change through a comprehensive model. In this study, the first conceptual model of the climate change process in the territory of Azerbaijan was developed (Figure 3). A detailed explanation of all phases of this model is provided in the discussion of the study. In the model, interrelated, unidirectional, and sequential connections are represented by arrows.

The development of transportation, industry, and infrastructure in new large urban agglomerations accelerates atmospheric pollution. Additionally, the construction of residential, industrial, and transportation infrastructure has led to the disruption of the natural surface cover, the cutting of trees and shrubs, and the replacement of this cover with various layers of stone and asphalt. In such anthropogenic surfaces, albedo levels change, and an increase in air temperature is

observed compared to the surrounding areas. Areas that release heat into the lower troposphere appear as small islands in thermal imaging from satellites, making the term "heat islands" more appropriate for these areas (Heaviside et al., 2017).

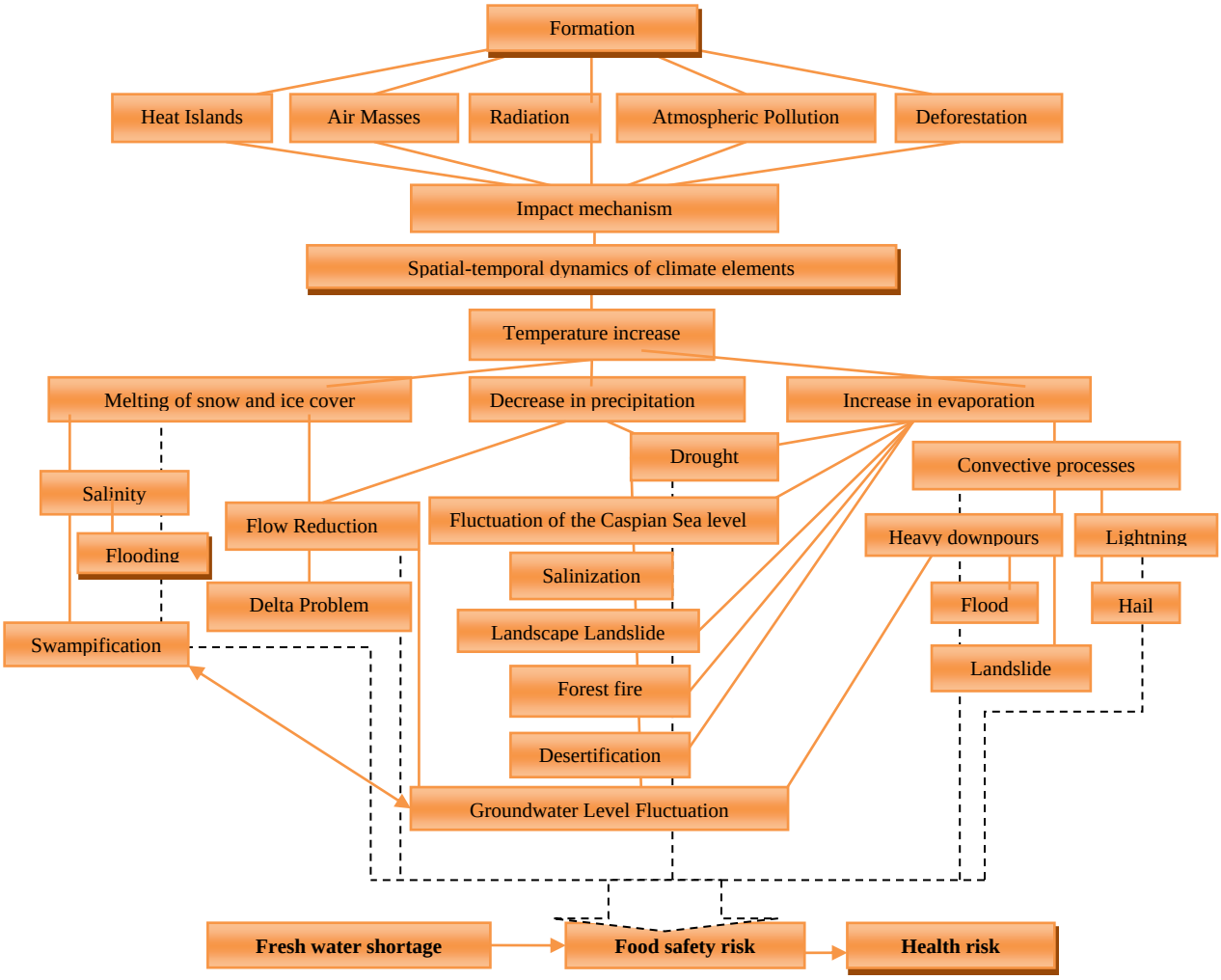

Figure 3. Conceptual Model of Climate Change in Azerbaijan

In Azerbaijan, heat islands cover an area of 3385.5 km² (3.9%). In the country, 31.4% of heat islands are located in the Lesser Caucasus, 27.3% in the Greater Caucasus, 26.1% in the Kura Depression, 5.1% in Lankaran, and 2.1% in Nakhchivan. Only 8.5% of the total heat islands are within the Baku agglomeration.During the post-Soviet period (after the 1990s), the development of industry and transportation accelerated the formation of agglomerations or large cities in the Republic of Azerbaijan. Cities such as Baku, Ganja, Nakhchivan, and others, where a significant portion of the population resides, serve as examples of such urban centers. Areas with high population density align with zones where employment opportunities have expanded, and large industrial facilities were located.

The increase in employment in these major cities has led to migration from other regions and accelerated urbanization. Efforts to improve the housing conditions of urban residents have triggered the rapid expansion of urban infrastructure.

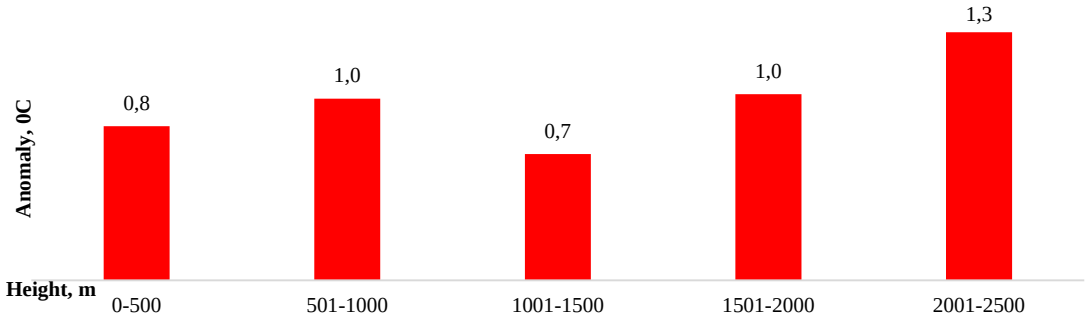

Figure 4. Air temperature anomaly by altitude across the territory of Azerbaijan (Source: National Hydrometeorological Service)

The largest urban agglomeration in Azerbaijan is Baku, home to one-fourth of the country's population. The expansion of the city's area has contributed to the formation of heat islands. As of January 1, 2023, Baku officially registered 2.34

million residents. The population density in the capital stands at 1,092 people per square kilometer. The rapid development of transportation and industry in Baku and other major cities has resulted in significant atmospheric pollution. Notably, the zones with the highest concentrations of atmospheric pollutants coincide with these urban areas. As in all regions, air temperatures in Azerbaijan have continued to rise sharply over the past 35 years. The temperature increases across elevations in the country, compared to the 1981-2010 period, during 2011-2023 is depicted in the figure below (Figure 4.

The air temperature increased by 0.8°C during the period 1991-2020 compared to 1961-1990 and by 0.9°C during 2011-2023 compared to 1981-2010. The increase in air temperature across Azerbaijan has led to the expansion of drought, a rise in potential evaporation, and a decrease in precipitation. The average annual temperature increase, ranging from 0.8°C to 1.3°C in various regions, has exhibited distinct characteristics (Huseynov, 2024). Across the country, air temperature increased by 0.9°C between 2011 and 2022. This rise was 0.9°C in winter, 1.1°C in spring, 1.2°C in summer, and 0.4°C in autumn. The highest increase, 1.6°C, was recorded in May and June. The rise in temperature significantly contributes to increased evaporation rates on the Earth's surface (Szilagyi et al., 2024). The highest levels of annual evaporation are observed on the surfaces of reservoirs, lakes, rivers, and bodies of water such as the Caspian Sea, Mingachevir, Sarsang, and Aras. The strong development of evaporation over the Caspian Sea's surface has resulted in an increase in water loss. Our research indicates that as a result of the fluctuations in the Caspian Sea level, 3,398 km² of saline coastal plains have formed, which constitutes 3.94% of the total country area. Half of these plains are newly emerged areas freed from sea water.

Evaporation has increased the demand for freshwater in the Kura Lowland natural region, one of the largest flat morphostructures in the country. Consequently, drought has expanded its area within the region. Over the past 33 years, the average annual air temperature in the Kura Lowland has risen from 15.0°C to 15.8°C, accelerating the degradation of forest shrubs, thickets, and riparian forests in mountainous areas. Not only has the Kura Lowland region experienced this effect, but all areas along the Aras River and mountainous terrains have been subjected to the "drought effects" of warming. The expansion of drought has been moving toward lower mountainous regions at elevations of 500-800 meters, affecting all mountainous regions Greater and Lesser Caucasus. This process has also been observed in the high mountainous areas of the Talish Mountains, particularly in river valleys and depression areas. The main result of the impacts of climate change in the territory of the Republic of Azerbaijan is the depletion of water resources and the increasing water scarcity over time. The results of our research are also confirmed by R. Ismayilov's studies (Ismayilov, 2024). The intensification of water scarcity leads to the development and expansion of all ecological crises. Balancing the growing demand for fresh water with responsible use can ensure a sustainable water strategy. The dynamics of surface and groundwater extraction have been analyzed in the study (Figure 5). Using state water usage accounting data (2000-2022), the volume of water extraction from water sources was analyzed by regions. Over the multi-year period (2000-2022), the amount of water extracted from surface water sources increased from 9.91 km³ to 13.03 km³. The maximum water extraction from the country's territory occurred in 2022, while the minimum was recorded in 2002. Overall, during this period, an average of 11.6 km³ of water was exploited from natural water sources. During this time, an increase of 2.2 km³ (11.4%) in the volume of extracted water was observed.

Recently, attention has also been paid to the dynamics of the volume of water extracted from groundwater sources in the country. Studies show that, between 2000 and 2022, there has been a significant increase in the volume of water extracted from groundwater sources. At the same time, during the average multi-year period, a decrease of 2.55 km³ in groundwater extraction was observed. The increase in groundwater extraction will lead to the depletion of water resources and the rapid development of water scarcity. Specifically, excessive water extraction from groundwater basins causes the depletion of these waters, land subsidence, damage to infrastructure and ecosystems, and the intrusion of saline water into freshwater layers in coastal areas. In addressing this issue, the application of sustainable practices in the effective management of water resources, continuous monitoring of groundwater levels, and regulation of extraction volumes is crucial. The analysis of water extraction by sources shows that the increase in the use of groundwater sources creates certain problems in the ecosystems of these areas.

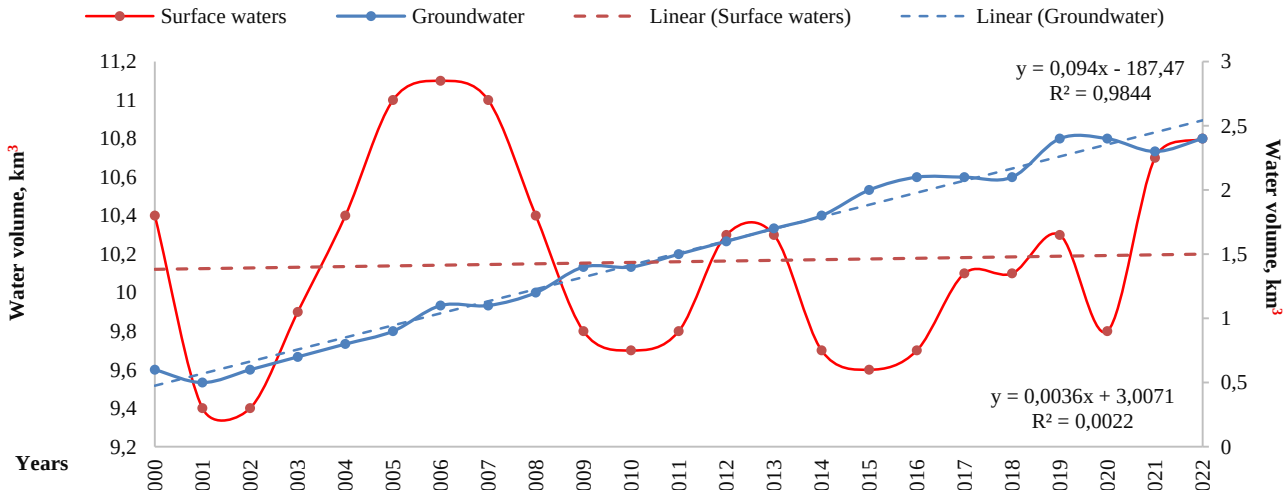

Figure 5. Long-term trends in average annual volume indicators of groundwater and surface water resources (Source: National Hydrometeorological Service)

Under the influence of modern warming, the increase in evaporation, along with the spread of drought, also impacts the atmospheric precipitation regime. In the country, the annual amount of precipitation has decreased by nearly 7% compared to the 1961-1990 period. This decline corresponds to approximately 26-31 mm. The negative anomaly of precipitation amounted to 4% (23 mm) in 2011-2023 compared to 1981-2010. The multi-annual precipitation amounts have decreased more significantly in 2011-2023 at elevations of 301-500 m and 1501-2500 m (Figure 6).

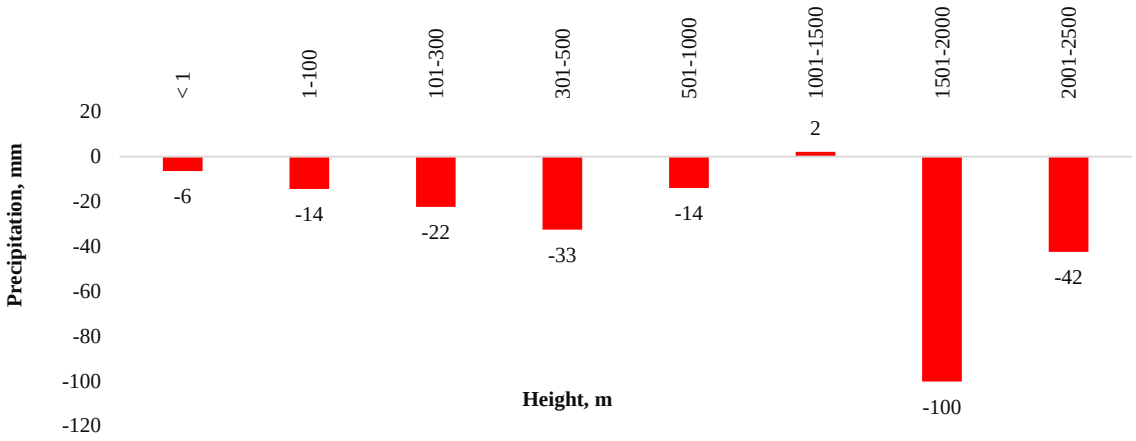

Figure 6. Anomaly of precipitation amounts by elevations in Azerbaijan (Source: National Hydrometeorological Service)

The influence of modern climate changes on the air masses that form the synoptic conditions in the territory of Azerbaijan has led to the alteration of their long-term characteristics, resulting in a decrease in precipitation. The reduction in atmospheric precipitation has created conditions for the expansion of drought and the upward shift of the lower boundaries of green landscapes to higher altitudes (Huseynov et al., 2024). Over time, shrubs are being replaced by semi-deserts and dry steppes, xerophytic forests by shrubs, and forests by forest-shrub complexes. This process is particularly evident on the southern slopes of the Lesser Caucasus Mountains. For instance, along the banks of the Hakari River, at altitudes of 900-1100 meters, the withering of forests and their replacement by forest-shrub complexes have been observed (Figure 7).

Figure 7. A dried forest massif in the altitude range of 900-1100 m in the southern part of the Lesser Caucasus region (The photo was taken on August 28, 2024, by Jamal Huseynov, on the right side of the Lachin-Minkend road in the Lachin district, at the 2nd kilometer of the road)

Although evaporation has increased across the country's surface, the amount of moisture contained within these air masses is significantly lower compared to previous years. This process is affecting the reduction of water resources in the region. In addition to the decrease in precipitation, shifts have also occurred in the periods of its occurrence throughout the year. Specifically, the period during which precipitation falls in solid form has decreased. Broadly speaking, if before the warming period, the snow cover on the southern slopes of the Greater Caucasus lasted from the end of December to mid-March, this period has now shortened to the beginning of January to the first ten days of March. Previously, this situation persisted in the southern part of the Lesser Caucasus from early November to late March, in the Talish Mountains from early November to the first ten days of April, and Nakhchivan from mid-December to early March.

Currently, this phase is observed with a reduction of at least ten days in both the start and end dates. The total number of days with snowfall has also decreased accordingly. Because the minimum temperature required for snowfall is recorded less frequently across the country's surface, and the effects of modern warming leading to 'milder' winters, precipitation during that period now tends to fall in mixed forms rather than as solid snow. Calculations show that, depending on the scenarios, the amount of potential evapotranspiration in the country's territory will increase by 15-35%. This change will lead to an increase in moisture deficit (climate-irrigation norm) by 70-540 mm.

Such a sharp rise in potential evapotranspiration will also worsen natural moisture conditions, causing the boundaries of moisture zones to shift toward the mountains (Aliev, 2021). A decrease in precipitation has led to an increase in the number of dry days in lowland and low-mountain areas. Additionally, the reduction in the period when precipitation falls in solid form and the increase in mixed precipitation poses a risk to the future existence of permanently and partially frozen areas. Alongside these effects, the impact of ablation on glaciers and snowfields in the high-altitude zones of the Greater and Lesser Caucasus Mountains during the warm season is also significant. In the study of glaciers, the research team first conducted field studies on the Tufan, Shahdagh, and Bazarduzu glaciers. Physical indicators obtained through GPS were integrated into the ArcGIS system, and their precise area measurements were determined.

The increase in the area and height of perennial glaciers, as well as their transition to firn, depends on the volume of solid precipitation from the previous year. The snow layer that remains unmelted into the next year (with a density of 50-300 kg/m³) is covered by new snowfall. Under the weight of the subsequent year's snow and partial melting, it begins to transform into firn (with a density of 400-830 kg/m³). In this way, perennial glaciers (with a density of 830-917 kg/m³) are formed (Roger, 2020). However, modern warming has accelerated the melting of snow on these mountain peaks, causing the area of glaciers and snowfields to shrink year by year. This trend is evident in the reduction of glaciers on the peaks of the Greater Caucasus-Bazarduzu (4466 m), Tufan Mountain (4191 m), and Shahdagh (4123 m)-which have decreased by 16-23% over the past 7 years, and the 'glacier tongue' has retreated upward by 80-100 meters. This indicates that the climate-snow line in mountainous regions has shifted from 2900-3000 m to 3000-3200 m in elevation. This process is clearly illustrated in the cartographic representation of the Tufan Mountain glacier's area dynamics over many years (Figure 8).

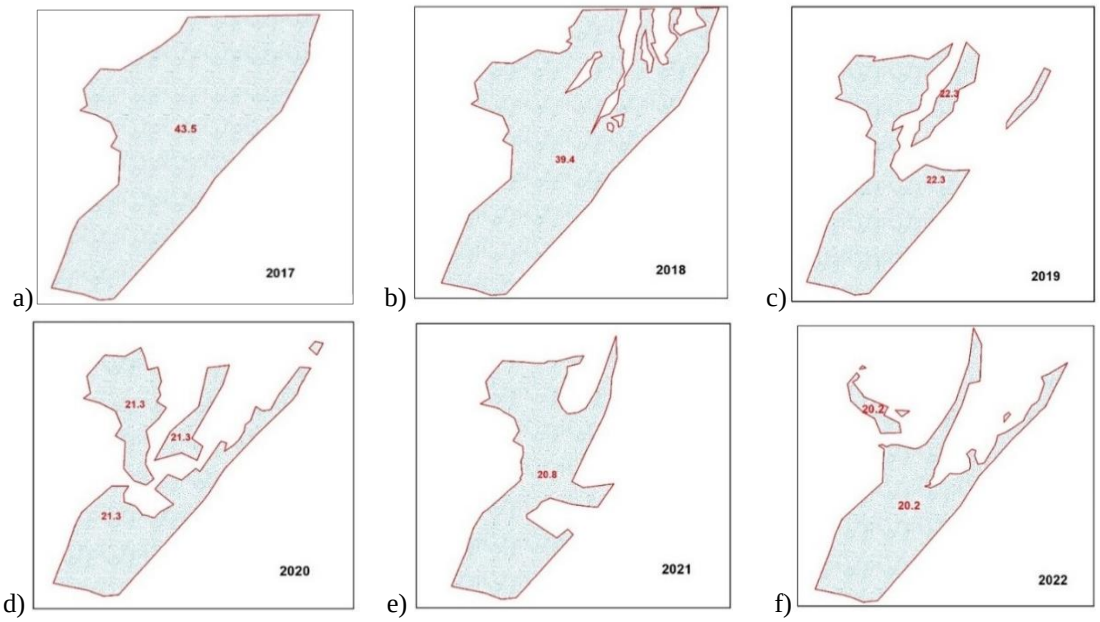

Figure 8. Long-term dynamics of the area of the Tufan Glacier (a-f)

In high mountain areas, the rapid melting of snow and ice cover in spring increases the flow volume of rivers fed by these areas over a short time frame. Such periods of high-water flow in rivers typically occur during transitional seasons, i.e., classical periods. However, in recent times, under the influence of climate change, sharp warming starting from early March has accelerated the melting of snow and ice cover. As a result, the flow volume of rivers during the traditional high-water period has increased by 1.5-2 times compared to previous periods. The rapid rise in water levels in rivers has led to the destruction of protective dams and the expansion of flooding zones (Arnell & Gosling, 2013).

Across the country, the annual runoff modulus increases with elevation. Under modern climate change conditions, in the Greater and Lesser Caucasus regions, the maximum annual water discharge in most high-water and flood-prone rivers has decreased, while winter minimum flows have increased (Imanov et al., 2009; 2024). Such events are frequently recorded in lowland areas around the Kura River, particularly in the Kura-Aras lowland. Flooding was observed almost every year over the past 15 years. The flooding that occurred in this zone in May 2010 is one of the most notable examples of significant hardship for the local population (Aghayev, 2018).

In the territory of Azerbaijan, alongside a decrease in the amount of atmospheric precipitation throughout the year, an increase in extreme precipitation events has also been observed. During the warm season, the increase in air temperature in lowland and low-mountain areas occurs due to intense insolation. Strong heating of the ground surface and maximum

evaporation accelerate the development of convective processes in mid-mountain areas. Such synoptic conditions, along with torrential rains, create an environment conducive to the intense development of lightning and hail phenomena in cumulonimbus clouds. Under the influence of climate change, these processes have intensified and accelerated. In mountainous areas, the time phase for the development of cumulonimbus clouds has shortened. Sometimes, the majority of annual precipitation is recorded in the form of prolonged torrential rains. As an example, we can cite the intense torrential rains that occurred in Baku on November 14-17 and December 2-3, 2024. The persistence of torrential rains in mountainous regions poses a risk during transitional and warm periods of the year.

During transitional periods of the year, continuous rainfall occurs, increasing soil moisture levels. During subsequent intense rainfall, the infiltration of rainwater into the already saturated soil is delayed (Assouline, 2013). This creates rapid and abundant water flow on steep slopes. As a result, such flows quickly show the first signs of flooding in ravines. Widespread rainfall over a short period leads to the formation of powerful floods. Thus, floods formed in large rivers carry all the dissolved materials they encounter along their path. When this process has destructive force and water levels remain high for an extended period, it causes significant damage to transportation, tourism, and agricultural infrastructure, increases food security risks, and can result in human casualties. When such flood processes occur in summer, the excessively dry soil further delays infiltration, and rainfall with an intensity exceeding 20 minutes accelerates the formation of flood events.

The increase in the intensity of torrential rains triggers landslides in areas with steep mountain slopes, clayey soil layers, and large terrace massifs. This process is frequently observed on the steep slopes of the Greater and Lesser Caucasus Mountains. In recent years, Baku has also suffered from an increase in landslides. Over the past 35 years, the city has experienced a nearly 32% increase in precipitation, which has heightened landslide activity (Huseynov & Huseynov, 2022). On the Absheron Peninsula, where Baku is located, the rise in torrential rains, combined with the insufficient capacity of the planned collector systems for handling traditional maximum rainfall, delays the drainage of rainwater and leads to flooding in the city's low-lying infrastructure. One such flooding event on October 22, 2024, resulted in the loss of two lives.

The rise in temperature, decrease in precipitation, and melting of glaciers have led to a reduction in river flow. The decline in freshwater resources has also reduced the flow volume of the tributaries of the Kura and Aras rivers within Azerbaijan's territory. It should be noted that the Kura and Aras rivers pass through several reservoirs before entering Azerbaijan, where they experience stable flow (Imanov et al., 2024; Klaphake & Kramer, 2011). This flow further decreases within the country due to increased demand for irrigation and the impact of climate change on the rivers' tributaries (reduced flow, increased evaporation, etc.) (Abbasov & Flores, 2023). During the warm season, the water level in the Kura River delta decreases, allowing the salty waters of the Caspian Sea to penetrate inland. As a result, salinization expands further. In general, fluctuations in the Caspian Sea level are also linked to modern climate changes. The Volga River contributes 85% to the Caspian Sea's water balance, while the Kura, Terek, Sulak, and other rivers collectively account for only 5%. The increase in temperature in the basins of these major rivers has affected climatic elements, reducing their flow volume. Additionally, the increase in evaporation from the sea surface has played a decisive role, causing the sea level to drop to -28 meters (Safarov et al., 2024). As the Caspian Sea recedes, the area of salt flats freed from salty waters continues to expand. During this process, intense insolation breaks down the salty sand, and aeolian processes carry salt particles inland. This primarily results in the expansion of salinization in the Kura-Aras lowland and inland areas. Moreover, during the high-water period, the water level rises in the areas through which the Kura and Aras rivers flow. Flooding processes, occurring along the riverbanks at elevations up to 100 meters above sea level, raise groundwater levels and create temporary wetlands.

In recent years, the anomalous rise in temperature during certain months has further intensified evaporation during transitional periods of the year. This has also expanded the development of convective processes from early spring to mid-summer. As a result of these processes, torrential rains, hail, and lightning are observed. Hail and lightning phenomena are more frequently recorded in mountainous areas. Due to the spatiotemporal shifts of these processes, the risk of hazards has increased in mountainous regions. The majority of areas (47.3%) where convective processes (lightning, hail) are expected to expand are located in the Lesser Caucasus region, covering an area of 14,877 km² (17.2% of the country). In the Greater Caucasus region, 37% of the area (11,632 km²) prone to such hazardous atmospheric processes is located, representing approximately 13.5% of the country's surface. Additionally, 8.5% of this area (2,659 km²) is located in the Nakhchivan region, accounting for 3.1% of the country. The zones experiencing hail cover 8.5% (2,291 km²) of the Lankaran region, representing 2.7% of the country's total surface area. In recent years, the rapid formation phase of convective processes is completed in the first half of the day. Lightning and hail processes form in mountainous areas during the early afternoon hours. The recurrence of lightning and hail events has increased significantly in recent years. These atmospheric phenomena cause considerable damage to agriculture, industry, and transportation. Shifts in the recurrence of such processes are also becoming evident. Lightning and hail events are primarily recorded in the mid-mountainous areas of the republic. Lightning events are more frequently observed in the mid-mountainous regions of the Greater and Lesser Caucasus Mountains and the Absheron Peninsula, while hail is more persistent in mid-mountainous areas. The calculations indicate that 36.5% of the country's surface is at risk of being affected by hazardous atmospheric processes.

Research on the impacts of regional climate change on hazardous atmospheric processes, including hail, is of particular importance. This is because hail causes significant damage to agriculture and infrastructure. For this reason, the analysis of increasing observational data over the years also allows us to identify trends in hail events from 1979 to 2020.

Doppler radar uses radar reflectivity (Z) and other parameters to detect the characteristics of hail particles (Jun et al., 2021). During hail events, radar reflectivity is very high (typically $Z > 55$ dBZ). $Z=\int \sigma D^6 n(D) dD$

There, σ represents the radar cross-section, D is the diameter of the particles, and $n(D)$ is the particle size distribution. In the country’s territory, hail processes are most frequently recorded on the northeastern slopes of the Lesser Caucasus

Mountains. Analysis of hail events in this area shows that the increase in hail recurrence is more pronounced in lowland areas. However, this indicator has also risen significantly at stations located in mid-mountainous regions. The increase in hail events is most notable in May, June, and July. In other months, hail recurrence has undergone minor changes (Table 1).

Table 1. Anomalies in hail events from 1991 to 2020, % (Source: National Hydrometeorological Service)

Station	Month									Year
	II	III	IV	V	VI	VII	VIII	IX	X	
Gadabay	0	2	4	2	8	7	-1	6	1	29
Dashkasan	0	0	2	19	19	7	7	9	2	64
Shamkir	-3	3	3	3	10	3	3	-3	3	27
Goygol	0	0	3	-7	13	13	-13	0	3	13

In the research, advanced GIS (Geographic Information System) technologies were used to identify areas affected by climate change and regions at risk of ecological crises. After refining the elevation ranges obtained from mathematical calculations using DEM (Digital Elevation Model) files, their areas were determined. A comprehensive map was developed to predict the spread of hazardous ecological crises and the impacts of climate change in the future. The delineation of ecological crisis zones was carried out through the following GIS steps (Figure 9).

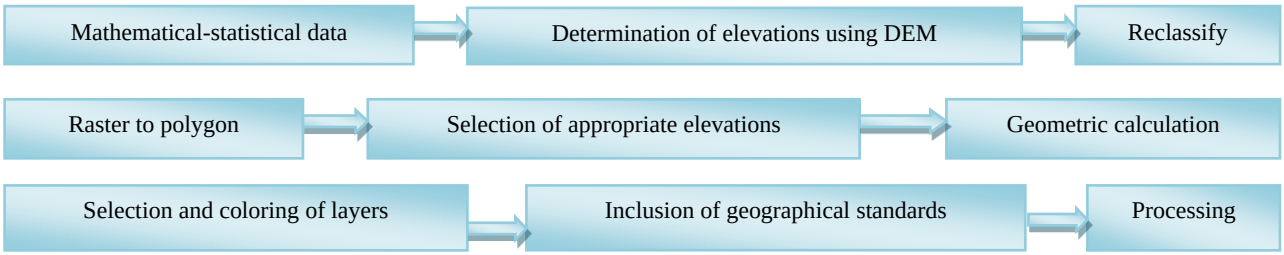

Figure 9. Methodology of the research conducted in GIS

A map was developed to provide a general overview of ecological concerns and processes that have reached crisis levels due to climate change (Figure 10). Natural causes have contributed to the current expansion of ecological crises.

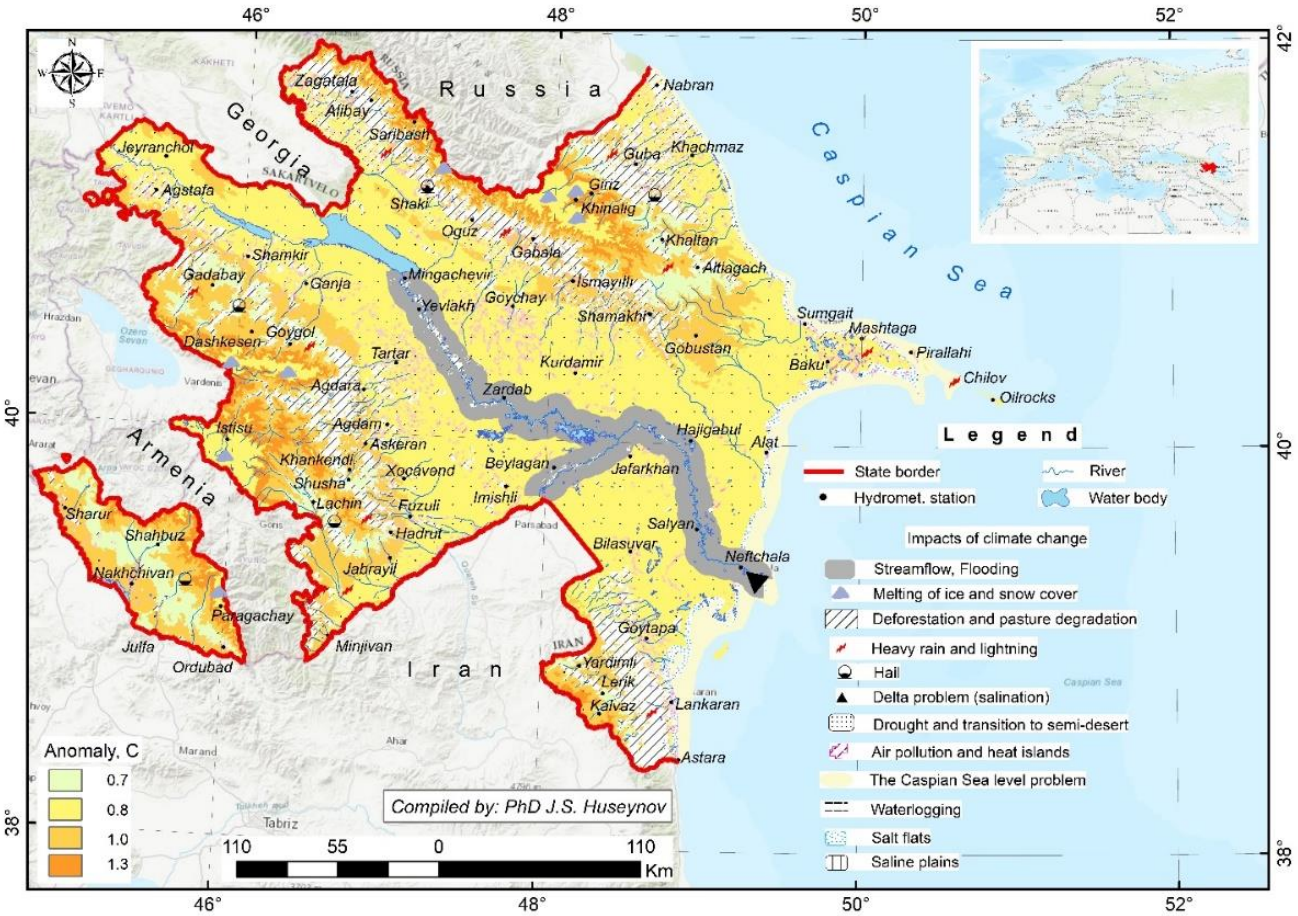

Figure 10. Map of ecological problems caused by climate change in the territory of the Republic of Azerbaijan (Source: National Hydrometeorological Service)

However, the sharp spatiotemporal expansion of destructive natural events such as waterlogging, salinization, hail, lightning, etc., has occurred over the past 3 and half decades. Areas where such processes are currently developing or are likely to expand in the future are reflected on the map.

CONCLUSION

The analysis of hazardous climatic factors in Azerbaijan from 1900 to 2023, along with the conceptual model developed based on these analyses, has enabled a precise identification of climate change issues and yielded the following comprehensive findings:

1. The ecological impact mechanism was systematized with the model that determines the effects of climate change. According to the model, compared to the norm (1981-2010), after an increase of 0.9°C in air temperature between 2011 and 2022, the main effects of climate change are the increase in evaporation, changes in wind directions and speeds, and a decrease in precipitation (by 4%).
2. The increase in air temperature has accelerated glacier melt (15-23% reduction over the past seven years), leading to increased exploitation of groundwater resources, reduction of surface water reserves, more frequent droughts, and expansion of desertification.
3. The increase in evaporation, reduction of glaciers, and decrease in precipitation have caused a decline in the current water level of the Caspian Sea. As a result, saline plains have formed across 3,398 km² of land (3.94% of the country's territory). Climate change has also expanded the spatiotemporal range (by 36.5%) of droughts, salinization, lightning, hail, landslides, and torrential rains in Azerbaijan.
4. The conceptual model for assessing climate change impacts will support the systematic planning of future research, development of advanced new models, and achievement of significant results in combating climate change.

The crises caused by observed climate changes in the territory of the Republic of Azerbaijan continue to expand gradually. The country's efforts in combating climate change at both international and local levels in recent years aim to mitigate these crises. While serious steps are being taken to limit global temperature rise to 1.5°C, these measures are insufficient to prevent freshwater shortages. Communities in the mountainous regions of the country are increasingly suffering from the acceleration of natural disasters. These processes are contributing to a rapid increase in risks to food security.

Author Contributions: Conceptualization, N.Sh. and J.S.; methodology and software, N.Sh.; validation, Z.G.; formal analysis and investigation, J.S. and Z.G.; data curation, J.S.; writing - original draft preparation, N.Sh. and Z.G.; writing - review and editing, Z.G. and A.T; visualization, supervision, and project administration, N.Sh. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The authors thank everyone who contributed to the publication of the article.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 02.04.2025 Revised: 30.07.2025 Accepted: 27.08.2025 Available online: 19.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1887-1899
DOI 10.30892/gtg.61346-1556

TOURISM VILLAGE DIGITAL TRANSFORMATION READINESS ANALYSIS: CASE STUDY IN TWO SUPER PRIORITY DESTINATIONS IN INDONESIA

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Citation: Rismayani, R., Tricahyono, D., Maulana, A., Oktaviyanti, D., Astuti, Y., Hakim, I., Khoiriyani, F., Milanyani, H., Tantra, T., Margono, T., Damayanti, S., Raharja, A.N., Dani, F., Usman, Y., Asshagab, S., & Inayati, A. (2025). Tourism village digital transformation readiness analysis: Case study in two super priority destinations in Indonesia. *Geojournal of Tourism and Geosites*, 61(3), 1887–1899. https://doi.org/10.30892/gtg.61346-1556

Abstract: The digital economy is increasingly vital to Indonesia's development strategy and presents a major opportunity for enhancing tourism, especially in rural areas. However, there exists a significant disparity in digital readiness between urban and rural regions. This study aims to assess the digital transformation readiness of tourism villages located within two Super Priority Destinations (SPDs) - Borobudur and Mandalika - by identifying their strategic positions and formulating targeted development approaches. This research adopted a qualitative methodology using in-depth interviews with 26 tourism village leaders and two local government officials, supported by focus group discussions and direct field observations. The study developed and applied a contextualized Digital Transformation Readiness Index (DTRI) tailored to rural tourism settings, which encompasses eight dimensions: technology, customer, product, process, people, culture, strategy & investment, and governance. In addition, GE and portfolio matrices were used to map the villages to enable a strategic classification of readiness levels. The matrix dimensions was based on Digital Transformation Readiness assessment to measure internal capacity for digital adoption, and Future Traveler Journey Digital Alignment assessment to measure the extent to which village infrastructure supports digital tourist engagement. The study identified varying levels of digital readiness among tourism villages. While Candirejo (Borobudur) and Bilebante (Mandalika) exhibit strong digital maturity supported by infrastructure and leadership, many others remain in early or partial stages, constrained by limited digital literacy and investment. Notably, government classifications did not consistently align with actual digital readiness. Using GE and BCG matrices, villages were categorized into superior, average, and inferior groups based on readiness and market potential. This strategic mapping supports tailored recommendations in capacity building, infrastructure, and stakeholder collaboration. The findings highlight the importance of locally adapted digital strategies and contribute a scalable framework for rural tourism development in emerging economies. Valuable lessons are provided for other emerging economies grappling with comparable challenges in the digitalization of their tourism sectors. Moreover, this research presents opportunities for future investigations into the enduring effects of digital transformation on tourism villages.

Keywords: digital transformation, digital transformation readiness, tourism village, strategic management, product portfolio strategy

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INTRODUCTION

Indonesia's digital economy was projected to grow to approximately USD 77 billion, marking a 22% increase compared to the previous year's valuation. The contributor to the gross sales value of goods and services during a specific period (Gross Margin Value / GMV) in Indonesia in 2022 is estimated to come from the e-commerce sector of US $ 59 billion. The value of Indonesia's digital economy will continue to grow and remain the largest in Southeast Asia until 2030. The main growth driver is dominated by economic activities in the major cities such as Jakarta, Bogor, Depok, Tangerang, and Bekasi (Jabodetabek) area, with a total expenditure of US $ 555 per capita GMV. Outside the Jabodetabek area, GMV is only US $ 103 per capita, which is average. This condition shows that there is a disparity in digital transformation in Indonesia. The Digital Economy is one of Indonesia's priority issues. It aligned the government's program to accelerate the digital economy and develop digital infrastructure. While the national agenda is increasingly focused on infrastructure and digital innovation,

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global scholarship also emphasizes the importance of readiness evaluation. Globally, efforts to evaluate digital readiness and policy alignment in tourism are growing, particularly in big data-driven environments (Al-Omari et al., 2024).

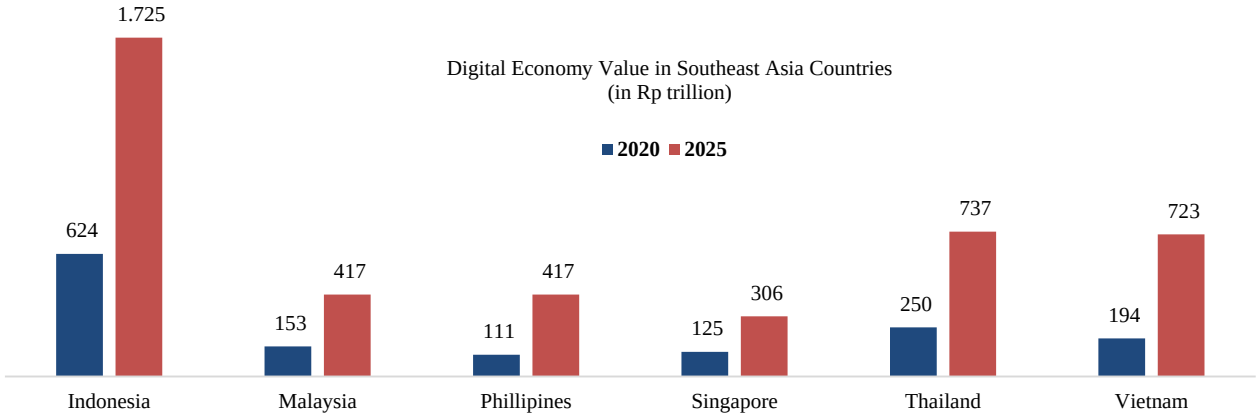

Figure 1. Indonesia Gross Margin Value 2020-2025 (Source: Ahdiat, 2025)

However, such assessments are still rare in rural or community-based tourism systems. Recent research in the Vietnamese Mekong Delta, for example, reveals that while digitalization efforts by destination marketing organizations are progressing, such initiatives still face structural and institutional limitations in rural contexts (Huynh et al., 2025).

Indonesia's digital transformation can be seen in the development of its digital economy. Google, Temasek, and Bain & Company in the Economy SEA 2022 report (Figure 1) said the value of the increase in the digital economy also occurs in the tourism industry and creative economy. According to the World Economic Forum's Digital Transformation Initiative (DTI), global digitalization in the aviation, travel, and tourism sectors is projected to generate a value of USD 305 billion, with approximately USD 100 billion attributed to emerging players and digital transformation processes. In the Indonesian context, the absolute economic contribution of the tourism sector is projected to increase significantly - from USD 29.9 billion in 2022 to USD 73.5 billion by 2028, marking a 145.34% growth (Degenhard, 2023). The economic contribution is expected to reach 124.0 billion US dollars by 2028. PricewaterhouseCoopers (PwC) reported that the tourism sector's contribution to GDP is still low at 5%. This figure is lower than that of other G20 countries such as Spain (14%), Italy (13%), Turkey (11%) and Thailand (12%). Contributions can be increased through promotion, improved access, and affordability.

In 2021, the contribution of Indonesia's tourism and creative industry to GDP is estimated at 7.3%. Previously, this contribution was weakened during the COVID-19 pandemic by 5%. Minister of Tourism and Creative Economy Sandiaga Uno targets this contribution to be increased by 10-12% on par with other countries in Southeast Asia in the next 5 to 10 years.

The Ministry of Tourism and Creative Economy (KEMENPAREKRAF) encourages an increase in the number of domestic tourists to achieve the GDP contribution growth target through the Super Priority Destination (DSP) development program in five locations to find "new Bali," namely Borobudur (Central Java) as one of UNESCO's world cultural heritage where the reliefs are full of detail and have 72 stupas with Buddha statues; Likupang (North Sulawesi) has tourism potential for five exotic beaches and mangrove forests; Labuan Bajo (NTT) has tourism potential for Komodo dragons, pink beach and Sylvia hills; Mandalika (NTB) has the potential of Gerupuk natural beach, Kuta beach and Bau Nyale Festival; and Lake Toba (North Sumatra) has the potential for lake cruising tourism, glamping (luxury camping). The main programs of KEMENPAREKRAF: (1) developing sports reputation and infrastructure in Mandalika; (2) popularizing creative economic potential such as weaving in Labuan Bajo; and (3) establishing a tourism special economic zone (SEZ) in Likupang.

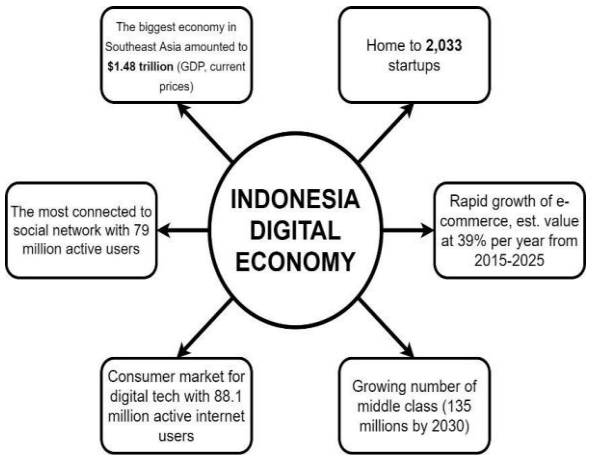

Figure 2. Indonesia Digital Economy (Source: Ulum, 2017)

Tiket.com CEO George explained three crucial things to increase contribution, namely (1) attraction, (2) accessibility, and (3) affordability. These three things can be improved through digital transformation in each DSP considering the market opportunities where Indonesia's current tendency as a digital society (Society 5.0) is the growth trend of internet penetration, digital buyers, startups, and e-commerce (Figure 2). The foremost opportunity in the tourism and creative industry today is also seen in the growth of middle-class people, estimated to reach 135 million by 2030. This shift encourages the creation of a new culture in consumption behavior where there is a shift in consumption patterns initially dominated by clothing-food-board to entertainment and leisure. Entertainment and leisure are included in the scope of KEMENPAREKRAF, especially to achieve domestic travel targets. The digital leisure experience of tourists or prospective tourists in Indonesia can be enhanced through digital transformation in each experience journey or point of interaction (POI). The Indonesian Ministry of Tourism and Creative Economy provided the internal documents that contain the core information in Figure 3. To align it with the context of the study, the authors adapted, visualized, and composed narrative framing from the information. Resulting in the map of Indonesia's Travel Journey Map (Figure 3).

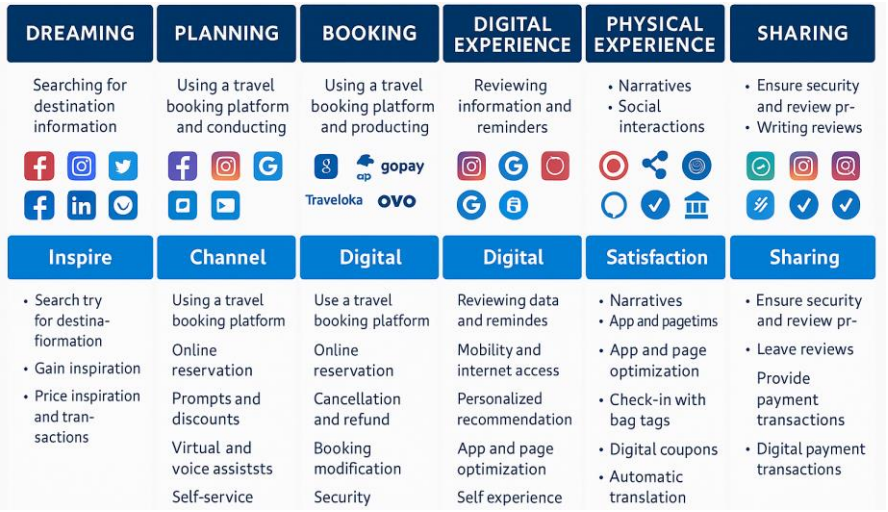

Figure 3. Indonesia Travel Journey Map (Source: Adapted from Internal data from the Indonesian Ministry of Tourism and Creative Economy (Kemenparekraf), 2023. Visualization adapted by the authors for explanatory purposes) (Source: Adapted from Internal Data from The Indonesian Ministry of Tourism and Creative Economy)

To successfully carry out digital transformation, several prerequisites must be met. First, adequate telecommunications infrastructure. Second, the demographic is young and tech-savvy. Third, supporting policies/regulations; finally, ecosystems supporting transformation (Pratama et al., 2021; Ulum, 2017).

To achieve the GDP contribution growth target of the tourism and creative industry through the development of DSP and equitable distribution of Tourism and Economy Creative digitalization, a study is needed to determine the readiness of DSP digital transformation through the measurement of the Digital Transformation Readiness Index (DTRI) including knowing the four prerequisites for digital transformation to produce recommendations for sustainable tourism governance.

Indonesian lifestyle trends after the pandemic persist in new normal conditions related to behavior, habits, lifestyles, or mindsets of digital-based leisure activities. Therefore, the digital leisure experience is a consumer need and desire. Indonesia has nearly 3,000 recreational tourism destinations that have yet to be digitized. Meanwhile, tourist destinations have three achievement targets: increasing the number of visitors, length of stay, and expenditure, which are the leading performance measures. The achievement of this target can be accelerated through digital transformation at each stage of the travel journey map (TJM). It has not been clearly mapped in the condition of digital transformation disparity, especially in the 5 DSPs. Therefore, measuring the level of digital readiness for destination transformation is necessary.

Therefore, this study aims to evaluate the level of digital transformation readiness among tourism villages in two Super Priority Destinations in Indonesia—Borobudur and Mandalika—and to develop a contextualized readiness index and strategic portfolio framework that supports differentiated policy intervention for inclusive rural digitalization.

Studies on tourism destination governance in Travel Journey Map (TJM)--based Tourism Villages could have been more consistent, especially in terms of digital readiness measurement frameworks tailored to rural settings (Shao et al., 2021). This destination governance strategy is seen from the state of digital transformation readiness. Previous research examining digital transformation readiness specifically for tourism or tourism villages in Indonesia has yet to exist. Recent studies have increasingly addressed digital transformation in tourism, focusing on smart destinations (Wu et al., 2023), digital social innovation in rural areas (García-Cabrera & Pérez-Tapia, 2023), and overall maturity of tourism systems (Baggio et al., 2023). However, these works are often situated in Global North or primarily urban contexts. Shao et al. (2021) and Vu et al. (2025) have highlighted the lack of empirical frameworks tailored to rural tourism digitalization in Southeast Asia. Additionally, Vu et al.(2025) conducted a comprehensive bibliometric and content analysis of digital transformation in rural tourism, identifying key research clusters, such as “Digital Folklore and Smart Travel Technology” and “Community-level IT

applications," while emphasizing the need for more empirical studies beyond 2023. Unlike previous research, our study advances by introducing a contextualized Digital Transformation Readiness Index and integrating strategic portfolio matrices to derive practical guidance for inclusive rural digital transformation in developing countries.

Resarch Gap and Novelty

Indonesia's digital economy is becoming more important, especially in the tourism industry. However, most of the current digital transformation efforts have been focused on cities, leaving tourism villages under examined. While existing models such as those by Schumacher et al. (2016) or Agostino & Costantini (2022) provide valuable frameworks for digital readiness, they are limited by their focus on technologically advanced institutions in urban or developed contexts. These frameworks tend to prioritize infrastructure and neglect softer variables such as institutional trust, leadership, or sociocultural adaptability—factors that are especially crucial in rural tourism ecosystems (García-Cabrera & Pérez-Tapia, 2023). Furthermore, few studies translate readiness assessments into practical strategy portfolios, creating a gap in implementation tools for policy and investment. Recent bibliometric work by Vu et al. (2025) further highlighted the underrepresentation of rural tourism in global digital transformation discourse. Their analysis revealed that most studies cluster around urban or smart destination contexts, with limited empirical focus on Southeast Asian community-based tourism. These shortcomings limit the usefulness of existing models in rural, resource-constrained settings.

Without integrating localized sociocultural and governance dimensions, global frameworks risk overlooking key barriers to successful implementation in Indonesian tourism villages. This concern is echoed by Vu et al. (2025), who stress that rural digital transformation models must include community-driven governance factors. Most of the research that has been done so far has focused on smart tourism development in cities or digital readiness in institutional or commercial tourism settings. For instance, González-Reverté (2021) conducted a comprehensive review on smart tourism and sustainability, yet his findings are largely concentrated on urban contexts. As a result, research on community-based tourism governance structures—such as those found in Indonesia's Super Priority Destinations (SPDs)—remains scarce (Wu et al., 2023).

While studies by Wu et al. (2023) and Baggio et al. (2023) explore themes related to digital transformation, their emphasis lies primarily on smart technology infrastructure, urban innovation systems, and macro-level strategic frameworks. García-Cabrera & Pérez-Tapia (2023), in contrast, highlight the role of digital social innovation in enhancing rural tourism competitiveness, but do not provide a structured readiness index or strategic classification of destinations. This study complements and extends these works by proposing a contextualized Digital Transformation Readiness Index (DTRI) and portfolio-based strategic framework tailored to community-managed tourism villages in Indonesia.

In addition, most of the digital transformation readiness models that are presently available (like Schumacher et al., 2016; Agostino & Costantini, 2022) are designed for mature tourism systems in developed countries. These frameworks tend to emphasize infrastructure and technical indicators, yet often fail to address the complex social, cultural, governance, and economic realities of rural tourism in developing contexts. Digital leadership has been emphasized as a crucial factor in national readiness strategies (Cahyadi & Magda, 2021), yet its operationalization in rural tourism contexts remains underexplored. Similarly, there is limited research on variables such as local leadership, institutional trust, and cultural openness—despite increasing evidence that these elements are critical for enabling effective rural digital transformation.

The second major issue is that strategic mapping frameworks are not sufficiently employed to translate digital readiness assessments into actionable development strategies. While digital maturity evaluations are increasingly common, only a few studies have utilized portfolio-based analytical tools like the GE Matrix or BCG Matrix to classify tourism villages based on their readiness and market opportunities (Shao et al., 2021; Baggio et al., 2023). Unlike network-oriented models such as Baggio et al. (2023), this study's framework emphasizes the alignment between community capacity and localized digital strategies tailored to rural tourism settings. As a result, the lack of targeted classification has led to generic digital transformation agendas with limited impact across diverse rural tourism types.

Furthermore, most of the research that has been done so far is in the Global North, which has left a gap in empirical data for rural tourism in Southeast Asia. This is more alarming because Indonesia is aggressively pushing for digital acceleration in tourism by designating SPDs like Borobudur and Mandalika. Yet, we are unaware much about how these national-level policies are put into action and received at the village level, where access to markets, digital literacy, and institutional capacity can be very different (Al-Omari et al., 2024; García-Cabrera & Pérez-Tapia, 2023).

In response to these gaps, the present study sets out to investigate rural digital transformation readiness from both diagnostic and strategic perspectives. To address these gaps, this study proposes the following research questions:

- What is the current level of digital transformation readiness among tourism villages located in Super Priority Destinations in Indonesia?
- What internal and external factors influence the strategic positioning of tourism villages in terms of digital transformation readiness?
- How can tourism villages be strategically categorized using portfolio analysis to support tailored digital development strategies?

The novel part of this study is the creation and use of a Digital Transformation Readiness Index (DTRI) that is specific to community-based tourism villages in Indonesia's Super Priority Destinations. The DTRI introduced here offers a novel departure from earlier frameworks as it includes a wide range of indicators, such as technology infrastructure, human capital, customer engagement, governance, innovation culture, and local collaboration. These indicators are more compatible with the

socioeconomic and institutional realities of rural tourism ecosystems (García-Cabrera & Pérez-Tapia, 2023; Torres-Delgado & Benach, 2022). This emphasis on indicator-based assessment aligns with the earlier work of Torres-Delgado & Saarinen (2014), who advocate for the use of measurable criteria to evaluate sustainable tourism development and inform policy decisions. This study additionally offers a dual strategic framework that combines the DTRI with portfolio analysis tools (the GE and BCG matrices) to illustrate and group tourism villages based on how ready they are and what opportunities are available in their area. This method makes it possible to group strategies and come up with different digital development strategies. This is a step toward closing the gap between designing digital policy and making sure that everyone has equal access to it in developing countries. This study also adds to the global discussion on inclusive digital tourism transformation by providing context-rich empirical evidence from fieldwork in Borobudur and Mandalika.

In summary, this study fills four major gaps: (1) the empirical gap of rural tourism digitalization in Southeast Asia, (2) the theoretical mismatch between existing models and the sociocultural realities of developing countries, (3) the methodological absence of strategic portfolio frameworks in readiness analysis, and (4) the practical lack of differentiated policy tools for digital transformation in tourism villages.

MATERIALS AND METHODS

This study adopts a naturalistic and interpretive stance rooted in qualitative inquiry traditions (Denzin & Lincoln, 2012), employing a qualitative descriptive approach to explore the contextual readiness of tourism villages for digital transformation. A qualitative design was considered appropriate because it enables researchers to examine complex social phenomena holistically and interpret them within their natural settings (Creswell, 2013). This approach is particularly suitable for tourism research, where understanding local dynamics, community values, and leadership requires deep contextual immersion (Myers, 2013). The data consisted of non-numeric, textual information derived from in-depth interviews and direct field observations (Check & Schutt, 2012).

Semi-structured interviews were conducted with tourism village leaders and institutional actors, allowing for flexible exploration of site-specific issues while maintaining thematic coherence. Field observations were also employed to triangulate findings and uncover tacit dimensions not easily captured through interviews alone.

The research used primary data derived from (1) the results of semi-structured interviews with several resource persons deemed needed by the research and (2) the results of observations of the research team when conducting direct field surveys. Before collecting data, the research team will conduct several literature reviews to create an interview / FGD framework and identify what should be anticipated in observational data collection activities.

Researchers will collect data from village managers and officials to identify indicators to assess tourism villages' readiness for digital transformation. They will be the resource people for this research. Because the number is small (13 tourist villages in each research location), the entire population in this study will be a resource person.

The sampling method used is purposive sampling, which requires selecting individuals and research sites that can deliberately provide information that can enrich the understanding of research problems and central phenomena in research, generally used in qualitative research (Creswell, 2013).

This study used the Digital Transformation Readiness Index (DTRI), developed by synthesizing and adapting dimensions from various existing frameworks (e.g., Schumacher et al., 2016; Bharatula & Murthy, 2020; Cahyadi & Magda, 2021; Wahyuningtyas et al., 2023; Agostino & Costantini, 2022) to suit the specific context of tourism villages in Indonesia. While institutional models such as Agostino & Costantini (2022) offer structured approaches for cultural institutions, and Bharatula & Murthy (2020) emphasize national digital readiness, this study's framework incorporates localized social, governance, and leadership variables that are critical in rural tourism ecosystems. The preliminary set of dimensions, sub-dimensions, and indicators was subsequently reviewed by five experts from the Ministry of Tourism and Creative Economy, BRIN, and tourism research centers to ensure contextual validity.

We also did a pilot test in three tourism villages, one from each of the three categories: pioneering, developing, and advanced. The goal was to see how clear, useful, and consistent the proposed indicators were. The feedback from this field test helped us improve the wording of some indicators and get dismissed of any that were unnecessary.

The final DTRI has eight dimensions, 25 sub-dimensions, and 34 indicators. It gives a complete picture of digital readiness that is both theoretically sound and practical in rural tourism settings.

Following the data collection process, the data will be analyzed by describing or depicting the data that has been collected using product portfolio analysis techniques. Ritson (2011) in (Pramudiana et al., 2016; Rismayani & Pramudiana, 2013) said that product portfolio analysis could be done through a positional approach that formulates strategies analytically and rationally with the aim of placing companies or products in a favorable environment proposed by Porter (1985) with the output of GE Matrix and BCG Matrix. The original framework proposed by Rismayani & Pramudiana (2013), although developed in the context of Indonesia's cement industry, emphasized how portfolio classification can be adapted to different sectors, including tourism, by focusing on the balance between internal capability and external opportunity. This foundational approach informs the portfolio adaptation model used in the present study to assess digital readiness in tourism villages. Furthermore, portfolio analysis provides strategic investment recommendations by positioning each business unit based on an integrated assessment of internal capabilities and market attractiveness.

This study employed an adjusted BCG matrix to map the strategic position of each tourism village and perform a portfolio-based classification. In corporate strategic analysis, the Boston Consulting Group (BCG) matrix is widely applied

to classify business segments by evaluating their relative market expansion rate and competitive positioning (Khajezadeh et al., 2019; see also Palazzo, 2024, for recent developments in strategic decision-making frameworks). This approach is further informed by Indonesian portfolio strategy literature, which highlights the importance of aligning internal capacity with market positioning (Pramudiana et al., 2016). Although originally developed for corporate settings, their framework provides a conceptual basis for adapting portfolio models to community-based tourism systems. However, its application in rural tourism remains limited. To better reflect the realities of rural tourism development, the matrix was restructured by replacing traditional business indicators with two customized dimensions: (1) Digital Transformation Readiness (DTRA), representing the internal capacity for digital adaptation; and (2) Future Traveler Journey Digital Alignment (FTJDA), indicating the extent to which village infrastructure supports digital tourist engagement across travel stages.

DTRA was conducted to determine the existing position of Tourism Villages based on the level of attractiveness of the industry (external) and the internal strength of Tourism Villages related to Digital Transformation Readiness (Figure 4). The X axis is the competitive position of the company/product that describes the competitiveness or strength of the company's products derived from internal company factors or business strength. This X-axis is divided into three parts or boundaries: weak, average, and vital. The lowest value on the X-axis is 1, and the highest value on this axis is 3. The Y axis is an external attractiveness that describes the company's product opportunities (business opportunities) derived from external company factors that the company cannot control. This Y-axis is divided into three parts or boundaries: unattractive, average, and attractive. The lowest value on the Y axis is one, and the highest value on this axis is 3.

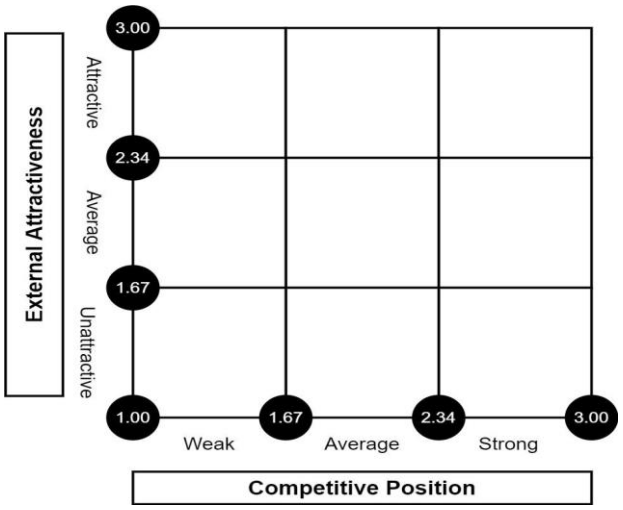

Figure 4. Digital Transformation Readiness Assessment Matrix

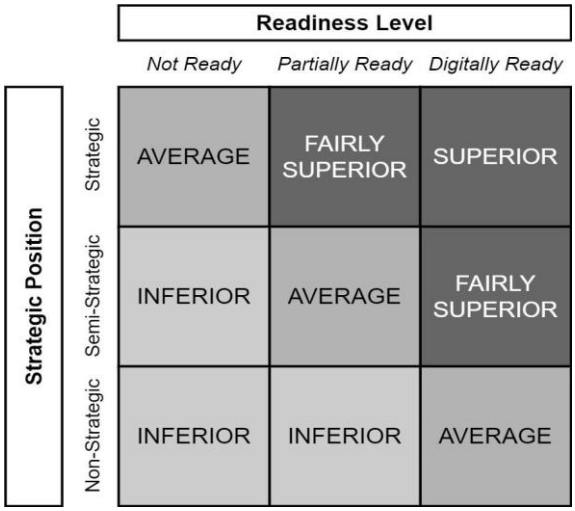

Figure 5. Digital Transformation Strategic Readiness Assessment Matrix

The Future Travel Journey Assessment (FJTA) was employed to identify key constraints in the digitalization process of tourism villages by mapping their alignment with FJT-based service flows. This diagnostic was integrated with the Theory of Constraints (TOC), a system-oriented methodology that posits every system has a singular goal—typically profit or performance—and that overall system performance is limited by its weakest or most constrained process.

By identifying and analyzing these bottlenecks, TOC enables decision-makers to formulate strategies for maximizing throughput and optimizing systemic efficiency. In this study, constraints were assessed in relation to the digital tourism service ecosystem, following a service design perspective adapted from Gao et al. (2022), which emphasizes holistic alignment between service processes and digital readiness across the travel journey.

The GE/McKinsey framework comprises nine strategic categories that allow firms to map their business units by evaluating internal strength alongside market appeal. Furthermore, market size and current sales will differentiate each SBU. Based on a clear understanding of all these factors decision makers are able to develop effective strategies. The nine cells in the matrix can be grouped into three main segments (Figure 5): (1) Superior: This is the best segment because it has a strong business and an attractive market; (2) Average: Have a good and strong business, but the market is not attractive or vice versa, the market is strong, and the business is not strong enough to pursue potential opportunities; and (3) Inferior: This is the worst segment because the business in this segment is weak and the market is not attractive.

RESULTS AND DISCUSSION

In developing digital transformation readiness measurements in tourism villages, this study refers to several articles on digital transformation readiness. One is an article from Agostino & Constantini (2022) that develops a framework to measure digital transformation in a cultural institution. In addition, the measurement model adopted several dimensions from the studies of Schumacher et al. (2016) and Wahyuningtyas et al. (2023). Then, experts reviewed and tested small samples' adopted dimensions, sub-dimensions, and indicators. Table 1 illustrates the measurement model of the digital transformation readiness of tourism villages.

Table 1. Digital Transformation Readiness Measurement Model in Tourism Villages

Dimension	Sub-Dimensions	Indicators
A. Technology	A.1. Technology Adoption	A.1.1. Technology presence
	A.2. Data Analysis	A.2.1 Digital archive
		A.2.2. Data collection and storage
	A.3. Technology Infrastructure	A.2.3. Data monitoring
		A.3.1. Wi-Fi presence
		A.3.2. Signal availability
		A.3.3. Electricity availability
B. Customer	B.1. Visitor/Customer Awareness	B.1.1. Digital marketing activity
		B.1.2. Social media preferences
		B.1.3. Tourism village presence in reputable website(s)
C. Product	C.1. Product Personalization	C.1.1. Product personalization
	C.2. Product Digitalization	C.2.1 Product digitalization
	C.3. Product Integration	C.3.1. Integrated and limitless digital product
D. Process	D.1. Front Office	D.1.1. Pre-requisite
		D.1.2 Payment method
	D.2. Back Office	D.2.1. Tourism village's operating service digitalization
E. Human	E.1. Digital Skills	E.1.1. Personnel with special task
		E.1.2. Personnel capability to use ICT
		E.1.3. Digitalization training and coaching
F. Culture	F.1. Knowledge Sharing	F.1.1. Occurring information exchange
	F.2. Innovation Openness	F.2.1. Support towards innovation openness
	F.3. Collaboration Between Actors	F.3.1. Collaboration between digital transformation actors
	F.4. Digital Transformation Importance	F.4.1. Awareness of digital transformation importance
G. Strategy & Investment	G.1. Strategy	G.1.1. Digital strategy
	G.2. Investment	G.2.1. Digital investment
		G.2.2. Digital investment penetration
H. Leadership and Governance	H.1. Leadership	H.1.1 Village leader commitment
		H.1.2. Leader's motivation
	H.2. Governance	H.2.1. Tourism village digital governance

The digital transformation readiness measurement model in tourism villages developed in this study produces seven measurement dimensions: technology, customer, product, process, people, culture, strategy and investment, and leadership and governance (Table 1). The technology dimension refers to digital technology, data utilization and analysis practices, and the availability of infrastructure such as Wi-Fi. It has three sub-dimensions and seven indicators. Customer dimension refers to the ability of tourism villages to engage with customers through digital interaction channels, both before and after the transaction or visit process, and has one sub-dimension with three indicators. Product dimensions refer to everything offered to tourists, whether nature- or culture-based, or tangible or intangible, and have three sub-dimensions with one indicator each. The process dimension describes how digital utilization is carried out in front- and back-office business processes. It has two sub-dimensions with three indicators. The human dimension refers to the availability of human resources with digital skills and utilization capabilities. It has one sub-dimension with three indicators. The cultural dimension refers to the values that develop in tourism villages to support the development of digital transformation. It has four sub-dimensions with four indicators.

The strategy and investment dimension refers to an organization's ability to achieve its long-term digital strategy by investing resources in digital transformation projects. It has two sub-dimensions with three indicators. Finally, the leadership and governance dimension refers to the digital capabilities of decision-makers and policy support from stakeholders. It has two sub-dimensions with three indicators. In Borobudur DPSP, tourism villages are excellent destinations that combine the beauty of natural potential with the richness of local culture. Villages such as Karangrejo, Candirejo, Kembanglimus, and Wanurejo offer a variety of products that are attractive to both local and foreign tourists.

Accessibility support and adequate tourism infrastructure are its advantages. Tourists can enjoy various exciting activities, such as Jeep, VW, bicycle, and Andong/Dokar tours. In addition, the agricultural sector is the main attraction in Candirejo and Karangrejo. The tourists could enjoy experiencing traditional farming. Tourism villages also offer other potentials, such as art and cultural performances like traditional dance in Candirejo and mask art in Tuksongo. Interaction with local communities is the focus, with various activities such as pottery crafts in Karanganyar, batik making in Wanurejo, and bamboo crafts in Kebonsari. Kembanglimus Village, famous for its Bukit Rhema, offers bamboo carving and traditional batik activities called 'jumputan'. In addition, the development of artificial attractions is also an integral part of Borobudur DPSP Tourism Village. Dolanan Jamuskauman Village serves a variety of traditional games, while Kebonlegi and Ngawen villages offer outbound and river tubing activities. Several villages also provide educational tourism, such as Ngargogondo Village with Borobudur Language Village, Ngargoretno Village with Dino Park and Marble Nature Museum, and Tanjungsari Village with ancient historical tours and Honey Bee education.

In utilizing technology in the Borobudur DPSP tourism village, almost all villages have provided digital payment options for tourists. Although most villages use digital technology for data collection, especially related to village visits and profiles, data updates are still unscheduled. The back office may not be entirely digital since marketing and finance is the

focus of digital transformation. Technological infrastructure such as Wi-Fi, telecommunication networks, and electricity are readily available in villages, although the stability of ICT infrastructure is affected by weather and geographical location. Data monitoring involves online reviews on social media, with support from the central and local governments through the Jadesta website and social media @Visitjawatengah. Most villages realize the importance of digital marketing, but the availability of competent human resources to use ICT is still a significant obstacle. Some villages, such as Wanurejo and Ngawen, have adopted digital transformation by involving the younger generation as local champions and digital ambassadors. However, digitalization training and assistance have not been running sustainably. Budget constraints for digitalization are also an obstacle, with an average allocation of less than 10% of the total village budget. Post-pandemic, several villages have started offering digital products such as virtual tours and virtual shows. Overall, tourism villages support innovation and collaboration, considering digital transformation a crucial aspect of village development. However, policy support and planning that accommodates digital innovation are still inadequate. Meanwhile, in DPSP Mandalika, besides marine tourism as the main attraction, many tourism villages with natural wealth and local wisdom that are still maintained have under-developed potential. Most villages offer natural charms, such as lakes and waterfalls in Karang Sidemen Village and camping grounds in Janggawana Village and Kabul Mandalika. Bilebante Village offers rice fields, forest trekking activities, and fitness therapy. The local wisdom and culture of the Sasak Tribe are the main attractions in DPSP Mandalika, and they are reflected in the traditional buildings and customs of Sasak Ende, Sengkoah, and Rembitan Traditional Villages. The villages of Monggas Tastura and Setanggor exhibit traditional music and Peresean dance. Weaving activities are in demand in Puyung and Sukarara Villages, while Beleka Village is famous for rattan and Ketak/Atte crafts. Jango Village offers religious educational tours. This potential is an essential foundation for developing tourism villages in Mandalika.

Although most tourism villages in DPSP Mandalika consider digital transformation vital, technology adoption in village development is still limited due to low digital literacy among village managers. The interaction and digital marketing process is not optimal, although villages generally have 1 to 2 types of social media. The introduction of digital tourism products tends to be done by travel agents rather than tourism villages themselves. Some villages, such as Kabul Mandalika and Sengkoah, still use cash payments. Although foreign investors are interested, essential tourism-supporting infrastructure is still lacking, and providing ICT infrastructure has not been a priority. Limited human resources and budget are obstacles to digital transformation, with less than 10% of village budgets allocated for digitalization. However, some villages, such as Bilebante, Karang Sidemen, and Sukarara Weaving Center, firmly commit to adopting digital technology. Some villages have developed digital travel guides, archived data through big data, and offer digital travel products such as virtual tours and workshops. Villages actively exchange communications, but involvement and support from stakeholders and local governments are still limited. Coordination between regional officials and tourism village managers is not optimal, and support for developing digital technology competencies is still inadequate. The training provided also lacks sustainability mechanisms.

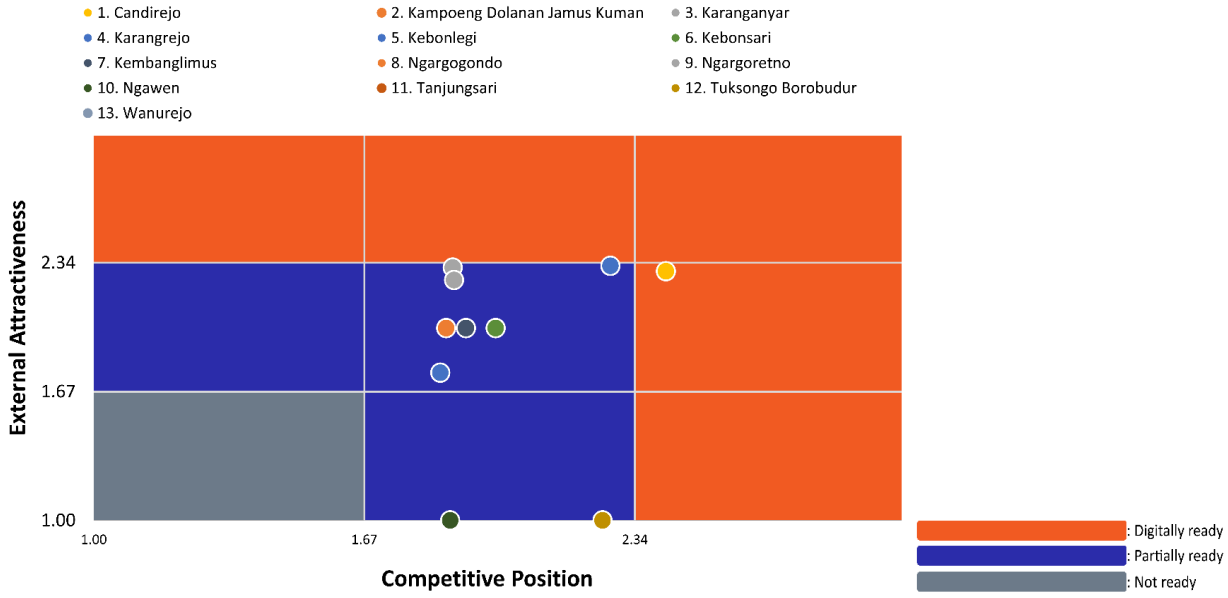

Figure 6. Digital Transformation Readiness Level of DPSP Borobudur Tourism Villages

Based on Figure 6, there are two groups of digital transformation readiness levels of tourism villages in DPSP Borobudur. A tourism village included in the digitally ready level is Candirejo Village. Meanwhile, 11 other tourism villages are at the partially ready level, namely Kampoeng Dolanan, Karang Anyar, Karangrejo, Kebonlegi, Kebonsari, Kembanglimus, Ngargogondo, Ngargoretno, Ngawen, Tuksongo Borobudur, and Wanurejo. Unlike the tourism villages located in Borobudur DPSP, tourism villages located in Mandalika DPSP (Figure 7) are divided into three groups of digital transformation readiness levels. The digitally ready level includes four tourist villages in Mandalika: Bilebante Village, Sasak Ende Custom, Setanggor, and Rembitan. The partially ready level encompasses three villages: Adat Sengkoah,

Karang Sidemen, and Kabul Mandalika. The remaining six villages, Monggas Tastura, Janggawana, Beleka, Jango, Puyung, and Sentra Tenun, are included in the not-ready level.

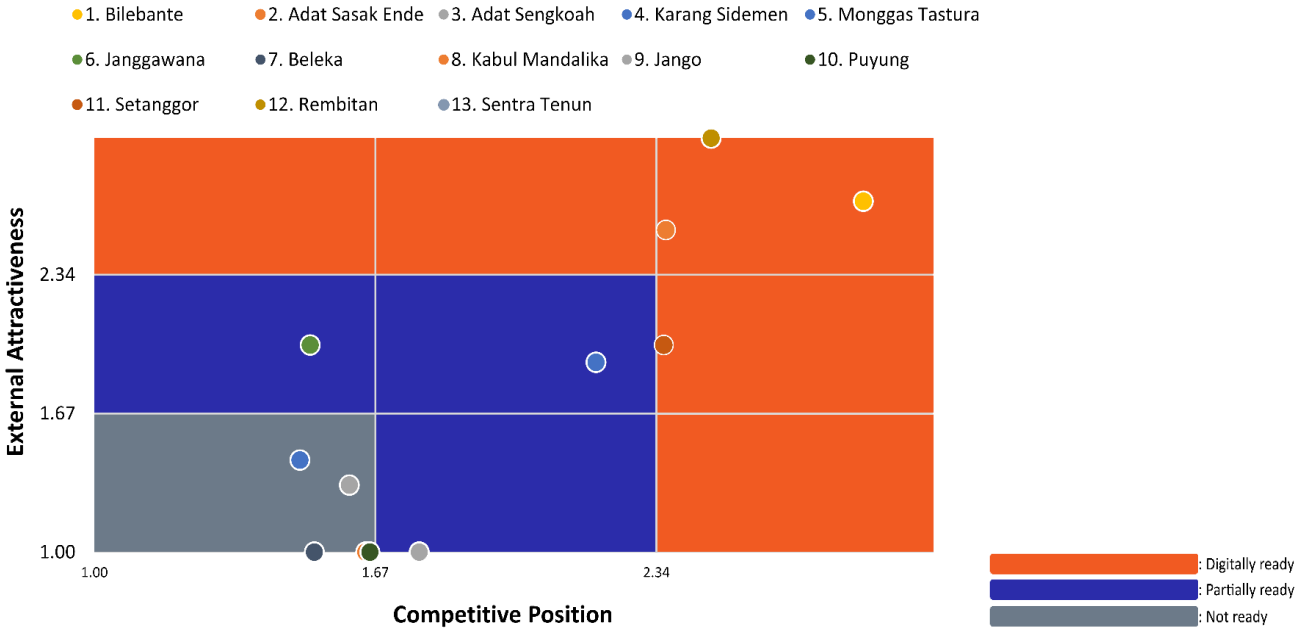

Figure 7. Digital Transformation Readiness Level of DPSP Mandalika Tourism Villages

The result highlights that DPSP Mandalika has more tourist villages that are at the digitally ready level compared to Borobudur. It shows that the more challenging the village's access to the market, the more innovative it is in making digital transformation one of its advantages. For tourism villages located in DPSP Mandalika, limitations in accessing the market make their efforts to carry out digital transformation even greater. They know the benefits of digital transformation in encouraging tourism villages to penetrate the market. However, if averaged cumulatively, Borobudur DPSP is better prepared for digital transformation than Mandalika DPSP. Some of the superior things from DPSP Borobudur include Technology infrastructure (Signal Availability, Electricity Availability), Customer / Visitor Awareness (Social Media Preferences), Digital Skills (HR Ability to use ICT), Knowledge Exchange (Information Exchange Process, Support for Open Innovation), Awareness of the importance of Digital Transformation, and Leadership (Commitment).

Figure 8. Grouping Matrix of Tourism Villages in DPSP Borobudur Tourism Villages

Meanwhile, some things that excel from DPSP Mandalika are awareness of the importance of digital transformation and leadership as well as the availability of electricity. In addition, there was no relationship between the status of tourism

villages assessed by the Ministry of Tourism and Creative Economy (Pioneering, Developing, Advanced, Independent) and digital transformation readiness. This is because the assessment related to the transformation and digital readiness of Tourism Villages has not been an essential aspect of its assessment. In formulating a strategy to increase digital transformation readiness in tourism villages, it is necessary first to identify the position of the tourism village's product portfolio to see its grouping. Figure 8 and Figure 9 shows the position of the tourism village portfolio in terms of digital transformation, as seen from the level of external attractiveness and competitive position of the tourism villages.

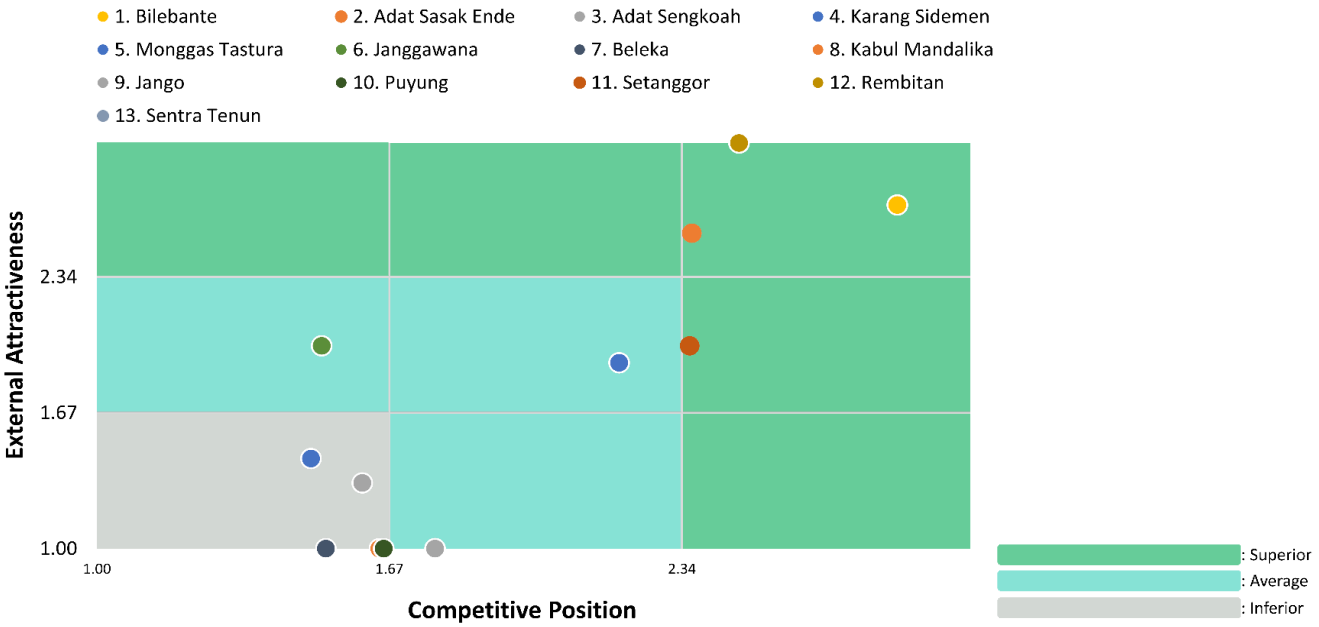

Figure 9. Grouping Matrix of Tourism Villages in DPSP Mandalika Tourism Villages

In Borobudur DPSP (Figure 8), the superior quadrant includes only one village, the Candirejo Tourism Village. The average quadrant consists of 11 tourism villages: Kampoeng Dolanan, Karang Anyar, Karangrejo, Kebonlegi, Kebonsari, Kembanglimus, Ngargogondo, Ngargoretno, Ngawen, Tuksongo Borobudur, and Wanurejo.

Meanwhile, DPSP Mandalika (Figure 10) has more tourism villages in the superior product category, namely Bilebante Village, Sasak Ende Custom, Setanggor, and Rembitan. The average product quadrant contains three: Sengkoah Sengkoah Traditional Village, Karang Sidemen, and Kabul Mandalika. Unlike DPSP Borobudur, six tourism villages of DPSP Mandalika tourism village has six villages that are included in the inferior quadrant, namely Monggas Tastura, Janggawana, Beleka, Jango, Puyung, and Sentra Tenun.

Based on Figures 6 to 9, we created a quadrant-based strategic framework to help us get insightful data from the digital readiness of tourism villages. Each quadrant shows a mix of internal digital capability and external attractiveness (market opportunity), helping to shape different intervention strategies:

- **The Superior Quadrant (High Readiness – High Attractiveness):** It includes villages like Candirejo, Bilebante, Sasak Ende, Setanggor, and Rembitan. These villages should work on scaling up digital innovations, introducing more digital products to their portfolios (such as virtual tours and digital booking systems), and forming strategic partnerships with technology providers and marketplaces. These villages can also be used as examples for other areas to follow or as pilot cases for how to do things.
- **Average Quadrant (Moderate Readiness – Moderate Attractiveness)**: Villages like Karangrejo and Wanurejo fall into this group. They need to make small improvements to their digital marketing skills, train their staff, and improve their digital infrastructure. These areas have a lot of potential, but they need help from local government programs and targeted capacity-building efforts.
- **Inferior Quadrant (Low Readiness – Low Attractiveness):** Villages like Jango, Monggas Tastura, and Puyung need to build up their basic digital skills. This group wants to set up basic ICT infrastructure, find local youth leaders, and make sure they have strong partnerships with universities, NGOs, or the private sector to help people become more digitally empowered. There should be a staged roadmap that starts with raising awareness and training and then moves on to implementing digital technology gradually.

This strategic categorization enables stakeholders, especially ministries, regional tourism boards, and funding agencies, to adjust their interventions, better manage their budgets, and keep track of how things are changing by looking at measurable outcomes at different levels of readiness.

Collaboration from actors, be it government, academics, or the private sector, is one indicator of digital transformation readiness for tourism villages included in the superior quadrant in Borobudur and Mandalika. Collaboration from actors, be it government, academics, or the private sector, is one indicator of digital transformation

readiness for tourism villages included in the superior quadrant in Borobudur and Mandalika. This is aligned with the findings of Wahyuningtyas et al. (2023), who emphasized the role of cooperative competitiveness and multi-actor collaboration as key enablers of inclusive community development in the context of Economic Society 5.0.

These five superior tourism villages (Candirejo, Bilebante, Adat Sasak Ende, Setanggor, and Rembitan) collaborate with various parties to optimize digitalization in their villages. Biliebante Tourism Village, for example, collaborates with Atourin, a travel marketplace platform, to promote sustainable tourism. In addition, as a fostered design of Bakti BCA, Bilebante opens up opportunities for cooperation with various parties.

In addition to collaboration between actors, the availability of digital infrastructure (such as Wi-Fi and internet signals) is also an indicator of digital transformation readiness owned by tourism villages in Borobudur and Mandalika. The five superior tourism villages in Borobudur and Mandalika have good digital infrastructure. Most of the five villages already have a good internet network, although some do not have smooth Wi-Fi.

For tourism villages that fall into the inferior quadrant (Monggas Tastura, Janggawana, Beleka, Jango, Puyung, and Sentra Tenun), digital transformation readiness indicators that must be improved are strategy and investment. These five tourism villages do not yet have a specific strategy or investment in digital transformation. Janggawana Village, for example, is a village included in this pioneer village classification that does not yet have a unique approach and investment in digital transformation. Various obstacles were faced, such as the absence of a management team focusing on digitalization to polemics in village governance. The condition is similar to what happened in Puyung village, where the main obstacle is the absence of support from the village related to the development of digitalization of tourism villages. Unlike the previous two tourism villages, Jango Tourism Village has investors who enter into management agreements within a few years with the Tourism Awareness Group (POKDARWIS).

Even so, Pokdarwis in Jango Tourism Village does not yet have a usable work plan, strategy, and target regarding digital transformation as a reference for the future. Tourism village managers have not been able to directly feel the impact of private investment through technology transfer and knowledge about digital transformation.

The research proposed models for assessing digital readiness in tourism by adopting several approaches from previous studies. Using the model, two critically important tourism villages in Indonesia were assessed. Several intriguing issues to discuss arose from the assessment results, such as the digital readiness in diverse contexts, the role of strategic and government policies, human and cultural issues, and sustainable tourism.

Digital readiness in diverse contexts refers to the level of preparedness individuals and organisations possess in effectively utilising digital technologies in various settings. This encompasses the ability to adapt and navigate digital platforms, tools, and resources to achieve desired outcomes in a wide range of environments.

The findings section highlights the challenges in diverse settings, showcasing the contrasting digital transformation readiness between DPSP Borobudur and Mandalika. The need for localised strategies tailored to each village's unique context is underscored by the disparity in infrastructure, digital literacy, and strategic planning. The contrasting approaches of Borobudur and Mandalika, with Borobudur emphasising digital payment and social media marketing while Mandalika focuses on natural and cultural attractions, highlight the importance of customised digital strategies. These findings align with prior studies that emphasize indicating the significance of tailored digital strategies in the management of tourist villages (Afrilian, 2022; Wiweka et al., 2021; Nasution et al., 2023; Supriadi et al., 2024). In particular, the lifecycle-based approach documented by Wiweka et al. (2021) in Desa Wisata Nglanggeran highlights how tourism villages in Indonesia can undergo systematic rejuvenation while embracing digital innovation.

The pivotal significance of strategic planning and policy-making cannot be overstated when it comes to shaping the digital landscape of tourism villages. According to the findings, it can be inferred that villages that possess stronger digital strategies, which are further reinforced by government policies and investments such as the establishment of Wi-Fi infrastructure, are more adept at utilising digital technologies to foster growth in the tourism sector.

The aspect is in accordance with prevailing global patterns, underscoring the significance of comprehensive approaches that encompass various actors (Vu et al., 2025). The alignment observed in this statement is consistent with the findings of Bencheva & Manevsky (2019), Ivancsóné Horváth et al. (2025), and García-Cabrera & Pérez-Tapia (2023), which collectively highlight the importance of developing integrated and context-specific strategies to ensure successful digital transformation in tourism systems. This is in line with Ivancsóné Horváth et al. (2025), who demonstrated how the digitalization of traditional angling tourism can modernize local experiences without eroding cultural authenticity. Similarly, this study shows that culturally grounded tourism villages such as Candirejo and Wanurejo are capable of adopting digital tools while maintaining local traditions and values.

Human resource development and cultural adaptation are widely recognized as critical components for organizational success in the context of digital transformation. The process involves enhancing employees' digital skills, cultural competencies, and institutional readiness to adapt to evolving technological landscapes.

Consistent with previous studies (Hien et al., 2020; Pranita, 2018; Huynh et al., 2025), the findings of this study indicate that villages prioritizing digital literacy programs and cultural integration—such as Candirejo and Wanurejo—demonstrate significantly higher levels of digital maturity compared to those lacking such initiatives. Villages that demonstrate higher digital maturity often share a common characteristic—strong local knowledge ecosystems and continuous learning efforts. This is consistent with findings from digital transformation research in small-medium enterprises, which emphasize the importance of knowledge base development (Pratama et al., 2021).

The research elucidates the dichotomous essence of digital transformation in the tourism industry, whereby it augments the quality of tourist experiences while concurrently posing obstacles such as the potential dilution of cultural authenticity. The finding presented in this statement aligns with the ongoing global discourse surrounding sustainable tourism, wherein the digital preparedness factor must be carefully weighed against the preservation of tourist attractions and the integrity of local communities, as previously emphasised as previously emphasised by Wardhani & Widodo (2020), who highlighted the role of destination innovativeness in achieving competitive advantage while navigating structural and cultural transformation.

The implications of the study's findings extend to the global domain of digital transformation in the tourism industry. Valuable lessons are provided for other emerging economies grappling with comparable challenges in the digitalization of their tourism sectors. Moreover, this research presents opportunities for future investigations into the enduring effects of digital transformation on tourism villages, specifically in relation to sustainability and the empowerment of communities.

CONCLUSION

Digital economy has been prominent issue in developing Indonesian economy that boasts its tourism and leisure reputations. This research proposed a model to assess the readiness of tourism villages in Indonesia to transform its operation towards digital economy. The implications of the study's findings extend to the global domain of digital transformation in the tourism industry. Valuable lessons are provided for other emerging economies grappling with comparable challenges in the digitalization of their tourism sectors.

Moreover, this research presents opportunities for future investigations into the enduring effects of digital transformation on tourism villages, specifically in relation to sustainability and the empowerment of communities.

However, there were some limitations that must be admitted related to the study. The methodology employed in this study, which heavily relies on qualitative assessments and incorporates only a limited number of quantitative metrics, may potentially fail to comprehensively capture the intricate nuances associated with the phenomenon of digital transformation. The research's scope, which is restricted to regions in Indonesia, constrains its applicability to different contexts. The findings pertain solely to the period of investigation and the designated areas, DPSP Borobudur and Mandalika. Given the dynamic nature of digital transformation, it is imperative to continuously reassess the readiness levels and challenges as they may evolve over time. Although the study acknowledges the significance of cultural factors in digital transformation, it falls short in delving into the intricate intricacies of social dynamics and their consequential influence on the adoption of digital technologies in tourism villages.

Author Contributions: Conceptualization, R.R., D.T., A.M., I.H., and H.M.; methodology, R.R., and H.M.; software, R.R.; validation, R.R.; formal analysis, A.M., I.H., H.M., F.D., and S.A.; investigation, R.R., Y.A., I.H., T.M., Y.S., and S.A. ;data curation, R.R., F.K., H.M., T.T., T.M., and Y.S.; writing - original draft preparation, R.R., A.M., F.K., H.M., T.T., T.M., F.D., and S.A.; writing - review and editing, R.R.; visualization, R.R., F.K., Y.S., S.A., D.T., and A.M.; supervision, R.R., D.T., A.M., and D.O.,; project administration, R.R., D.O., Y.A, F.K., S.D., A.N.R., and A.I. All authors have read and agreed to the published version of the manuscript.

Funding: This work was supported by Indonesia National Research and Innovation Agency (grant number 360/V/KS/08/2023, in 2023), Ministry of Tourism and Creative Economy of Indonesia (grant number B/HK.02.00/004/D.1.2/V/2023, in 2023), and Telkom University (grant number 120/SAM4/EB-DEK/2023, in 2023).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Verbal informed consent was obtained from all participants prior to their involvement in the study. The consent was recorded and documented in the interview transcripts as a part of the study protocol.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The authors wished to thank Telkom University, The National Research and Innovation Agency of Republic of Indonesia, and The Ministry of Tourism and Creative Economy of Indonesia for supporting this research project. This contribution presents some results from research projects with collaboration between the three institutions. The authors acknowledge to anonymous reviewers for their thoughtful suggestions and comments.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 26.04.2025 Revised: 30.07.2025 Accepted: 27.08.2025 Available online: 19.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1900-1909
DOI 10.30892/gtg.61347-1557

HOW DESTINATION SOCIAL RESPONSIBILITY IMPROVES INTERNATIONAL TOURISTS' REVISIT INTENTION: DOES DESTINATION REPUTATION MATTER?

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Citation: Vuong, B.N., Hieu, V.T., & Lien, L.T.P. (2025). How destination social responsibility improves international tourists' revisit intention: Does destination reputation matter? *Geojournal of Tourism and Geosites*, 61(3), 1900–1909. https://doi.org/10.30892/gtg.61347-1557

Abstract: This study examines the impact of destination social responsibility (DSR) on the revisit intention (RI) of international tourists, emphasizing the mediating role of relationship quality (RQ) and the moderating role of destination reputation (DR). By integrating the Stimulus–Organism–Response (SOR) framework, Social Exchange Theory, and Attribution Theory, this research develops a comprehensive conceptual model to capture the complex dynamics among these variables in the context of international tourism. Empirical testing was conducted using partial least squares structural equation modeling (PLS-SEM) on survey data collected from 732 international tourists who had previously visited Vietnam at least once. The analysis revealed several noteworthy findings. First, destination social responsibility has a significant and positive direct effect on revisit intention, demonstrating that socially responsible initiatives by destinations can encourage tourists to return. Second, RQ partially mediates the relationship between DSR and RI, indicating that elements such as trust, satisfaction, and the perceived strength of the tourist–destination relationship serve as key mechanisms through which positive perceptions of DSR are converted into behavioral intentions. Third, DR was found to significantly moderate these effects, enhancing the influence of DSR on both RQ and RI when the destination enjoys a strong reputation. This implies that destinations perceived as reputable can leverage DSR efforts more effectively to strengthen relationships with tourists and encourage repeat visits. The study offers both theoretical and practical contributions. Theoretically, it extends the understanding of how DSR operates through relational mechanisms and interacts with reputation to shape tourist behavior. Practically, the findings suggest that destination managers and policymakers should strategically invest in DSR initiatives while simultaneously managing and enhancing destination reputation. By combining socially responsible practices with reputation-building efforts, destinations can cultivate stronger relationships with tourists, increase revisit intentions, and maintain a competitive edge in the global tourism market. Overall, this research highlights the strategic importance of integrating social responsibility and reputation management to foster sustainable tourism development and long-term destination loyalty.

Keywords: destination social responsibility, relationship quality, revisit intention, destination reputation, Vietnam

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INTRODUCTION

In the context of global tourism undergoing profound transformations in the aftermath of crises such as the pandemic and increasing environmental challenges, restructuring destination development strategies toward sustainability has become a top priority for many countries. One of the key pillars to achieve this goal is the promotion of destination social responsibility (DSR). DSR is increasingly recognized as a strategic approach to building a positive destination image, enhancing tourist experiences, and maintaining long-term competitiveness (Ramli et al., 2024). However, while the role of social responsibility has been extensively studied in business contexts, particularly at the firm level through corporate social responsibility (CSR), extending this concept to the destination ecosystem level, where multiple actors co-create value, has received limited scholarly attention. Most existing studies on CSR in tourism focus primarily on individual service providers such as hotels, airlines, or restaurants, examining how CSR activities influence customer loyalty, satisfaction, or supportive behavior (Wang et al., 2024). Nevertheless, a tourism destination is not merely an aggregation of service firms, but a complex socio-environmental entity shaped by public policies, local cultures, and community engagement. As such, traditional CSR perspectives fall short of capturing the systemic nature of DSR and may overlook broader structural elements shaping tourist experiences. This gap underscores the need for research that conceptualizes DSR as a property of the entire destination, reflecting tourists' perceptions of the collective responsible behavior of all tourism stakeholders, from local governments and businesses to community residents and non-profit organizations (Fennell et al., 2025).

Another critical issue is that existing studies have yet to offer a comprehensive theoretical model explaining how DSR influences tourist behavior, particularly revisit intention, a key indicator of loyalty and destination sustainability. While several studies have confirmed that CSR can positively impact consumer behavior in service sectors, the

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psychological mechanisms by which DSR shapes tourist decisions remain underexplored. In this regard, relationship quality between tourists and the destination is measured by tourist satisfaction and tourism trust, emerges as a promising mediating factor that may explain how DSR fosters long-term tourist commitment. This aligns with the principles of relationship marketing, which focuses on the significance of building and maintaining long-term, mutually beneficial relationships with customers (Martínez García de Leaniz et al., 2025). However, there is a dearth of research that integrates these components into a unified framework, particularly in the context of international tourism. Notably, the mediating role of relationship quality between DSR and revisit intention remains empirically underdeveloped, thereby limiting our understanding of how socially responsible destinations influence repeat visitation behavior, especially in an era of intensified global competition among destinations. In addition to the mediating mechanism, this study introduces destination reputation (DR) as a moderating variable to further explain the boundary conditions of the DSR-behavioral intention relationship. Reputation is a crucial intangible asset for destinations, shaping tourists' perceptions, emotions, and decision-making processes (Hassan & Soliman, 2021). However, the interaction between DR and DSR in shaping relationship quality and revisit intention has yet to be clearly defined. A critical question arises: Can a destination with a high DSR but a poor reputation generates the same level of satisfaction and loyalty as one with both a high DSR and a strong reputation? Addressing this gap is essential for advancing theoretical models of tourist behavior. From an academic standpoint, this study contributes to the tourism literature by broadening the scope of DSR beyond the firm level and toward a systemic, destination-level construct.

This study also heightens the mediating and moderating mechanisms that explain how DSR influences revisit intention, addressing theoretical voids in current behavioral tourism models. Furthermore, the simultaneous application of social exchange theory, stimulus–organism–response theory, and attribution theory theories enhances the explanatory power of the proposed framework and strengthens its relevance for future empirical investigations. Finally, this research will provide destination policymakers, managers, and tourism stakeholders with actionable insights into how DSR and DR can be leveraged to build lasting relationships with international tourists. Managers can craft targeted strategies that enhance destination reputation and foster tourist loyalty. This is especially pertinent for countries like Vietnam, which are striving to position themselves as sustainable and socially responsible destinations in the global tourism landscape.

THEORETICAL BACKGROUND

This study is based on three classic theories: social exchange theory (SET), stimulus–organism–response (SOR) framework, and attribution theory (AT). The SET theory was developed by Blau (1964), a valuable insight into understanding tourist behavior (Ahmad et al., 2023). It offers a robust theoretical framework to explain the interactions between tourists and the entities they encounter at their destinations. According to this theory, social relationships are maintained based on the benefits and costs perceived by each party during their interactions. If tourists believe they are receiving greater value than what they give in return, such as feeling respected, having a positive experience, or engaging in socially responsible practices, they are more likely to maintain these relationships through positive behaviors, such as returning to the destination or recommending it to others. Additionally, this study incorporates the SOR model proposed by Mehrabian & Russell (1974) as a key theoretical foundation for explaining the psychological processes that occur in visitors when they encounter external stimuli. In this model, the DSR stimulus elicits emotional and cognitive responses in tourists. These responses are reflected by internal states (organisms), such as satisfaction and trust in a destination, two critical components of the relationship between tourists and the places they visit. Ultimately, revisit intention acts as the response, demonstrating the conclusion of the information and emotion processing. Attribution theory suggests that people often interpret others' behaviors by attributing them to intrinsic or extrinsic motives (Martinko et al., 2007).

In the context of tourism, destination reputation (DR) acts as a moderating factor that influences how tourists interpret the motives behind DSR. When a destination has a strong reputation, tourists are more likely to view DSR initiatives as driven by intrinsic motivations, such as genuine concern for the community or a commitment to ethical practices. This perception enhances the perceived sincerity of DSR efforts, which in turn strengthens relationship quality and the likelihood of return visits. Conversely, a weak destination reputation may undermine the credibility of DSR initiatives.

HYPOTHESIS DEVELOPMENT

1. Destination social responsibility

Destination social responsibility is a concept that has not yet achieved full consensus within the academic community, and a universally accepted definition remains elusive. Scholars often approach DSR by adapting the well-established concept of CSR to the complex dynamics of the tourism industry. CSR, which emerged in the 1930s and gained significant traction in business administration, was classically defined by Bowen (1953) as the responsibility of businesses to implement policies that do not harm social interests. However, when CSR is applied to tourism destinations, researchers face a unique set of challenges. The model, originally designed for individual entities, struggles to capture the multidimensional characteristics and complex interactions among stakeholders in these locations (Agapito et al., 2023).

While CSR primarily focuses on the socially responsible behaviors of individual businesses such as hotels, travel agencies, or restaurants, DSR demands a broader approach. It requires the responsible involvement of not only businesses but also local governments, social organizations, resident communities, tourists, and other relevant groups in sustainably managing and developing destinations. As an evolved form of CSR, DSR is tailored to the collective dynamics of tourism destinations. Su et al. (2017) introduced the DSR concept, emphasizing the collective responsibility of all stakeholders at a destination. This collective responsibility aims to minimize negative environmental, economic, and social impacts while maximizing the value of the destination for visitors. DSR goes beyond legal obligations or mere profit motives, reflecting a commitment to protect common interests and focusing on community development and

environmental conservation. Such initiatives can include sustainable development policies, responsible tourism planning, and creating educational and culturally enriching tourism experiences. These efforts are communicated to visitors through tourism services, the attitudes of local residents, and the overall atmosphere at the destination.

Despite variations in scope and composition, most definitions of DSR encompass the three pillars of sustainable development: economic, social, and environmental. However, DSR is not a one-dimensional concept. It represents a complex, multidimensional approach to sustainable tourism that transcends the traditional metrics of CSR. A prevailing trend in academic literature recognizes DSR as a multidimensional concept, highlighting the need for more nuanced and context-sensitive measurement approaches. Yu & Hwang (2019) built upon well-known CSR model of Carroll (1979), which includes economic, legal, ethical, and philanthropic elements, to address this gap. They developed an international assessment scale for DSR that operates as a second-order construct with five dimensions: (1) economic responsibility, (2) legal responsibility, (3) ethical responsibility, (4) philanthropic responsibility, and (5) environmental responsibility. This scale not only reflects diverse social expectations but is also tailored to the specific characteristics of the tourism industry.

2. Revisit intention

Revisit intention refers to a person's willingness or readiness to return to the same tourism destination. It is widely recognized as one of the most accurate predictors of actual revisit behavior, such as purchasing a travel package to the same location (Han & Kim, 2010). In this context, DSR plays a significant role. DSR pertains to the ethical and sustainable practices adopted by a tourism destination to minimize negative impacts while maximizing positive contributions to the local community and environment. These practices can greatly influence tourists' intentions to revisit a destination.

Tourists' evaluations of DSR affect their perceptions of a destination in several ways (Yu & Hwang, 2019). For instance, tourists may prioritize their health and well-being. Destinations that are perceived to lack social or environmental responsibility such as those associated with pollution, high crime rates, disease outbreaks, or excessive noise, are likely to be avoided. Conversely, destinations that demonstrate high social responsibility are viewed more favorably, which increases the likelihood of tourists returning. Additionally, a strong commitment to DSR indicates that natural, historical, and cultural attractions are well-preserved. These authentic experiences not only allow tourists to engage with elements they may not encounter in their daily lives but also evoke positive emotional responses, such as inspiration and uplift, toward the destination, thereby reinforcing their intention to revisit. From a theoretical perspective, the relationship between DSR and revisit intention (RI) can be effectively explained using the SET theory (Ahmad et al., 2023). This theory posits that individuals, including tourists, are inclined to engage in and maintain social relationships based on reciprocity, where each party evaluates the benefits and costs derived from their interactions. A relationship is likely to persist if individuals perceive that the benefits outweigh the costs. In the context of tourism, SET provides valuable insights into how and why tourists may develop loyalty-related behaviors, such as revisit intention, after experiencing a socially responsible destination. When a destination engages in responsible practices such as environmental protection, community support, public safety, and cultural heritage preservation, tourists receive not only functional value (like quality services and clean surroundings that contribute to their comfort and enjoyment) but also emotional and ethical value, including a sense of respect, alignment with social values, or pride in choosing a sustainable and responsible destination. According to SET, these perceived benefits represent the "value received" in the exchange relationship. For tourists, one of the most evident and tangible forms of "reciprocation" is their intention to return to the destination in the future and recommend it to others. In this light, the act of revisiting may not only reflect a personal preference but also serve as a demonstration of gratitude for the meaningful and responsible experience the destination has provided, in line with SET's core principle of positive social exchange. Furthermore, empirical evidence from Hassan & Soliman (2021) confirms the positive association between DSR and tourists' revisit intention, reinforcing the theoretical assumption. Thus, the following hypothesis is proposed:

H_1: Destination social responsibility positively influences revisit intention of international tourists.

3. Relationship quality

In the realm of relationship marketing, relationship quality is a key concept that reflects the sustainability and effectiveness of the bond between customers and a brand or organization. Deb et al. (2025) defined relationship quality as an overall assessment of the strength and value of a relationship formed through accumulated interactions over time. It is typically viewed as a second-order construct, often measured through essential components like satisfaction and trust, which are particularly significant in tourism destinations (Alves et al., 2019; Giao et al., 2021). Destination satisfaction generally indicates how well a tourist's experiences align with their pre-trip expectations. Destination trust refers to the belief that the destination will fulfill its promises, especially those communicated through marketing and promotional efforts (Li & Yang, 2022). In recent years, destination management organizations have increasingly adopted DSR practices. These initiatives, which include reducing carbon emissions, preserving natural resources, and adhering to green tourism standards, not only contribute to the long-term sustainability of destinations but also enhance tourists' experiences. The SOR model of Mehrabian & Russell (1974) suggested that external stimuli like DSR can impact tourists' internal states, leading to increased levels of satisfaction and trust, both fundamental elements of relationship quality. Furthermore, from the perspective of the SET theory, tourists are more likely to develop positive attitudes and stronger trust when they perceive that a destination engages in DSR practices in a responsible and genuine manner, focusing on the public good rather than merely commercial interests. Specifically, DSR initiatives aimed at benefiting the wider community such as protecting local residents, preserving cultural heritage, and safeguarding ecosystems, play a crucial role in creating a sense of psychological safety, fostering emotional attachment, and strengthening the connection between tourists and the destination. This relationship is a vital aspect of the tourist experience and is essential for the sustainability of the bond. Therefore, Hypothesis H_2 is suggested:

H_2: Destination social responsibility positively influences relationship quality between tourists and the destination.

Tourists often choose their destinations based on their perceptions of attributes that they believe will best fulfill their needs and expectations (Stylos et al., 2017). According to Seetanah et al. (2020), a tourist's revisit intention in the future is significantly influenced by how well the destination's attributes align with their actual needs. This concept of perceived fit is vital in shaping revisit intention. When visitors have experiences that meet or surpass their expectations, they are more likely to form a positive evaluation of the destination, fostering a compelling motivation to return. Robust empirical studies have demonstrated that satisfaction and trust, two fundamental components of relationship quality, play a crucial role in driving revisit intention. In this context, relationship quality refers to the overall satisfaction and trust a tourist holds towards a destination. Torabi et al. (2022) revealed that a higher level of satisfaction dramatically increases the likelihood of tourists returning to the same destination. Trust, in particular, stands as a critical factor in mitigating perceived risk and uncertainty, especially when information is incomplete or unreliable (Su et al., 2017). When tourists perceive that a destination's information, services, or promises are credible, they are imbued with a sense of security and confidence, propelling them toward future visits. Conversely, when trust erodes, due to misleading promotions, inconsistent service quality, or disappointing experiences, tourists may hesitate and significantly reduce their likelihood of returning. This observation is consistent with the principles of the SET, which posits that trust emerges when one party in a relationship is perceived as acting with integrity and reliability, while meeting mutual expectations. Misleading promotions in particular can drastically undermine trust. When such perceptions take root, individuals are more inclined to maintain their relationship with the destination, leading to positive reciprocal behavior in the tourism context, this translates to a greater likelihood of return visits. To summarize, tourists who perceive a high level of relationship quality evidenced through satisfaction and trust are far more likely to develop emotional attachment and favorable attitudes toward a destination. This, in turn, dramatically strengthens their revisit intention. Thus, this study proposes the following hypothesis:

H_3: Relationship quality positively influences international tourists' revisit intention.

When tourists perceive that authentic intentions and genuine goodwill drive a destination's social responsibility initiatives, they are significantly more likely to cultivate trust and satisfaction toward that destination. These positive emotional responses can lead to enhanced attitudes and supportive behaviors, particularly an increased intention to revisit. When tourists perceive that authentic intentions and genuine goodwill drive a destination's social responsibility initiatives, they are significantly more likely to cultivate trust and satisfaction toward that destination. These positive emotional responses can lead to enhanced attitudes and supportive behaviors, particularly an increased intention to revisit. Acknowledgment of responsible practices at a destination not only enhances tourists' perception of value but also fosters long-lasting loyalty. To elucidate this behavioral process, the current study employs the SOR framework (Uddin et al., 2025). This framework illustrates that external stimulus, specifically, DSR can profoundly influence an individual's internal psychological state (the organism), including factors such as satisfaction and trust. These internal states, in turn, drive behavioral responses, particularly revisit intention. In alignment with this theoretical model, relationship quality captured through tourist satisfaction and trust serves as a critical mediating variable that clarifies how perceptions of DSR translate into behavioral outcomes. In essence, DSR impacts revisit intention indirectly by enhancing the depth of the relationship tourists share with the destination. When DSR is perceived positively, it not only fortifies tourists' emotional attachment and confidence in the destination but also catalyzes their desire to return. This study proposes the following hypothesis:

H_4: Relationship quality mediates the positive relationship between destination social responsibility and revisit intention of international tourists.

4. Destination reputation

Destination reputation is shaped by the collective evaluations, perceptions, and experiences of key stakeholders, including tourists, local residents, businesses, and destination management organizations (Yamashita & Takata, 2020). Unlike the more subjective and individualized concept of destination image, a reputation reflects a stable and unified social judgment. It embodies a shared belief in the trustworthiness and credibility of a destination. As noted by Darwish & Burns (2019), destinations with robust reputations are viewed as more reliable, consistently offering high-quality service and a compelling reason for tourists to return, elements that profoundly influence initial perceptions and expectations.

Drawing on attribution theory, individuals often assess behavior by attributing it to intrinsic or extrinsic motives. When a destination boasts a positive reputation, its socially responsible actions (DSR) are more likely to be perceived by tourists as stemming from genuine intrinsic motivations such as a sincere commitment to societal and environmental well-being rather than mere marketing strategies. This constructive perception cultivates deeper trust and satisfaction towards the destination. Conversely, a weak or ambiguous reputation can breed skepticism among tourists, leading them to view DSR efforts as superficial or driven by external incentives, thereby undermining their potential impact on relationship quality. In this context, destination reputation functions not only as a critical perceptual factor but also as a vital moderator that amplifies the relationship between DSR and relationship quality (i.e., satisfaction and trust). The benefits of DSR on relationship quality are likely to be significantly enhanced when a destination enjoys a strong reputation, as tourists are more inclined to recognize these responsible actions as authentic and credible. So, the following hypothesis is posited:

H_5: Destination reputation positively moderates the relationship between DSR and RQ.

Attribution theory is a key concept in consumer behavior, suggesting that individuals evaluate the actions of others based on whether they attribute those actions to intrinsic (internal) or extrinsic (external) motives. In marketing, this theory is especially important when examining the impact of brand reputation. A brand's reputation significantly affects how consumers interpret socially responsible actions (Praprom & Laipaporn, 2025). When a company with a poor reputation engages in corporate social responsibility activities, consumers often question the authenticity of these

efforts, viewing them as self-serving attempts to enhance the brand's image. On the other hand, a positive reputation leads consumers to perceive these actions as genuine and motivated by intrinsic values, fostering more favorable attitudes toward the brand. Translating this concept to the tourism sector, destination reputation serves as a lens through which tourists assess destination social responsibility. A destination with a strong reputation is more likely to be seen as trustworthy, and its DSR initiatives are viewed as authentic commitments rather than mere promotional strategies.

This positive perception enhances tourists' trust and emotional connection, ultimately increasing their revisit intention. Conversely, if a destination has a weak or unclear reputation, tourists may question the sincerity of its DSR efforts. This skepticism can diminish or neutralize the positive effects of DSR on revisit intention. Consequently, destination reputation acts as a moderator that influences the strength of the relationship between DSR and tourists' behavioral responses. It is clear that destination reputation shapes how tourists interpret the motives behind DSR, which in turn affects their actions. A strong reputation increases the likelihood that tourists will view DSR as authentic, thereby amplifying its positive impact on revisit intention. Therefore, the following hypothesis is proposed (Figure 1):

H_6: Destination reputation positively moderates the relationship between DSR and RI.

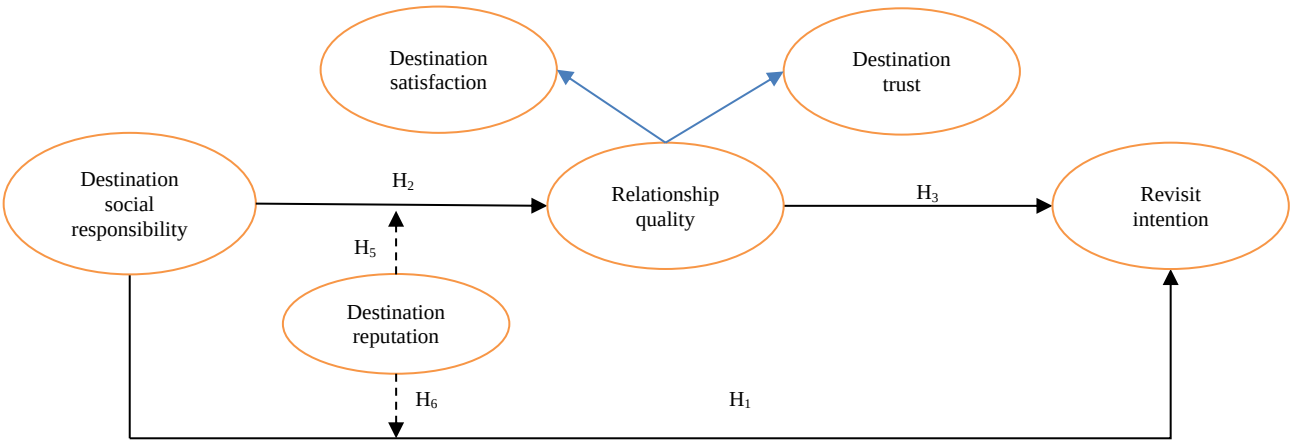

Figure 1. The conceptual model

RESEARCH METHODS

In this study, measurement scales were selected and adapted based on previously validated research from reputable sources. Referencing these prior studies ensures theoretical validity and allows for comparability of findings across similar research in the tourism field. However, since these scales were originally developed in different cultural and national contexts, it was necessary to revise the wording and confirm their contextual appropriateness before launching the main survey. Following the pretest phase, the study proceeded to the main quantitative survey, targeting international tourists who had visited Vietnam at least once. This sampling criterion ensured that respondents had firsthand experience evaluating key constructs such as destination social responsibility, relationship quality, destination reputation, and revisit intention. The survey was conducted between May and July 2024 through direct, on-site distribution of questionnaires in key tourist destinations, including Ho Chi Minh City, Hanoi, Da Nang, and Hoi An. A total of 770 questionnaires were distributed, with all being fully returned during this period. Once data collection was completed, a screening process was implemented to assess data quality. A total of 38 questionnaires were excluded due to invalid responses, such as respondents who had never been to Vietnam or those who selected the same response for all items, resulting in 732 usable responses. Descriptive statistics include gender, age, and marital status, are summarized and presented in Table 1.

Table 1. Demographic statistics

N=732		**Frequence**	**Percent**
Gender	Male	448	61.2
	Female	284	38.8
Age	Under 25 years old	164	22.4
	25 - 34 years old	250	34.2
	Above 34 years old	318	43.4
Marital status	Married	433	59.2
	Single	289	39.5
	Other	10	1.4

RESULTS

The measurement model was rigorously evaluated through an examination of both reliability and validity indicators, as illustrated in Figure 2. To assess reliability, Cronbach's alpha (CA) and Composite Reliability (CR) were utilized as key metrics. According to the recommendation by Hair et al. (2019), a scale is considered to have acceptable internal consistency if both CA and CR values exceed the threshold of 0.70. In this study, the minimum CA and CR values across all constructs were 0.733 and 0.878, respectively (as presented in Table 2), confirming that the measurement instruments exhibit good reliability. In terms of convergent validity, the outer loading of each observed variable was examined.

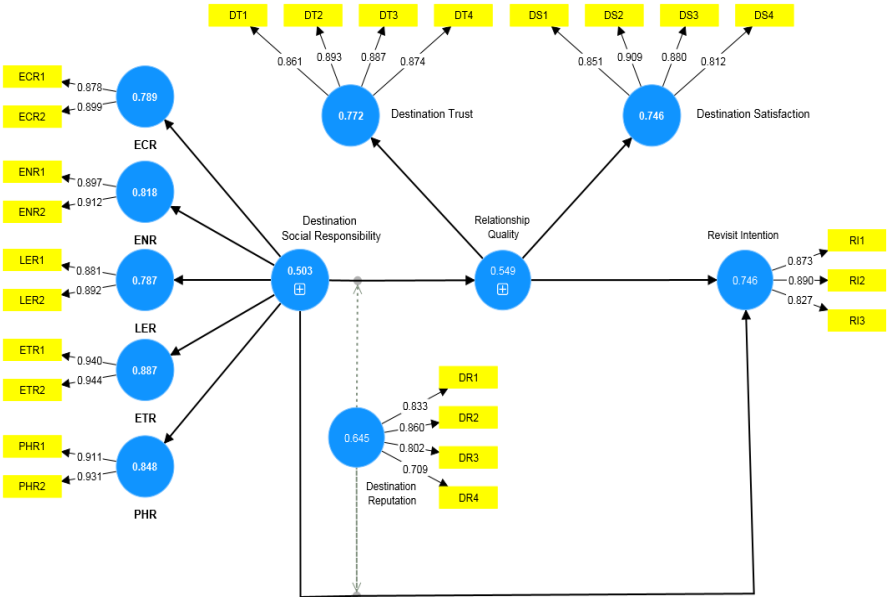

Figure 2. The measurement model

Following the criteria proposed by Hair et al. (2019), a factor loading greater than 0.50 indicates that the indicator reliably measures the associated latent construct. The results from Figure 2 and Table 2 showed that all item loadings surpass this benchmark, reinforcing the adequacy of the measurement model. Additionally, average variance extracted (AVE) was used as another indicator of convergent validity. Hair et al. (2019) also suggested that an AVE value above 0.50 is required to confirm that the majority of variance in the indicators is captured by the construct. Table 3 revealed that AVE values range from 0.503 to 0.848, supporting the model's convergent validity.

Table 2. The reliability and validity of constructs

Constructs	Coded	Items	CA	CR	AVE	MOL
Destination social responsibility	DSR	10	0.890	0.910	0.503	0.662
Economic responsibility	ECR	2	0.733	0.882	0.789	0.878
Environmental responsibility	ENR	2	0.778	0.900	0.818	0.897
Legal responsibility	LER	2	0.729	0.881	0.787	0.881
Ethical responsibility	ETR	2	0.873	0.940	0.887	0.940
Philanthropic responsibility	PHR	2	0.821	0.918	0.848	0.911
Destination reputation	DR	4	0.814	0.878	0.645	0.709
Relationship quality	RQ	8	0.883	0.907	0.549	0.697
Destination satisfaction	DS	4	0.886	0.922	0.746	0.812
Destination trust	DT	4	0.902	0.931	0.772	0.861
Revisit intention	RI	3	0.829	0.898	0.746	0.827
Notes: CA = Cronbach's Alpha; CR = Composite reliability; MOL = Minimum Outer Loading; AVE = Average Variance Extracted						

Table 3. Fornell-Larcker criterion

Constructs	DSR	DR	RQ	RI
DSR	(0.709)			
DR	0.813	(0.803)		
RQ	0.591	0.448	(0.741)	
RI	0.557	0.450	0.620	(0.864)
Notes: The values in parentheses represent the square roots of the AVEs for the latent constructs				

Table 4. Variance inflation factor of constructs

Construct	DS	DT	ECR	ENR	ETR	LER	PHR	RQ	RI
DSR			1.000	1.000	1.000	1.000	1.000	2.944	2.648
DR								2.983	2.991
RQ	1.000	1.000							1.584
DSR*DR								1.036	1.063

Discriminant validity was assessed using the Fornell-Larcker criterion, which compares the square root of each construct's AVE with the correlations between that construct and others. As demonstrated in Table 3, the square root of the AVE for RQ was 0.741, exceeding its highest inter-construct correlation (e.g., 0.591, 0.448, 0.620). This indicated that each construct is empirically distinct and measures a unique concept. Finally, to detect multicollinearity issues, the variance inflation factor (VIF) was examined. Hair et al. (2019) recommended that VIF values should be below 5 to avoid concerns of multicollinearity. Table 4 showed that all VIF values fall within an acceptable range, with the maximum being 2.983,

confirming that multicollinearity is not a problem in the model. The structural model evaluation was conducted to examine the hypothesized relationships among key constructs, with the results presented in Figure 3 and detailed in Table 5.

Table 5. Results of hypothesis testing

Hypothesis	Relationship			β	P-values	Conclusion
	DSR	➞	ECR	0.832	0.000	
	DSR	➞	ENR	0.779	0.000	
	DSR	➞	LER	0.811	0.000	
	DSR	➞	ETR	0.717	0.000	
	DSR	➞	PHR	0.768	0.000	
	RQ	➞	DS	0.852	0.000	
	RQ	➞	DT	0.850	0.000	
H_1	DSR	➞	RI	0.277	0.000	Accepted
H_2	DSR	➞	RQ	0.667	0.000	Accepted
H_3	RQ	➞	RI	0.428	0.000	Accepted
H_5	DSR*DR	➞	RQ	0.115	0.000	Accepted
H_6	DSR*DR	➞	RI	0.095	0.000	Accepted

The analysis reports both the standardized path coefficients and associated p-values, providing a comprehensive view of the model's predictive validity and explanatory power. The major findings are discussed in the following sections:

Hypotheses H_1 and H_2: The empirical results provide strong support for the first three hypotheses. Specifically, destination social responsibility was found to have a significant and positive impact on revisiting intention, and relationship quality. The standardized regression coefficients for these relationships are 0.277, and 0.667, respectively, with all corresponding p-values falling below the 0.05 threshold for statistical significance. These results underscore the importance of DSR as a foundational driver of tourists' revisit intention and relationship quality. Thus, H_1 and H_2 were supported.

Hypotheses H_3: The study further confirms that RQ act as significant antecedents of RI. The path from RQ to RI yielded a coefficient of 0.428. This relationship was statistically significant with p-values of 0.000, indicating a very strong level of support. These findings are consistent with prior tourism and marketing literature, which suggests that relationship quality (destination satisfaction and destination trust) is a critical psychological mechanism that translate perceptions into behavioral outcomes. Therefore, H_3 was supported.

Hypotheses H_4: The mediating role of RQ in the relationship between DSR and RI were examined through indirect effect analysis. As presented in Table 6, the indirect effect of DSR on RI via RQ was found to be 0.285, and statistically significant at the 0.00 level. Importantly, the direct effect of DSR on RI remained significant, suggesting that RQ function as partial mediators rather than full mediators. These findings provide nuanced insight into how destination social responsibility influences revisiting intention, not only directly but also indirectly through enhancing relationship quality. So, H_4 was supported. Hypotheses H_5 and H_6: The study also explored the moderating role of destination reputation in the relationships between DSR and RQ as well as DSR and RI. Interaction terms for each of these three relationships were analyzed, and the results demonstrated positive and statistically significant moderating effects with coefficients of 0.115, and 0.095, respectively. These effects were significant at the 5% level ($p < 0.05$) (Table 5), they provided empirical evidence that DR strengthens the impact of DSR on other constructs.

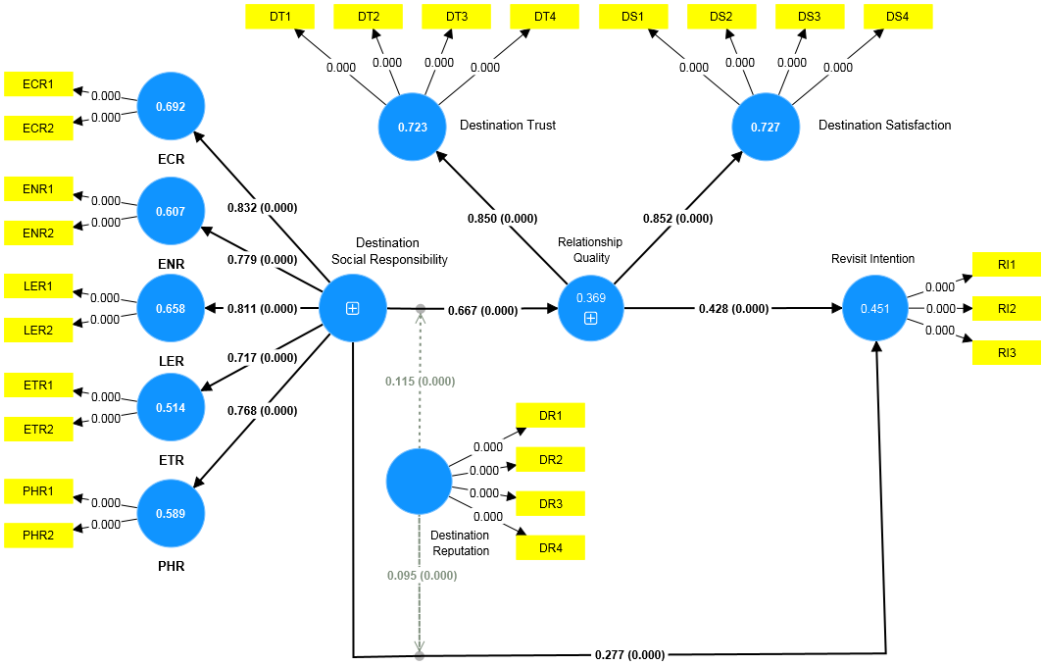

Figure 3. The structural model

Table 6. The mediation role of relationship quality

Hypothesis	Relationship	Direct effect		Indirect effect		Types of mediation effect	Conclusion
		β	Sig	β	Sig		
H_4	DSR → RQ → RI	0.277	0.000	0.285	0.000	Partial meditation	Accepted

These findings suggest that the positive influence of DSR on tourist outcomes is amplified when the destination is perceived as having a strong and favorable reputation (Figure 4). Therefore, H_5 and H_6 were supported.

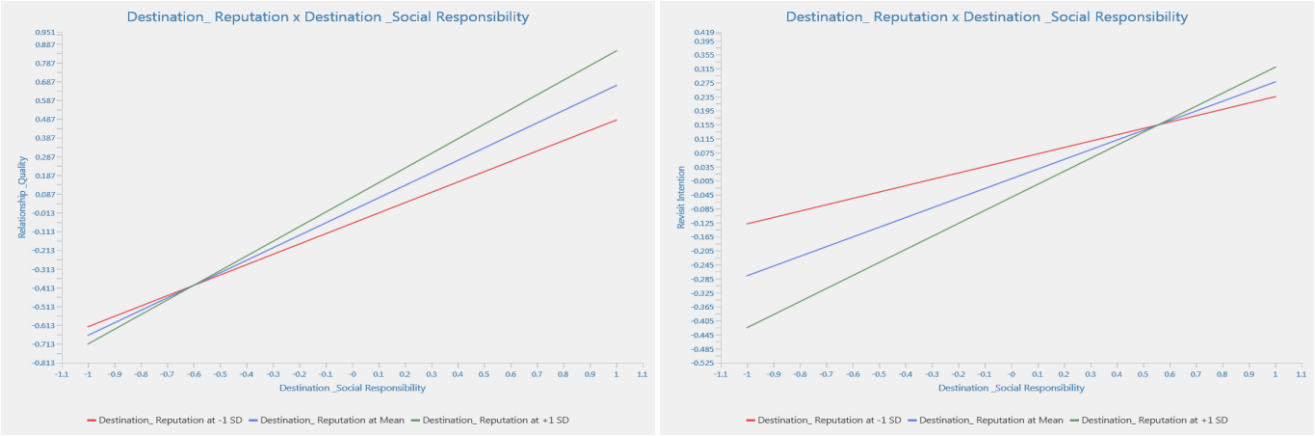

Figure 4. The moderating role of destination reputation

The explanatory power of the model was further assessed through the coefficient of determination (R^2) for each dependent variable. The R^2 value for RI was found to be 0.451, indicating that approximately 45.1% of the variance in tourists' intention to revisit is explained by DSR and RQ combined. Additionally, DSR accounted for 36.9% of the variance in RQ. According to benchmarks established by Hair et al. (2019), R^2 values of 0.02, 0.13, and 0.26 represent small, medium, and large effect sizes, respectively, within the behavioral sciences. Based on this guideline, the R^2 values observed in this study reflect a substantial effect size, supporting the model's practical relevance and its robustness in predicting consumer behavior in the tourism context.

THEORETICAL CONTRIBUTIONS

This study aims to explore how destination social responsibility influences international tourists' revisit intention. Drawing on three foundational theories: SOR model, SET theory, and attribution theory. This research proposes an integrated conceptual model that explains the psychological and behavioral mechanisms linking DSR to RQ and RI.

First, this research expanded the SOR framework by modeling tourist decision-making as a three-phase process: pre-visit, during-visit, and post-visit. Within this framework, DSR is conceptualized as a stimulus (S) during the pre-visit stage, relationship quality, operationalized through satisfaction and trust, represents the organism (O) during the visit, and revisit intention serves as the behavioral response (R) post-visit. This approach clarifies the temporal sequence of behavioral formation and reinforces the applicability of the SOR model in international tourism contexts. Second, the study contributes to tourism literature by validating DSR as a key antecedent of revisit intention, thereby extending the application of the SET theory to destination marketing. According to SET, when tourists perceive that a destination engages in socially responsible behavior such as environmental protection or community support, they are inclined to reciprocate by forming positive behavioral intentions, such as returning to or recommending the destination. This study provides empirical evidence for the direct effect of DSR on revisit intention, a connection that previous studies have often failed to establish.

Third, the research enhances theoretical understanding by integrating attribution theory into the model. Attribution theory posits that individuals evaluate behaviors based on perceived underlying motives, either intrinsic or extrinsic. DR serves as a perceptual filter through which tourists interpret the motivations behind DSR. When a destination has a strong reputation, tourists are more likely to attribute DSR to intrinsic motives, such as authenticity or genuine concern, which enhances their satisfaction and trust. In contrast, weak or unclear reputations may lead tourists to view DSR efforts as promotional or insincere, thereby reducing their effectiveness. This attributional process supports the study's moderating hypothesis and introduces a novel theoretical contribution to destination research. Fourth, regarding measurement, the study proposes a second-order structure for DSR, reflecting its multidimensional nature. While previous research has often treated DSR as a unidimensional construct, this study draws from the CSR model of Carroll (1979) and evaluates DSR across five dimensions: economic, legal, ethical, philanthropic, and environmental responsibilities. The results confirmed high reliability, convergent validity, and discriminant validity, thereby providing a more rigorous and comprehensive measurement framework for DSR in tourism studies. Fifth, although relationship quality has long been recognized as important predictors of consumer behavior in marketing, their mediating role in tourism, specifically in the relationship between DSR and revisit intention has been largely overlooked. This study addressed that gap by confirming that relationship quality acts as a crucial mediator, reinforcing the idea that perceived social responsibility fosters emotional bonds and behavioral commitment toward destinations. Sixth, the study introduces destination reputation as a novel

moderator in tourism literature. The interaction analysis reveals that the positive effects of DSR on relationship quality and revisit intention are amplified when destination reputation is high. These finding positions destination reputation not merely as an independent variable but as a contextual factor that shapes how tourists interpret and respond to DSR efforts. To the best of the author's knowledge, this is the first study to empirically validate the moderating role of DR in this context, enriching our understanding of interactive effects in responsible tourism research. Finally, while most prior studies have focused on domestic tourists, this research addresses an empirical gap by targeting international tourists visiting Vietnam. By collecting direct responses from international travelers, the study enhances its external validity and contributes valuable cross-cultural insights to the broader literature on sustainable tourism and tourist behavior in emerging destinations.

MANAGERIAL IMPLICATIONS

The findings of this study present several important managerial implications for destination management organizations and stakeholders in the tourism industry, especially in light of increasing competition among destinations and the growing need to foster tourist loyalty. First, the results indicate that DSR significantly influences revisit intention by enhancing the relationship quality between tourists and the destination. When tourists perceive that a destination actively engages in socially responsible initiatives such as environmental conservation, heritage preservation, community support, and ethical business practices, they are more likely to feel a connection to the destination, trust it, and be satisfied with their experiences. These positive evaluations often lead to stronger intentions to revisit and typically result in favorable word-of-mouth recommendations or online reviews. Therefore, stakeholders in the destination including local authorities, tourism businesses, tour operators, accommodations, and host communities should view DSR not just as an ethical obligation, but as a strategic asset that enhances the long-term competitiveness and sustainability of the destination.

DSR initiatives should be developed systematically, consistently, and integrated into the destination's long-term strategic planning. These initiatives could involve carbon-reduction programs, environmental awareness campaigns, volunteer opportunities for tourists, fair and ethical business practices, and partnerships with local communities. Importantly, effectively communicating these actions and ensuring transparency are vital for helping tourists recognize the destination's genuine commitment to social responsibility, rather than perceiving it as a mere marketing tactic.

Furthermore, the study underscores that relationship quality, encompassing satisfaction and trust, is a key predictor of tourists' behavioral intention. Therefore, destination stakeholders should focus on creating emotionally rich and meaningful touchpoints that foster empathy and a sense of belonging among tourists. This can be achieved through personalized services, authentic cultural experiences, opportunities for interaction with locals, and immersive storytelling. Additionally, systematically monitoring satisfaction and trust levels via regular surveys or digital feedback platforms is essential for assessing service effectiveness and refining destination strategies over time. Another significant insight is the moderating role of destination reputation in enhancing the impact of DSR initiatives. A well-reputed destination is more likely to be viewed as genuinely motivated by its responsible actions, significantly boosting relationship quality and revisit intention. In contrast, destinations with weak or ambiguous reputations risk having their DSR efforts perceived as inauthentic or purely promotional. Therefore, building and managing reputation should be a core strategic priority within DSR initiatives. Destination managers should identify their core values and unique attributes, develop a compelling brand story, and implement consistent branding strategies to establish clear positioning in the minds of international tourists.

8. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

While this study provides several valuable theoretical and practical insights, it is important to acknowledge certain limitations and suggest areas for future research to improve the generalizability and depth of the findings. First, the current research utilized a convenience sample of international tourists visiting selected destinations in Vietnam. This sampling method may restrict the generalizability of the results to the broader population of international travelers. Therefore, future studies should consider employing probability sampling techniques such as stratified or systematic random sampling to ensure greater representativeness. Second, although DSR is theoretically acknowledged as a multidimensional construct, this study treated it as a unidimensional higher-order variable for the sake of parsimony and analytical clarity. While this simplification aids in exploring the relationship between DSR and other latent constructs (such as relationship quality and revisit intention), it may overlook the distinct effects of individual DSR dimensions. Future research should consider breaking down DSR into its core components: economic, legal, ethical, philanthropic, and environmental responsibilities and examine their individual and differential impacts on tourist behavior. It would also be beneficial to investigate whether these dimensions have unique mediating or moderating roles within extended theoretical models. In summary, addressing these limitations in future research will not only enhance the scientific rigor of the findings but will also contribute richer empirical evidence to the expanding literature on tourist behavior and destination social responsibility, particularly in international and cross-cultural contexts.

Author Contributions: Conceptualization, B.N.V. and V.T.H.; methodology, B.N.V. and V.T.H.; software, B.N.V.; validation, V.T.H. and L.T.P.L.; formal analysis, B.N.V.; investigation, V.T.H. and L.T.P.L.; data curation, B.N.V., V.T.H. and L.T.P.L.; writing - original draft preparation, B.N.V., V.T.H. and L.T.P.L.; writing - review and editing, B.N.V., V.T.H. and L.T.P.L.; visualization, V.T.H. and L.T.P.L.; supervision, B.N.V.; project administration, B.N.V. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 27.04.2025 Revised: 31.07.2025 Accepted: 28.08.2025 Available online: 22.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1910-1921
DOI 10.30892/gtg.61348-1558

SERVICE QUALITY OR SUSTAINABILITY? DETERMINING PRIORITIES FOR HOTEL BUSINESSES THROUGH BWM ANALYSIS

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Citation: Ülkü, A. (2025). Service quality or sustainability? Determining priorities for hotel businesses through BWM analysis. *Geojournal of Tourism and Geosites*, 61(3), 1910–1921. https://doi.org/10.30892/gtg.61348-1558

Abstract: Service quality and sustainability are not only strategically important for achieving competitive advantage in the hotel industry but also serve as critical indicators of long-term resilience, customer loyalty, and multi-dimensional sustainability encompassing environmental, social, cultural, and economic responsibilities in a rapidly evolving global tourism market. Service quality practices that focus on immediate customer satisfaction- such as rapid service or high-consumption amenities - can conflict with sustainability goals. These goals require long-term planning and efficient resource use. This creates a strategic tension in hospitality management. While academic interest in these two concepts has increased in recent years, the interaction between them and how different stakeholder groups prioritize these concepts have not been sufficiently investigated. In this context, the present study aims to determine the prioritization of service quality and sustainability dimensions among different stakeholder groups (hotel managers, academics and institution representatives) in the hotel industry. To this end, we used the Best Worst Method (BWM), one of the Multi-Criteria Decision Making (MCDM) techniques known for its simplicity and consistency. The data were collected through interviews with a total of 18 experts. The findings revealed that, across all stakeholder groups, service quality dimensions were prioritized over sustainability dimensions. Hotel managers emphasized operational efficiency and environmental sustainability. Furthermore, while academicians focused on reliability and adopted a more balanced view of sustainability, institution representatives prioritized tangible aspects of service quality. Social and cultural sustainability dimensions were consistently assigned lower importance by hotel managers and institution representatives. The priority given to service quality highlights the short-term and performance-oriented mentality in the hotel industry. The limited emphasis placed on social and cultural sustainability, particularly among practitioners, suggests that these dimensions are still not sufficiently considered in strategic decision-making processes. Taken together, the results of the present study highlight the varying evaluation patterns among stakeholder groups and underscore the need for a more holistic perspective on managing service quality and sustainability in hotel businesses.

Keywords: Service quality, sustainability, hotel industry, multi-criteria decision making, Best Worst Method (BWM)

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INTRODUCTION

Service quality, one of the fundamental criteria of the tourism industry, was consistently reported to have a strong impact on customer loyalty and satisfaction (Parasuraman et al., 1988; Ladhari, 2009). Due to responsibilities to the environment and society, as well as customers' changing expectations and demands, hotel businesses face various service quality management challenges (Munawaroh et al., 2024; Shyju et al., 2021). To address these complexities, the SERVQUAL model is widely adopted as a robust framework for evaluating the dimensions of service quality (Smith, 1995; Bhattacharya et al., 2023). In an environment where interest in service quality is increasing, the integration of sustainability into business strategies has become increasingly important; this approach not only enables tourism enterprises to fulfill their environmental responsibilities, but also serves as an effective means of gaining competitive advantage (Lichtenthaler, 2022; Michailidou et al., 2015). Overall, while sustainability offers strategic benefits, its implementation may involve certain trade-offs, particularly in relation to perceived service quality, leading to various complexities (Seyfi et al., 2025).

The idea that sustainability dimensions always positively contribute to customer satisfaction may be misleading, as emphasizing these practices could result in a decline in service quality (Baratta & Simeoni, 2021; Perramon et al., 2022). This tension is particularly evident considering that high tourist expectations for service quality may not align with the sustainability objectives of hotel businesses, as sustainable practices—particularly those involving water and energy conservation—frequently require compromises in the quest for comfort (Pirani & Arafat, 2016; Oloyede et al., 2024). As a result, hotel businesses are required to strike a balance between long-term sustainability practices and short-term service quality expectations (Christofi et al., 2022; Pirani & Arafat, 2016; Sholeha & Sumarmi, 2025; Tourais & Videira, 2024).

To date, the interaction and potential contradictions between service quality and sustainability have not been thoroughly examined in the literature. Previous studies predominantly analyzed these two concepts in isolation (Oliveras-Villanueva et al., 2020; Zhuk & Bukhta, 2023). Furthermore, economic, cultural, and social dimensions of sustainability have received

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limited scholarly attention in sustainability-related research (Boswell, 2023; Njoroge et al., 2020; Tavakoli & Tumer, 2024). In addition, while available studies primarily reflect the views of hotel managers (Fatima & Elbanna, 2023; Oliveras-Villanueva et al., 2020; Zhuk & Bukhta, 2023), the views of academics or industry representatives remain underrepresented. To the best of our knowledge, to date, none of the previous studies examined how different stakeholders prioritize sustainability and service quality dimensions. However, determining the prioritization by various stakeholders could provide a new and holistic approach to tourism literature which includes studies on sustainability and service quality (Boswell, 2023; Christofi et al., 2022; Fatima & Elbanna, 2023; Oliveras-Villanueva et al., 2020). Taking this into account, and seeking to bridge the aforementioned gap in the literature, the present study provides a comparative analysis of multiple stakeholder groups (managers, academics, and public institution representatives), offering a holistic view of service quality and sustainability trade-offs in the hotel industry. By demonstrating how these concepts are perceived across a wide range of perspectives, the approach we use goes further than previous studies that focused solely on specific stakeholder groups.

Upon the Resource-Based View (RBV), sustainability practices are regarded as strategic resources capable of generating long-term competitive advantage. However, these practices may entail additional costs or potentially compromise service quality (Lichtenthaler, 2022; Perramon et al., 2022). Accordingly, in the present study, we use a multi-theoretical approach to evaluate the balance between benefits and costs. One of the theories the present study relies on is Stakeholder Theory (Freeman, 2010), which argues that businesses should consider interests of all stakeholders, not only shareholders, but also employees, customers, and local people. Furthermore, Institutional Theory (DiMaggio & Powell, 1983) posits that businesses are influenced by social and cultural pressures, in addition to economic forces. As a result, stakeholder priorities concerning service quality and sustainability may vary across different stakeholder types and institutional settings. This approach reflects Triple Bottom Line (TBL) approach framework (Elkington, 1997), which evaluates business performance across economic, environmental and social dimensions. In addition, Contingency Theory (Lawrence & Lorsch, 1967; Donaldson, 2001) emphasizes situational nature decision-making, highlighting that the appropriateness of any decision depends on internal and external contingencies. Accordingly, in the present study, we used the Best–Worst Method (BWM) to systematically identify and compare stakeholder priorities.

More specifically, the core research problem addressed in the present study is understanding how different groups perceive the dimensions of sustainability and service quality. The major research question asked in this research is as follows: "How are priorities concerning sustainability and service quality dimensions shaped among different stakeholder groups in hotel businesses?" Seeking to answer this question, the study aims to contribute the gap identified in the literature. We analyze the relationship between sustainability and service through a holistic view by incorporating the perspectives of diverse stakeholder groups. In contrast to previous research that predominantly relied on traditional multi-criteria decision-making methods such as AHP and TOPSIS, in the present study, we adopted the Best Worst Method (BWM) analysis, which offers lower cognitive demand and improved consistency compared to traditional techniques (Corrente et al., 2024; Johny et al., 2025; Rezaei, 2015; Roshanvaran et al., 2025; Yildirim & Sisman, 2025; Vatankhah et al., 2023). This methodological approach enables a refined analysis of the sustainability and service quality nexus and offers strategic recommendations to improve the long-term competitiveness of hotel businesses. The results are expected to guide hotel managers in balancing short-term operational goals with long-term sustainability practices, as well as inform public institutions on areas where policy support and stakeholder alignment are most needed.

LITERATURE REVIEW

In the literature, service quality is considered one of the success criteria for hotel businesses as it significantly shapes the customer experience (Munawaroh et al., 2024). Considering that hotel services involve direct customer interaction, the way quality is perceived becomes particularly important (Shyju et al., 2021). Therefore, effective service quality management is associated with gaining a sustainable competitive advantage (Fam et al., 2021; Shams et al., 2021). As core elements of the SERVQUAL model, assurance and reliability were previously reported to be strongly linked to increased customer trust and satisfaction (Abdullah et al., 2022; Adzinyo et al., 2024; Hoo et al., 2024; Ranatunga et al., 2022).

However, the impact of each SERVQUAL dimension may vary in magnitude. For instance, responsiveness may emerge as a service element that needs improvement (Bhattacharya et al., 2023). This variation may be attributed to the cultural sensitivity of the SERVQUAL dimensions (Ladhari, 2009; Smith, 1995). Empirical evidence from the Himalayan region supports the notion that SERVQUAL dimensions exhibit regional variability (Bhattacharya et al., 2023). However, in today's hospitality industry, where sustainability is increasingly coming to the forefront, an exclusive focus on service quality is no longer considered to be sufficient (Blanco-Moreno et al., 2025). Sustainability has become a strategic imperative for enhancing corporate image and driving financial performance (Stombelli, 2020; Su & Chen, 2020). Despite being primarily associated with environmental practices, sustainability strategies can also generate economic, social and cultural benefits for hotel businesses (Pereira et al., 2021; Rasel, 2024; Remenyik et al., 2025). Accordingly, it may be necessary to explore other sustainability dimensions (economic, social and cultural) to understand these benefits (Boswell, 2023; Tavakoli & Tumer, 2024; Yang et al., 2020). Sustainability can generate both economic returns and non-financial benefits, thereby positively impacting various dimensions of hotel performance (Khalil et al., 2024; Koch et al., 2020; Preziosi et al., 2022). However, the implementation of sustainability practices does not always lead to improvements in quest satisfaction.

For instance, water and energy conservation efforts in hotels may compromise guest comfort and reduce overall satisfaction (Baratta & Simeoni, 2021). At this point, a critical strategic decision-making area for hotel businesses is attaining the balance between the multifaceted benefits of sustainability and the challenges encountered during its implementation (Du et al., 2025). As service-driven organizations, hotels that prioritize social and environmental sensitivity may gain a competitive

advantage by aligning with shifting consumer values (Fatima & Elbanna, 2023). Sustainability practices are now considered as critical as service quality in achieving long-term customer loyalty and market competitiveness (Josimović et al., 2025). Yet, a comprehensive evaluation of these strategic trade-offs requires theoretical frameworks capable of explaining how organizations perceive, prioritize, and operationalize sustainability alongside service quality (Rinomhota et al., 2025).

Furthermore, although sustainability practices are widely considered to be valuable resources under Resource-Based View (RBV) framework, they may simultaneously increase operational burdens (Lichtenthaler, 2022) and adversely affect service performance (Perramon et al., 2022). The Stakeholder Theory posits that achieving success in the field of sustainability requires businesses to consider the perspectives of a broad range of stakeholders, not just shareholders (Freeman, 2010). In line with this principle, in the present study, we employed a methodology that incorporates stakeholder diversity by gathering the views of various stakeholder groups on both service quality and sustainability. Furthermore, as highlighted by Institutional Theory, businesses are influenced not only by economic forces, but also by cultural and social pressures (DiMaggio & Powell, 1983). What this suggests is that hotel businesses are subject to institutional demands and pressures related to both sustainability and service quality. The priorities of different stakeholder groups in these domains may widely vary depending on the institutional characteristics and pressures that shape their expectations. Furthermore, the Triple Bottom Line (TBL) approach posits that business performance should be evaluated not solely on economic outcomes, but also on relevant social and environmental dimensions (Elkington, 1997). This framework provides a comprehensive perspective on evaluating sustainability practices. The present study seeks to apply the TBL framework in practice by offering empirical insights into the sustainability-related perspectives of stakeholder groups actively engaged in the tourism industry.

According to Contingency Theory, which is one of the theoretical cornerstones of the present study, there is no universally optimal approach to decision-making or strategy formulation; rather, the effectiveness of a given method depends on situational factors and stakeholder expectations (Lawrence & Lorsch, 1967; Donaldson, 2001). Said differently, strategic priorities may vary depending on contextual conditions, the expectations of relevant stakeholders, and environmental uncertainties. Using employing the Best-Worst Method (BWM), the present study seeks to capture these variations, thereby reinforcing a situationally adaptive perspective on strategic decision-making within the tourism and hotel industry.

While sustainability and service quality are frequently regarded as distinct concepts (Oliveras-Villanueva et al., 2020; Yuliawati et al., 2025; Zhuk & Bukhta, 2023), recent research suggests that these two dimensions—traditionally seen as short-term and long-term, respectively—can influence and even complement one another (Christofi et al., 2022; Kwan, 2025; Tourais & Videira, 2024). Typically associated with immediate customer satisfaction, service quality may intersect with sustainability goals aimed at long-term strategic outcomes (Narendratama & Wijoyo, 2025).

However, some studies argued that these concepts may be at odds. For instance, Perramon et al. (2022) contend that businesses that overemphasize service quality risk escalating resource consumption, thus potentially neglecting sustainability goals. Similarly, Oloyede et al. (2024) found that, in hotel settings, offering larger portion sizes in food services enhanced customer satisfaction, but also resulted in significant food waste, thereby undermining sustainability efforts. These conflicting dynamics highlight the urgent need for hotel businesses to strike a balance between service quality and sustainability (Pirani & Arafat, 2016; Sholeha & Sumarmi, 2025). Overall, there is a broad scholarly consensus that service quality can serve as a strategic tool to support and reinforce sustainability efforts (Chaudhary & Dey, 2021). For long-term success and competitive advantage, businesses are encouraged to implement both elements in an integrated manner (Lichtenthaler, 2022; Preziosi et al., 2022; Seidel et al., 2021; Yu et al., 2024). In the tourism industry, aligning sustainability practices with service quality initiatives was previously argued to be capable of enhancing businesses' brand image and providing a distinct competitive edge (Fatima & Elbanna, 2023). Moreover, effective service quality management was reported to not only contribute to customer satisfaction, but also support sustainability by creating operational efficiencies and cost advantages (Pereira-Moliner et al., 2016). To date, most of the previous studies have examined service quality and sustainability as separate constructs, thereby overlooking the interactions between them (Fatima & Elbanna, 2023; Oliveras-Villanueva et al., 2020; Zhuk & Bukhta, 2023).

Accordingly, relevant research integrating the analysis of these two dimensions remains scarce, which results in the lack of integrative and comparative evaluations reflecting how service quality and all sustainability dimensions (not just environmental) are prioritized by different actors within the industry. This gap is particularly evident in the hotel industry, where the prioritization of these elements remains insufficiently explored (Perramon et al., 2022; Oloyede et al., 2024). Another notable gap is the narrow emphasis on specifically environmental sustainability. The interrelationship between other dimensions of sustainability—such as social and economic—and service quality also remains underexplored in the literature.

In terms of previously used methodologies, several recent studies employed advanced decision-making approaches. For example, Wang & Nguyen (2022) and Assad et al. (2024) employed multi-criteria decision-making techniques to evaluate sustainability priorities in hospitality. In another relevant study, Perramon et al. (2022) provided empirical insights into the joint effects of service quality and environmental practices. However, these studies predominantly focused on single stakeholder groups or emphasized specific sustainability aspects without adopting a comparative, multi-stakeholder perspective. Seeking to address these gaps, the present study aims to investigate how different stakeholder groups—including hotel managers, academics, and tourism-related institution representatives—prioritize the dimensions of service quality and sustainability in the hotel industry. To this end, we use the Best Worst Method (BWM) as a decision-making framework. Our ultimate goal is to develop a holistic understanding of how service quality and sustainability are evaluated in the hotel industry context and to provide strategic contributions to sectoral decision-making processes.

An important issue that warrants further attention is the complexity and potential inconsistency associated with traditional multi-criteria decision-making (MCDM) methods such as AHP and TOPSIS. While widely used, these

approaches frequently involve high computational complexity and may lead to inconsistencies in judgments (Amiri et al., 2021; Kumar & Pamucar, 2025; Opricovic & Tzeng, 2007; Wei et al., 2025). Despite these limitations, MCDM techniques remain effective for prioritizing sustainability practices (Tian et al., 2022). Yet, in recent years, more innovative and streamlined approaches have emerged. Among them, the Best Worst Method (BWM) has gained traction for its simplicity, consistency, and efficiency (Garabinović et al., 2021; Roshanvaran et al., 2025; Wang & Nguyen, 2022; Yildirim & Sisman, 2025). The BWM allows decision-makers to achieve greater consistency with fewer comparisons by selecting only the best and worst criteria (Corrente et al., 2024; Johny et al., 2025; Rezaei, 2015). Accordingly, in the present study, we adopt the BWM to ensure higher decision consistency (Vatankhah et al., 2023) and to analyze the perspectives of different participant groups in a structured comparative manner. A comparison of multi-criteria decision-making methods used in previous research (Amiri et al., 2021; Opricovic & Tzeng, 2007; Vagiona, 2021) is provided in Table 1.

Table 1. Comparison of multi-criteria decision-making methods

Method	Calculation time	Simplicity	Mathematical operations	Reliability	Data type
BWM	Low	Simple	Medium	High	Quantitative
AHP	Very high	Very critical	Maximum	Weak	Mixed
TOPSIS	Medium	Moderately critical	Medium	Medium	Quantitative
VIKOR	Low	Simple	Medium	Medium	Quantitative
ELECTRE	High	Moderately critical	Medium	Medium	Mixed
PROMETHEE	High	Moderately critical	Medium	Medium	Mixed

MATERIALS AND METHODS

The study aims to understand how decision-makers prioritize service quality and sustainability dimensions for hotel businesses using a holistic and novel approach. To this end, several groups of relevant stakeholders were interviewed. These included managers from international chain hotels (6 individuals), academicians specializing in hotel management, sustainability, and service quality (6 individuals), destination management organization managers (3 individuals), managers of tourist guide chambers (2 individuals), and a travel agency association manager (1 individual). The limited number of participants was a deliberate methodological choice, as the Best Worst Method (BWM) is particularly suitable for studies involving a small group of experts. BWM enables high decision consistency and allows for in-depth analysis with fewer comparisons (Rezaei, 2015). Service quality dimensions were adopted from the SERVQUAL scale, while sustainability dimensions were developed through a literature review. Environmental, social, cultural, and economic sustainability dimensions were structured based on hotel and business-oriented academic studies (Table 2). The reason for selecting these four dimensions was that sustainability in tourism and hospitality has a multi-dimensional structure and requires a balanced development in all these areas for long-term success.

Best Worst Method (BWM) analysis was employed; as this analysis requires decision-makers to make comparisons solely based on the best and worst criteria, it can be implemented with fewer participants and provides high consistency compared to other multi-criteria decision-making methods (Rezaei, 2015). The interviews were conducted both in person and via online video meetings. All relevant information about BWM was also provided during the interviews.

Table 2. Service quality and sustainability criteria adopted in the study

Criteria	Explanation	Reference
C_1 Tangibles	Physical elements of the service-providing establishment include modern equipment, cleanliness of facilities, employee appearance, and quality of materials used.	(Parasuraman et al., 1988; Smith, 1995)
C_2 Reliability	Accurate, complete, and timely delivery of the promised service to customers. Minimizing errors and providing service that customers consistently trust.	(Parasuraman et al., 1988; Smith, 1995)
C_3 Responsiveness	Employees' ability to respond promptly and willingly to customer requests; capacity to assist customers even in emergency situations.	(Parasuraman et al., 1988; Smith, 1995)
C_4 Assurance	Employees' knowledge, courtesy, and ability to instill confidence in customers; ensuring customers feel secure during service interactions.	(Parasuraman et al., 1988; Smith, 1995)
C_5 Empathy	Individualized attention provided by the establishment to its customers, understanding their specific needs, and being customer-friendly regarding working hours, communication, etc.	(Parasuraman et al., 1988; Smith, 1995)
C_6 Environmental sustainability	Practices focusing on reducing energy consumption, water usage, waste management, and carbon emissions. Efficient use of resources without harming the environment.	Campos et al., 2024; Michailidou et al., 2015; Prakash et al., 2023)
C_7 Social sustainability	Social responsibility practices including employee rights, occupational health, community contribution, and the welfare of local people.	(Pereira et al., 2021; Salama et al., 2024; Timur & Timur, 2016)
C_8 Cultural sustainability	Respect for local culture, traditions, and heritage; supporting cultural events.	(Boswell, 2023; Lee & Chhabra, 2015; Tavakoli & Tumer, 2024)
C_9 Economic sustainability	Financial stability, profitability, occupancy rate, business volume, and long-term economic contributions.	(Njoroge et al., 2020; Pratt et al., 2018; Vasilakakis et al., 2023)

Best Worst Method (BWM) steps are as follows:

Step 1. The criteria affecting the decision problem are determined. When a matrix related to the decision criteria is

created in a decision problem, the criteria matrix formed for pairwise comparison of the criteria can be represented as shown in Equation 1 (Hasan et al., 2022).

$$A = \begin{matrix} C_1 \\ C_2 \\ \vdots \\ C_n \end{matrix} \begin{matrix} \begin{matrix} C_1 & C_2 & \cdots & C_n \end{matrix} \\ \begin{pmatrix} o_{11} & o_{12} & \cdots & o_{1n} \\ o_{21} & o_{22} & \cdots & o_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ o_{n1} & o_{n2} & \cdots & o_{nn} \end{pmatrix} \end{matrix} \quad (1)$$

Step 2. Select the best criterion (C_B) and the worst criterion (C_W) from the set of criteria.

Step 3. The pairwise comparison between the best criterion (C_B) and all other criteria is performed resulting best-to-others (O_B) vector as shown in Equation 2 as (Hasan et al., 2022)

$$O_B = (o_{B1}, o_{B2}, o_{B3}, \ldots, o_{Bn}), \quad (2)$$

where, $o_{Bj}; o_{Bj} \geq 1, j = 1,2,\ldots,n$ represents the degree of preference regarding the best criterion C_B with other criterion $C_j, j \neq B$. At this stage, the decision-maker uses the 1-9 scale in Table 2 to determine the priority of the most important criterion over the other criteria through pairwise comparisons.

Step 4. The others-to-worst (O_W) vector presenting the pairwise comparison of preferences between all criteria and the worst criterion (C_W) is given in Equation 3 as (Hasan et al., 2022)

$$O_W = (o_{1W}, o_{2W}, o_{3W}, \ldots, o_{nW})^T, \quad (3)$$

where, $o_{jW}; o_{jW} \geq 1, j = 1,2,\ldots,n, j \neq W$ represents the degree of preference regarding the worst criterion C_W with other criteria C_j. At this stage, the decision-maker uses the 1-9 scale in Table 3 to determine the priority of the least important criterion compared to the other criteria through pairwise comparisons.

Table 3. Pairwise comparison scale and descriptions

Numerical Value	Judgmental statements used in the comparison of criteria
1	Equal importance
3	Moderately Important
5	Important
7	Very important
9	Extremely Important
2,3,4,6	Intermediate values

Step 5. Calculate the weights of criteria by formulating an optimization model. To calculate the weights for ranking of criteria, the optimal weights must satisfy $W_B / W_j = o_{Bj}$ and $W_j / W_W = o_{jW}$. Thus, the objective is to minimize the absolute maximum difference of $| W_B / W_j - o_{Bj} |$ and $| W_j / W_W - o_{jW} |$. Then, a min-max optimization model is formulated as follows (Hasan et al., 2022):

Model 1:

$$\begin{aligned} \underset{j}{\text{MinMax}} \quad & \{| W_B / W_j - o_{Bj} |, | W_j / W_W - o_{jW} |\} \\ \text{subject to} \quad & \textstyle\sum_j \quad W_j = 1, W_j \geq 0, \forall j = 1,2,\ldots,n. \end{aligned} \quad (4)$$

Here, W_B and W_W are the weights of best and worst criterion, respectively. The weight of criterion C_j is represented by W_j. The linear programming model of model 1 is transformed as (Hasan et al., 2022)

Model 2:

$$\begin{aligned} \text{Min} \quad & \xi \\ \text{subject to} \quad & | W_B - W_j \times o_{Bj} | \leq \xi \\ & | W_j - W_W \times o_{jW} | \leq \xi \\ & \textstyle\sum_j \quad W_j = 1, W_j \geq 0. \end{aligned} \quad (5)$$

The optimal values of ξ are utilized to determine the consistency ratio. A comparison is said to be fully consistent, when $o_{Bj} \times o_{jW} = o_{BW} \forall$.

Step 6. Determining the consistency ratio of the pairwise comparisons. This step also reflects the usability of the method. The consistency ratio is calculated using the minimum ξ^* value obtained from the model and the consistency index provided in Table 4. A low consistency ratio indicates that the pairwise comparisons are reliable and the results are valid for decision-making (Rezaei, 2015).

Table 4. Consistency index (CI)

o_{BW}	1	2	3	4	5	6	7	8	9
CI(max ξ)	0.00	0.44	1	1.63	2.30	3	3.73	4.47	5.23

The consistency ratio (CR) is calculated as follows (Rezaei, 2015):

$$ConsistencyRatio = \frac{\xi^*}{ConsistencyIndex},$$

The consistency ratio (CR) takes a value between 0 and 1. The smaller the consistency ratio, the more reliable the comparison results are. A ratio of less than 0.10 is an acceptable ratio.

RESULTS

Table 5 presents the findings of all decision-makers' evaluations, while Table 6 displays their respective rankings. According to the evaluations of managers in international chain hotels, service quality criteria (C1–C5) generally stood out.

Table 5. The importance weights and consistency of criteria

Managers in international chain hotels										
Decision-maker	**C_1**	**C_2**	**C_3**	**C_4**	**C_5**	**C_6**	**C_7**	**C_8**	**C_9**	**CR**
Dm_1	0.1324	0.1035	0.1324	0.1035	0.1180	0.1324	0.0503	0.1180	0.1095	0.0169
Dm_2	0.1372	0.1030	0.1546	0.1030	0.1372	0.1642	0.1642	0.0566	0.0801	0.0184
Dm_3	0.1201	0.1201	0.1201	0.1201	0.1334	0.1636	0.0545	0.1090	0.1090	0.0128
Dm_4	0.1297	0.1668	0.1486	0.1297	0.1668	0.1386	0.0454	0.1127	0.1620	0.0171
Dm_5	0.1297	0.1606	0.1491	0.1168	0.1297	0.1133	0.1006	0.0412	0.1591	0.0184
Dm_6	0.1386	0.1732	0.1589	0.0842	0.0497	0.1184	0.1184	0.1184	0.1402	0.0164
Mean W_j	*0.1313*	*0.1379*	*0.1473*	*0.1095*	*0.1225*	*0.1384*	*0.0889*	*0.0926*	*0.1267*	*0.0167*
Academicians										
Decision-maker	**C_1**	**C_2**	**C_3**	**C_4**	**C_5**	**C_6**	**C_7**	**C_8**	**C_9**	**CR**
Dm_1	0.0297	0.1485	0.1188	0.1485	0.1485	0.1782	0.2079	0.2079	0.2376	0.0077
Dm_2	0.2333	0.1121	0.1121	0.1121	0.1121	0.1682	0.1402	0.1402	0.0697	0.0595
Dm_3	0.2009	0.1850	0.1850	0.1471	0.0575	0.1020	0.1020	0.1020	0.1020	0.0155
Dm_4	0.2494	0.1878	0.0442	0.0883	0.1325	0.1104	0.1325	0.1546	0.1002	0.0154
Dm_5	0.1438	0.2227	0.1544	0.0889	0.0457	0.1111	0.1111	0.0897	0.1330	0.0163
Dm_6	0.0475	0.1476	0.1180	0.1476	0.0738	0.2780	0.1084	0.1084	0.0710	0.0124
Mean W_j	*0.1508*	*0.1673*	*0.1221*	*0.1221*	*0.0950*	*0.1580*	*0.1337*	*0.1338*	*0.1189*	*0.0211*
Managers of tourism-related organizations										
Decision-maker	**C_1**	**C_2**	**C_3**	**C_4**	**C_5**	**C_6**	**C_7**	**C_8**	**C_9**	**CR**
Dm_1	0.1192	0.1949	0.1511	0.1192	0.1192	0.0648	0.1357	0.1192	0.1370	0.0171
Dm_2	0.1897	0.1641	0.1897	0.1282	0.1487	0.0598	0.0507	0.0345	0.0345	0.0227
Dm_3	0.1724	0.1562	0.1659	0.1562	0.1753	0.1368	0.0438	0.0636	0.1300	0.0177
Dm_4	0.1374	0.1009	0.1181	0.1066	0.1232	0.0674	0.0983	0.0968	0.1513	0.0157
Dm_5	0.1443	0.1247	0.1046	0.1443	0.1592	0.1223	0.0488	0.1223	0.1294	0.0158
Dm_6	0.1492	0.1143	0.0964	0.1143	0.1333	0.1203	0.0976	0.0422	0.1323	0.0189
Mean W_j	*0.1520*	*0.1425*	*0.1376*	*0.1281*	*0.1432*	*0.0952*	*0.0791*	*0.0798*	*0.1191*	*0.0179*

Table 6. Importance weights of the criteria

Managers in international chain hotels			
Rank	**Criterion**	**Criteria Description**	**Mean W_j**
1	C3	Responsiveness – Speed and willingness to help customers	0.1473
2	C6	Environmental Sustainability – Energy, waste, carbon management	0.1384
3	C2	Reliability – Service accuracy, consistency, trust	0.1379
4	C1	Tangibles – Physical appearance, cleanliness, equipment quality	0.1313
5	C9	Economic Sustainability – Financial stability, profitability	0.1267
6	C5	Empathy – Personalized attention, understanding customer needs	0.1225
7	C4	Assurance – Staff knowledge, courtesy, ability to inspire trust	0.1095
8	C8	Cultural Sustainability – Respect for local culture and heritage	0.0926
9	C7	Social Sustainability – Employee rights, community contribution	0.0889
Academicians			
Rank	**Criterion**	**Criteria Description**	**Mean W_j**
1	C2	Reliability – Service accuracy, consistency, trust	0.1673
2	C6	Environmental Sustainability – Energy, waste, carbon management	0.1580
3	C1	Tangibles – Physical appearance, cleanliness, equipment quality	0.1508
4	C8	Cultural Sustainability – Respect for local culture and heritage	0.1338
5	C7	Social Sustainability – Employee rights, community contribution	0.1337
6	C3	Responsiveness – Speed and willingness to help customers	0.1221
7	C4	Assurance – Staff knowledge, courtesy, ability to inspire trust	0.1221
8	C9	Economic Sustainability – Financial stability, profitability	0.1189
9	C5	Empathy – Personalized attention, understanding customer needs	0.0950
Managers of tourism-related organizations			
Rank	**Criterion**	**Criteria Description**	**Mean W_j**
1	C1	Tangibles – Physical appearance, cleanliness, equipment quality	0.1520
2	C5	Empathy – Personalized attention, understanding customer needs	0.1432
3	C2	Reliability – Service accuracy, consistency, trust	0.1425
4	C3	Responsiveness – Speed and willingness to help customers	0.1376
5	C4	Assurance – Staff knowledge, courtesy, ability to inspire trust	0.1281
6	C9	Economic Sustainability – Financial stability, profitability	0.1191
7	C6	Environmental Sustainability – Energy, waste, carbon management	0.0952
8	C8	Cultural Sustainability – Respect for local culture and heritage	0.0798
9	C7	Social Sustainability – Employee rights, community contribution	0.0791

Hotel managers considered the criteria of "responsiveness (C3; 0.1473)", "environmental sustainability (C6; 0.1384)" and "reliability (C2; 0.1379)" as being of similar importance. These results suggest that managers evaluate both operational efficiency and environmental sustainability together. The prioritization of environmental sustainability as a secondary criterion suggests its growing importance on the managerial level.

Furthermore, the average value assigned to social (C7; 0.0889) and cultural sustainability (C8; 0.0926) criteria were comparatively lower than others. This finding suggests that managers have not prioritized elements such as social contribution and cultural heritage in their decision-making processes. These findings indicate that hotel managers adopt a service approach focused on customer satisfaction and environmental sensitivity, while social factors receive comparatively less attention. Moreover, the average consistency rate observed in this group was "0.0167", indicating that decision-makers exhibited high-level stable preferences.

In addition, academicians evaluated the "reliability (C2; 0.1673)" criterion with the highest mean weight. The academic perspective considered consistency, accuracy and the level of meeting expectations in service delivery fundamental aspects of service quality. "Environmental sustainability (C6, 0.1580)" also emerged as an important criterion recognized by academics. Taken together, these findings indicate that awareness and responsiveness towards sustainability issues are high in academic circles. Consequently, the academic perspective considers service quality and environmental impact as a primary evaluation criterion. Conversely, the academic group evaluated the "empathy (C5; 0.0950)" criterion the lowest. This finding suggests that academics place less emphasis on interpersonal interactions and emotional closeness as compared to other service delivery dimensions. The academic approach is predominantly science-driven and rooted in systematic principles. According to our results, this group assigned greater importance to environmental sensitivity and service reliability. The average consistency rate for this group amounted to 0.0211, indicating a high level of decision-making stability and rational evaluation.

Furthermore, the interviewed representatives working in public and private sector tourism-related institutions assigned the highest values to service quality dimensions. Specifically, the "tangibles (C1, 0.1520)" criterion received the highest weight. This finding suggests that institutional representatives place a greater emphasis on observable and measurable external factors when evaluating service quality. Furthermore, in this group of stakeholders, "empathy (C5, 0.1432)" and "reliability (C2, 0.1425)" received comparable weights. Representatives working in public and private sector tourism-related institutions also ranked "social sustainability" (C7; 0.0791) as the least prioritized dimension. Taken together, results suggest that social inclusion, social justice, and employee rights remain secondary considerations in practical service evaluations. The fact that the social responsibility criterion was not sufficiently prominent indicates the need for policy development and awareness raising in this area. The average consistency rate of this group was "0.0179", indicating that results with high internal consistency are produced, similar to other groups.

Figure 1 provides a summary of the comparative importance ratings of three stakeholder groups (hotel managers, academics and representatives of tourism-related institutions) across nine criteria. As can be see in the figure, all three groups assigned relatively higher weights to service quality dimensions (C1–C5) as compared to other criteria. In particular, the "reliability" criterion (C2) was the most highly valued service quality dimension across all groups. The differences regarding the sustainability criteria are more pronounced. Academics demonstrated a more balanced approach to environmental and cultural sustainability, assigning weights to these dimensions comparable to those given to service quality criteria. While hotel managers deprioritized social sustainability (C7), tourism-related institution representatives placed less emphasis on environmental sustainability (C6).

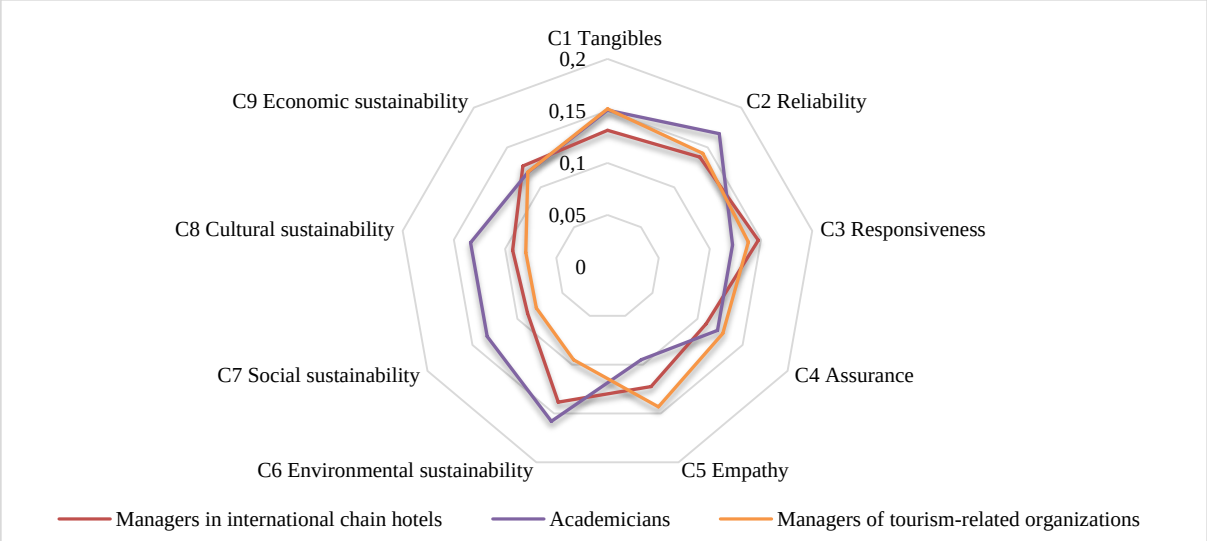

Figure 1. Comparative importance levels assigned by decision-makers to service quality and sustainability dimensions.

Overall, the observed differences suggest that the institutional structures, areas of responsibility, and decision-making dynamics of each group influence their evaluation patterns.

DISCUSSION AND CONCLUSION

The results revealed significant differences in the three main stakeholder groups' perceptions of the evaluation criteria. All three groups, consistently prioritized sustainability criteria. This finding suggests that service quality remains the primary performance indicator for hotel businesses, while sustainability elements are perceived as complementary. All groups primarily evaluated the classical SERVQUAL dimensions of service quality—namely physical elements, reliability, responsiveness, assurance, and empathy. However, each group interpreted these criteria differently based on their respective institutional contexts. For instance, hotel managers prioritized fast and enthusiastic service delivery, whereas academics emphasized accuracy and consistency of services. Meanwhile, representatives from tourism-related institutions predominantly focused on the physical aspects of service quality.

Furthermore, the results also revealed that each stakeholder group's approach to service quality varied according to their specific areas of responsibility. In this context, the Best Worst Method (BWM) provided significant advantages in analyzing the multi-stakeholder structure due to its requirement for fewer comparisons and its ability to ensure high decision consistency compared to traditional methods.

Specifically, the used method proved to be functional for the hospitality and tourism field by preventing judgment inconsistencies commonly encountered in techniques such as AHP, as well as by allowing a clear comparison of the priorities of each stakeholder group. The BWM enabled making clear comparisons of the weights assigned to the criteria by managers, academics, and institutional representatives, making the decision support process more transparent.

The results also highlighted pronounced distinctions among the three groups. These differences should be evaluated not only as statistical outcomes, but also within the framework of each stakeholder group's institutional role and sectoral responsibilities. First, academics assigned high importance to environmental sustainability and evaluated the cultural and social sustainability dimensions with a relatively more balanced perspective. This indicates that the academic approach tends to view sustainability from a multi-dimensional perspective and reflects a more normative, long-term outlook. By contrast, although hotel managers also considered environmental sustainability in their evaluations, they assigned lower priority to the social and cultural dimensions during decision-making processes.

This tendency can be interpreted as a result of environmental issues being more easily measurable and thus more applicable within practice-oriented management approaches. In their turn, institutional representatives generally placed sustainability criteria behind service quality elements, attributing the lowest levels of importance particularly to social and cultural sustainability dimensions. This finding indicates that this group of stakeholders has not yet successfully transformed the concept of sustainability into a practical policy tool.

Table 7. Prioritization of criteria according to stakeholder groups

Criterion	Hotel Managers	Academicians	Institution Representatives
Highest Priority	C3 (Responsiveness)	C2 (Reliability)	C1 (Tangibles)
Lowest Priority	C7 (Social Sust.)	C5 (Empathy)	C7 (Social Sust.)
Sustainability	Environmental focused	Balanced approach	Lower level
Service Quality	Operation focused	Systematic & technical	Physical & tangible

Furthermore, more personalized service dimensions, such as empathy, were assigned relatively lower importance by the academic group, reflecting an approach grounded in analytical and objective values. Conversely, the prominence of the empathy dimension among the other two groups that are more engaged in direct customer interaction suggests that this criterion holds a greater relevance in practical field applications. When evaluated overall (Table 7), it becomes clear that stakeholder groups' perceptions of service quality and sustainability concepts are shaped by their positions within the industry, their areas of responsibility, and their roles in decision-making processes.

These differences highlight the need to adopt multi-stakeholder approaches for the holistic management of service delivery. The findings also demonstrate that service quality and sustainability goals are not mutually exclusive priorities, but rather objectives that must be carefully balanced to achieve effective outcomes.

In this study, the finding that all stakeholder groups prioritize service quality criteria over sustainability criteria aligns with the established influence of the SERVQUAL model within the tourism industry. Specifically, Parasuraman et al. (1988) and Ladhari (2009) emphasized the significant impact of service quality on customer satisfaction, particularly highlighting the dimensions of "reliability," "speed," and "physical environment" as critical determinants in the hotel industry. The evaluations of the three stakeholder groups regarding service quality in the present study are broadly consistent with this framework. Specifically, the high importance placed by hotel managers "fast service" and "reliability" aligns with the short-term, customer satisfaction-oriented management approach described by Pirani & Arafat (2016). Similarly, the concern that such a focus might overshadow sustainability practices also aligns with the criticisms previously raised in the literature.

Furthermore, the finding that academics prioritize environmental sustainability while assigning slightly a greater importance to social and economic sustainability aligns with the Triple Bottom Line (TBL) framework proposed by Elkington (1997). TBL advocates for the simultaneous consideration of environmental, social, and economic dimensions. In the present study, the observed relatively balanced evaluation of these three dimensions by academics is consistent with the theoretical foundation of the TBL approach. Furthermore, the positive attitude of academics towards social and cultural sustainability dimensions corresponds with the emphasis on social contribution and cultural heritage

sensitivity highlighted in studies such as Boswell (2023) and Tavakoli & Turner (2024). However, while Boswell (2023) drew attention to the frequent neglect of cultural sustainability within the tourism industry, the academics interviewed in the present study prioritized this dimension more highly than the other groups. In addition, the finding that the "empathy" criterion was assigned lower priority by the academic group indicates that the emotional dimensions of service quality tend to remain secondary in academic evaluations. This detail may offer a critical and original contribution to existing generalizations suggesting that the "empathy" criterion is universally perceived as important across all stakeholders in current SERVQUAL applications (Ranatunga et al., 2022; Temory, 2024).

Yet, while the findings clearly reveal different prioritization patterns across the three stakeholder groups, they also reflect some limitations in how sustainability is conceptualized in hotel businesses.

The systematic low prioritization of social and cultural sustainability dimensions may indicate a lack of either awareness of these areas or of concrete frameworks for their implementation. On the other hand, the high importance assigned to service quality suggests that decision-making is still dominated by a short-term performance-orientated perspective, which may result in long-term sustainability goals taking a back seat. Although the findings are consistent with sectoral realities, they suggest that the concept of sustainability is narrowly framed, which may be limiting in terms of innovation and adaptation to environmental changes. Therefore, the present results should be interpreted with caution, especially considering the national context and sample structure of the study.

One of the original findings of this study is the systematic low prioritization of sustainability dimensions—particularly social and cultural sustainability—by hotel managers and public institution representatives. Although the literature strongly emphasizes the importance of all three dimensions of sustainability (e.g., Elkington, 1997; Christofi et al., 2022; Pereira et al., 2021), our finding that the practical importance attributed to social and cultural sustainability remains low highlights a gap that has not been sufficiently addressed in previous research. Moreover, the observation that public institutions and tourism-related organizations assign a lower priority to environmental sustainability as compared to other groups contradicts the corporate responsibility-focused evaluations commonly found in the literature. For instance, while Fatima & Elbanna (2023) argued that sustainable performance management should be a central focus of institutional structures, our finding that representatives from public institutions in this study de-emphasize environmental sensitivity constitutes an important original contribution to the field.

Another unique contribution of the present study is the simultaneous comparative analysis of different stakeholder groups. Such comparative studies are relatively limited in the literature. For example, while Oliveras-Villanueva et al. (2020) and Zhuk & Bukhta (2023) focused specifically on hotel managers or customers, they did not offer a direct comparison of prioritization among academics, public sector representatives, and industry professionals.

In this regard, the present study provides an innovative contribution to the literature and provides a concrete example of applying the multi-stakeholder analysis approach advocated by Stakeholder Theory (Freeman, 2010).

Practical Implications

The findings of this study reveal that, while service quality remains the primary priority for hotel businesses, environmental sustainability is gaining increasing importance. Accordingly, hotel managers must integrate environmental sustainability principles into their operational processes while simultaneously ensuring customer satisfaction. Furthermore, our observation that academics adopt a more balanced approach to sustainability highlights the need to facilitate the transfer of academic knowledge into industrial practices. In addition, the neglect of social and cultural sustainability dimensions by hotel managers and institutional representatives underscores the urgent need to implement awareness-raising initiatives, training programs, and strategic guidance in these areas. Similarly, the integration of sustainability criteria into policy documents and implementation guidelines by public institutions could support the sector-wide institutional transformation process. Finally, considering the varying prioritization approaches among different stakeholder groups regarding service quality and sustainability, the long-term success of the hotel industry requires further development of multi-stakeholder and inclusive decision-making mechanisms.

Further Research

The results of the present study revealed significant differences in the service quality and sustainability priorities among different stakeholder groups. However, our sample was limited to a small number of expert groups operating in Turkey. Accordingly, future studies could enhance the generalizability of the findings by employing larger and more representative samples from various geographical regions. Moreover, this study included only expert opinions, excluding the customer perspective. Incorporating evaluations from service recipients in future research could enable more comprehensive, multi-dimensional analyses. Another venue of further research could be using qualitative data collection methods, such as focus group discussions or in-depth interviews, which would offer more profound insights into how stakeholders interpret sustainability within decision-making processes. In addition, future research should consider the influence of dynamic environmental variables—such as crisis periods or post-pandemic developments—on the balance between service quality and sustainability. Finally, the comparative application of alternative multi-criteria decision-making methods would contribute to the literature by promoting methodological diversity.

Limitations

The present study has several limitations. First, the relatively small sample size (n = 18) that we used may limit the generalizability of our results. Second, considering that the present study was limited to the context of Turkey, our

conclusions may not generalize to other cultural contexts. Thirdly and finally, we did not analyze the views of hotel customers as important stakeholders at the center of the service experience. Accordingly, in future studies, our research design could be extended to larger and more versatile samples and to a broader range of stakeholder groups.

Author Contributions: Author Contributions: Conceptualization, A.Ü.; methodology, A.Ü.; software, A.Ü.; validation, A.Ü.; formal analysis, A.Ü.; investigation, A.Ü.; data curation, A.Ü.; writing - original draft preparation, A.Ü.; writing - review and editing, A.Ü.; visualization, A.Ü.; supervision, A.Ü.; project administration, A.Ü. The author have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the scientific involvement of the author concerned.

Conflicts of Interest: The author declare no conflict of interest.

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Article history: Received: 28.04.2025 Revised: 01.08.2025 Accepted: 29.08.2025 Available online: 22.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1922-1931
DOI 10.30892/gtg.61349-1559

SPATIAL ANALYSIS OF ECOTOURISM RESOURCE POTENTIAL IN THE MOUNTAINOUS REGIONS OF SURKHANDARYA, UZBEKISTAN

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Citation: Shokhrukh, R., Dunyobek, K., Xudayberdiyevich, R.A., Suhail, M., Ganiyev, Z., Gulrukh, M., Mirzomurodovich, K.F., & Jannazarovich, A.K. (2025). Spatial analysis of ecotourism resource potential in the mountainous regions of Surkhandarya, Uzbekistan. *Geojournal of Tourism and Geosites*, 61(3), 1922–1931. https://doi.org/10.30892/gtg.61349-1559

Abstract: This study comprehensively assesses the ecotourism potential of Surkhandarya region, Uzbekistan, utilizing a multivariate criterion approach to evaluate its suitability for sustainable tourism development. Surkhandarya, characterized by approximately 70% mountainous terrain and nestled among the Hisor, Boysun, Bobotog, and Ko'hitang mountain ranges, is rich in natural, historical, and cultural assets. The region's diverse landscapes, which include hydrological features, geological formations, and biological diversity, present significant opportunities for ecotourism. However, despite the vast natural potential, the region faces challenges in infrastructure development and socio-economic engagement, hindering the full realization of its ecotourism prospects. This study applies the Ecotourism Potential Mapping and Assessment (ETPSMA) framework, which evaluates natural conditions, socio-economic factors, and infrastructural readiness, providing a clear picture of the region's current state and potential for ecotourism. The Boysun-Hisor zone emerged as having the highest potential, with rich natural resources and considerable community engagement, while the Bobotog zone showed limited potential due to infrastructural and socio-economic deficits. The Ko'hitang zone presented moderate potential, requiring targeted investments to enhance infrastructure and community participation. Recommendations for improvement include infrastructure enhancement, development of ecotourism routes, local community involvement, environmental education, and zoning for sustainable tourism practices. The study concludes that with strategic investments and policies, Surkhandarya could become a leading ecotourism destination, fostering both environmental conservation and socio-economic development. This research provides a solid foundation for the region's ecotourism strategy, aligning with global sustainable tourism principles.

Keywords: Surkhandarya, Hisor mountain range, sustainable development, tourism infrastructure, ecotourism potential, tourism planning, cultural heritage, biodiversity, regional development

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INTRODUCTION

The United Nations World Tourism Organization (UNWTO) underscores in its reports the imperative for sustainable tourism development, highlighting critical areas such as climate change mitigation, sustainable land management, biodiversity conservation, and the safeguarding of specially protected territories vital for ecotourism expansion (WTO, 2018). Further, the advancement of ecotourism necessitates the ecological sustainability of geosystems, the scientifically informed preservation of biodiversity and natural monuments, and the formulation of strategic frameworks aimed at the sector's sustainable evolution (WTO, 2024). Contemporary global practices reflect an increasing emphasis on research dedicated to the protection of natural monuments, conservation areas, and fragile geosystems, recognizing these as pillars for the long-term viability of ecotourism. Key priorities identified in academic discourse include the rational and efficient use of natural resources, the extension of ecotourism seasonality to reduce environmental pressure, the optimization of regional tourism infrastructures, and the rigorous application of sustainable development principles across all operational stages (Pešić et al., 2025; Ramos & Byrne, 2024). Furthermore, global scholarship actively engages in enhancing the theoretical and practical underpinnings of ecotourism and recreational service innovation, with particular focus on delineating future directions for ecotourism markets and integrating tourism sector models into

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broader national economic frameworks (Shi et al., 2023; Paul & Roy, 2023; Azmaiparashvili, 2021). Crucially, the determination of tourism's multiplier effects on related industries and its overall impact on national economies remains an ongoing challenge necessitating multidimensional analytical approaches (Shi & Chen, 2024).

The theoretical and methodological foundations of ecotourism have been extensively examined by numerous scholars, whose contributions have significantly shaped the contemporary understanding of the field, which include the seminal works by Krippendorf (1982) and Ceballos-Lascuráin (1980) who pioneered early conceptualizations of ecotourism, emphasizing its socio-ecological dimensions and sustainability imperatives. Subsequent studies by Ziffer (1989), Butler (1992), Lindberg (1993), Western (1993), Wall (1994), and Nelson (1994) deepened analyses of ecotourism development trends, economic viability, and environmental impacts. Scholars such as Thompson (1995), Honey (2008), and Shestakova et al., (2022) advanced critical perspectives on the commercialization of ecotourism and its integration into global tourism markets, while earlier insights introduced frameworks for biodiversity conservation within ecotourism strategies (Hasmira et al., 2025; Heshmati et al., 2022). Research from CIS countries - particularly by Drozdov (2005), Abylkassimova et al. (2024), Abdikarimova et al. (2025) - has provided valuable regional adaptations, focusing on the sustainable management of natural heritage sites and the socio-economic dynamics of ecotourism in post-Soviet landscapes. Within this global context, the mountainous and foothill regions of Surkhandarya province emerge as among Uzbekistan's most valuable ecotourism frontiers, distinguished by their rich assemblage of natural and cultural assets, diverse landscapes, and high levels of biological endemism.

The comprehensive assessment and strategic development of Surkhandarya's ecotourism potential hold substantial scientific and practical relevance. Not only would such efforts facilitate the enhancement of tourism infrastructure and the creation of alternative economic livelihoods for local populations, but they would also play a pivotal role in safeguarding natural ecosystems and promoting environmental stewardship. Moreover, strengthening the ecotourism sector is essential for elevating the international profile of the Surkhandarya region, aligning with broader national strategies aimed at sustainable tourism-driven economic diversification.

Within Uzbekistan, tourism and ecotourism-related issues have been investigated by prominent scholars including Khamidov (2016), Ergasheva & Eralov (2024), and others. Specific studies addressing the scientific and theoretical underpinnings of ecotourism were conducted by Narmanov et al. (2023), Nigmatov (2019), Nigmatov & Tobirov (2021), Nilufar et al., (2021), Usmanov et al. (2020), Ravshanov & Xursanov (2024) and among others, who have sought to adapt global ecotourism models to Uzbekistan's environmental and cultural contexts. Nevertheless, despite these considerable efforts, critical knowledge gaps persist—particularly regarding the assessment and development of ecotourism in the mountainous and foothill regions, such as those found in Surkhandarya Province. These landscapes, characterized by their distinct geomorphological features, rich biodiversity, endemic species, and unique cultural attributes, represent highly valuable but underexplored ecotourism assets. Moreover, there remains a marked absence of geospatially driven studies that systematically evaluate ecotourism potential in these regions. Contemporary literature highlights that spatial analysis, using tools such as Geographic Information Systems (GIS) and remote sensing, is essential for identifying suitable ecotourism zones, assessing environmental sensitivity, mapping biodiversity hotspots, and modeling sustainable tourism infrastructure (Ardoin et al., 2015; Abtahee et al., 2023; Likun et al., 2025b; Pešić et al., 2025). Without the integration of geospatial methodologies, strategic planning for ecotourism remains fragmented and less resilient to environmental and socio-economic challenges (Paul & Roy, 2023; Barman et al., 2024).

Therefore, the ecotourism potential of Surkhandarya's mountainous and foothill territories warrants a comprehensive, multidisciplinary approach—one that combines ecological field studies, socio-economic analysis, and cutting-edge geospatial techniques to formulate sustainable development models (Abtahee et al., 2023; Shang et al., 2023; Thompson, 2022; Ahmad et al., 2022). This approach not only fills a significant gap in national research but also aligns Uzbekistan's ecotourism aspirations with global best practices in sustainable and responsible tourism planning. Therefore, this study assesses the ecotourism potential of the mountainous and foothill regions of Surkhandarya using field surveys, SWOT analysis, and complementary GIS analysis. It also aims to evaluate the area's natural and cultural resources, identify key heritage sites, analyse stakeholder interest, and determine critical strengths, weaknesses, opportunities, and threats. Based on these findings, the research proposes innovative strategies to promote ecologically, economically, and socially sustainable ecotourism development in the region. However, there are a number of limitations in the study as region remains in a formative stage, constrained by systemic data limitations, and methodological simplifications.

METHODS AND METHODOLOGY

Study Area

The Surkhandarya Region, Uzbekistan's southernmost province, is distinguished by its unique geographic and climatic attributes. Enclosed by the foothills of the Western Tien Shan mountains—including the Babatag, Surkhantau, and Hissar ranges—its basin-like topography contributes to a climate that is the hottest in the nation during summer and mild in winter. The Hissar Mountains act as a natural barrier, shielding the region from Arctic air masses. Despite its arid conditions, which can see temperatures soar above 45°C (Figure 1), Surkhandarya is endowed with substantial recreational and mineral wealth. The infamous "Afghan wind" poses a challenge to agriculture, desiccating vegetation rapidly and historically limiting the cultivation of orchards and vineyards. Nevertheless, through adaptive strategies inspired by global best practices, local agronomists have revived horticulture and viticulture, with the Denau district emerging as a regional hub. The region is also exploring ecotourism as a sustainable development pathway.

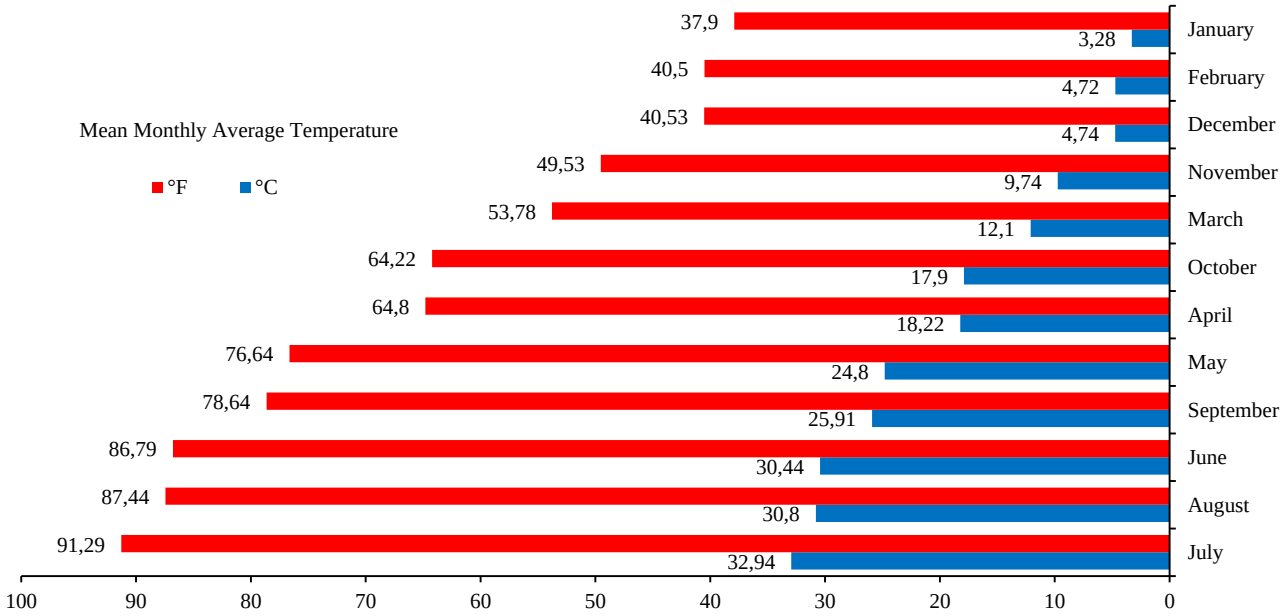

Figure1. Mean monthly temperature in Surkhandrya region, Uzbekistan (Weather and Climate, 2025)

Topographically, its rugged beauty offers niche opportunities for eco- and adventure tourism. Surkhandarya is rich in captivating natural formations—caves, trekking trails, and waterfalls—many formed by the dynamic Surkhandarya River system. Furthermore, the Baysuntau Range, part of the greater Hissar system, presents immense potential for extreme mountain tourism. It features some of the deepest caves in Central Asia, such as Dark Star and Yubileynaya, and pristine alpine landscapes. The Khaja Gurgur-Ata and Ketmanchapty massifs, rising up to 3,168 meters, offer breathtaking natural vistas and ecotourism promise, especially near settlements like Machay. The region represents a rare confluence of extreme climate, untapped natural beauty, and mineral wealth. Unlocking its full potential demands a nuanced approach—balancing ecological preservation, economic utilization, and community empowerment.

Data and Methods

The prospects for ecotourism development are fundamentally shaped by the region's Ecotourism Potential (ETP). ETP is predominantly defined by the inherent natural characteristics and resources of a territory, given that ecotourism, by its very essence, is centered around the sustainable appreciation of nature. However, the successful realization of this potential extends beyond environmental attributes alone. It is inextricably linked to the socio-economic context of the region and the existing level of tourism infrastructure development. Without an enabling socio-economic environment and a robust support system, even regions rich in natural wonders may struggle to foster a thriving eco tourism sector. Accordingly, the comprehensive evaluation of a region's ecotourism potential necessitates the analysis of three interrelated categories of indicators (Likun et al., 2025a; Ravshanov et al., 2024):

- **Natural Indicators:** These encompass the suitability of the region's natural conditions, the aesthetic and ecological appeal of its landscapes, and the richness and accessibility of ecotouristic resources.
- **Socio-Economic Indicators:** These involve assessing the extent of local employment generated by the tourism sector, the region's attractiveness for tourism-related investments, and its contribution to broader sustainable development objectives.
- **Ecotourism Infrastructure Indicators:** These pertain to the density and quality of accommodations (such as hotels, guesthouses, and eco-lodges), the adequacy and connectivity of transportation and communication networks, and the availability and professionalism of trained tourism personnel.

A critical and balanced appraisal across these domains is imperative to identify strengths, address deficiencies, and craft sustainable strategies that maximize ecological preservation while delivering tangible socio-economic benefits to local communities. Therefore, the study is an attempt to include those consideration while combining both quantitative measurements and qualitative judgments in a more ethically grounded and scientifically informed basis for decision-making. The scale of measurement for ecotourism potential zones were scaled on standardized five-point scale, from highly favourable to unfavourable zone based on the above three indicators by using the eq.1 (Baiburiyev, 2022; Wang, 2024):

$$ETP_{SMA} = \frac{\mathrm{NI}\,(\mathrm{NI}_1+\mathrm{NI}_2+\mathrm{NI}_3)+\mathrm{SEI}\,(\mathrm{SEI}_1+\mathrm{SEI}_2+\mathrm{SEI}_3)+\mathrm{IEI}(\mathrm{SEI}_1+\mathrm{SEI}_2+\mathrm{SEI}_3)}{3} \qquad \text{eq.1}$$

Where, $\mathrm{ETPS_{MA}}$ is the ecotourism potential of mountainous areas, which is to be determined comprehensively by NI (natural indicators), SEI (socio-economic indicators), and SEI (ecotourism infrastructure indicators).

Further, the entire region of Surkhandarya was divided into three major groups depending to its natural landscape and field excursion. These regions were Boysun-Hisar, Bobotog, and Ko'hitang respectively. Table 1 exhibits assign scores for each indicator and their relative importance I those three defined regions for the above equation.

Table 1. Summary of indicators and ETP_{SMA} scores output from field survey

Sr. No.	Transboundary Ecotourism Zones (as an example).	Natural Indicators			Socio-economic Indicators			Ecotourism Infrastructure Indicators			Integral Average score			Overall score (EPMA)
		Favorable natural conditions	Ecotourism attractiveness of landscapes	Provision of ecotourism Resources	Employment of local Population in the Tourism sector	The investment Importance of regions	Contribution to sustainable development	Density of hotels and other tourist accommodationsi	Road and communication infrastructure	Provision of tourism personnel	**NI**	**SEI**	**IEI**	**ETP_{SMA}**
1	Boysun-Hisor	5	5	5	4	4	4	4	4	2	5	4	3.3	**4.1**
2	Bobotog ‘	3	3	2	1	2	2	1	2	1	3	1,6	1.3	**1.8**
3	Ko‘hitang	3	4	4	2	3	3	2	3	2	4	2.6	2,3	**2.8**

RESULT AND DISCUSSION

Based on multivariate criterion, the present research presents a compressive assessments of tourism potential in Surkhandarya region, Uzbekistan and affirm that the region holds exceptional promise for the development of ecotourism. This potential is rooted in the region’s distinctive natural features and diverse landscapes of southern Uzbekistan, complemented by an abundance of natural and historical monuments and the rich cultural and ethnic heritage preserved by the peoples who have inhabited Surkhandarya across successive historical epochs. Yet, while ecotourism is lauded for its comparatively minimal environmental footprint and its lower infrastructural demands relative to mass tourism, it is not without significant challenges. Although Surkhandarya's natural endowments for ecotourism are virtually limitless, the realization of this potential necessitates substantial investment in planning, development, and maintenance. The establishment of essential ecotourism infrastructure is critical to enabling visitors to experience the region’s pristine natural environments responsibly and sustainably. Particular emphasis must be placed on developing well-organized ecotourism hubs in scenic areas such as Sairob, Khojaipok, Khojamaykhona, Darband, Sangardak, and Khonjiza, located within the Hisor, Boysun, and Bobotog mountain regions. The imperative to develop ecotourism in the Surkhandarya region is driven not solely by economic considerations—such as the creation of employment opportunities and the revitalization of remote areas—but also by an increasing societal demand. As public expectations regarding tourism, health, and the pursuit of meaningful and restorative leisure experiences grow more sophisticated, the impetus for advancing ecotourism initiatives correspondingly intensifies (Yiamjanya et al., 2024). In this context, the development of ecotourism emerges as both a response to market demand and a strategic vehicle for promoting balanced regional development.

The region demonstrates significant progress in the development of tourism infrastructure across the Surkhandarya region, aimed at enhancing visitor experiences and promoting sustainable regional growth. Recognizing the centrality of digital connectivity in modern tourism, authorities have installed Wi-Fi access points at 132 tourism facilities, enabling visitors to share their experiences instantly via social media. This initiative not only meets the digital expectations of tourists but also serves as an effective instrument for destination marketing through user-generated content, a strategy increasingly validated by contemporary tourism scholarship. To facilitate independent and group travel, 345 directional signs in Uzbek, Russian, and English have been erected at 101 major tourist sites, including 150 signs dedicated to cultural heritage monuments. As emphasized in tourism planning literature, clear and accessible wayfinding significantly enhances tourist mobility, satisfaction, and site engagement, contributing to more inclusive tourism experiences. The diversification of accommodation options further reflects an evolving responsiveness to varied tourist needs. Of the 215 operational lodging facilities, 58 are hotels, 19 are hostels, and 138 are family-run guesthouses, collectively offering 1,930 rooms and 4,228 beds. In addition, health tourism is supported by 91 sanatoriums and health clinics, providing over 3,300 beds for visitors seeking therapeutic services—an area of tourism increasingly recognized for its contribution to sustainable local economies. Transport infrastructure has similarly been expanded, with 90 tourist-class vehicles—comprising 45 buses, 35 minibuses, 2 electric cars, 3 jet skis, and 4 motorboats—made available to facilitate mobility within the region. The strengthening of internal transport networks is widely acknowledged in academic studies as a fundamental prerequisite for regional tourism competitiveness. Furthermore, the entrepreneurial environment within the tourism sector has grown rapidly. Over the past three years, the number of tourism enterprises has doubled. In 2023, 260 tourism companies operated in the region; by 2024, this number is projected to increase to 275. Currently, 58 tour operators and travel agencies are active, with six new businesses (two tour operators and four agencies) established in 2024 alone. This upward trend reflects the dynamic nature of the region’s tourism industry and aligns with international models of decentralized and community-based tourism development.

Further, the analyses of Surkhandarya’s natural and geographical assets also suggest that the classical model of ecotourism is particularly well-suited for the region’s mountainous and foothill territories. This model typically emphasizes activities conducted in or near protected areas, including wildlife and bird observation, educational lectures delivered by scientists, guided nature exploration, and engagement with traditional ecological knowledge systems. Such practices are widely recognized in ecotourism scholarship as central to fostering environmental awareness, conservation support, and

sustainable community involvement. The specific districts of Boysun, Sariosiyo, Oltinsoy, Uzun, and Sherobod—situated along the Hisor, Bobotog, and Ko'hitang mountain ranges—present especially favorable conditions for the development of ecotourism initiatives. These areas are distinguished by their rich biodiversity, dramatic landscapes, and relatively undisturbed ecosystems, which align with international ecotourism criteria emphasizing low-impact, conservation-oriented travel. Furthermore, academic studies affirm that mountain-based ecotourism not only contributes to preserving fragile natural environments but also serves as an instrument for rural socio-economic revitalization.

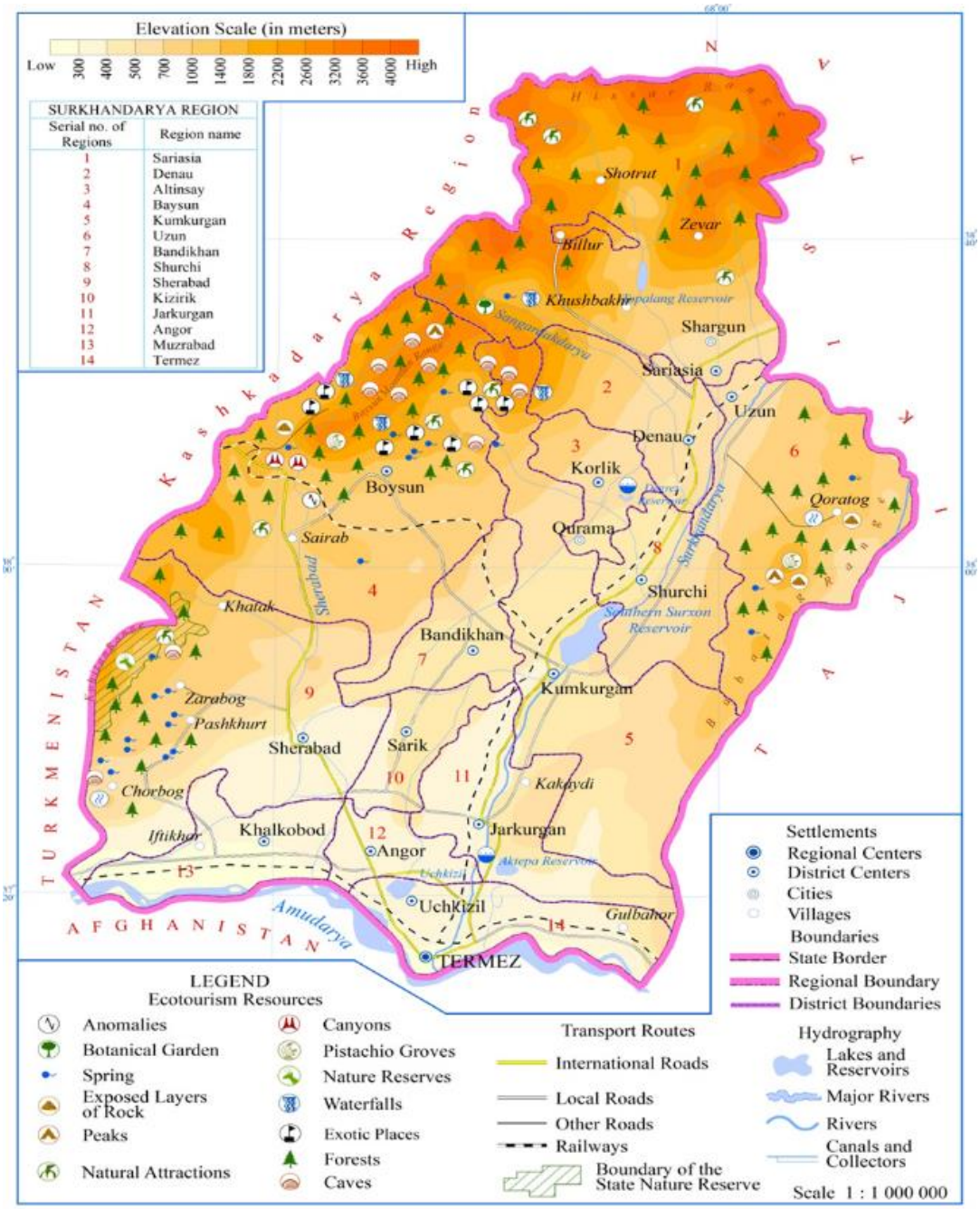

Figure 2. Ecotourism resource regions in Surkhandarya Transboundary region, Uzbekistan (Source: authors)

In Surkhandarya's region, ecotourism has the potential to stimulate local livelihoods, promote indigenous cultural heritage, and offer sustainable alternatives to extractive economic activities, which often threaten both ecological integrity and long-term community welfare. The results of the conducted analysis reveal that among the three designated regions—referred to as (a) Boysun-Hisor, (b) Bobotog, and (c) Ko'hitang Transboundary region—the ecotourism potential of three transboundary ecotourism zones has been systematically evaluated (Figure 2). This evaluation utilized ETP_{SMA} framework, incorporating scores derived from three principal categories: natural conditions, socio-economic factors, and infrastructural development indicators (Figure 3). By applying a multi-criteria assessment approach, the study systematically analyzed the natural resource base, the socio-economic readiness of local communities, and the quality and accessibility of tourism infrastructure across the regions. These composite indicators provided a holistic understanding of each area's viability for

sustainable ecotourism development. The comparative analysis of these three zones thus allowed for a structured ranking of their respective opportunities, strengths, and limitations regarding ecotourism expansion. The findings, summarized in the following section, offer critical insights into the prioritization of investments, policy interventions, and targeted capacity-building efforts necessary to unlock the ecotourism potential of each transboundary zone.

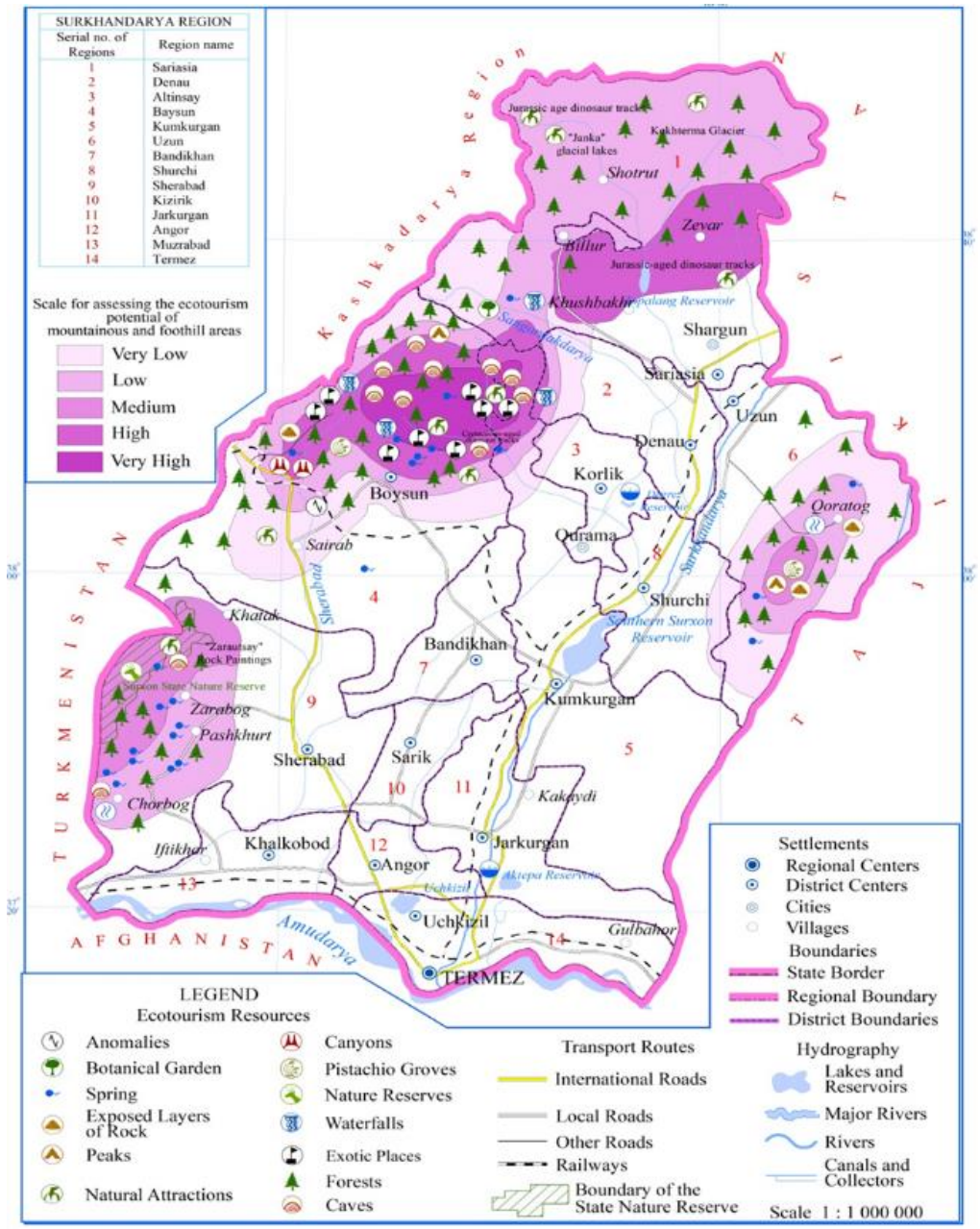

Figure 3. Ecotourism potential zoning (a) Boysun-Hisor, (b) Bobotog, and (c) Ko'hitang area in the mountainous and foothill region of Surkhandarya, Uzbekistan (Created by authors based on output from eq.1 and Table 1)

Firstly, the Boysun-Hisor transboundary ecotourism zone emerges as a region of exceptional promise for sustainable ecotourism development. Based on ETP_{SMA} model, the zone achieves an impressive score of 4.1, placing it within the "very high potential" category. Its natural indicators, scoring the maximum of 5 points, highlight the presence of diverse landscapes, abundant biodiversity, and rich ecotourism resources—factors that Ceballos-Lascuráin (1996) identifies as fundamental to authentic nature-based tourism experiences. From a socio-economic perspective, the zone earns 4 points, reflecting considerable community engagement in tourism activities and strong investment potential. This aligns with Honey's (2008) argument that local involvement is crucial to ensuring that ecotourism promotes sustainable development rather than reinforcing socio-economic disparities. Infrastructure indicators, however, reveal a critical shortfall. Although hotels, accommodations, and transportation networks are relatively well-established, the shortage of skilled tourism personnel, scoring only 3 points, presents a significant limitation. The absence of adequately trained human capital can undermine even the most naturally endowed tourism regions. Therefore, while Boysun-Hisor possesses substantial natural and infrastructural advantages, its success in ecotourism development critically depends on strategic investments in human resource training and

capacity building. Without focused efforts to enhance professional competencies in sustainable tourism, the region risks failing to fully realize its remarkable potential, a concern consistently echoed in the broader ecotourism literature.

Secondly, the Bobotog transboundary ecotourism zone, in contrast to other regions assessed, demonstrates notably limited potential for ecotourism development. According ETP_{SMA} model, the area achieves a low score of 1.8, demonstrate serious deficiencies across natural, socio-economic, and infrastructure indicators. Natural indicators register only 2.6 points, reflecting an insufficient diversity of landscapes and a scarcity of ecotourism-attractive resources. The absence of compelling natural assets significantly diminishes the viability of ecotourism initiatives, which rely heavily on authentic and high-quality environmental attractions. Socio-economic indicators are similarly discouraging. With a score of merely 1 point, the local population is minimally involved in the tourism sector, and the investment climate remains largely underdeveloped. It is argued that without active local participation and investment readiness, sustainable tourism models often fail to take root. Infrastructure assessments also reveal serious shortcomings, with roads, communication networks, accommodation facilities, and skilled tourism personnel scoring between 1 and 2 points, indicating a critical lack of basic tourism services. Therefore, Bobotog clearly faces major developmental barriers. Consequently, while the region possesses certain latent possibilities, realizing its ecotourism potential would require extensive resource allocation, long-term planning, and focused interventions. Early strategies must prioritize infrastructure development and community engagement, complemented by thorough scientific research to map and enhance latent ecotourism assets for marginalized ecotourism destinations (Rahman & Haque, 2024).

Thirdly, the Ko'hitang transboundary ecotourism zone demonstrates moderate potential for ecotourism development, achieving an Ecotourism Potential Mapping and Assessment (EPMA) score of 2.8, categorizing it within the "medium" potential range. Natural indicators stand relatively strong at 3.6 points, signifying the presence of appealing landscapes and a reasonably rich natural resource base that could support ecotourism initiatives. As emphasized by Honey (2008), such environmental richness forms the bedrock for authentic ecotourism experiences that prioritize conservation and local benefit. Socio-economic indicators, however, are less robust, ranging between 2 and 3 points. While the local community exhibits some involvement in tourism and limited investment activities, this engagement is notably weaker than that seen in zones like Boysun-Hisor. The infrastructure indicators reveal similar constraints, ie. road networks, accommodations, and tourism-related services are evaluated at only 2–3 points, reflecting the infrastructural gaps typical of many emerging ecotourism destinations. A further critical limitation lies in the insufficient availability of skilled tourism personnel, which could undermine the delivery of high-quality ecotourism experiences. Consequently, although the Ko'hitang zone possesses a sound natural foundation, its advancement as a competitive ecotourism destination depends on strategic investments in physical infrastructure, comprehensive capacity-building initiatives, and greater community engagement to foster sustainable practices, in line with the principles set forth by the World Tourism Organization (WTO, 2024).

SWOT Analysis

The evaluation of the ecotourism potential in the Surkhandarya region was undertaken through a comprehensive SWOT analysis (refer to Table 2), offering an assessment of its strengths, weaknesses, opportunities, and threats. This analytical framework serves as a critical tool for identifying key factors influencing the region's ecotourism development, providing both a strategic overview and a foundation for informed decision-making in line with sustainable tourism principles.

Table 2. Results from SWOT analysis (based on field survey and interview method)

Strength	**Weakness**
The Surkhandarya region boasts vast natural landscapes, including areas rich in biodiversity like Bokira, and features UNESCO-protected sites. The Surkhon Reserve, with its unique ecological significance, further enhances the region's ecotourism potential. The area's distinct culture and local customs add to its allure, complemented by a strong legislative framework supporting tourism development. The region is poised to achieve sustainable development, with growing interest in ecotourism and well-equipped guesthouses in ecotourism zones. Additionally, the region offers lower service prices compared to other tourism types and provides access to naturally clean food products, making it an attractive destination for eco-conscious travellers.	The region faces several challenges that hinder the growth of ecotourism, including underdeveloped road infrastructure and a shortage of qualified personnel in the field. There is also a lack of marketing and branding for ecotourism, alongside insufficient investment and financing in the sector. Most infrastructure is concentrated in cities and large population centers, with the existing ecotourism facilities not meeting international standards. Additionally, the organization of activities at tourist attractions, including protected areas, is inadequate, and there is a general lack of proficiency among stakeholders and staff, particularly in foreign languages, further impeding the development of the sector.
Opportunity	**Threat**
Ecotourism in Uzbekistan is gaining increasing popularity both domestically and globally, driven by a rising interest in education and sustainable travel. Government initiatives aimed at preserving ecological balance and promoting ecotourism are further fostering growth. These efforts create new job opportunities, particularly in the mountain and foothill regions, while developing a national tourism product centred around ecotourism. The sector's expansion is expected to boost both domestic and international tourist flows, while also fostering ecological awareness among local populations and preserving the natural, historical, and cultural heritage of specific regions. Additionally, improved relations with neighbouring countries and the removal of border barriers will enhance cross-border tourism, further supported by events like the Boysun Bahori International Festival, which attracts numerous visitors.	The development of ecotourism in Surkhandarya is hindered by several significant challenges, including the low purchasing power of the population and the absence of a clear ecotourism development strategy. The lack of a well-defined concept of ecotourism among the public, coupled with a low level of ecological education, further complicates efforts to promote sustainable tourism. Additionally, global climate change and the deteriorating environmental situation pose risks to the region's natural resources, while natural disasters such as floods, snowstorms, and rainy periods add to the unpredictability, making it difficult to ensure consistent growth in the sector.

Incorporating insights from existing literature on ecotourism, this approach highlights the intricate balance between environmental conservation and tourism growth, emphasizing the need for a holistic understanding of the region's unique ecological assets and socio-economic dynamics. The findings contribute to a broader discourse on sustainable development in ecotourism, particularly in the context of Central Asia's evolving tourism landscape.

Based on the above research findings, the following strategic recommendations and proposals have been formulated:

1) Infrastructure Development – There is an imperative need to enhance tourist infrastructure in harmony with natural resources. This encompasses improving road networks, expanding accommodations such as hotels, hostels, and guesthouses, establishing information centers, ensuring reliable internet connectivity, and introducing eco-friendly transportation options to reduce the carbon footprint.

2) Defining Tourist Routes – It is essential to design captivating travel routes through the mountainous and foothill regions, offering activities such as hiking and horseback riding. These routes should be complemented by professional tour guides and clear signage, with eco-routes specifically crafted to acquaint tourists with natural landmarks in alignment with ecotourism principles.

3) Enhancing Local Community Participation – The active inclusion of local communities in ecotourism development is paramount. Supporting the growth of local services, such as the sale of artisanal products, traditional cuisine, and handcrafted goods, will stimulate the local economy while contributing to sustainable development by integrating cultural authenticity into the tourism experience.

4) Developing Environmental Education Programs – To foster environmental stewardship, it is crucial to implement ecological education programs targeting both ecotourists and local populations. These initiatives will raise awareness of environmental conservation and encourage the responsible use of natural resources, ensuring the long-term viability of the region's ecosystems.

5) Zoning the Region – In order to optimize ecotourism potential, it is necessary to zone Surkhandarya's mountainous and foothill areas according to their suitability for sustainable tourism development. This zoning should incorporate protected areas, recreational zones, and designated areas for tourism infrastructure, all designed to safeguard ecological integrity and ensure sustainable growth.

6) International Cooperation and Promotion – To elevate Surkhandarya's ecotourism profile on the global stage, it is vital to host international tourism forums, attract foreign investments, and engage in cross-border collaborations. These efforts will enhance the region's visibility, fostering increased tourist arrivals and positioning Surkhandarya as a prime ecotourism destination.

CONCLUSION

The mountainous and foothill regions of Surkhandarya exhibit substantial ecotourism potential, offering diverse opportunities for sustainable development in alignment with global ecotourism principles. With approximately 70% of its area characterized by mountainous terrain, Surkhandarya is bordered by the Hisor, Boysun, Bobotog, and Ko'hitang mountain ranges, creating a natural fortress that holds significant ecological, geological, and hydrological assets.

Key ecotourism attractions in these regions include hydrological features such as springs, rivers, and waterfalls; geological wonders like caves, rock formations, and canyons; and rich biological diversity, including ancient plane trees and pristine forests—each contributing to the region's high ecotourism potential.

The evaluation of Surkhandarya's ecotourism prospects was conducted using three primary indicators: ecological, social, and economic factors. While the region's natural assets were found to be of exceptional value, social and economic indicators were found lacking. Specifically, the region suffers from insufficient development in tourism infrastructure and environmental management, which impedes its full ecotourism potential.

Despite this, the findings highlight the region's diverse and significant opportunities for growth, provided that the necessary infrastructure and environmental protection measures are implemented.

Grounded on established literature in the field of sustainable tourism development, it is evident that infrastructure development, local community involvement, and environmental education are critical to overcoming these challenges. To that end, the study offers several practical recommendations, including the improvement of road infrastructure, the creation of eco-routes, the promotion of local community participation, and the development of eco-friendly services. Furthermore, it emphasizes the importance of aligning tourism development with the preservation of the region's ecological and cultural heritage, as well as the need for targeted government policies and investments.

The insights derived from this study offer a solid scientific foundation for shaping a comprehensive strategy for the sustainable development of ecotourism in Surkhandarya. By leveraging its natural and cultural wealth in a responsible manner, the region has the potential to become a model for ecotourism development in Central Asia, contributing both to the preservation of its unique environment and the socio-economic empowerment of its local communities.

Limitation of the study

The present research on ecotourism in Uzbekistan has offered practical and innovative contributions to the field particularly in the context of the Surkhandarya region. However, several limitations persist in the study which includes:

1) The limited access to reliable and comprehensive data on ecotourism indicators specifically to Surkhandarya region. The absence of a unified or specialized regional database has significantly hindered the depth and accuracy of empirical analysis. More accurate and reliable data would contribute to further refinement the current ecological, socio-

cultural, or infrastructural dynamics of the region. Therefore, this may affect the precision of policy recommendations derived from the research.

2) Furthermore, most existing research has been constrained by narrow geographical sampling, often excluding comparative analysis with other regions in Uzbekistan or similar ecotourism sites in Central Asia. This limits the potential to develop robust, transferable models that capture broader trends.

3) Methodologically, many studies have not yet incorporated advanced modeling techniques, such as artificial neural networks or trend-based predictive frameworks, which could enhance the capacity to simulate and forecast ecotourism growth under varying environmental and socio-economic conditions in future.

In view of the above, therefore, it is recommended that the future research shall include detail local surveys, more advance satellite data, and community-based records. Also, there is need to include comparative and cross-regional approaches to contextualize Surkhandarya's ecotourism within national and regional frameworks. Further, the adaptation of advanced econometric and machine learning models would certainly contribute in better understanding of complex interactions between tourism, local development, and sustainability.

Author Contributions: Conceptualization, R.S. and M.S. and R.A.X.; methodology, R.S. and M.S.; software, R.S. and M.S.; validation, R.S. and K.D. and M.S. and R.A.X. and A.K.Z.; formal analysis, R.S. and M.S. and R.A.X.; investigation, R.S. and K.D. and M.S. and R.A.X.; data curation, R.S. and K.D. and R.A.X. and Z.G.; writing - original draft preparation, R.S. and M.S.; writing - review and editing, R.S. and K.D. and R.A.X. and M.S. and K.F.M and A.K.Z.; visualization, R.S. and K.D. and K.F.M. and M.G. and A.K.Z.; supervision, R.A.X. and K.D. and M.S.; project administration, R.S. and R.A.X. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 28.04.2025 Revised: 04.08.2025 Accepted: 01.09.2025 Available online: 22.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1932-1943
DOI 10.30892/gtg.61350-1560

THE USE OF GEOGRAPHIC INFORMATION SYSTEMS IN SELECTING THE MOST SUITABLE SITES FOR TOURISM PROJECTS IN EL DRIOUCH (NORTHEASTERN MOROCCO)

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Citation: Mohamed, E., & Smail, B. (2025). The use of geographic information systems in selecting the most suitable sites for tourism projects in El Driouch (northeastern Morocco). *Geojournal of Tourism and Geosites*, 61(3), 1932–1943. https://doi.org/10.30892/gtg.61350-1560

Abstract: This study explores the potential of using Geographic Information Systems (GIS) in spatial analysis to identify the most suitable locations for establishing tourism projects in the Driouch Province. The study aims to diagnose the reality of tourism in the Driouch province, identify tourism potential, and develop sustainable tourism planning for the long term. The research adopts the Analytic Hierarchy Process (AHP) as a multi-criteria decision-making methodology. Optimal tourism planning contributes to the development of the tourism sector in a sustainable, organized, and effective manner. It leads to economic and social growth while preserving natural and cultural resources an endeavor that requires the collective will of state institutions, the private sector, associations, and the local population. The study employed various analytical and methodological tools, starting with theoretical approaches and fieldwork, and incorporated modern geographical techniques particularly GIS, satellite imagery, and the Global Positioning System (GPS). The findings reveal that Driouch Province possesses diverse tourism assets (natural, cultural, and historical), which could serve as pillars for strengthening the tourism economy. However, these resources remain underutilized, and the tourism sector has yet to contribute meaningfully to regional development. Moreover, tourism in the area is characterized by randomness and a lack of proper planning. To address this, the study proposes areas potentially suitable for tourism projects, selected based on several criteria, including proximity to road networks, the coastline, and urban centers, and distance from watercourses, hazard zones, agricultural land, and residential areas. The results offer significant potential for optimized tourism planning and will support decision-makers in making informed administrative choices not only for establishing tourism projects but also for prioritizing economic development initiatives in the Driouch Province based on its tourism assets.

Keywords: tourism, tourism planning, GIS, tourism development, AHP, Driouch Province, cultural heritage, spatial analysis

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INTRODUCTION

Tourism is one of the main economic sectors that is of great importance in many countries of the world, as it represents an important source of financial revenues. This activity contributes to creating jobs for the community, which in turn leads to increased income and automatically improves the welfare of the population (Grilli et al., 2021).

It brings in hard currency (Apergis & Payne, 2012) and contributes to a country's gross domestic product (Khasawneh et al., 2023), meaning that tourism has become a driving force for global economic and social development (Danish & Wang, 2018). It also plays a key role in achieving the Sustainable Development Goals (World Tourism Organization,2022). Moreover, tourism promotes people-to-people communication and cultural exchange, which contributes to strengthening international relations and easing tensions between countries and regions.

The tourism sector has become one of the main sectors that is witnessing continuous development (Suma, 2018). This development is the result of the curiosity and desire of individuals to discover new things, places and people (Khairun et al., 2015). With the development of tourism and the improvement of living standards, tourists have become increasingly interested in the tourism experience, with a focus on the environment of the tourist destination (Pei et al., 2022).

Tourists prefer to spend less time in the tourist destination, but in return they visit multiple places and at the same time need diverse services at lower costs (Shaghaghipour & Larijani, 2017). Considering that tourism is an activity closely linked to recreational activities mainly (Acharya et al., 2023). It depends on travel and movement, which requires diverse psychological, cultural, social and financial needs (Sani et al., 2011). In order to achieve this, it requires precise tourism planning and careful management (Daghestani, 2012). However, it remains a very complex matter due to the overlap of a group of factors with each other (Husain et al., 2024). Several factors intervene in the development of sustainable tourism, such as central and local institutions and administrations, actors in the commercial sector, investors and society, in addition to the availability of infrastructure, a transportation network and a suitable environment (Kuklina et al., 2022; Trigo et al., 2022). As one of the most important factors contributing to tourism attractiveness

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(Kulakov et al., 2024) in this regard, researchers have identified six basic elements of tourism planning, namely: food, shopping, transportation, accommodation, entertainment, and tourist attractions (Sánchez et al., 2022).

Today, tourism is witnessing continuous expansion and has become one of the largest and fastest growing sectors in the world (Wibisono et al., 2024). with the number of tourists reaching approximately 1.3 billion international tourists in 2017 and expected to reach 1.8 billion by 2030 (Thomas & Asrat, 2018). At the national level, Morocco achieved a new historic step in 2023, as the Kingdom received approximately 14.5 million tourists, recording a significant increase of 34 percent compared to 2022, and 12 percent compared to 2019 (Moroccan Ministry of Tourism, 2020). This sector thus enjoys an important strategic role in the Moroccan economy, thanks to its multiplier effects and strong connections with many other sectors in the national economy (Arib, 2005). It played a vital role in creating more than 550,000 jobs in 2019 (Ksissou et al, 2024). This prompted the authorities responsible for the tourism sector in Morocco and businessmen to promote and develop tourism and to bring to mind its cultural and environmental dimensions due to its important roles (Héctor et al., 2003).

The study of tourism as an academic field is a recent phenomenon. Over the past few decades, this field has witnessed rapid transformations and has become a subject of interest and focus for academic research (Xiao & Smith, 2006). Therefore, in this study, we wanted to shed light on an important topic related to the importance of employing geographic information systems in tourism planning, and thus enhance the ability of officials to direct investments towards tourist destinations while taking into account sustainable development and the protection of natural resources. This research seeks to achieve a set of key objectives, the most important of which is to highlight the pivotal role played by Geographic Information Systems (GIS) in supporting decision-making and effectively guiding tourism development paths. It focuses on the study of the Driouch province, a region rich in diverse natural and cultural assets. The study monitored and analyzed the factors influencing tourism attractiveness, such as infrastructure, environmental resources, heritage sites, and accessibility. The study also relied on GIS tools and techniques to draw analytical maps that highlight spatial disparities in tourism potential. The results aim to suggest ideal locations for future tourism projects that take in to account the geographical distribution of resources and development determinants. The outcomes of this research constitute a reference for developing sustainable tourism development strategies in the Driouch province, by directing investments and providing an appropriate environment to enhance tourism attractiveness locally and regionally.

Among the most important studies that addressed the issue of spatial suitability of tourism projects, we find the study (Sagatbayev et al., 2025). This study focuses on assessing the natural and recreational potential of the Teniz-Korgalzhyn Depression using remote sensing and GIS technologies. It aims to analyze key environmental components such as relief, vegetation, and water resources to support ecotourism development. The balance method was applied to identify priority areas for recreational use and their accessibility. NDVI and MNDWI analyses revealed spatial variations in vegetation and water presence, aiding in environmental planning and identifying degraded areas. The findings highlight the importance of sustainable resource management to maintain ecological balance. The Korgalzhyn Nature Reserve stands out as the region's most valuable natural asset. Then we find the study (Waiyasusri et al., 2025).

The aim of this study was to identify the spatial distribution of Buddhist cultural tourism sites in Nakhon Si Thammarat Province, Thailand, and to map the tourism route using geographic information technology. The methodology included field surveys using Global Positioning System (GPS) to record coordinates, and the application of Geographic Information System (GIS) tools with kernel density analysis to assess spatial patterns.

The results showed a high density of tourist attractions in the eastern coastal plain, divided into three regions: northern, central, and urban, with density increasing toward urban areas. A total of 16 Buddhist cultural sites were identified, including temples, archaeological sites, and natural features. A four-day tourism plan, distributed across three regions, was proposed to ensure efficient travel and site visits. In addition, a study (Naimi et al., 2024) aimed to identify optimal areas for geomorphosite sites across large areas by analyzing the influencing factors, with a focus on the Upper Ziz Basin (ZUW) in southeastern Morocco. A field inventory of 120 geomorphosite sites was conducted, and detailed topographic data were collected. A "bagging" machine learning algorithm was applied to develop a predictive model that achieved high performance (AUC = 0.935). The model identified highly favorable areas covering approximately 12% of the area, particularly in the mountainous western regions with steep slopes and high elevations.

These results support the development of geotourism and guide decision-makers in site selection.

MATERIALS AND METHODS

Study area

The area being studied is naturally bounded between the Nekour Valley to the west and the Kert Valley to the east. It opens to the Mediterranean coast to the north and connects to the Guercif Basin to the south. Geographically, as is well known by geographers, it belongs to the Eastern Rif region and is part of the Rif Mountain e. Administratively, it is considered a newly established region, having been separated from the Nador Province by Royal Decree No. 2.03.319 issued on June 11, 2009. It belongs to the Eastern region and is bordered by Nador Province to the east, Al-Hoceima Province to the west, guersif Province to the south, and Taza Province to the southwest (Figure 1). Thus, it is considered a transitional area between Nador and Al-Hoceima. The total area of the study region is approximately 2,867 km², which represents 3.2% of the total area of the region and 0.40% of the national territory. It consists of two districts: the Driouch District and the Rif District, with eight administrative subdivisions, three urban centers, and 23 local communities, including three urban municipalities.

According to the most recent official census in 2024, the total population is about 188,191 people (8.20% of the total population of the Eastern region). The population is distributed as follows: 46,054 urban residents, representing 24.47% of the total population of the region, and 142,137 rural residents, making up 75.53% of the total population of the region.

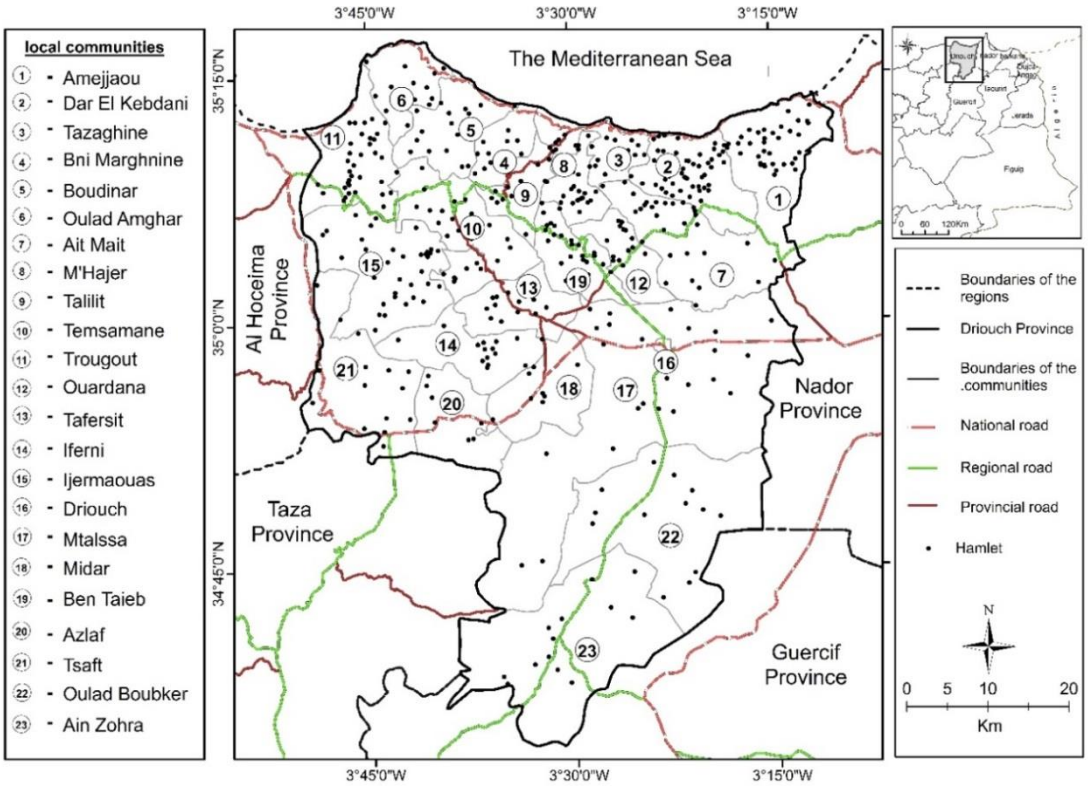

Figure 1. Geographic location and administrative division of the study area
(Source: Map of the administrative division of Morocco 2015, personal work)

Database collection and construction sources

We relied on various sources to collect data for the topic. In addition to field work, we used open source data provided by a group of global sites. After collecting the necessary data about the phenomenon to be modeled on maps, we were required to follow the following steps:

- Step One: In the first stage, we prepared each criterion in the form of an independent layer (Shapefile), which allowed us to control each of the adopted variables.
- Step Two: Processing each criterion using the (Euclidean Distance) tool and reclassifying it using the (Reclassify) tool in order to unify the criteria and give all sites a value representing the degree of suitability on a continuous scale ranging from 1 to 10.
- Step Three: We applied the process of cumulative matching of weighted criteria (Map Algebra)
- Step Four: Extracting the final result in the form of a composite map showing the degree of suitability according to its preference.

Table 1. Approved criteria, their weights and data collection sources (Source: Own work 2025)

Approved standards	Weights (%)	Data source
Proximity to tourist sites	20	GPS
Proximity to coastline	20	Google Earth pro 2022
Proximity to the road network	20	Shape File
Slopes	15	DEM (USGS)
Distance from water network	5	DEM (USGS)
Proximity to vegetation	5	Satellite Images
Distance from cultivated (agricultural) lands	5	Satellite Images
Proximity to urban and sub-urban centres	5	Shape File
Distance from built-up area (housing)	5	Satellite Images

The data obtained enabled us to create an important database on the field of study, and we focused primarily on the data that would be of interest to us in our research, and on the basis of that, a set of criteria were selected to determine the best paths for implementing tourism projects and giving weight to each criterion according to the degree of impact. It is worth noting that there are other criteria that can be added to determine the appropriate areas, such as distance from airports, ports, neighboring urban centers, etc., but they remain of little importance, so we limited ourselves to only the aforementioned criteria (Table 1).

METHODOLOGY

The Analytical Hierarchy Method (AHP) has gained wide importance and use due to its reliance on quantitative and qualitative analytical methodology. By integrating multiple criteria that are converted into quantitative expressions, which enhances the credibility of the evaluation results (Lee, 2016) where the ranking of all criteria is determined by a

comparison system that is applied to the elements of the hierarchy. This process involves converting these verbal criteria into numerical values on a scale ranging from 1 to 9 (Gompf et al., 2021). The Analytical Hierarchy Method (AHP) is an effective way to deal with complex decision-making, and can help in identifying and evaluating criteria, analyzing collected data, and accelerating the decision-making process (Saaty, 1980).

The AHP method also provides a useful mechanism for verifying the consistency of assessments, which helps reduce bias in decision-making (Alessio & Markus, 2002), especially since it is based on comparison and giving weight to each proposed criterion (Jamshidi & Solmi, 2012). Therefore, it is considered a methodology and a method used specifically in collective decision-making, and it has been applied globally in various fields such as industry, health, education, business, and site selection (Saaty & Vargas, 2013) because it guides decision-makers towards the best options based on their goals and enhances accurate judgments (Mahmood, 2023) and relies on effective mathematical equations (Triantaphyllou & Mann, 1995). The strength of the methodology lies in its ability to integrate a set of tangible and intangible factors and criteria, in addition to qualitative and quantitative measures in the decision-making process (Akıncı et al., 2013) and to reach a range of preferences derived from a set of alternatives (Abedini et al., 2017), especially since this method has proven its success and high efficiency in solving complex problems (Elkasseb, 2021). AHP works in geographic information systems to calculate the relative importance value of each criterion with the aim of extracting a final result (a composite map) that shows the degrees of spatial suitability (Figure 2).

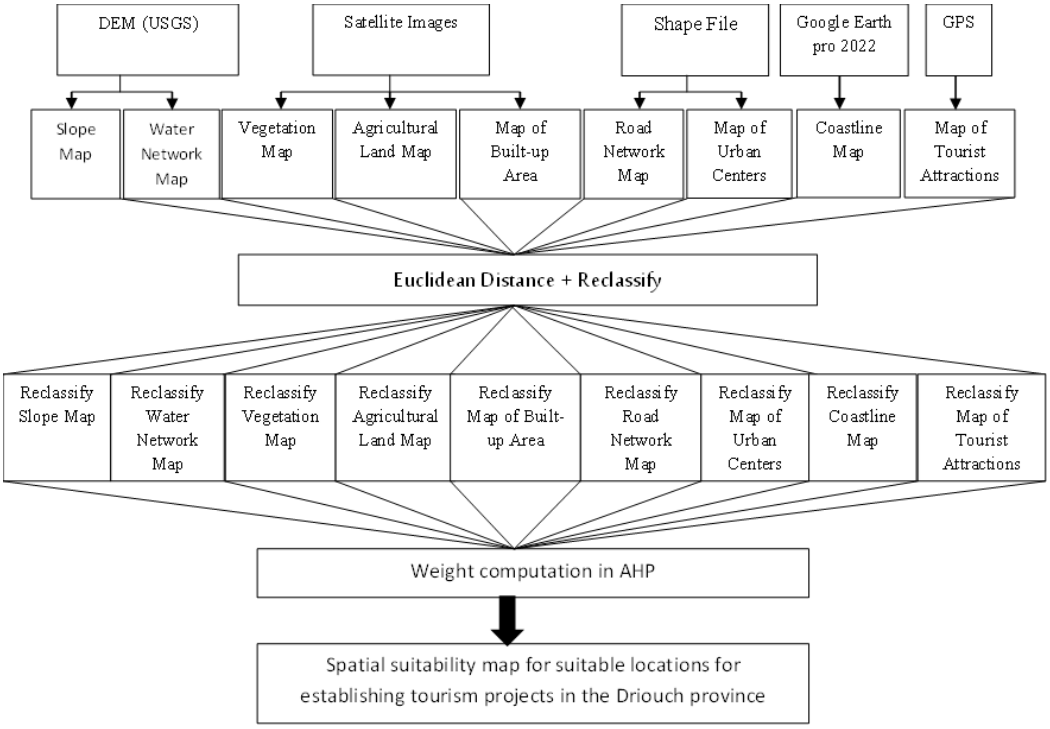

Figure 2. Summary of the methodology used (Source: Own work 2025)

(a) **(b)**

Figure 3. Some tourist attractions in the Driouch province (a) Kilati historical landmark, (b) Sidi Bou Said beach) (Source: Images taken by researchers 2024)

RESULTS AND DISCUSSION

1. Diversity of tourism qualifications in the Driouch province

The Driouch province is located within an area that has distinct natural, cultural and environmental components and

qualifications, in addition to having a hinterland with important qualifications that constitute the basic pillar of tourism development. In addition to the beach qualifications, it also has important aspects of cultural tourism with local production.

- Attractive beaches: The Driouch province has various sandy and rocky beaches that offer important opportunities for developing the tourism sector, as they allow for the practice of various activities related to the sea (swimming, fishing, surfing.). Among the most important of these beaches are Sidi Idriss, Tzaghine, Chemlala, Ghanso, and others (Figure 3).

- Mountainous and picturesque landscapes: Due to its location and belonging to the Rif Mountains, the Driouch province is distinguished by its diverse terrain that provides great opportunities for mountain activities such as sports, climbing and camping. Especially since the region has forests, valleys and biological diversity.

- Cultural and historical heritage: In addition to its natural assets, the Driouch province also has an important cultural and historical heritage, where tourists can discover traditional villages and engage in local cultural activities, such as seasonal festivals that reflect popular customs and traditions. In addition, the region includes many historical.

- Agricultural heritage and fishing: The Driouch province is famous for producing high-quality local fruits and vegetables. Tourists can visit local farms to learn about traditional farming methods and discover aspects of rural life in the region. Fishing is also part of the daily lives of many fishermen in the Driouch province. In general, the Driouch region is a tourist destination characterized by a great diversity in its natural, cultural and historical landscapes. From its picturesque beaches to its mountains, from its cultural heritage to its biological diversity, the region offers a rich tourist experience for visitors seeking to explore the local culture and interact with nature. It is therefore considered a strategic choice for domestic and foreign tourism.

2. Analysis and discussion of the approved standards

In studying, analyzing and selecting suitable places for implementing tourism projects in the Driouch region, we relied on nine criteria whose importance varies from one criterion to another according to the degree of influence of each one. In order to obtain greater accuracy, each criterion was divided into ten equally spaced categories whose degree of preference ranges between number (1), which corresponds to areas unsuitable for implementing the project, and value (10), which expresses the best place to establish the project. These values are graded so that the higher the value and the closer it is to 10, the more suitable areas it expresses, and vice versa. In determining and classifying these values, we employed the (Euclidean Distance) tool and the (Reclassify) tool, which are provided by the Spatial Analyst Tools toolbox. The following are the results of each criterion:

2.1. Spatial suitability according to the criterion of proximity to tourist sites

Tourist sites play a fundamental role in tourism promotion, as they can attract many tourists and visitors to discover these landmarks and qualifications. Therefore, it is natural to build tourism projects near these sites in order to facilitate tourist access and provide suitable conditions for tourists (hotels, restaurants, tourist routes, services). Given the importance of these sites in tourism planning, we have given them an influence weight of 20%. Accordingly, the classification of the degree of spatial suitability according to the criterion of proximity to tourist sites came as follows: The areas close to tourist sites took the highest value (7, 8, 9 and 10) and thus they are excellent areas for building the tourist project, while the very distant areas took values (1, 2, 3) and thus they are not suitable according to this classification, while the areas between them took values (4, 5 and 6) and they are classified within areas of medium to very weak suitability (Figure 4).

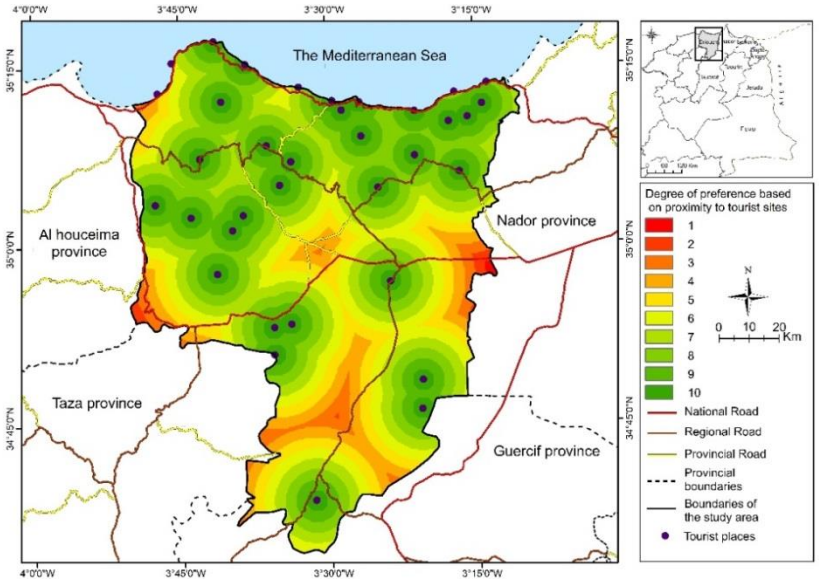

Figure 4. Spatial suitability for the implementation of tourism projects according to the criterion of proximity to tourist sites (Source: Personal work based on geographic information systems, 2025)

2.2. Spatial suitability according to the criterion of proximity to the coastal area

Coastal areas or those adjacent to them are considered among the most important tourist sites worldwide, as they witness significant tourist dynamics, especially during the summer. Given their importance, we have taken the coastline as

a criterion for determining the most appropriate site for implementing tourism projects, and we have given it an influence percentage estimated at 20%. This adopted standard gave us a result that all areas adjacent to the coast (values 8, 9, 10) are suitable to a good to excellent degree for establishing tourism projects, and this is what is expected from adopting this standard, while the further we are from the coast, the weaker the degree of suitability, and thus it ranges between average (values 7 and 6) and unsuitable, as expressed by the values (1, 2, 3, 4, and 5) fixed on the map (Figure 5).

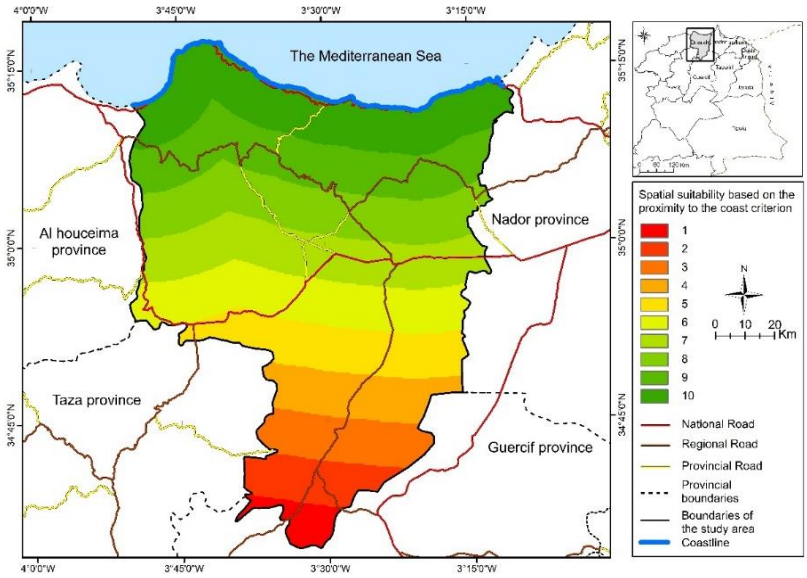

Figure 5. Spatial suitability for the implementation of tourism projects according to the criterion of proximity to the coastline (Source: Researcher's achievement using Geographic Information Systems 2025)

2.3. Spatial suitability according to the criterion of proximity to the road network

The road network and its efficiency are considered the arteries through which various currents flow, whether it is related to population movements or commercial movement and the movement of goods and capital, or to facilitating access to basic social, economic and recreational services. Here, the issue of access to tourism services is of utmost importance, considering that the road network plays a prominent role in introducing the region and attracting tourists and thus attracting various tourism investments, and without it, the area loses its attractiveness. On this basis, we classified all areas adjacent to the road network among the most suitable areas and took a value of (10), while the distant areas took a value of (1) as unsuitable according to this criterion. As for the weight of the criterion and given the importance of the road network, we took an impact rate of 20%. By analyzing the criterion of proximity to the road network, it became clear to us that the area we are studying is crossed by a diverse road network (national, regional, provincial). Therefore, the issue of localizing and establishing tourism projects does not pose any obstacle. As shown by the map, it appears that the most suitable areas are distributed almost throughout the territory of the Driouch region; meaning that most of the excellent areas (values 7, 8, 9 and 10) are located less than 5 kilometers from the nearest main road, while others that are considered unsuitable because they are far from the main roads are concentrated in very limited areas of the Ijermaous and Ouled Boubker communities (values 1, 2 and 3) (Figure 6).

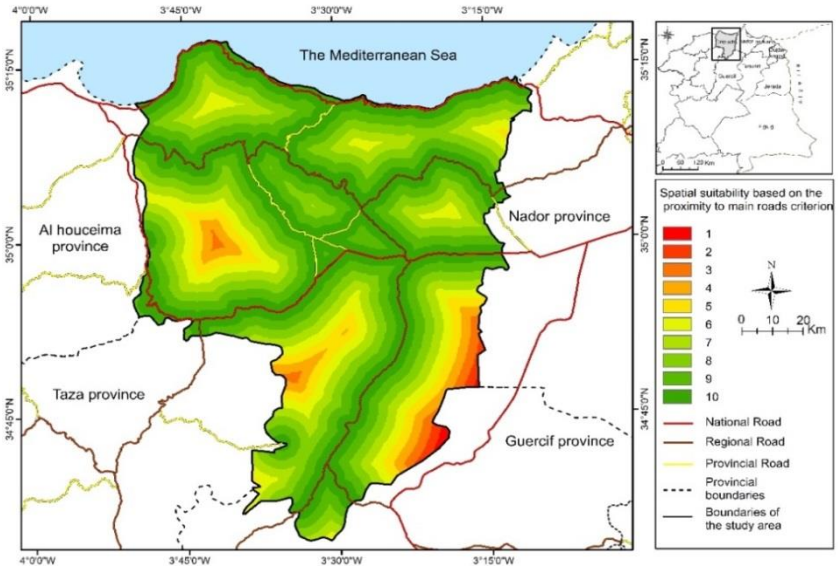

Figure 6. Spatial suitability for the implementation of tourism projects according to the road network criterion (main axes) (Source: Personal work based on GIS 2025)

2.4. Spatial suitability of tourism projects according to the slope criterion

Areas with steep slopes are considered unsuitable for the establishment of urban or tourist facilities, as they are areas threatened by danger (erosion, floods, landslides) and also because the cost of completing projects in flat areas with less slopes remains low compared to rugged areas with steep slopes, which in turn require the construction of roads, the provision of water and electricity, and the construction of tunnels and bridges. Therefore, it was necessary to adopt this criterion, which we classified into ten categories ranging from value (1), which corresponds to unsuitable places because they are located on steep slopes exceeding 60 degrees, to value (10), which is considered the most suitable areas, and between them there is a group of values whose degree of preference varies from medium to very weak (Figure 7).

We conclude from the map of the slope criterion, whose impact is estimated at 15%, that all areas with a slope of less than 15 degrees are suitable for completing the project, while areas with a slope ranging between 15 and 24 degrees are medium to weak, while those with a slope of more than 24 degrees remain unsuitable for establishing tourism projects

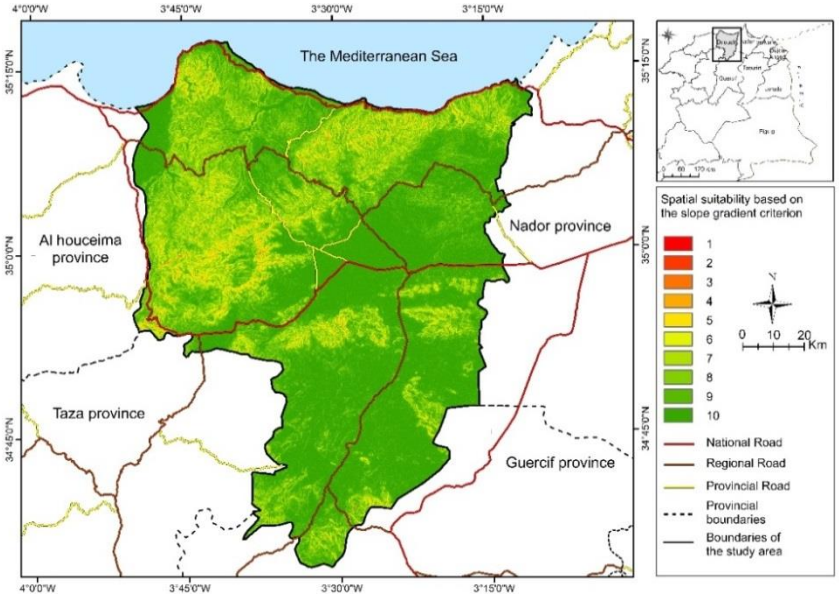

Figure 7. Spatial suitability for tourism projects according to slope degree (Source: Personal work based on GIS, 2025)

2.5. Spatial suitability according to the criterion of distance from the water network (main sewers)

Waterways are considered places classified as areas threatened by natural hazards, where construction, housing and project completion are prohibited. Therefore, we took this criterion into consideration during the analysis and classification of the criteria and gave it an impact weight of 5%. The result was as shown in the following map (Figure 8).

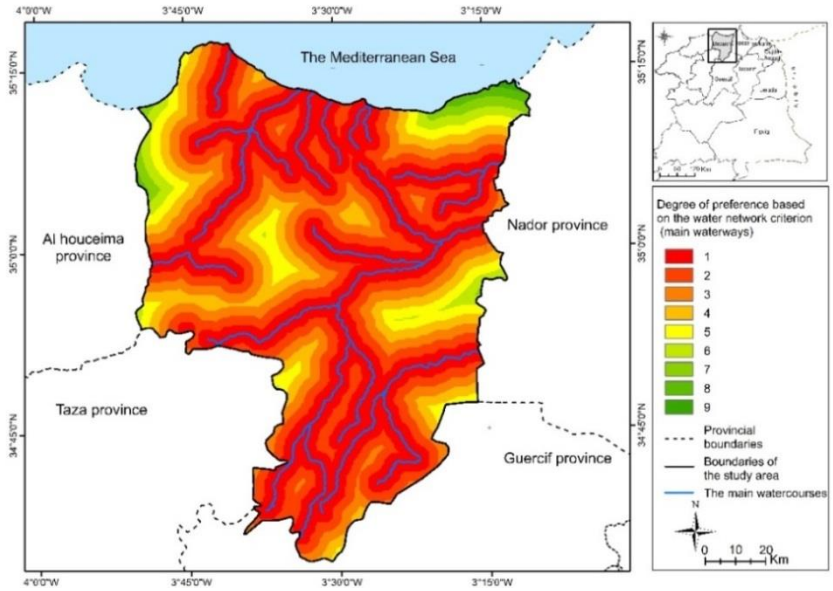

Figure 8. Spatial suitability for the implementation of tourism projects according to the criterion of distance from the water network (main sewers) (Source: Personal work based on Geographic Information Systems 2025)

To analyze this criterion, we relied on the main watercourse layer (Shapefile) extracted from the digital elevation model (DEM) and reclassified it into ten equidistant classes using the (Euclidean Distance) tool and the (Reclassify) tool.

The results of adopting this standard were that all sites adjacent to waterways fall within the scope of areas unsuitable for establishing tourism projects, as shown on the map through values (1, 2, 3). The further we move away from waterways, the more suitable places there are for completing the project. Accordingly, it can be said that adopting the water network standard remains of great importance in tourism planning in order to avoid programming any project in areas close to waterways.

2.6. Spatial suitability by distance from forest

Forest areas constitute distinguished tourist places on the global level due to the space they provide for recreation and entertainment and as a tourist product, and thus they have the ability to develop the eco-tourism sector. We adopted this criterion not only to measure the degree of tourism suitability, but also to raise awareness of the importance of preserving the forest heritage and preventing the programming of projects of any nature at the expense of the forest. In other words, there must be a balance between the implementation of tourism projects and ensuring the sustainability of the vegetation cover, as we observed in many parts of the study area urban expansion without taking into account the forest environment (Figure 9). The result of the spatial analysis of this criterion showed that all forest areas and those adjacent to them that carry values (1, 2, and 3) are not suitable for establishing a tourism project in order to preserve the forest heritage, while areas with values (4, 5, and 6) are considered medium to weakly suitable, while values (7, 8, 9, and 10) are considered excellent and very suitable for establishing tourism projects. It is worth noting that this criterion took an impact rate estimated at 5%, which seems weak but is expressive and important considering that the area includes other tourism qualifications of great importance and thus took a high impact rate.

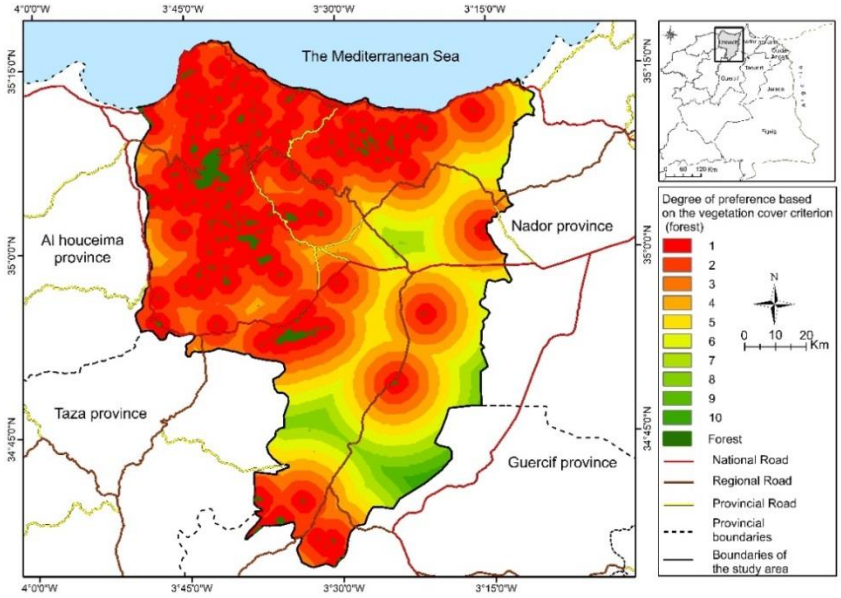

Figure 9. Spatial suitability for the implementation of tourism projects according to the criterion of distance from the forest area (Source: Personal work based on geographic information systems 2025)\

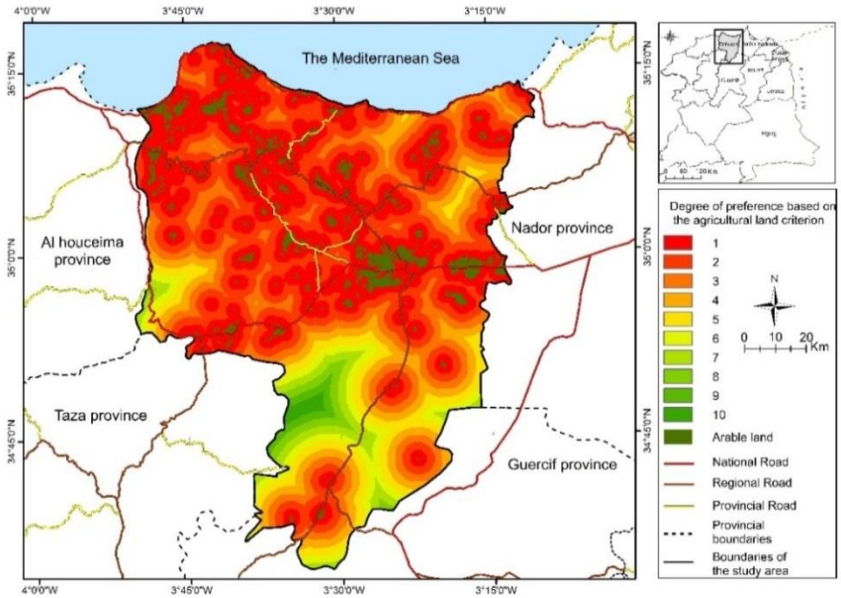

Figure 10. Spatial suitability for the implementation of tourism projects according to the criterion of distance from agricultural lands (Source: Personal work based on geographic information systems 2025)

2.7. Spatial suitability according to the criterion of distance from agricultural lands

Agricultural areas and lands used for agriculture and planting are areas where it is recommended not to build on or program projects because they are considered a means of agricultural production and ensuring the continuity of the countryside. Therefore, this criterion remains important because it reconciles the requirement to complete tourism projects on the one hand and protect cultivated lands on the other hand (Figure 10).

As a first step, we completed a land use map, which included a layer for agricultural lands (planted and cultivated), and then we entered the data into the SIG program in order to rearrange this criterion into a set of equidistant values arranged in ascending order from value (1) to value (10). As for the weight of the impact of this criterion, we gave it a percentage of 5%. The results of this criterion showed that all agricultural and cultivable areas remain unsuitable for establishing tourism projects at their expense. Thus, values (1, 2, 3, 4) were taken. In contrast, areas with values (5, 6) are considered to be of medium suitability, while areas with good and excellent suitability are concentrated in limited areas (values 7, 8, 9, 10).

2.8. Spatial suitability according to the criterion of proximity to urban and semi-urban centers

Proximity to urban and semi-urban centers is considered one of the factors that help in tourism planning, considering that tourism does not only need qualifications and attractive locations, but also the services provided by urban centers (shopping, restaurants, cafes, other services) which are of particular importance. Therefore, we took this criterion to determine the most appropriate paths for completing tourism projects, and we relied on a point layer (Shapfile) for distributing urban and semi-urban centers and reclassifying them into equidistant criteria with values arranged in ascending order according to their suitability. The criterion of proximity to urban and semi-urban centers took an impact rate estimated at 5%, and thus the results were as follows (Figure 11):

- All areas close to urban and semi-urban centers are more suitable for establishing tourism projects; that is, those that are less than 5 km away from these centers, and thus the values (8, 9, 10) were taken;
- Relatively distant areas (between 5 and 10 km) are considered areas of medium to weak suitability, which correspond to the values (5, 6, 7);
- Areas far from these centers (more than 10 km) are classified as areas that are not suitable for establishing tourism projects.

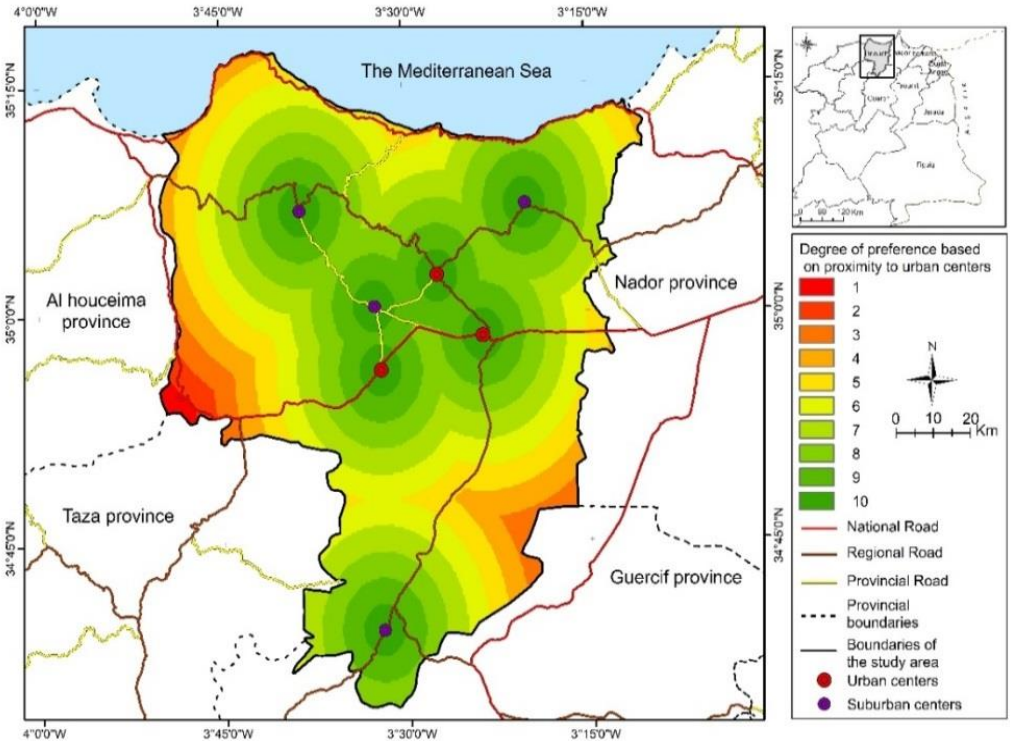

Figure 11. The form of spatial suitability for the implementation of tourism projects according to the criterion of proximity to urban centers and emerging centers (Source: Personal work based on Geographic Information Systems, 2025)

2.9. Spatial suitability according to housing criterion

In analyzing this criterion, we relied on a satellite image (Landsat 8-9) provided by the famous American website USGS (United States Geological Survey), where we extracted the built-up areas using geographic information systems tools. After that, we employed the (Euclidean Distance) tool and the (Reclassify) tool to reclassify the criterion into ten equidistant categories in order to show the suitable, medium, and less suitable areas.

The adoption of this criterion is due to the fact that built-up areas cannot accommodate tourism projects, as they are areas that are already consumed in construction. Therefore, we gave a value of (1) to all built-up areas, and thus they are considered areas unsuitable for completing tourism projects, while empty areas took a value of (10), and therefore they can be considered the best areas for completing projects, while values between (2) and (9) are of weak to medium suitability (Figure 12).

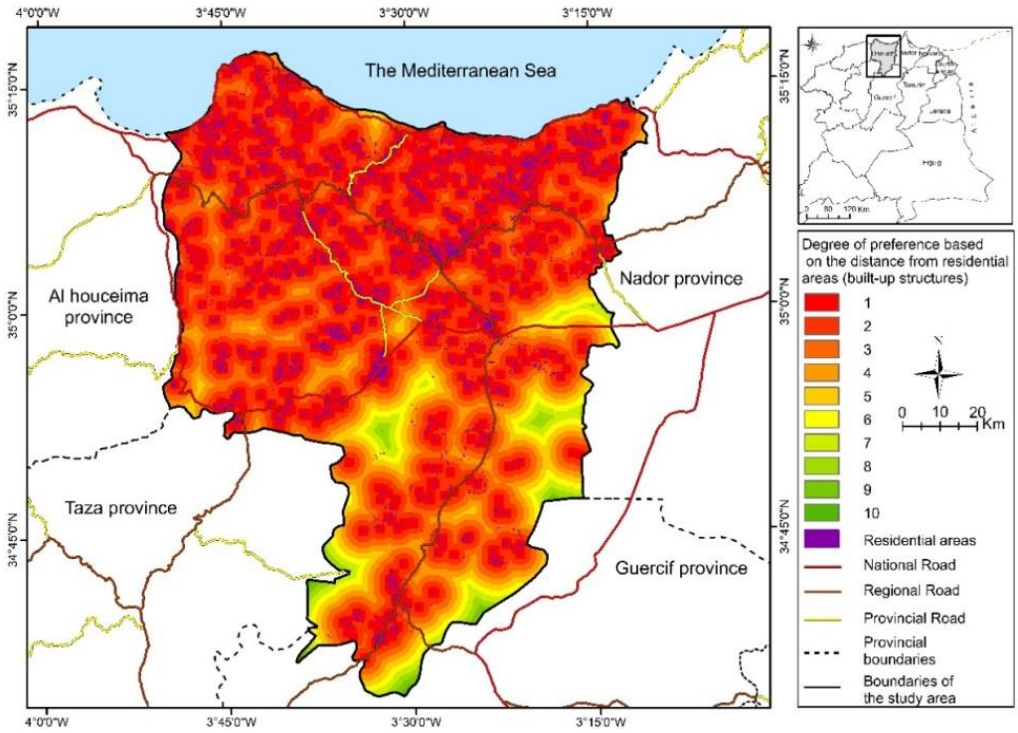

Figure 12. The form of spatial suitability for the implementation of tourism projects according to the housing criterion (built area) (Source: Personal work based on Geographic Information Systems, 2025)

3. Synthetic summary of the results of spatial suitability for the implementation of sustainable development tourism projects in the Driouch province

In extracting the final result to determine the most suitable locations for establishing tourism projects, we relied on the cumulative matching process (balance) provided by the Raster calculator available in ArcToolbox, where each criterion was given a specific weight in percentage (%) according to the importance and degree of impact, and this was calculated based on the following equation: (Work at SIG by researchers) $\sum C_i * P_i$ Ci: standard employed, Pi: weight of standard

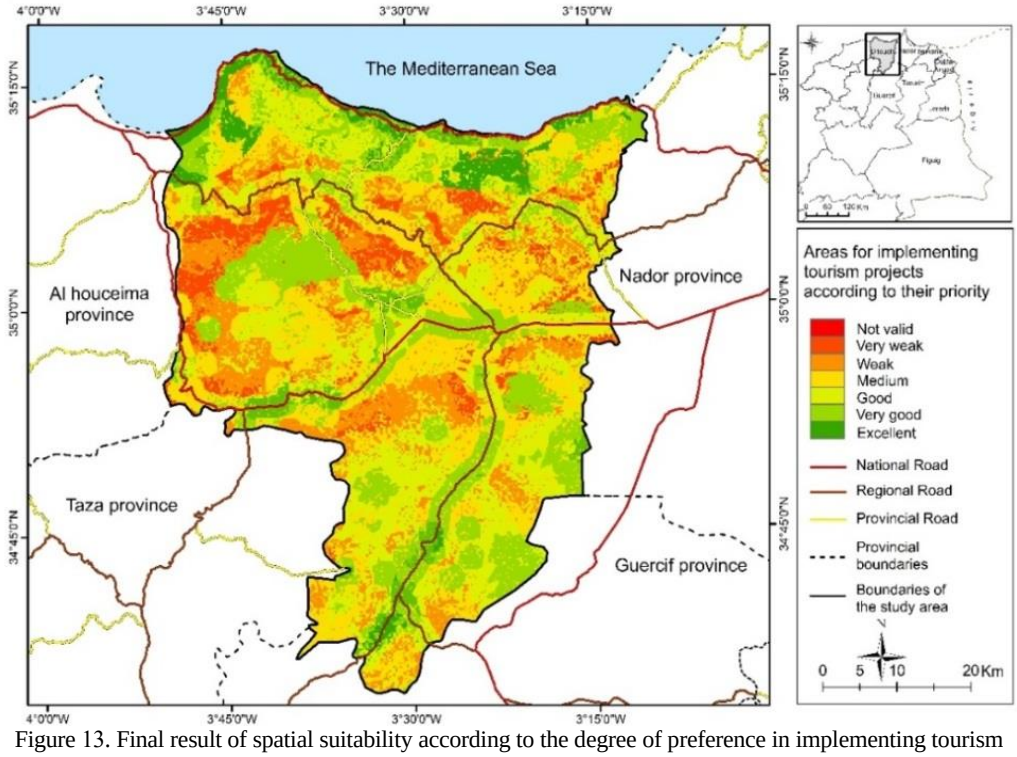

Figure 13. Final result of spatial suitability according to the degree of preference in implementing tourism projects in the Driouch Province (Source: Personal work based on Geographic Information Systems, 2025)

After collecting the approved criteria and carrying out the balancing process, we reached a set of results as is clear from the synthetic map. The paths that are not suitable for the implementation of tourism projects represent about 12.78 km2, while the

paths with a suitability ranging from very weak to medium represent about 911.66 km2, while the paths with a degree of suitability ranging from good to excellent extend over an area estimated at 1914.2 km2 (Figure 13).

Suitable areas were concentrated along main roads and near tourist sites, in addition to areas adjacent to the coast and those located on a slope of less than 15 degrees, while areas adjacent to waterways, agricultural and forest lands, and lands used for housing were considered unsuitable areas for establishing projects. This classification largely responded to the expected results that we were hoping for from applying the multi-criteria spatial analysis methodology (AHP).

CONCLUSION

The Analytic Hierarchy Process (AHP) is a highly effective tool for analyzing and determining the spatial suitability of sites for tourism projects. It provides a systematic and mathematical framework for making informed decisions based on multiple, often overlapping criteria. This methodology helps transform both quantitative and qualitative data into decisions that reflect the relative importance of each criterion. Moreover, it allows for the adjustment of criterion weights based on the specific nature of a tourism, industrial, commercial, or other project, making it a flexible and valuable tool adaptable to various geographical, economic, and social contexts. In this study, we applied nine criteria to assess spatial suitability: proximity to the coast, urban centers, tourist sites, and road networks, as well as distance from waterways, housing, vegetation, agricultural land, and steep slopes. These criteria enabled the creation of a composite map highlighting areas classified as highly suitable, moderately suitable, or unsuitable for tourism development. While the methodology itself is robust, its success heavily depends on the accuracy and relevance of the data and criteria used. Therefore, effective implementation requires collaboration among various stakeholders, including decision-makers, experts, and academics, to ensure outcomes that support sustainable and practical tourism planning.

In conclusion, the use of AHP in determining the spatial suitability of tourism projects in the Driouch Province goes beyond decision-making it serves as a key contributor to sustainable tourism development. It supports the local economy and benefits the population while ensuring the preservation of natural resources, cultural heritage, and regional characteristics. As such, AHP represents a strategic approach for all those involved in tourism planning and development.

Future prospects for research

With regard to the future prospects for research on the subject of using geographic information systems to determine the spatial suitability of tourism projects in the Driouch province, and in order to obtain more comprehensive data and more accurate results, the scope of research can be expanded to include other geographical units and new criteria for evaluation and study. Therefore, our study can be considered an introduction to new, more accurate future research.

Author Contributions: Conceptualization, E.M. and B.S.; methodology, E.M. and B.S.; software, E.M. and B.S.; validation, B.S. and E.M.; formal analysis, E.M. and B.S.; investigation, E.M. and B.S.; data curation, E.M. and B.S.; writing - original draft preparation, E.M. and B.S.; writing - review and editing, E.M. and B.S.; visualization, E.M. and B.S.; supervision, E.M. and B.S.; project administration, E.M. and B.S. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: We extend our sincere thanks to everyone who helped us complete this study. We also thank the research team in Geographic Information Technology and Field Management. Special thanks go to Professor Abir Sabri for her linguistic review of the research paper.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 28.04.2025 Revised: 05.08.2025 Accepted: 02.09.2025 Available online: 23.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1944-1951
DOI 10.30892/gtg.61351-1561

STAKEHOLDER INSIGHTS ON TOURISM SEASONALITY AND DESTINATION PERFORMANCE ALONG THE ALBANIAN ADRIATIC COAST

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Citation: Dhimitri, J., Çinaj, N., Brakaj, E.P., Qosja, E., Dibra, M., & Mbrica, A. (2025). Stakeholder insights on tourism seasonality and destination performance along the Albanian Adriatic coast. *Geojournal of Tourism and Geosites*, 61(3), 1944–1951. https://doi.org/10.30892/gtg.61351-1561

Abstract: This study explores the quality of tourist destinations along the Albanian Adriatic coast, focusing on seasonality, visitor motivations, and barriers to year-round tourism. It examines key predictors of destination quality from stakeholder perspectives. Albania has a coastline stretching 477 kilometers, washed by both the Adriatic and Jon seas. They are integral parts of the Mediterranean basin. The study focuses on the Albanian Adriatic coastline, which represent not only a valuable natural resource, but also a key asset for sustainable tourism development. From a physical geography perspective, this area is part of Albania's Western Lowland. A quantitative approach was employed, using an online questionnaire completed by 186 stakeholders from tourism-related sectors. They offer a multifaceted perspective on tourism development. Addressing challenges such as seasonality and ensuring a comprehensive evaluation of destination quality. Data were analyzed using descriptive statistics, frequency analysis, Spearman's correlation, and multiple regression. Findings reveal that seaside tourism (23.6%) is the primary reason for visits, followed by cultural (16.8%) and gastronomic tourism (13.5%). However, strong seasonality persists, with 88.2% of visits occurring in summer. Regression analysis indicates that public transport is the strongest predictor of destination quality, followed by accommodation, and pre-arrival information, accessibility, and on-site tourist information. To extend the tourism season, investment in infrastructure, and accessibility is important. Strengthening public transport, improving tourist information, and enhancing environmental sustainability will boost destination quality and competitiveness. Furthermore, improving collaboration between local stakeholders and central institutions is important for strengthening destination quality. The study contributes to the literature on emerging tourism by offering recommendations for more effective policies and practices in managing coastal destinations in Albania.

Keywords: tourism seasonality, destination quality, accessibility, stakeholder perceptions, the Albanian Adriatic coast

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INTRODUCTION

Tourism is recognized as one of the key industries for development and a major source of income, jobs and wealth creation, particularly for less developed countries (Dupeyras & MacCallum, 2013; WEF, 2015). In Albania, according to theMinistry of Tourism and Environment (MTE, 2019: 3) is highlighted that "Data year after year prove the rise of tourism as one of the sectors that bring the most revenue to the state budget, entrepreneurial and family budget, with a direct contribution to the GDP of 8.5% and an indirect value added of 26.2%. This means that the added value of this sector is of importance economic and strategic for the country, since for every 1 Lek invested, 3 Lek of added value are created and for every 1 employee in this sector, 3 new jobs are opened." High-quality tourism destinations nowadays have become the expectations of tourism stakeholders. However, these quality tourism destinations do not have a definition and key performance indicator that can be used as a measurement indicator (Utama et al., 2021). Referring to Chen (2024), it is now widely accepted by researchers that the key to achieving sustainable destination development is the full participation of multiple stakeholders in the decision-making process and in the practice of destination management.

In contemporary tourism literature, stakeholders are typically framed as groups or individuals who are associated with tourism development initiatives and therefore can affect or are affected by the decisions and activities of those initiatives (Waligo et al., 2013: 343). To address the challenges of managing the eclectic needs and demands of multiple stakeholders, stakeholder theory has commonly been positioned as an important 'cross-sectional and integrated approach' during the development of tourism destinations (Ruhanen, 2009). Most notably, stakeholder theory advocates

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for the building of strong relationships between different actors that represent private and public interests and acknowledges the 'interconnectedness of a variety of international, national, regional, and local individuals, groups and organizations (Nguyen et al., 2021). The future approaches must not only continue to critically engage the optimal ways in which participation should be facilitated but respond to new destination geographies that present unique social, cultural, and political challenges (Al-Mohmmad & Butler, 2021).

Another important factor in destination management and performance is seasonality. Seasonality can be understood as a tourist destination being busier at certain times of the year than others (Butler, 1998). The usual aim of addressing the issue of seasonality is to balance the pressure and burden that tourism seasonality places on different stakeholders in a destination and to enhance the experience of tourists during peak seasons Chen (2024). Among the widespread discussions on causes of seasonality, Allcock (1995) contends that seasonality is a complex and variable phenomenon that cannot be explained by direct reference to any one set of factors, climatic or otherwise. Seasonality can affect both the demand and supply sides of tourism, potentially having significant consequences for destinations (Amelung et al., 2007; Koenig, 2004). The impact of seasonality would vary depending on the characteristics of destinations. From an economic standpoint, seasonality is generally agreed to impact the tourism business negatively (Allcock, 1995; Butler, 1998; Manning & Powers, 1984). It can cause numerous problems for all major stakeholders in tourism including operators, employees, local people, and tourists themselves (Commons, 1999), in a similar vein, Manning & Powers (1984) state that seasonality can cause inefficient resource use, loss of profit potential, and administrative scheduling difficulties.

In the European tourism scene, Albania is considered a developing destination, with significant and visible improvements in recent years. In 2023, Albania ranked 4th globally for the highest increase in the percentage of international tourist arrivals, marking a 56% increase compared to 2019 (UN Tourism, 2024). However, although the figures show an increase in the number of tourists and their spread in territory and time, tourism in Albania still presents a seasonal trend. Up to 95% of international visitors (Ministria e Turizmit dhe Mjedisit, 2024) to Albania have as their main motive beach tourism holidays and are from neighboring countries such as Kosovo, Montenegro, Greece and Italy, which constitute the main source markets, contributing to 63% of total arrivals in 2023. This dependence on a small number of main markets indicates the need for further efforts to diversify the market in the coming periods.

Many studies focus on perspectives from tourism businesses and local authorities, potentially overlooking the views of tourists themselves. For instance, Brokaj & Murati (2014) examines sustainable tourism development in Albania through stakeholders' involvement, primarily gathering data from residents, tourism businesses, and governance bodies. Incorporating tourist perceptions could offer a more balanced view of the tourism landscape. Studies often define seasonality in terms of peak and off-peak seasons, without delving into micro-seasonal shifts. For example, Spahiu & Kushta (2023) discuss challenges in winter tourism in Albania, focusing on infrastructure and environmental issues during the winter season. Exploring factors influencing tourism during shoulder seasons could provide deeper insight into seasonality patterns.

Many studies identify issues but may not provide actionable recommendations for policymakers. For example, the study by Qosja et al., (2022) highlights the need for cooperation and accountability among stakeholders but does not offer specific policy suggestions. Incorporating strategic recommendations could guide effective tourism management.

The hospitality industry in Albania is a growing service sector. The quality of tourism services in Albania (in the central area, from cities such as Tirana—the country's capital city and Durres—the largest port city and the largest beach area in the country) live up to the expectations of tourists (Schiopoiu & Ozuni, 2021). But in terms of experience, the tourism sector in Albania is new, and its chaotic development reflects the evolving entrepreneurial mindset, the lack of vision of governments to design and implement strategies aimed at creating a sustainable sector, the problems of local administration, and the lack of cooperation among stakeholders (Mbrica et al., 2023). One of the biggest problems of the tourism sector in Albania, especially for the operators conducting such activity along the coast, is its seasonality and the few days the tourists stay (Mbrica et al., 2023). According to the online media "Fjala" which refers to EUROSTAT (2023) data, Albania ranks third after Croatia and Bulgaria for the high degree of seasonality with a weight of 46%. More than a third of tourist nights are spent in July and August. Based on this overview, the study sets out to achieve clear objectives related to its purpose. Its objectives from the perspective of stakeholders seek to present and analyze: 1) Key factors in the frequency of tourist destinations; 2) Seasonality of tourist destinations along the Adriatic coast and barriers to extending this seasonality throughout the year; 3) Determining the dependence of key factors on the quality of the tourist destination and the tourist product along the Albanian Adriatic coast.

MATERIALS AND METHODS

The research adopted a quantitative approach, utilizing an online questionnaire specifically designed and implemented for the aim of research to Adriatic coast touristic destinations from stakeholders' perception. Subsequently, data analysis was conducted, followed by the development of a multiple regression analysis model.

Population and sample

The study sample consists of the stakeholders that operate directly to indirectly to tourism sectors. They contributed to the research by sharing their perspectives on the reasons tourists visit their respective tourist destinations, the factors limiting year-round visitation, and their assessments of the quality of both the tourist destination and the tourist product. Their insights were grounded in their professional experience in the development of tourism within the destination.

The study employed a non-probability sampling approach, comprising 186 stakeholders. Their professional backgrounds span across various domains, including civil society, tourism enterprises, other businesses, central public institutions, local public institutions, non-profit organizations, educational institutions (universities, training and vocational education centers, high schools), public agencies, media, and donors (Table 1).

Table 1. Professional sector of stakeholders (Source: authors' editing)

Professional sector	Southern Albanian Adriatic coast	Central Albanian Adriatic coast	Northen Albanian Adriatic coast	Albania Adriatic coast
Civil society	14.2% (N=9)	16.7% (N=9)	18.8% (N=13)	19.4% (N=31)
Tourism enterprises	26.9% (N=17)	35.2% (N=19)	34.8% (N=24)	32.3% (N=60)
Other businesses	6.3% (N=4)	12.9% (N=7)	8.7% (N=6)	9.1% (N=17)
Central public institution	9.5% (N=6)	3.7% (N=2)	2.98% (N=2)	4.8% (N=10)
Local public institution	22.2% (N=14)	3.7% (N=2)	14.5% (N=10)	13.9% (N=26)
Non-profit organization	0	9.3% (N=5)	2.98% (N=2)	3.8% (N=7)
Educational institution	11.1% (N=7)	16.7% (N=9)	15.9% (N=11)	14.5% (N=27)
Public agency	1.6% (N=1)	0	0	0.5% (N=1)
Media,	7.9% (N=5)	0	0	2.68% (N=5)
Donors	0	1.9% (N=1)	1.5% (N=1)	1.1% (N=2)
Total	100% (N=63)	100% (N=54)	100% (N=69)	100% (N=186)

Instrument

The online questionnaire, administrated via Google Forms, was designed to collect information on stakeholders' perspectives based on the aim of the study. It was validated in a previous study and adapted to this current research (Qualitest; European Communities, 2003). The development of the questionnaire items and later analysis was further supported by prior studies (Komppula, 2016; MTE, 2019; Dwye, 2022; Morrison et al., 2025; Agaraj (Shehu) & Pulaj (Brakaj), 2024). The first item specifies the tourist destination, while the second identifies the representation of the stakeholder group involved in tourism development within a given destination. The third and fifth items are multiple-choice ones, aiming to determine the reasons tourists visit the destination and to identify factors limiting year-round visitation. The fourth item focuses on identifying the most frequent period of tourist visits to the destination.

Additionally, 14 other items are structured on a Likert scale, ranging from 1 (very poor) to 5 (very good), with a sixth option specified as "not applicable." The reliability of the instrument was measured using Cronbach's Alpha with a score of 0.853, analyzed with IBM SPSS program (version 20). Out of these items, the assessment of quality of the tourist destination is carried out through nine of them with the reliability of Cronbach's Alpha, scoring 0.854, meanwhile five items assess the quality of the tourist product at the destination, with a reliability of Cronbach's Alpha, equal to 0.775, presenting that these items with values higher than 0.43 on the discrimination indexes. Questions can be considered excellent discriminators if they have a score > 0.40. (El-Uri & Malas, 2013: 4).

The assessing of the tourist destination quality was done by 9 evaluated items. They are presented as: Q1- How do you assess the potential for the tourism industry to grow and develop in this destination? Q2 - How do you assess the support provided to local tourism businesses (training, consulting, financing programs, etc.)? Q3 - How do you assess the promotional and marketing activities of tourism services in this destination? Q4 - How do you assess the hospitality shown to tourists in this destination? Q5 - How do you assess tourist safety in this destination from a law and police perspective? Q6 - How do you assess tourist safety in this destination from the perspective of healthcare service availability? Q7 - How do you assess the air quality in this tourist destination? Q8 - How do you assess the cleanliness of the environment in this tourist destination? Q9 - How do you assess the noise level at this tourist destination? To assess the tourist product quality in destination 5 items are taken into consideration. They are: Q10 - How do you assess the quality of the information tourists receive before arriving at the destination? Q -11 How do you assess the accessibility of tourists with disabilities to tourist services at this destination? Q12 - How do you assess the development of public transportation at this destination? Q-13 How do you assess the accommodation at the destination? Q14 - How do you assess the completeness of the information tourists receive at the destination about the activities and tourist services offered there?

Procedures and data analysis

The questionnaire was created using Google Forms and distributed online to various stakeholders. They were informed about the researchers' commitment to confidentiality and anonymity. Frequency analysis was used for multiple-choice questions related to the reasons tourists visit tourist destinations and why this destination is not visited throughout the year. Frequency analysis is the process of determining the number of times reasons appear in stakeholders' responses. Other data analysis was conducted with a 95% confidence level using the IBM SPSS program. After performing descriptive statistics for 14 items related to the quality of the tourist destination (9 items) and the quality of the tourist product of the destination (5 items), various measures of central tendency and distribution characteristics were observed. A Spearman correlation was used to determine the relationships and strength among the 14 variables. Afterwards, a multiple regression analysis model was developed between the averaged variables of tourist destination quality and the variables of tourist product quality to calculate the effect size.

RESULTS AND DISCUSSION

The study engaged 186 stakeholders from diverse professional backgrounds to assess the quality of both tourist destinations and their associated products. These stakeholders include representatives from civil society, tourism enterprises, other businesses, central and local public institutions, non-profit organizations, educational institutions, public agencies, media, and donors (Table 1). Their involvement is important as they provide a multifaceted perspective on tourism development, ensuring a comprehensive evaluation of destination quality. Several authors have suggested that mayor stakeholders of the supply side, such as national tourism boards, and local tourism operators are essential elements for the

sustainable development and competitiveness of tourist destinations (Dredge, 2006; Ritchie & Crouch, 2003). Tourism enterprises (32.3%) and local institutions (13.9%), which constitute a significant portion of respondents, play a key role in shaping tourism experiences, while educational institutions (14.5%) contribute through research and workforce training. The participation of central public institution (4.8%), public agencies (0.5%), media (2.68%), and donors (1.1%) further strengthens the assessment by incorporating regulatory, promotional, and financial dimensions into the evaluation process.

The analysis of stakeholders' responses regarding the reasons for visiting tourist destinations along the Albanian Adriatic coast highlights notable regional variations in tourism appeal. The table presents stakeholders' responses regarding the reasons for visiting tourist destinations along the Albanian Adriatic coast, categorized into three main regions: the Southern, Central, and Northern Albanian Adriatic coasts (Table 2). The Southern Albanian Adriatic coast had the highest number of total responses (232), followed by the Northern region (193) and the Central region (146). Each region shows distinct tourism patterns, with seaside tourism being the most common reason of all three. In the southern Albanian Adriatic coast, seaside tourism dominates with 24.1%, followed by cultural tourism (15.1%) and ecotourism (13.8%), emphasizing the region's natural and historical assets. The central Albanian Adriatic coast shows a more balanced distribution, with seaside tourism (22.6%), gastronomic tourism (12.5%), and cultural tourism (21.9%) leading, reflecting this destination's role as a beach destination and a historical site. In the northern Adriatic region, seaside tourism (23.8%), gastronomic tourism (15.5%), and ecotourism (16%) stand out, indicating a mix of natural beauty, culinary experiences, and outdoor activities.

Looking at the Albanian Adriatic coast, (the last column of the Table 2) confirms that seaside tourism remains the dominant reason for visits (23.6%), underscoring the importance of coastal attractions. Cultural tourism (16.8%) and gastronomic tourism (13.5%) follow, highlighting Albania's historical and culinary appeal. Ecotourism (12.6%) also holds a significant presence, pointing to an interest in nature-based activities. Other reasons such as health tourism (6.5%), professional visits (6.1%), and recreational/sport tourism (4.5%) have a more limited but still relevant impact, showing potential for further development. Categories like transit (3.7%), shopping (1.7%), and religious tourism (1.9%) have minor representation, suggesting specialized tourism segments and that the coast is not a major destination for these activities. These insights emphasize the dominance of leisure tourism, with emerging niches in cultural, ecological, and culinary experiences.

Table 2. Stakeholders' responses regarding the reasons for visiting tourist destinations along the Albanian Adriatic coast (Source: authors' editing)

Reasons	Southern Albanian Adriatic coast 63 stakeholders	Central Albanian Adriatic coast54 stakeholders	Northen Albanian Adriatic coast 69 stakeholders	Albania Adriatic coast 186 stakeholders
	Total (ne %)	Total (ne %)	Total (ne %)	Total (ne %)
Seaside tourism	56 (24.1)	33 (22.6)	46 (23.8)	135 (23.6)
Ecotourism	32 (13.8)	9 (6.2)	31 (16.0)	72 (12.6)
Cultural tourism	35 (15.1)	32 (21.9)	29 (15.0)	96 (16.8)
Health tourism	16 (6.9)	14 (9.4)	7 (3.6)	37 (6.5)
Relative/friendship visiting	15 (6.4)	11 (7.5)	14 (7.3)	40 (7.0)
Gastronomic tourism	29 (12.5)	18 (12.3)	30 (15.5)	77 (13.5)
Professional visiting	16 (6.9)	12 (8.2)	7 (3.6)	35 (6.1)
Recreative/sport visiting	11 (4.7)	5 (3.4)	10 (5.2)	26 (4.5)
Transit	10 (4.3)	-	11 (5.7)	21 (3.7)
Shopping	7 (3.0)	-	3 (1.6)	10 (1.7)
Religious tourism	4 (1.7)	2 (1.4)	5 (2.6)	11 (1.9)
Other business	1 (0.4)	-	-	1 (0,2)
Total	232 (100%)	146 (100%)	193 (100%)	571 (100%)

The Figure 1 shows the seasonality of visits to the Albanian Adriatic coast tourist destination, based on stakeholder responses. The data reveal that summer overwhelmingly dominates as the peak season, accounting for 88.2% of visits, aligning with previous findings that highlight seaside tourism as the primary attraction (23.6%). This type of tourism in Albania has a pronounced seasonal character, and for as a result, most accommodation structures in the coastal area face difficulties seasonal operation (MTE, 2019: 6). Spring (8.1%) and autumn (3.2%) see significantly fewer visitors, likely due to interest in cultural, gastronomic, and ecotourism activities. For example, Cordova-Buiza, et al., (2024) mentioned in their study that "Local gastronomy plays a direct role as a tourist attraction, being a relevant objective when visiting a tourist destination". Winter (0.5%) has minimal tourism, reinforcing the region's strong seasonal dependence on summer beach tourism. These results highlight the need for diversification strategies to promote year-round tourism.

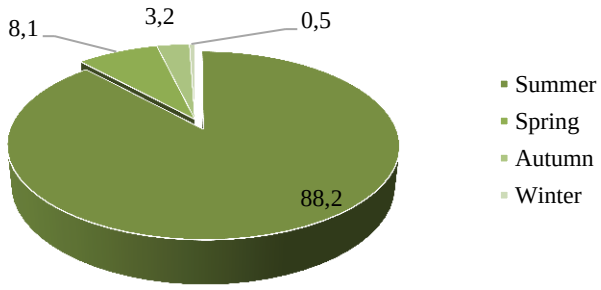

Figure 1. The seasonality of visits to Albanian Adriatic coast tourist destination (in %, stakeholders' responses) (Source: authors' editing)

To better understand why seasonality is highly concentrated during the summer and why year-round tourism is lacking, stakeholders were asked about the reasons the destination is not visited throughout the year. This question was presented to them as a multiple-choice question, allowing them to select multiple barriers based on their perspectives. Results are shown in Table 3. The Table 3, evidence that the northern Albanian Adriatic coast faces multiple barriers to year-round tourism, with the lack of entertainment options (21.6%), insufficient social media promotion (11.1%), and limited local tours (10%) being the most significant reasons. Meanwhile, poor road infrastructure (7.9%) and a shortage of cultural events (9.5%) hinder off-season tourism. Other challenges, such as harsh climate conditions (5.3%) and urban distance (4.7%), further discourage visitors beyond the summer months. These limitations highlight the need for investment in entertainment, digital marketing, and infrastructure improvements to extend the tourism season. The central Albanian Adriatic coast presents similar concerns but with some distinct trends. While lack of entertainment (21.6%) remains a primary issue, the region also struggles with limited cultural events (14.7%) and deficient local tours (12%). Road infrastructure damage (7.2%) and inaccessibility to rural areas (7.2%) are also notable deterrents. The absence of sports activities (4.8%) and low urban connectivity (2.4%) suggest that infrastructural and recreational development could significantly improve tourism retention.

Table 3. The reasons the Albanian Adriatic coast is not visited throughout the year. (Source: authors' editing)

Reasons	Southern Albanian Adriatic coast 63 stakeholders	Central Albanian Adriatic coast 54 stakeholders	Northen Albanian Adriatic coast 69 stakeholders	Albania Adriatic coast 186 stakeholders
	Total (ne %)	Total (ne %)	Total (ne %)	Total (ne %)
Entertainment lacks	34 (18.3)	27 (21.6)	41 (21.6)	102 (20.3)
Social media lack	13 (6.9)	9 (7.2)	21 (11.1)	43 (8.6)
Local tours lack	25 (13.4)	15 (12.0)	19 (10)	59 (11.8)
Cultural events lack	22 (11.8)	16 (14.7)	18 (9.5)	56 (11.2)
Road infrastructure damage	25 (13.4)	9 (7.2)	15 (7.9)	49 (9.8)
Agency of rural information lacks	15 (8.1)	12 (9.6)	13 (6.8)	40 (7.9)
Sports activity lack	17 (9.1)	6 (4.8)	13 (6.8)	36 (7.2)
Local guides lack	13 (6.9)	8 (6.4)	11 (5.8)	32 (6.4)
Rural area inaccessibility	9 (4.8)	9 (7.2)	10 (5.3)	28 (5.6)
Harsh climate	2 (1.1)	5 (4.0)	10 (5.3)	17 (3.4)
Urban distance	4 (2.2)	3 (2.4)	9 (4.7)	16 (3.2)
Online booking absence	4 (2.2)	5 (4.0)	5 (2.6)	14 (2.8)
Difficult terrain	3 (1.6)	1 (0.8)	5 (2.6)	9 (1.8)
Total	186 (100%)	125 (100%)	190 (100%)	501 (100%)

The southern Albanian Adriatic coast, while sharing similar limitations, has some challenges, particularly a lack of local tours (13.4%), cultural events (11.8%), and agency of rural information (8.1%). Sports activity deficiencies (9.1%) limited social media presence (6.9%) and difficult terrain (1.6%) further contribute to restricted year-round tourism potential.

For the entire Albanian Adriatic coastline, the most important issues are the lack of entertainment (20.3%), insufficient local tours (11.8%), and limited cultural events (11.2%). While harsh climate (3.4%) and difficult terrain (1.8%) are natural constraints, others—such social media lack (8.6%) and absence of online booking options (2.8%)—can be addressed through targeted policies. Even the MET (2019: 13) evidence that "In order for this industry to become one of the pillars of the Albanian economy, it is necessary to mitigate the seasonal effects of coastal tourism through the development of other forms of tourism, increasing the number of visitors, nights of stay and consequently income from tourism".

Strengthening tourism services, improving accessibility, and diversifying entertainment and cultural offerings could significantly enhance the region's year-round tourism appeal. To gain a deeper understanding of the factors influencing the quality of tourism development of the Adriatic coast in Albania, stakeholders were surveyed about them. The relationships between these factors were assessed using Spearman's correlation analysis (Table 4).

Table. 4. Spearman's rho correlation matrix (Source: authors' editing)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Q1	1.000	.286**	.331**	.432**	.403**	.356**	.242**	.288**	.199**	.184*	.323**	.255**	.183*	.225**
Q2		1.000	**.552****	.390**	.285**	.304**	.232**	.390**	.276**	.438**	.197**	.393**	.263**	.210**
Q3			1.000	.422**	.371**	.311**	.185*	.347**	.258**	.460**	.150*	.377**	.148*	.134
Q4				1.000	**.593****	.449**	.473**	**.558****	.416**	.311**	.441**	.356**	.319**	.404**
Q5					1.000	.535**	.414**	.473**	.379**	.271**	.360**	.312**	.264**	.298**
Q6						1.000	.344**	.492**	.407**	.399**	.407**	.301**	.188*	.372**
Q7							1.000	**.644****	.614**	.166*	.295**	.366**	.497**	.461**
Q8								1.000	**.686****	.344**	.367**	.471**	.387**	.468**
Q9									1.000	.163*	.325**	.340**	.336**	.427**
Q10										1.000	.336**	.472**	.301**	.315**
Q11											1.000	.459**	.334**	**.575****
Q12												1.000	.330**	**.505****
Q13													1.000	.482**
Q14														1.000

** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed)

Table 4 presents the evaluation provided by stakeholders regarding relationship between variables measuring key factors influencing the tourist destination quality and the tourism product quality in the Albanian Adriatic coast touristic destination. This assessment serves to identify significant trends and interdependencies. The Spearman's rho correlation coefficient is represented in the values of the table, and they are statistically significant at the 0.01 level and 0,05 level. Their positive values indicate a direct correlation between variables, which means that an increase in one variable is associated positively with an increase in another one. To interpret the correlation values, we refer to the size of the correlation coefficient and its general interpretation as following: .8 to 1.0 very strong relationship, .6 to .8 strong relationship, .4 to .6 moderate relationship, .2 to .4 weak relationship, .0 to .2 weak or no relationship (Salkind, 2000: 96).

The study shows *strong correlations* (rho ≥ 0.6) between some variables of tourist destination quality. Stakeholders consistently associate better air quality (Q7) with a cleaner environment (Q8), (*0.644, p = 0.000*). This suggests that destinations implementing strong environmental policies and sustainable waste management practices are perceived more favorably.A strong correlation between environmental cleanliness (Q8) and noise levels (Q9), *(0.686, p = 0.000)* indicates that stakeholders perceive these factors as important in maintaining an attractive tourist environment. Reduced noise pollution often signals a well-managed, high-quality destination. Stakeholders recognize that a welcoming atmosphere (Q4) is closely linked to a clean and well-maintained environment (Q8), reinforcing the idea that service quality and environmental upkeep are interdependent in shaping a positive tourist experience (0.558, *p = 0.000).*).

Some noteworthy *moderate correlations* (0.4 ≤ rho < 0.6) emerge as important trends in stakeholder perceptions. Stakeholders link high hospitality standards (Q4) with better air quality (Q7), suggesting that destinations focusing on guest satisfaction often implement environmental policies to enhance visitor comfort (*0.473, p = 0.000).*

A cleaner environment (Q8) is perceived as directly contributing to health and safety (Q6). This supports the idea that effective waste disposal and sanitation influence both environmental and public health outcomes *(0.492, p = 0.000).*

Stakeholders acknowledge that destinations providing greater accessibility for disabled tourists (Q11) also tend to offer comprehensive tourist information (Q14), suggesting a commitment to inclusivity in tourism planning *(0.575, p = 0.000).*

Limited stakeholders' influence was observed in some variable relationships, where *weak correlations* (0.2 ≤ rho < 0.4) were identified. Stakeholders do not strongly relate business support initiatives (Q2) with tourist legal safety (Q5), *(0.285, p = 0.000).* This implies that business support initiatives are not sufficient to ensure tourism' safety, highlighting the importance of regulations and law enforcement in protecting tourists. Governmental intervention is considered important to tourism safeties. Çinaj et al., (2022) in their study, highlighted that "Through law enforcement institutions, measures were taken which increased / strengthened the trust of the actors in the tourism industry to ensure security.

The involvement of the state in concrete actions to promote domestic tourism demand, to help the tourism economy, strengthened the perception that Albania is a safe destination for tourism". The quality of pre-arrival information (Q10) has only a weak correlation with perceived accommodation standards (Q13), suggesting that stakeholders believe on-site experiences weigh more heavily in tourist satisfaction (0.301, *p = 0.000).*

The study shows *very weak correlations* (rho < 0.2) in the minimal perception relationships of stakeholders. Stakeholders do not perceive noise levels (Q9) as a major barrier to tourism development potential (Q1), indicating that infrastructure investment, marketing strategies, and regulatory policies play a more significant role *(0.199, p = 0.007)*

Legal safety (Q5) concerns appear to be independent of the quality of tourist information before arrival (Q10), suggesting that stakeholders view legal security as a destination-specific factor rather than something that can be influenced by external communication. *(0.184, p = 0.000).*

To better understand the assessment of the tourist destination' performance along the Albanian Adriatic coast a multiple regression model was conducted between mean variable of tourist destination quality variables and tourist product quality variables. The main purpose of multiple linear regression is to predict changes in the dependent variable because of variations that occur in several independent variables (Hamied & Malik, 2017). Questions Q10, Q11, Q12, Q13, Q14 are considered components of tourist product based on Qualitest, 2003.

They are independent variables and are predictors in multiple regression model. Pre-arrival information quality (Q10) is an important factor of the tourist product, as accurate and complete information about the destination helps tourists plan their trip and have better experience. Meanwhile, accessibility for tourists with disabilities (Q11) provides opportunities for inclusion, making the destination more accessible to everyone. Completeness of tourist information (Q12) ensures that tourists have all the necessary information to enjoy easily the destination. Tourist information on-site (Q14) has a direct impact on the tourist experience. The timely information on-site can greatly improve the tourist experience. This regression model about tourist destination quality and tourist product quality in destination, explains 40.7% of the total explained variance (adjusted R square), and it is significant [F (5, 180) = 26.36; p < .001]. This result suggests a good model fit.

Table 5. Multiple regression model of Tourist destination quality (Source: authors' editing)

Model		B	Std. Error	Beta	t	p-value
1	(Constant)	1.389	.217		6.402	.000
	Q10	.117	.046	.167	2.554	.011
	Q11	.127	.057	.158	2.214	.028
	Q12	.163	.049	.240	3.311	.001
	Q13	.110	.042	.173	2.626	.009
	Q14	.094	.046	.150	2.023	.045

B: Unstandardized Coefficients; Beta: Standardized Coefficients; t: T-statistic

Table 5 represents the mean values of unstandardized and standardized coefficients, t, and p-value for all variables. All the variables are statistically significant ($p<.05$), so they are predictors of the touristic destination quality.

The model estimates that the evaluation of public transport in the destination (Q12, Beta .240) constitutes the most significant predictor of the quality of the tourist destination. This is followed by the evaluation of accommodation in the destination (Q13, Beta .173), the quality of information received by tourists before arriving at the destination (Q10, Beta .176), the assessment of accessibility for tourists with disabilities to tourism services in the destination (Q11, Beta .158), and finally, though statistically significant, the evaluation of the overall information received by tourists at the destination regarding available activities and tourism services (Q14, Beta .150).

CONCLUSION

Stakeholder perspectives highlight that in the Albanian Adriatic coast, destination quality is significantly influenced by environmental sustainability and hospitality, while tourism product quality is shaped by accessibility and service infrastructure. These findings emphasize the importance of collaborating and integrating environmental, regulatory, and service-based improvements to create a more competitive and attractive tourism destination.

Šambronská et al. (2025) in their study highlighted that "Cooperation in tourism refers to the joint efforts of various stakeholders, including governments, local communities, businesses and tourists themselves, to promote and develop tourism in a responsible and sustainable manner. Examples include organizations that bring together local stakeholders to promote and manage tourism in a particular destination. They work together to develop marketing campaigns, improve the infrastructure and improve the overall tourist experience.

Stakeholders appreciate the driving force that factors such as air quality, cleanliness and noise levels have in increasing the quality of a destination. For them, hospitality, access to information and the more complete it is, again increase visitor satisfaction. Even more important is the increased attention to taking concrete actions for visitors with disabilities. They do not see the connection between the development of concrete tourism business plans and the impact they have on tourist safety. For this reason, it is suggested that management plans for tourist destinations be developed separately. In their assessment, what visitors experience at a destination is more important than what they are informed about before arriving at the destination. Such an assessment, from a tourism perspective, is relevant to the strategic perspective of tourism development in Albanian coastal tourist destination, adding to the premises for a sustainable and year-round development of tourism. Although the study brings valuable findings from the perspective of stakeholders, it focuses only on the Albanian Adriatic coast, leaving out of the analysis the Ionian coast and the potentials that the latter offers, although there are similarities, especially regarding seasonality.

This suggests the need for undertaking similar studies with a wider geographical reach. Also, follow-up studies may also include visitor perspectives, in line with the initial research objectives. However, current findings can serve valuably for decision-making processes, helping to provide practical and concrete solutions.

Author Contributions: Conceptualization, J.Dh., N.Ç., E.P.B. and M.D.; methodology, J.Dh., N.Ç. and E.P.B.; software, J.Dh.; validation, J.Dh., N.Ç., E.Q. and E.P.B.; formal analysis, J.Dh. N.Ç. and E.P.B.; investigation, J.Dh., N.Ç., M.D. and E.Q.; resources, J.Dh., N.Ç., E.P.B., A.M., M.D.; writing - original draft preparation, J.Dh. and N.Ç.; writing - review and editing, J.Dh. and N.Ç.; visualization, J.Dh.; project administration, N.Ç. and E.Q.; All authors have read and agreed to the published version of the manuscript.

Funding: This study is undertaken as part of the project "The integrated tourist product in the function of the year-round responsible tourism along the Albanian Adriatic Coast" and financed by the National Agency of Scientific Research and Innovation (AKKSHI).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 30.04.2025 Revised: 06.08.2025 Accepted: 03.09.2025 Available online: 23.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1952-1958
DOI 10.30892/gtg.61352-1562

SPATIAL CONDITIONALITY OF TOURISM SUPPLY WITH A FOCUS ON SMART DESTINATIONS: THE CASE OF CROATIA AND THE EUROPEAN PERSPECTIVE

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Citation: Marinac, A., Budić, H., & Ergović, A. (2025). Spatial conditionality of tourism supply with a focus on smart destinations: The case of Croatia and the european perspective. *Geojournal of Tourism and Geosites*, 61(3), 1952–1958. https://doi.org/10.30892/gtg.61352-1562

Abstract: The aim of this paper is to examine how spatial factors of tourism supply and the implementation of smart technologies influence the shaping and competitiveness of destinations, with an emphasis on the Croatian and European context. A quantitative study (questionnaire, N=300) and qualitative research (semi-structured interviews) were conducted, accompanied by a comparative analysis of different destinations. A Spatial Attractiveness Index (SAI) was introduced to compare the attractiveness of regions. Spatial localization and smart technologies significantly contribute to the competitiveness of destinations. Quantitative analyses reveal key factors and respondents' attitudes, while qualitative findings deepen the understanding of major challenges and advantages. Furthermore, the analysis identified significant differences in the degree of smart technology adoption across destination types. Urban areas demonstrate higher levels of digital maturity, while rural and peripheral regions face infrastructural barriers. The research also highlights the importance of strategic investments in ICT infrastructure and the integration of spatial planning with digital solutions. Stakeholders must prioritize collaboration and data-driven management to achieve balanced tourism development. In conclusion, this study provides practical recommendations for policymakers and destination managers to foster sustainable and innovative tourism supply, emphasizing the combined role of spatial and technological components. Additionally, it underscores the necessity of continuous capacity-building and digital skills development across all stakeholder groups. Future research should explore the long-term impacts of smart technologies on destination resilience and visitor satisfaction.

Keywords: socio-economic indicators, econometric analysis, Europe, Croatia, destination competitiveness, sustainable development, smart destinations, spatial dimension of tourism, tourism supply

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INTRODUCTION

Context and Importance of the Research

Spatial conditions of tourism supply are one of the fundamental characteristics of contemporary tourism, as the geographical distribution of natural and social resources directly affects tourist decisions and the shaping of destinations (Dwyer, 2010). In the era of rapid technological advancement, the concept of smart destinations has emerged as a prominent strategy for the development of the tourism sector, aimed at optimizing the user experience and sustainably managing resources (Buhalis & Amaranggana, 2014). Croatia, as one of the Mediterranean tourist destinations, faces challenges of balanced distribution of tourist flows and the implementation of smart solutions across different regions (Ministry of Tourism and Sports of the Republic of Croatia, 2021). The same applies to the European context, where tourism is increasingly viewed through the lens of sustainability and digitalization (European Commission, 2020).

Tourism plays a pivotal role in regional development, influencing infrastructure, employment, and investment patterns. However, the spatial distribution of tourism activity remains highly uneven, with coastal and urban areas typically dominating over rural and inland regions (UNWTO, 2022; Mandić and Pavić, 2023; Gretzel et al., 2020).

Problem and Current State

Despite general consensus on the importance of the spatial component of tourism and the potential of "smart solutions," a more comprehensive analysis that combines these elements in a comparative perspective between different regions of Croatia and the rest of Europe is still lacking. Emphasis is often placed on central urban areas (e.g., Zagreb, Split, Dubrovnik), while less developed or rural areas receive less attention. At the same time, the implementation of smart technologies in the tourism sector is varied and depends on capacities, financial possibilities, legal frameworks, and the willingness of stakeholders to embrace change (Gretzel et al., 2015). There is a need for deeper insight into the spatial and technological determinants that shape tourism supply, and for empirical research that will indicate concrete solutions and models applicable both in Croatia and in other European destinations.

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Objectives and Research Hypothesis

The main objective of this paper is to examine how spatial conditions and the implementation of smart technologies influence the shaping and competitiveness of tourism supply, with a special focus on Croatia and a comparison with European destinations. Accordingly, the following research hypothesis has been defined:

H1: Destinations that actively implement smart technologies and strategically manage spatial resources achieve statistically significantly higher ratings of competitiveness and visitor satisfaction compared to destinations that do not.

LITERATURE REVIEW

Critical Review of Previous Studies

The spatial conditioning of tourism supply has been of interest to many authors (Smith, 2015; Hall & Page, 2014).

The spatial dimension encompasses natural and social factors, such as relief, climate, distance from markets, and the distribution of attractions (Williams & Lew, 2015). Recent research highlights the increasing importance of smart technologies and data-driven management in tourism planning, especially through the concepts of smart tourism and smart destinations (Buhalis & Amaranggana, 2014). These approaches offer potential to address spatial imbalances and foster regional competitiveness. The implementation of smart technologies, on the other hand, emphasizes the need for stakeholder cooperation in creating an innovative environment that will utilize digital tools, big data analytics, and intelligent infrastructure to enhance the user experience (Buhalis & Amaranggana, 2014; Gretzel et al., 2015). Previous research on smart destinations has mostly focused on technical and marketing aspects, while geographic distribution and regional influences remain insufficiently addressed (Boes et al., 2016). Geoparks play an increasing role as platforms for sustainable tourism development in sensitive landscapes (Malatyinszki & Kálmán, 2025).

In the European context, some countries such as Spain and Italy are strongly engaged in smart city and destination strategies (Garau & Pavan, 2018). The concept of smart destinations is based on three key pillars: technology, governance, and human capital (Buhalis & Amaranggana, 2014). However, technology alone will not automatically create a competitive destination if there are spatial constraints (e.g., insufficient transport connectivity) or if there is no clear strategic development vision (European Commission, 2020). Therefore, it is crucial to establish an interdisciplinary approach that connects geography, destination management, information sciences, and sustainable development (Gretzel et al., 2015).

In recent times, an integrated approach combining spatial theories with the concepts of "smart destinations" has become more prevalent. Smart destinations aim to ensure better interaction between visitors, the local community, and destination offerings through advanced technologies (Buhalis & Amaranggana, 2014). However, research (Boes et al., 2016) shows that technological solutions often remain at the level of pilot projects, especially in regions with inadequate transport and information-communication infrastructure. An additional issue is that many studies focus on urban environments and leading tourist cities, while rural and less developed regions remain under-researched (Gretzel et al., 2015).

Theoretical and Conceptual Framework

In theoretical terms, the concept of spatial conditioning relies on geographically determined factors, such as transport connectivity, relief, and climate, but also on socio-economic indicators (e.g., level of development and regional policies).

A contemporary interdisciplinary approach combines geographical analysis and destination management, enabling a comprehensive view of spatial relations and technological solutions (Hall & Page, 2014). Furthermore, theoretical frameworks of sustainable tourism development (Dwyer, 2010) add an additional dimension to the discussion, emphasizing that spatial and technological solutions must align with principles of long-term economic, environmental, and social sustainability.

A destination that wants to brand itself as "smart" must simultaneously integrate: spatial solutions (transport and information infrastructure), technological platforms (applications, sensor systems), strategic management (development vision, marketing initiatives) and inclusion of the local community (participation and adoption of innovations).

Recent studies propose multi-dimensional frameworks for understanding how smart technologies shape tourist experiences and value creation in destinations (Neuhofer et al., 2024). The findings support previous research on the role of technological innovation and spatial policy in enhancing regional competitiveness (Mariani et al., 2023). In conclusion, existing literature confirms that only the simultaneous addressing of spatial (geographic) dimensions and technological (digital) components can result in sustainable and competitive tourist destinations (European Commission, 2020; Gretzel et al., 2015).

MATERIALS AND METHODS

Research Approach

The research employed a mixed-method approach, combining quantitative and qualitative techniques to explore the spatial conditionality of tourism supply. This combination is in line with recent research trends in smart tourism studies that emphasize methodological triangulation to better capture the complexity of innovation in spatially diverse destinations (Sotiriadis, 2023). **Quantitative research** was conducted using a structured survey questionnaire. **Qualitative research** was based on semi-structured interviews with 15 stakeholders from public and private tourism sectors in Croatia and selected European countries. Additionally, a **comparative analysis** was applied to evaluate differences between Croatian and European destinations. The data were statistically processed using descriptive and comparative methods.A **Spatial Attractiveness Index (SAI)** was constructed as a composite indicator derived from normalized scores of selected variables.

Quantitative Methods: Survey Questionnaire

The aim of this paper is to examine how spatial factors of tourism supply and the implementation of smart destination principles influence regional disparities and destination competitiveness, with a focus on Croatia and selected European

regions. The research applies a mixed-methods approach. The quantitative component is based on a structured questionnaire (N = 300), designed to identify key spatial and innovation-related factors influencing tourism supply and demand.The survey instrument was constructed to assess respondents' attitudes regarding the significance of spatial components in tourism development, the adoption of smart technologies, and perceptions of destination competitiveness. It comprised 25 items grouped into four thematic sections: (1) socio-demographic characteristics, (2) travel preferences, (3) degree of smart technology usage in destinations, and (4) evaluation of spatial accessibility, attractiveness, and sustainability. Degree of use of smart technologies in destinations was assessed through a set of questions evaluating the presence and frequency of ICT tools such as mobile applications, geolocation services, digital tourist information, and contactless systems. Respondents were asked to indicate how often they encountered these technologies and to what extent they influenced their overall tourist experience. The sample was formed by combining purposive and convenience sampling, aiming to include diverse profiles of travelers and local residents from various Croatian counties, with an additional subsample of respondents from European destinations (Spain, Italy, Germany). The structure of respondents by group is shown below.

As shown in Figure 1, the respondent structure includes both domestic (Croatian) and international participants, ensuring a comparative perspective. This distribution enables a more nuanced understanding of attitudes across different spatial and cultural tourism contexts. The integration of AI and big data in tourism research design has become crucial for understanding tourist behavior and service optimization, especially in smart destinations (Gretzel et al., 2024).

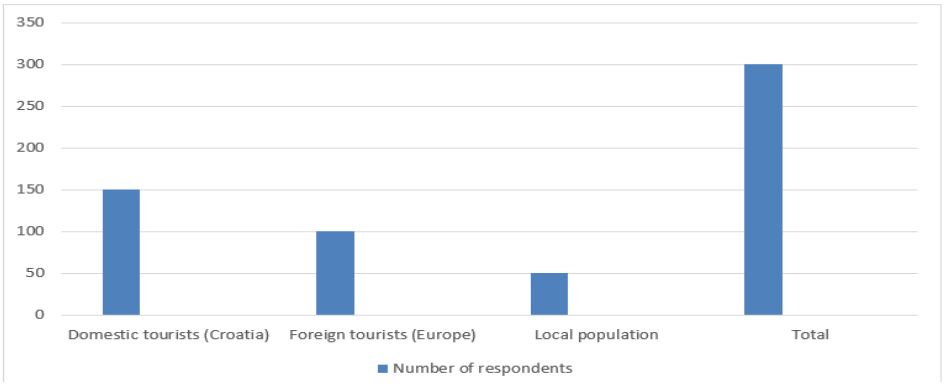

Figure 1. Structure of respondents by group (Source: Author, based on survey results)

Qualitative Methods

The qualitative component consists of semi-structured interviews with tourism professionals and local stakeholders, aiming to contextualise the survey findings. Additionally, a Spatial Attractiveness Index was developed by aggregating indicators such as accessibility, accommodation density, natural attractions, and smart infrastructure availability. This index served to compare the relative tourism appeal of different regions.

Interviews: A total of 15 semi-structured interviews were conducted with key stakeholders, including representatives of local tourist boards, hotel chains, technology companies, and spatial planning experts. Interviews were recorded with prior consent from the interviewees and lasted an average of 40 minutes. The interview guide covered topics such as the perception of smart solutions, the spatial distribution of tourism, funding opportunities, and management of tourism resources. Smart technologies were not uniformly applied. In some cases, the lack of coordination and investment delayed implementation, which aligns with trends identified in comparative research on European smart destinations (Buhalis & Sinarta, 2021). Interview data supported these conclusions, highlighting structural imbalances between core and peripheral regions, as well as opportunities for targeted innovation in spatially disadvantaged areas.

Data Processing and Analysis: Data from the survey were analyzed using SPSS software (version 26.0). Descriptive statistics (mean, standard deviation, minimum, maximum) were applied to gain insights into the basic characteristics of the sample and check the distribution of responses. To test differences between groups (domestic vs. foreign tourists, different regions), inferential statistical tests (ANOVA, t-test) were used. Multiple regression analysis was applied to examine causal relationships. Qualitative data from interviews were transcribed and imported into NVivo software (version 12). Thematic analysis was conducted (Braun & Clarke, 2006), generating categories and subcategories based on frequency and contextual relevance.

Comparative Analysis: Comparative analysis was applied to compare results from the Croatian and European contexts. In this part of the research, spatial conditioning was considered in terms of geographic distribution, transport connectivity, historical and cultural heritage, and the level of implementation of smart technologies in different regions. A regional comparison within Croatia (Adriatic vs. continental) and an analysis of several European destinations recognized as smart city/smart destination examples (Barcelona, Amsterdam, and Rome) were also performed.

COMPARATIVE ANALYSIS

This comparative analysis includes a comparison of different regions within Croatia (coastal versus continental parts) and a comparison of Croatian with European examples of smart destinations (Barcelona, Amsterdam, Rome). To provide an overview of regional specificities, Table 2. This table clearly shows the difference between continental and coastal parts of Croatia, as well as different levels of technology implementation in European destinations.

Comparing the data, it is evident that smart solutions actively contribute to the overall competitiveness of a destination (Buhalis & Amaranggana, 2014). Digital tools enhance interest in heritage visits (Gburová et al., 2024).

From the basic indicators (Table 2), it is clear that smart solutions and the degree of digitalization vary significantly, which is reflected in competitiveness and the spatial distribution of tourism demand. The analysis reveals a significant spatial disparity in tourism development across Croatian regions. Coastal destinations scored considerably higher in the Spatial Attractiveness Index (SAI), primarily due to their superior accommodation density, transport accessibility, and digital infrastructure. In contrast, inland regions lag behind in all measured dimensions. A comparative analysis with selected European countries confirms the persistence of spatial imbalances in tourism development, commonly characterized by dominant coastal zones and capital regions, while inland and peripheral areas remain underutilized.

Spain, Italy, and Portugal have implemented targeted policy frameworks aimed at diversification, regional branding, and the development of lesser-known destinations through smart tourism initiatives (García-Hernández et al., 2021).

Regarding smart technologies, their implementation varied considerably among destinations. Some urban coastal areas have introduced digital signage, interactive apps, or sensor-based visitor tracking, while others - particularly rural destinations - still lack basic ICT support. These patterns reflect broader European trends (Buhalis & Sinarta, 2021).

Table 2. Comparative analysis of regional tourism localization
(Source: Adapted from Eurostat (2020), Ministry of Tourism and Sports of the Republic of Croatia (2021)

Region	Tourist overnight stays (mil.)	Degree of digitalization	Infrastructure investments (€)	Smart solutions (number of projects)
Adriatic Croatia	80	Medium	1.2 billion	10
Continental Croatia	15	Low	0.5 billion	4
Barcelona (Spain)	30	High	2.0 billion	15
Amsterdam (Netherlands)	20	Very High	3.1 billion	20
Rome (Italy)	25	High	2.5 billion	12

Introduction of the Spatial Attractiveness Index (SAI)

To further illustrate how spatial attractiveness of destinations can be measured and compared, we introduced the Spatial Attractiveness Index (hereinafter: SAI). SAI is a simple mathematical measure that considers several relevant attributes (A_i) of a destination and their respective weights (W_i). Formally, it is expressed by the equation (Hall & Page, 2014):

$$SAI = \sum(A_i \times W_i) \qquad (1)$$

where: A_i = score of attribute i representing a specific spatial or infrastructural component of the destination (dimensionless; typically scored on a scale from 0 to 10); W_i = weight assigned to attribute i, reflecting its relative importance (dimensionless; sum of all weights equals 1); SAI = Spatial Attractiveness Index, composite score representing overall spatial attractiveness of the destination (dimensionless). In practical application, SAI helps in comparing different destinations or regions so that, for example, one destination can be assigned a higher weight to transport connectivity, while another region might prioritize cultural heritage or smart technologies. This results in a composite indicator that more easily highlights the strengths and weaknesses of each destination (Hall & Page, 2014).

Critical Comparison of SAI Results and Existing Indicators

When comparing SAI with already used indicators (such as the number of tourist overnight stays or degree of digitalization), it is evident that SAI offers a more comprehensive view. The mere number of overnight stays does not reveal the extent to which development is spatially balanced or whether technological innovations have been effectively implemented. In contrast, SAI integrates multiple variables and allows for a more precise identification of steps needed to enhance competitiveness. In the Croatian context, for example, coastal destinations would generally have high values in natural and cultural resources factors, but in some cases, they would need to strengthen transport and digital connectivity outside the main season. Continental destinations often have strong potential for the development of continental and rural tourism but lack adequate marketing visibility and smart solutions. By comparing these two types of regions through SAI, policymakers can more clearly identify thematic and investment areas that need to be prioritized.

RESULTS

Results of Quantitative Analysis: Sample Structure and Descriptive Statistics

The quantitative research included 300 respondents divided into three main groups (domestic tourists, foreign tourists, local residents). The socio-demographic structure indicates a diverse age and educational representation, which is useful for gaining a broader insight into perceptions of spatial conditioning and smart technologies. On average, respondents emphasized the high importance of natural attractions ($M \approx 4.20$), but interestingly, awareness of digital solutions ranged from low to above-average ratings ($M = 3.82$), indicating potential for strengthening technological literacy.

Differential Analyses and Variable Correlations

ANOVA and post hoc tests (shown in the previously mentioned Table 4) reveal that the assessment of smart technology usage differs among groups; foreign tourists statistically significantly value such innovations more than local residents. This difference is likely linked to habits of foreign guests who are accustomed to more advanced digital solutions in their home countries (Gretzel et al., 2015). Results of multiple regression analysis (Table 5) confirm that the perception of destination competitiveness is strongly associated with both spatial factors (e.g., accessibility and infrastructure) and the use of smart technologies. Marketing strategy also plays an important, though slightly smaller, role. The model explains 32% of variance, which is a relatively good indicator in social sciences.

Additional Analyses (Factor and Cluster Analysis)

Although not detailed in the original text, factor analysis (principal components method) was conducted to examine the dimensionality of attitudes towards smart technologies and spatial accessibility. Two factors were identified that together explain 54% of variance: (1) "technological capacity and innovativeness" and (2) "spatial accessibility and sustainability". Furthermore, cluster analysis (k-means method) showed that respondents can be categorized into three profiles: "technology enthusiasts", "traditionally oriented", and "moderate technology users". These additional analyses provide deeper insight into the heterogeneity of attitudes and potentially guide the adaptation of destination offerings. Descriptive Statistics: Below is Table 3, presenting descriptive statistics of key variables, referring to (a) attitudes on the importance of the spatial component, (b) the level of use of smart technologies, and (c) overall perception of destination competitiveness. Attitudes were measured on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). Results show that respondents generally rate the importance of the spatial dimension (M = 4.21) and destination competitiveness (M = 4.10) highly, while the level of smart technology use is somewhat moderate (M = 3.82). Standard deviations indicate relatively homogeneous opinions within the sample.

Differential Analyses for Hypothesis Testing

To determine whether there are statistically significant differences in attitudes towards smart technologies among different respondent groups (domestic tourists, foreign tourists, and local residents), a one-way analysis of variance (ANOVA) was conducted. Results are shown in Table 4. ANOVA showed a statistically significant difference ($F(2,297)=4.10$; $p=0.018$) in attitudes towards smart technologies among the three groups. Post hoc test (Tukey HSD) revealed that foreign tourists had a higher average rating (M=3.95) than local residents (M=3.65), while domestic tourists (M=3.80) did not differ significantly from the other groups. Furthermore, to examine the research hypothesis about the relationship between smart technology implementation and perception of destination competitiveness, multiple regression analysis was conducted.

The model included independent variables: (1) level of smart technology use, (2) spatial accessibility (rating 1–5), and (3) destination marketing strategy (rating 1–5), while the dependent variable was the perception of destination competitiveness.

As shown, all three independent variables have a statistically significant impact ($p<0.05$) on the perception of competitiveness, with the highest standardized coefficient β for the use of smart technologies ($\beta=0.29$). The results support hypothesis H1 that the combination of spatial dimension and smart technologies is key to destination competitiveness.

Table 3. Descriptive statistics of key variables (N=300) (Source: Author, based on survey results)

Variable	M	SD	Min	Max
Importance of spatial dimension (1–5)	4.21	0.65	2	5
Level of use of smart technologies (1–5)	3.82	0.78	2	5
Perception of destination competitiveness (1–5)	4.10	0.71	1	5

Table 4. ANOVA results for comparing attitudes towards smart technologies among groups (N=300) (Source: Author, based on survey results) *p < 0.05

Source of Variation	SS	df	MS	F	p
Between Groups	4.32	2	2.16	4.10	0.018*
Within Groups	154.35	297	0.52		
Total	158.67	299			

Table 5. Regression analysis summary (dependent variable: perception of destination competitiveness) (Source: Author, based on survey results) $R^2 = 0.32$; $F(3,296)=15.55$; $p<0.001$; *p < 0.05

Variable	b	SE	β	t	p
(Constant)	1.52	0.38	–	3.89	0.000
Use of smart technologies	0.35	0.09	0.29	3.89	0.000*
Spatial accessibility	0.28	0.08	0.24	3.50	0.001*
Marketing strategy	0.22	0.10	0.15	2.20	0.029*

Table 6. Main thematic categories from NVivo analysis (Source: Author, based on NVivo analysis results)

Category	Number of references	Example quotes
Infrastructure and transport connectivity	45	"The key problem is the lack of transport…"
Technological solutions and digital transformation	60	"Smart applications for tourists facilitate…"
Destination management and marketing strategies	35	"It is important to have a clear vision and strategy…"
Sustainable development and community participation	40	"The local community must be involved…"

Results of Qualitative Analysis

Qualitative analysis deepens the understanding of the obtained quantitative results, emphasizing that technological solutions and the spatial dimension are not separate segments but complement each other within a broader destination management system.

Thematic Categories

In the qualitative part of the research, 15 semi-structured interviews were conducted with representatives of tourist boards, hotel managers, spatial planning experts, and IT companies. The average interview duration was 40 minutes, and all were transcribed and analyzed in NVivo software (Table 6) using thematic analysis (Braun & Clarke, 2006). Thematic analysis of interview transcripts identified four main categories: (1) infrastructure and transport connectivity, (2) technological solutions and digital transfor-mation, (3) destination management and marketing, (4) sustainable development and commu-nity involvement.

Key Insights from Interviews

Interviewees emphasized that spatial conditioning, especially transport connectivity, is often a limiting factor in the development of smart destinations. Rural areas lack adequate infrastructure and digital networks, which hinders the even implementation of technological solutions. Nevertheless, almost all agree that smart technologies are essential for enhancing competitiveness, particularly in terms of personalized visitor experiences (Buhalis & Amaranggana, 2014).

DISCUSSION

The results of this research confirm that the spatial dimension, in terms of infrastructural development and locational accessibility, is crucial for the success of smart destinations (Hall & Page, 2014; Smith, 2015). Findings from the quantitative analysis (Table 5) show that both spatial accessibility and the level of use of smart technologies are significant predictors of perceived competitiveness. This means that the contemporary trend of digitalization is not sufficient by itself, but must be viewed in synergy with sustainable spatial planning (Gretzel et al., 2015). The comparative analysis (Table 2) points to significant differences between coastal and continental areas of Croatia, consistent with previous studies on the importance of balanced development (Ministry of Tourism and Sports of the Republic of Croatia, 2021). European destinations most frequently cited as case studies of smart destinations (Barcelona, Amsterdam) invest significant resources in technology and sustainable infrastructure, resulting in a high degree of competitiveness (Garau & Pavan, 2018).

Qualitative findings further confirm that the integration of the local community and a well-defined marketing strategy are often decisive. Without a shared vision and coordination, even with advanced technology, destinations risk uncoordinated development and possible declines in visitor satisfaction. The findings of this research are consistent with previous studies (Gretzel et al., 2015; Buhalis & Amaranggana, 2014), which emphasize that the level of spatial accessibility is inextricably linked to the implementation of smart technologies. It was quantitatively confirmed (Table 5) that both spatial and technological factors significantly contribute to the perception of destination competitiveness, which aligns with the concept that smart destinations must integrate physical and digital infrastructure (European Commission, 2020).

Furthermore, the introduction of the Spatial Attractiveness Index (SAI) as a measurement tool in the comparative analysis proved useful for more precise comparisons of different regions. Previous methods, such as merely summing tourist overnight stays, are limited because they do not reflect the multidimensional character of destination attractiveness and do not account for spatial inequalities. SAI, on the other hand, allows for adjustment of different weighting factors, thus providing a more holistic insight. Qualitative findings also emphasize the importance of social and organizational aspects: even if infrastructure is satisfactory, weaker involvement of the local community and the absence of a strategy can limit the benefits of smart technologies. This observation aligns with the works of Boes et al. (2016); Gretzel et al. (2015), who warn that technology must not remain an isolated experiment, but rather be part of an integrated destination policy and stakeholder cooperation (the so-called ecosystem approach). Recent empirical research confirms that smart technologies significantly enhance the sustainable competitiveness of tourism destinations (Garau-Vadell et al., 2023).

CONCLUSION

This research highlighted the importance of viewing the spatial dimension and smart technologies as interconnected elements shaping tourism supply. In the Croatian and broader European context, destinations that actively implement technological solutions and strategically plan spatial resources tend to achieve higher levels of competitiveness and visitor satisfaction. Quantitative findings suggest statistical confirmation of hypothesis H1, while qualitative analyses provided a deeper explanation of how this manifests in practice. This research provides insight into the interrelationship between spatial conditioning and smart technologies in the development of tourist destinations, with a special focus on the Croatian and European context. The main contributions of this paper can be summarized in three points:

1.) Integration of Spatial and Technological Perspectives – Quantitative analysis confirmed that both infrastructure accessibility and the level of implementation of smart technologies are significant predictors of destination competitiveness. This emphasizes the need for synergy between physical and digital investments.

2.) Application of the Spatial Attractiveness Index (SAI) – By introducing SAI as an additional tool for comparative analysis, we obtained a more comprehensive view of spatial attractiveness. This measure can be adapted to various contexts, with the definition of appropriate values and weights (A_i, W_i).

3.) Combination of Quantitative and Qualitative Insights – Survey and interview results point to the importance of strategic management and community involvement.

Practical implications arise from the need for spatial aspects (especially transport connectivity) and digital infrastructure to be developed in parallel. In regions where transport isolation is still a problem, investments in basic infrastructure should be initiated before or simultaneously with the introduction of new technologies. Moreover, for the successful implementation of smart destination solutions, educational activities for local stakeholders and greater cooperation between the public and private sectors are essential. Research limitations include the fact that the survey sample of 300 respondents is relatively small in relation to the entire market. Also, the results do not cover a longitudinal perspective, which would allow monitoring of changes over time. Furthermore, although SAI proved useful in comparative analysis, the selection of factors and weights always partially depends on subjective assessments and the context of the destination.

Future research could focus on deepening econometric analyses and evaluating the cost-benefit of implementing smart technologies, especially in rural areas. Longitudinal monitoring of the development of destinations that choose to integrate SAI into their strategic plans is also recommended, to observe how the spatial and technological components affect the long-term sustainability of tourism. This research has confirmed that the synergy of spatial conditioning and smart

technologies is one of the key characteristics of modern tourist destinations. The analysis showed that destinations that actively implement technological solutions and strategically manage spatial resources generally achieve better competitiveness and a higher level of visitor satisfaction. By introducing a comparative method and the Spatial Attractiveness Index (SAI), the way in which overall attractiveness and sustainability of destinations can be assessed was further refined, making the similarities and differences between various regions in Croatia and Europe clearer.

Author Contributions: Conceptualization, M.A., B.H. and E.A.; methodology, M.A., B.H. and E.A.; software, M.A., B.H. and E.A..; validation, M.A., B.H. and E.A.; formal analysis, M.A., B.H. and E.A.; investigation, M.A., B.H. and E.A.; data curation, M.A., B.H. and E.A.; writing - original draft preparation, M.A., B.H. and E.A.; writing - review and editing, M.A., B.H. and E.A.; visualization, M.A., B.H. and E.A.; supervision, M.A., B.H. and E.A.; project administration, M.A., B.H. and E.A. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The authors would like to thank all survey participants and interviewees who enabled the collection of the necessary data. They also thank tourism and spatial planning experts for their advice during the research concept development.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 30.04.2025 Revised: 07.08.2025 Accepted: 04.09.2025 Available online: 24.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1959-1968
DOI 10.30892/gtg.61353-1563

INVESTIGATING THE RELATIONSHIP BETWEEN SOCIAL CAPITAL, KNOWLEDGE MANAGEMENT, AND EFFICIENCY OF GEOTOURISM SITE MANAGEMENT: A CASE STUDY OF A NATIONAL PARK IN NORTHEASTERN THAILAND

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Citation: Sanvises, D., & Kaewnuch, K. (2025). Investigating the relationship between social capital, knowledge management, and efficiency of geotourism site management: A case study of a national park in Northeastern Thailand. *Geojournal of Tourism and Geosites*, 61(3), 1959–1968. https://doi.org/10.30892/gtg.61353-1563

Abstract: Managing geotourism site in national park presents several challenges that must be addressed to ensure the preservation of its unique geological resources and the sustainability of its tourism activities. Mitigating the impact of tourism on these fragile resources remains a critical concern. Another major challenge is limited community involvement in the park's management, which often results in a lack of ownership. The research aims to test a structural model of social capital, knowledge management, and efficiency of geotourism site management in northeastern Thailand. Data were collected from 280 residents of Nai Mueang Subdistrict Municipality, Khon Kaen Province. Descriptive statistics (frequency, percentage, mean, and standard deviation) and structural equation modeling were used for data analysis. Purposive and convenience sampling methods were applied to select participants who had visited Phu Wiang National Park at least once. Data were collected using a structured questionnaire. The results revealed that the active involvement of diverse stakeholders significantly fosters the development of social capital - particularly trust, norm, network, sense of belonging, and shared value - among various groups. These relational assets enhance the collective capacity to address challenges and achieve common goals within the geotourism context. Furthermore, stakeholder diversity plays a key role in improving knowledge management, as different groups contribute tools, expertise, and perspectives. This diversity ensures that management strategies are comprehensive, adaptive, and grounded in real-world contexts. Ultimately, the strengthening of social capital and the advancement of knowledge management enhance the efficiency of geotourism site management. A more connected and knowledgeable stakeholder network supports better decision-making and more sustainable practices. Accordingly, the study contributes to the theoretical understanding of stakeholder-based geotourism management and provides practical implications for policymakers and local stakeholders seeking to improve management practices in protected areas.

Keywords: social capital, knowledge management, efficiency, geotourism site management, national park

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INTRODUCTION

Geotourism site management in Phu Wiang National Park is crucial for preserving its unique geological, ecological, and cultural heritage while enhancing its efficiency. The park is renowned for its significant dinosaur fossil discoveries, including species like Phuwiangosaurus sirindhornae, which attract tourists and researchers. Effective management protects these invaluable geological resources from environmental degradation and human activities. The park can maintain its natural integrity while allowing public access and education, contributing to global knowledge about prehistoric life (Vivitkul & Singtuen, 2021). Phu Wiang National Park, located in Wiang Kao District, Khon Kaen Province, spans approximately 380 square kilometers and encompasses a variety of geotourism attractions. Key sites within the park include the Phu Wiang Dinosaur Museum and Dinosaur Sri Wiang Dinosaur Park, which highlight the region's paleontological significance. The park also features dinosaur footprints and the Dinosaur Nature Trail, offering educational insights into prehistoric life (Tourism Authority of Thailand, 2025). Additionally, the area includes prominent natural and cultural landmarks such as Chom Tawan Cliff, Scorpion Cave, Famue Daeng Cave, and the Giant Dipterocarp tree.

Visitors can also explore several waterfalls, including Tad Fa Waterfall, Wang Sak Siw Waterfall, and Thap Phaya Suea Waterfall, which contribute to the park's ecological diversity. Other significant sites include the Reclining Buddha, Thung Yai Sao Aram, Tad Fa Camp Site, and Tham Pha Keang Temple, enhancing the park's cultural and recreational value. These tourist attractions in Phu Wiang National Park, as described above, are illustrated in Figure 1.

Managing the geotourism site in Phu Wiang National Park presents several challenges that must be addressed to ensure the preservation of its unique geological resources and the sustainability of its tourism activities. Mitigating the impact of tourism on these fragile resources remains a critical concern (Gordon, 2023). Another major challenge is limited community involvement in the park's management. While local communities have the potential to contribute to the park's geotourism initiatives, there is often a lack of capacity-building and training to help them become effective geotourism guides or active

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participants in park management. This gap in social capital can hinder the development of geotourism initiatives, which are crucial for fostering local economic benefits and enhancing visitor experiences (Matshusa et al., 2021).

Additionally, knowledge management in the park is a critical issue. While the park contains valuable geological and paleontological information, there is a need for better systems to organize, share, and utilize this knowledge effectively among park authorities, local communities, and visitors. Without proper knowledge-sharing platforms, such as training programs or accessible educational materials, the full potential of the park's resources may not be realized, leading to missed opportunities for scientific research and visitor education (Hvenegaard et al., 2021). Lastly, coordinating the efforts of multiple stakeholders - including park authorities, local government, and academic institutions - can be difficult. Effective collaboration is essential for policy implementation, research initiatives, and resource management. Still, the lack of coordination can lead to inefficiencies and conflicting interests, ultimately hindering the park's overall management goals (Williams et al., 2020). The management of geotourism site, particularly in the context of Phu Wiang National Park, presents a unique challenge in balancing conservation and the engagement of local communities. Despite the park's significant geological value, there is limited research on how social capital and knowledge management interact to enhance the efficiency of geotourism site management. Social capital, which refer to the trust, norm, network, sense of belonging, and shared value, plays a key role in geotourism site practices and resource conservation. However, the extent to which these social capitals influence knowledge management and contribute to decision-making in geotourism site management remains underexplored. Similarly, while knowledge management are essential for organizing and disseminating valuable information about the park's geological and ecological features, the impact of knowledge flow on management efficiency has not been adequately examined. Therefore, the researcher conducts this research to fill this gap.

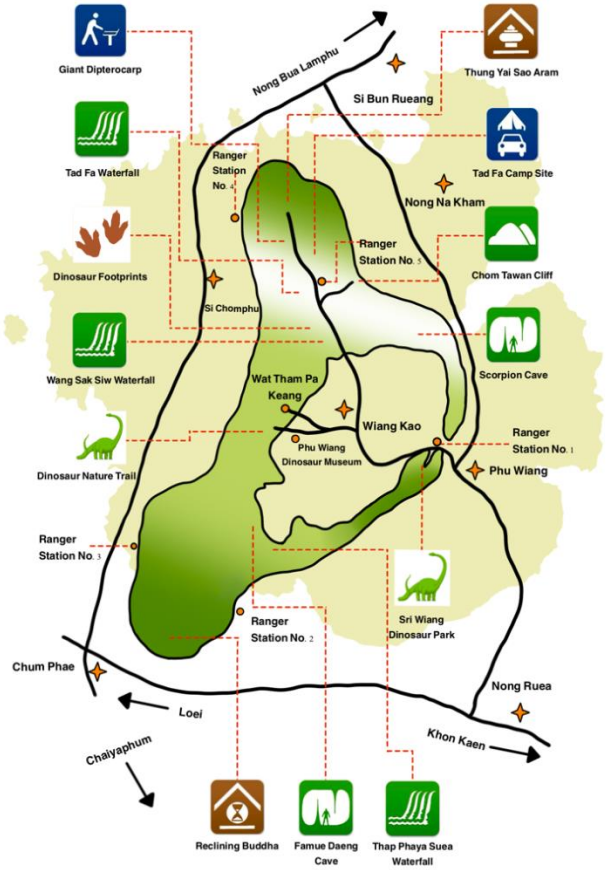

Figure 1. Tourist Attractions in Phu Wiang National Park (Source: Developed from Phu Wiang National Park, 2023)

LITERATURE REVIEW

Trust

Cooperation and sustainable development rely heavily on trust among the local community, business, and geotourism site management. Trust is the foundation of social cohesiveness in the local community setting since it helps people to work for shared interests (Kummitha, 2021). Recent research highlights that trust among stakeholders enhances the effectiveness of participatory management approaches by fostering open communication and collective accountability (Ghorbani et al., 2025). However, studies have also noted that trust-building is fragile and context-dependent; it requires ongoing engagement, historical sensitivity, and transparency in decision-making processes. For instance, in co-management models, uneven power dynamics and exclusion of marginalized voices have been shown to erode trust (Liu et al., 2022). Therefore, while trust is a facilitator of knowledge sharing and stakeholder integration, its establishment is neither automatic nor guaranteed and must be intentionally nurtured. Therefore, it is hypothesized that:

H1: Trust has a positive relationship with knowledge management in a statistically significant way.

Norm

Norm refers to the shared expectations, rules, and standards that guide behavior within a social group or community. They play a crucial role in maintaining social order, fostering mutual respect, and preserving cultural values (Saracevic & Schlegelmilch, 2021). In the context of geotourism site management, norm establishes guidelines for responsible behavior among visitors, local communities, and stakeholders, which is essential for the long-term sustainability of natural and cultural resources (Zheng et al., 2025). Many studies have highlighted the importance of community engagement in establishing and reinforcing norm. For instance, Rosilawati et al. (2020) emphasize that active participation of local communities in heritage conservation efforts fosters leads to the internalization of sustainable practices. Similarly, Zhu et al. (2020) discuss how social norms and values within a community can influence tourists' behavior, encouraging them to act responsibly and align with local expectations. Therefore, understanding and fostering appropriate norms is vital for effective knowledge management and collective action in geotourism site. Therefore, it is hypothesized that:

H2: Norm has a positive relationship with knowledge management in a statistically significant way.

Network

Networks - linked systems and structures - help people or companies coordinate, interact, and share resources. For knowledge sharing on sustainable practices, local involvement in conservation projects and cultural event staging, networks are important in communities around Phu Wiang National Park. These networks not only promote information flow and resource mobilization but also foster long-term trust and collective action among diverse actors (Aktymbayeva et al., 2020). In the concept of geotourism site management, networks are coordinated activities of the public sector, the park authority, the private sector, the academic sector, and the local community to provide effective site management and sustainable tourism. They facilitate joint decision-making, shared responsibilities, and adaptive strategies in response to local needs and environmental challenges. Witchayakawin et al. (2022) indicate that well-established networks foster mutual accountability and empower local actors to take leadership roles, thereby enhancing the sustainability of tourism initiatives and facilitating effective knowledge management through collaborative learning and experience exchange. Therefore, it is hypothesized that:

H3: Networks have a statistically significant positive relationship with knowledge management.

Sense of Belonging

Sense of belonging refers to the emotional connection people feel toward their local environment, community, and shared cultural traditions. This feeling plays an important role in encouraging people to take part in geotourism activities, help protect natural resources and support local knowledge sharing. In the case of Phu Wiang National Park, this sense of belonging promotes community responsibility and helps maintain ongoing efforts in both cultural and environmental conservation. Singtuen et al. (2022), in their study of a geosite in Khon Kaen, emphasized the value of participatory learning - such as local field trips and guided tours - in building community identity and pride. Their research shows that when local people join educational tourism activities based on their own surroundings, it strengthens their emotional connection to the place and increases their willingness to support sustainable site management. This suggests that feeling emotionally connected to a place can strongly influence people's long-term commitment to protecting it. Therefore, it is hypothesized that:

H4: A sense of belonging has a statistically significant positive relationship with knowledge management.

Shared Value

Shared value refers to creating economic value in a way that also creates value for society. In the local community context, shared value arises when community members work together to achieve common goals that benefit everyone, such as improving local infrastructure, supporting education, or preserving cultural heritage. At Phu Wiang National Park, shared value can be seen in how local communities collaborate with park authorities to promote sustainable tourism while benefiting from increased economic opportunities through tourism-related activities. Sarabia-Molina et al. (2022) caution that the implementation of shared value in tourism contexts can be uneven, particularly when external investors prioritize profit over local benefits. Achieving shared value requires continuous dialogue among stakeholders, clear benefit-sharing mechanisms, and inclusive planning processes. Without these, initiatives branded as 'sustainable' may end up reinforcing inequalities or cultural commodification. Therefore, it is hypothesized that:

H5: Shared value has a statistically significant positive relationship with knowledge management.

Knowledge Management

In geotourism site management, knowledge management (KM) helps improve operational efficiency, which in turn reduces environmental harm. KM also supports better decision-making by combining local knowledge with scientific research to address specific challenges at the site (Ferdowsi et al., 2025). KM encourages cooperation among different stakeholders, ensuring that everyone shares their knowledge to protect the natural and cultural values of the area (Pourfaraj et al., 2020). Additionally, KM supports continuous learning and adaptive management, increasing the ability to respond to new challenges. As a result, it boosts the overall efficiency, sustainability, and long-term success of geotourism site management. Otowicz et al. (2022) offer a more stakeholder-centered view, highlighting that effective knowledge management depends not only on the availability of information but also on the willingness of actors to collaborate and exchange insights. Therefore, it is hypothesized that:

H6: Knowledge management has a positive relationship with the efficiency of geotourism site management in a statistically significant way.

Efficiency of Geotourism Site Management

Efficiency in the use of resources at geotourism site is essential for balancing social, economic, and environmental sustainability. From a social perspective, efficient resource management ensures local communities benefit from tourism through job creation, cultural preservation, and community involvement in conservation efforts (Ma et al., 2023). From an economic perspective, the efficient use of resources at geotourism site maximizes financial benefits while minimizing waste and operational costs. Sustainable infrastructure, such as eco-friendly visitor centers and low-impact transportation, reduces energy consumption and maintenance costs. Implementing policies such as controlled visitor numbers, fair pricing strategies, and revenue-sharing models ensures that tourism income is distributed equitably among stakeholders (Herrera-Franco et al., 2021). From an environmental perspective, efficiency in resource use involves minimizing ecological disturbance and conserving the geological integrity of the site. This includes implementing measures such as waste reduction, water and energy conservation, and using renewable energy sources to support tourism operations. Sustainable site management strategies include limiting visitor access to sensitive areas and using eco-friendly materials for infrastructure (Frey, 2021). Figure 2 illustrates the conceptual framework of this research based on the above-mentioned literature review and proposed hypotheses.

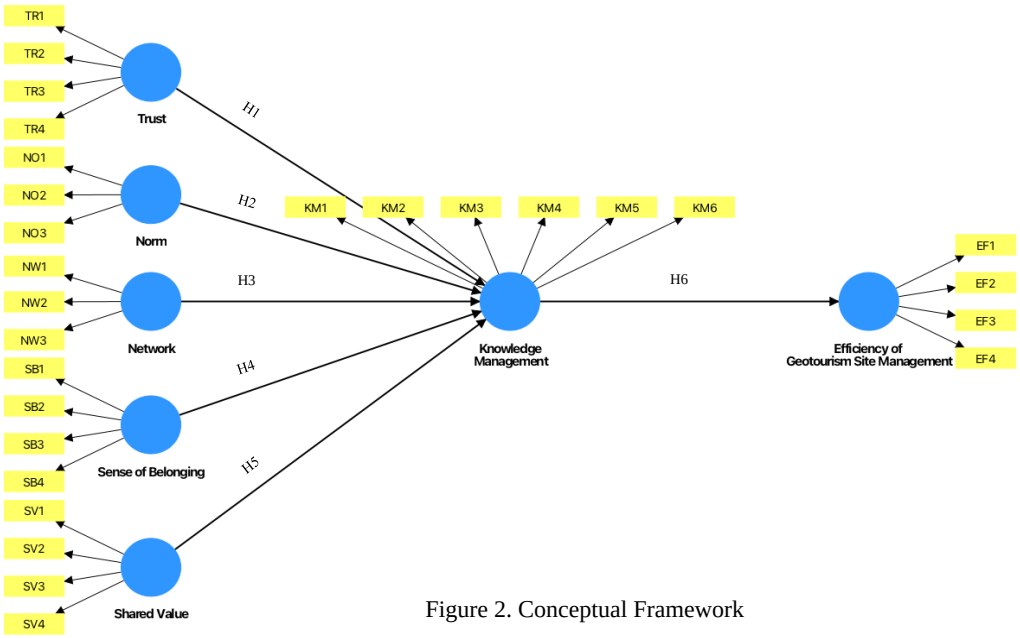

Figure 2. Conceptual Framework

METHODOLOGY

According to the general rule of thumb for structural equation modeling, the minimum sample size should be at least ten times the number of observed variables. Given that this study includes 28 observed variables, the required minimum sample size is 28 ×10 = 280 participants. The researcher uses purposive sampling and convenience sampling methods from people living in the Nai Mueang subdistrict municipality, with a minimum of one visit. The data collection instrument used in this study is a questionnaire, which is divided into four sections: 1) demographic information of the respondents, 2) social capital, 3) knowledge management, and 4) efficiency of geotourism site management. Three experts reviewed the questionnaire before distributing. The respondents rated all value items on a 5-point Likert scale (1 = 'strongly disagree'; 5 = 'strongly agree'). This research has received approval for human research protection by the Ethics Committee in Human Research, National Institute of Development Administration (NIDA) (No. ECNIDA 2024/0206), which is in full compliance with international guidelines of human research protection, such as the Declaration of Helsinki, CIOMS Guidelines, and the Belmont Report. The study employed partial least squares–structural equation modeling (PLS–SEM) as the primary analytical technique. The research flowchart is illustrated in Figure 3.

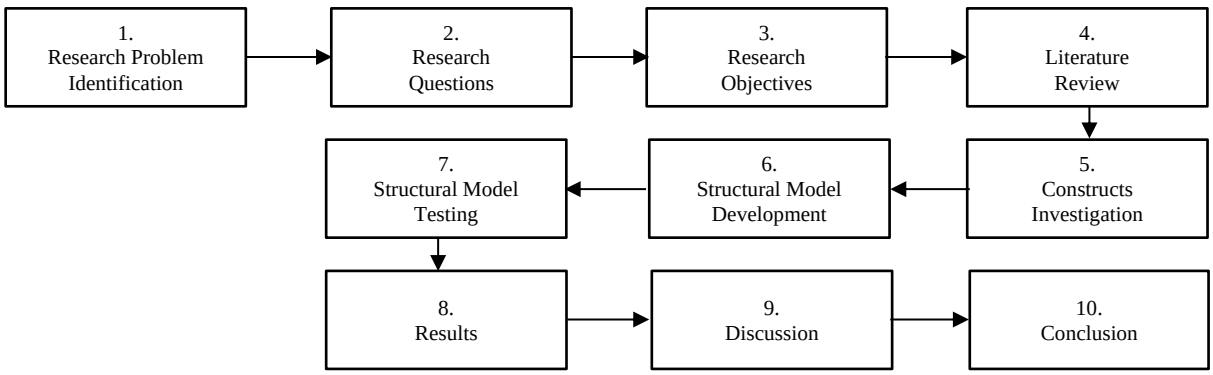

Figure 3. Research Flowchart (Source: Researcher)

RESULTS

Demographic information of the respondents

The characteristics of the respondents include gender, age, marital status, education, occupation, and salary. The sample was found to consist of 280 individuals, with most being male (182 individuals, or 65.0%). The largest age group was 30-39, comprising 109 individuals (38.9%). Most respondents had a bachelor's degree as their highest level of education (224 individuals, or 80%). Most were employed as private company employees (127 individuals, or 45.4%), and most earned a monthly salary between 20,000 and 29,999 THB (113 individuals, or 40.4%).

Table 1. Demographic information of the respondents

	Demographic	Frequency	Percent
1. Gender	Male	182	65.0
	Female	98	35.0
	Total	**280**	**100**
2. Age	20 – 29	87	31.0
	30 – 39	109	38.9
	40 – 49	65	23.2
	50 – 59	19	6.8
	Total	**280**	**100**
3. Marital Status	Single	117	41.8
	Married	144	51.4
	Divorce	19	6.8
	Total	**280**	**100**
4. Education	Below undergraduate	32	11.4
	Undergraduate	224	80.0
	Graduate	24	8.6
	Total	**280**	**100**
5. Occupation	Student	38	13.6
	Government Officer / Public Sector Employee	32	11.4
	State Enterprise Employee	19	6.8
	Private Company Employee	127	45.4
	Self-Employed / Business Owner	54	19.3
	Unemployed	10	3.6
	Total	**280**	**100**
6. Salary	Lower 15,000 THB	27	9.6
	15,000 – 19,999 THB	55	19.6
	20,000 – 29,999 THB	113	40.4
	30,000 – 39,999 THB	54	19.3
	40,000 – 49,999 THB	20	7.1
	50,000 THB or above	11	3.9
	Total	**280**	**100**

Measurement Model

The Measurement Model is assessed based on Convergent Validity, Discriminant Validity, and Reliability. The factor loadings must be greater than 0.5 and statistically significant. The obtained factor loadings range from 0.826 to 0.940. Additionally, the Average Variance Extracted (AVE) must exceed 0.5. The AVE values for all seven latent variables range from 0.745 to 0.858. Reliability is evaluated using Cronbach's Alpha (α), and Composite Reliability (ρC), all of which should be greater than 0.7 (Henseler et al., 2016). The results indicate that Cronbach's Alpha ranges from 0.870 to 0.940, and ρC ranges from 0.920 to 0.957, as presented in Table 2.

Table 2. The Measurement Model

Construct	Loading	Mean	SD	Cronbach's Alpha	CR	AVE
Trust (TR)						
TR1: You have confidence in the services provided by Phu Wiang National Park.	0.871					
TR2: You are willing to disclose information to Phu Wiang National Park.	0.826	3.82	0.673	0.888	0.922	0.748
TR3: You feel safe residing near Phu Wiang National Park.	0.881					
TR4: You have confidence in the safety and security measures implemented by Phu Wiang National Park.	0.881					
Norm (NO)						
NO1: You contribute to maintaining cleanliness and order near Phu Wiang National Park.	0.905					
NO2: You adhere to the guidelines provided by Phu Wiang National Park officials.	0.940	4.17	0.803	0.917	0.948	0.858
NO3: You comply with the rules and regulations of Phu Wiang National Park.	0.934					
Network (NW)						
NW1: You have collaborative networks with government agencies to	0.931	3.72	0.687	0.870	0.920	0.794

manage geotourism site within the national park jointly.						
NW2: You have collaborative networks with private business organizations to manage geotourism site within Phu Wiang National Park jointly.	0.840					
NW3: You have collaborative networks with the academic sector to manage geotourism site within Phu Wiang National Park jointly.	0.934					
Sense of Belonging (SB)						
SB1: You participate in the planning of geotourism site management in Phu Wiang National Park.	0.846					
SB2: You participate in managing geotourism site in Phu Wiang National Park.	0.899	3.88	0.663	0.925	0.947	0.817
SB3: You monitor the management of geotourism site in Phu Wiang National Park.	0.876					
SB4: You participate in receiving benefits from the management of geotourism site in Phu Wiang National Park.	0.876					
Shared Value (SV)						
SV1: You appreciate the historical significance of Phu Wiang National Park.	0.918					
SV2: You appreciate the value of natural resources and the environment within Phu Wiang National Park.	0.929					
SV3: You appreciate the importance of geotourism site management in Phu Wiang National Park.	0.938	4.18	0.748	0.940	0.957	0.847
SV4: You appreciate the significance of the existence of Phu Wiang National Park.	0.894					
Knowledge Management (KM)						
KM1: You share and exchange knowledge about Phu Wiang National Park with tourists.	0.842					
KM2: You share and exchange the knowledge from your travel experiences to Phu Wiang National Park on social media platforms.	0.879					
KM3: You provide feedback and share opinions on the management of geotourism site in Phu Wiang National Park.	0.857	3.82	0.626	0.931	0.946	0.745
KM4: You apply the knowledge gained from participating in tourism activities at Phu Wiang National Park to the local community.	0.871					
KM5: You apply the knowledge acquired through Phu Wiang National Park knowledge exchanges to the local community.	0.872					
KM6: You apply the knowledge obtained from Phu Wiang National Park study visits to the local community.	0.857					
Efficiency of Geotourism Site Management (EF)						
EF1: You believe that Phu Wiang National Park can effectively utilize its budget for geotourism site management.	0.890					
EF2: You believe that Phu Wiang National Park can efficiently utilize its natural resources and environment to benefit the local community and society.	0.886					
EF3: You believe Phu Wiang National Park can effectively utilize its natural resources and environment for economic benefit.	0.885	3.92	0.718	0.910	0.937	0.788
EF4: You believe that Phu Wiang National Park can use its natural resources and environment for geotourism site management without causing negative impacts on natural resources and the environment.	0.888					

Discriminant Validity is assessed using the Average Variance Extracted (AVE), which must be greater than the correlations with other latent variables (Fornell & Larcker, 1981). The results indicate that the diagonal values, representing the AVE of each latent variable, are higher than the correlations between that latent variable and others (Table 3). Additionally, the Heterotrait-Monotrait Ratio (HTMT) values are less than 1, satisfying the recommended threshold (Henseler et al., 2016) (Table 4). Moreover, the indicator loadings for each latent variable are higher than their cross-loadings with other latent variables (Table 5). All criteria meet the established validity thresholds.

The next test for discriminant validity involved examining cross-loadings ranging from 0.826 to 0.940. The cross-loadings presented in Table 5 suggest that all indicators loaded most strongly on their respective constructs. This finding indicates that there were no discriminant validity issues, and that further analysis could be carried out.

Table 3. Fornell-Larker Criterion

Construct	EF	KM	NO	NW	SB	SV	TR
EF	0.887						
KM	0.719	0.863					
NO	0.395	0.400	0.927				
NW	0.467	0.568	0.407	0.891			
SB	0.566	0.662	0.459	0.730	0.874		
SV	0.514	0.565	0.645	0.475	0.567	0.920	
TR	0.546	0.582	0.564	0.624	0.577	0.521	0.865

Table 4. Heterotrait-Monotrait Ratio (HTMT)

Construct	EF	KM	NO	NW	SB	SV	TR
EF							
KM	0.779						
NO	0.430	0.431					
NW	0.522	0.629	0.450				
SB	0.622	0.722	0.502	0.825			
SV	0.556	0.604	0.696	0.520	0.614		
TR	0.605	0.638	0.624	0.707	0.641	0.569	

Table 5. Cross Loading

Item Codes	EF	KM	NO	NW	SB	SV	TR
EF1	**0.890**	0.677	0.379	0.445	0.533	0.484	0.488
EF2	**0.886**	0.637	0.304	0.405	0.505	0.438	0.465
EF3	**0.885**	0.642	0.370	0.446	0.486	0.445	0.546
EF4	**0.888**	0.590	0.346	0.358	0.481	0.456	0.436
KM1	0.619	**0.842**	0.344	0.484	0.577	0.490	0.496
KM2	0.629	**0.879**	0.405	0.532	0.620	0.515	0.563
KM3	0.611	**0.857**	0.290	0.532	0.573	0.461	0.473
KM4	0.605	**0.871**	0.320	0.471	0.550	0.472	0.496
KM5	0.622	**0.872**	0.359	0.449	0.539	0.483	0.467
KM6	0.635	**0.857**	0.349	0.473	0.568	0.504	0.513
NO1	0.404	0.382	**0.905**	0.405	0.423	0.558	0.531
NO2	0.364	0.370	**0.940**	0.365	0.427	0.608	0.522
NO3	0.326	0.358	**0.934**	0.359	0.427	0.629	0.514
NW1	0.431	0.533	0.411	**0.931**	0.669	0.496	0.613
NW2	0.374	0.450	0.273	**0.840**	0.549	0.321	0.491
NW3	0.441	0.530	0.391	**0.900**	0.723	0.438	0.556
SB1	0.433	0.529	0.318	0.688	**0.846**	0.429	0.438
SB2	0.454	0.572	0.424	0.675	**0.899**	0.481	0.500
SB3	0.535	0.586	0.376	0.571	**0.876**	0.477	0.470
SB4	0.546	0.623	0.477	0.628	**0.876**	0.586	0.598
SV1	0.464	0.527	0.597	0.443	0.565	**0.918**	0.516
SV2	0.460	0.519	0.587	0.423	0.511	**0.929**	0.449
SV3	0.482	0.530	0.595	0.454	0.524	**0.938**	0.503
SV4	0.486	0.503	0.596	0.426	0.486	**0.894**	0.449
TR1	0.485	0.517	0.495	0.515	0.542	0.457	**0.871**
TR2	0.415	0.492	0.421	0.503	0.460	0.455	**0.826**
TR3	0.468	0.476	0.488	0.556	0.461	0.410	**0.881**
TR4	0.518	0.525	0.545	0.582	0.528	0.478	**0.881**

Structural Model

The path coefficient analysis indicates that the R^2 values for knowledge management and efficiency of geotourism site management are 51.7% and 53.4%, respectively. Additionally, the path coefficients for four examined relationships are statistically significant and exceed 0.2, with values ranging from 0.400 to 0.719. These results are presented in Figure 4 and Table 6.

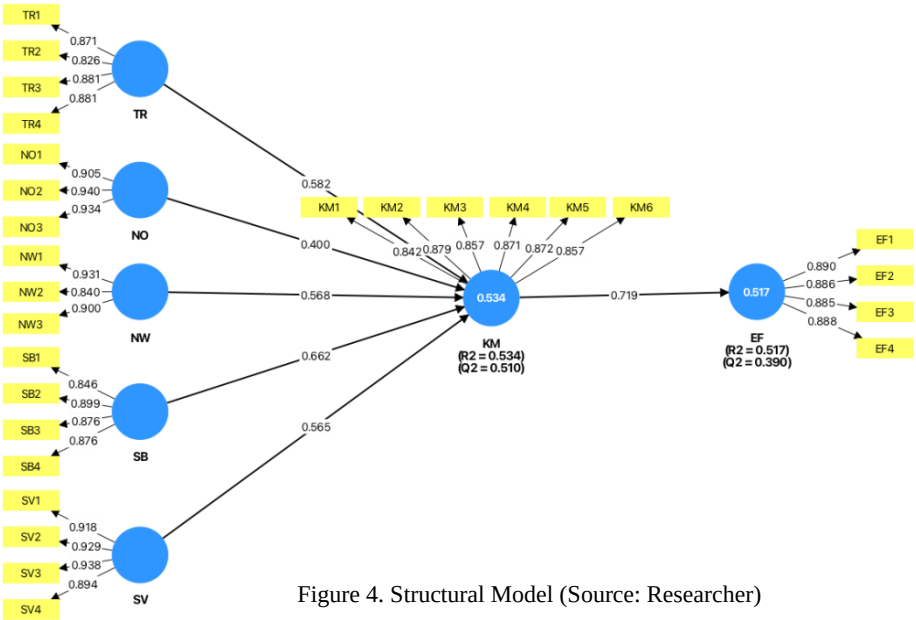

Figure 4. Structural Model (Source: Researcher)

Hypothesis Testing

The statistical significance testing of the parameters using the Bootstrapping process, with the criteria set at $p < 0.05$ and a t-value greater than the critical value of 1.96, resulted in the acceptance of four hypotheses and the rejection of two hypotheses presented in Table 6.

Table 6. Hypothesis Testing

Hypothesis Testing	Path Coefficient	t-value	p-value	Results
TR → KM	0.582	3.607	0.000	Supported
NO → KM	0.400	1.838	0.066	Not Supported
NW → KM	0.568	0.668	0.504	Not Supported
SB → KM	0.662	4.899	0.000	Supported
SV → KM	0.565	4.229	0.000	Supported
KM → EF	0.719	19.521	0.000	Supported

DISCUSSION

The findings of this study emphasize the relationship between social capital, knowledge management, and the efficiency of geotourism site management driven by stakeholders. Building trust and guaranteeing efficient knowledge management depend on a participatory strategy that includes the government sector, local leaders, the academic sector, and the community. This emphasizes the need for multistakeholder participation in decision-making procedures so that the several knowledge systems are appreciated and included in the plans of park management (Williams & Baláž, 2021).

The result also implies how norms might help or hinder cooperative efforts in the management of geotourism site (Wasaya et al., 2024). Networks improve stakeholders' capacity, skills, and knowledge management capacity (Yanou et al., 2023). The park should provide a more cooperative model for preserving and advancing knowledge by strengthening links between the public sector, the business sector, the academic sector, and local communities, therefore guaranteeing the long-term viability of the park. Sense of belonging is a fundamental factor in the success of knowledge co-creation and community involvement in the management of the National Park. They can actively contribute to knowledge sharing and management when local communities feel connected to the park and are given opportunities to participate in decision-making and conservation efforts (Ma et al., 2023). Shared value is essential for the successful and sustainable management of geotourism site. It emphasizes the need to make sure the local community gains fairly from tourism activities, including social, economic, and environmental benefits (Obradović et al., 2023). Knowledge management (KM) is fundamental for creating a sustainable, efficient, and collaborative management framework for geotourism site. KM facilitates effective communication, which leads to conservation and management outcomes. It also promotes local business participation in sustainable practices, supports the acceptance of policies, and helps resolve conflicts between stakeholders (Singtuen et al., 2022).

Cooperative partnerships among stakeholders help to enable the flow of scientific and indigenous knowledge, ensuring that management tactics complement social, economic, and environmental advantages (Kunjuraman, 2022).

Reducing barriers to information flow and encouraging a cooperative culture helps social capital become a main driver of knowledge management. Established social capital communities are more likely to see stakeholders engaged in knowledge management, directing more informed decision-making processes (Peng, 2024). The results show that geotourism site with well-organized knowledge management systems, including formalized knowledge sharing platforms or effective knowledge application, can improve resource optimization and environmental conservation, enabling the efficiency of geotourism site management. These revelations support the case that knowledge is not just a tool for information but also a strategic instrument for gaining efficiency and long-term success of geotourism site.

Similar to the findings of Ferdowsi et al. (2025), the study confirms that social capital plays a critical role in enhancing the knowledge management process. Communities with stronger knowledge capacity are more likely to improve operational efficiency in nature-based tourism, which supports the present study regarding geotourism site management.

Furthermore, Aktymbayeva et al. (2020) indicate that collaborative management models that formalize knowledge-sharing mechanisms and promote inclusive participation tend to be more resilient and adaptable in the face of environmental challenges and the pressures of growing tourism demand. Therefore, a well-structured stakeholder engagement strategy that fosters equity, inclusivity, and co-creation is essential for achieving sustainable geotourism site management.

In summary, stakeholder engagement and knowledge integration are not secondary but foundational elements of effective geotourism site management. Leveraging the collective wisdom and capacity of all stakeholders enhances efficiency, promotes shared responsibility, and supports sustainable tourism that respects both natural heritage and community well-being. Future frameworks should adopt a knowledge-inclusive governance model, rooted in mutual respect and co-creation, to ensure long-term success. This approach not only fosters resilience in management systems but also empowers local communities to become active stewards of their own cultural and natural resources.

CONCLUSION

The researcher discovers that the active involvement of diverse stakeholders significantly fosters the development of social capital - particularly trust, norm, network, sense of belonging, and shared value - among various groups.

These relational assets enhance the collective capacity to address challenges and achieve common goals within the geotourism context. Furthermore, stakeholder diversity plays a key role in improving knowledge management, as

different groups contribute tools, expertise, and perspectives. This diversity ensures that management strategies are comprehensive, adaptive, and grounded in real-world contexts. Ultimately, the strengthening of social capital and the advancement of knowledge management enhance the efficiency of geotourism site management. A more connected and knowledgeable stakeholder network supports better decision-making and more sustainable practices.

The findings highlight the importance of prioritizing local community participation and recommend that policymakers cultivate social capital through strong interpersonal relationships and clear communication of shared goals. The conclusion of this study is illustrated in Figure 5.

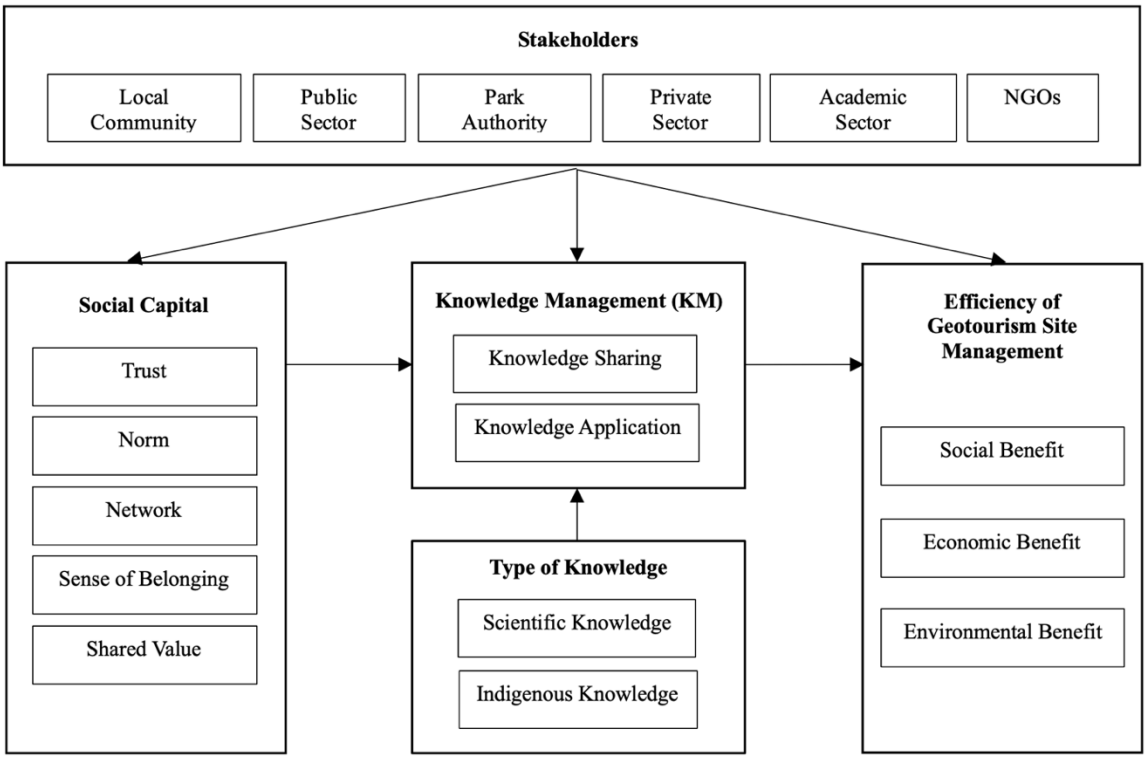

Figure 5. The Relationship between Social Capital, Knowledge Management, and Efficiency of Geotourism Site Management (Source: Researcher)

Author Contributions: Conceptualization, D.S. and K.K.; literature review, D.S.; methodology, D.S. and K.K.; validation, D.S.; formal analysis, D.S.; investigation, D.S. and K.K.; data curation, D.S. and K.K.; writing - original draft preparation, D.S.; writing - review and editing, D.S. and K.K.; visualization, D.S.; supervision, K.K.; project administration, D.S. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: This research was approved by the Ethics Committee in Human Research, National Institute of Development Administration (NIDA) (No. ECNIDA 2024/0206).

Informed Consent Statement: Informed consent was obtained from all participants, and all responses were anonymized to ensure confidentiality.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: This research was supported by Graduate School of Tourism Management (GSTM), National Institute of Development Administration (NIDA), Bangkok, Thailand.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 15.04.2025 Revised: 08.08.2025 Accepted: 05.09.2025 Available online: 24.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1969-1979
DOI 10.30892/gtg.61354-1564

TOWARDS A FRAMEWORK FOR RESILIENCE BUILDING IN SPORT EVENT TOURISM IN THE DEVELOPING CONTEXT

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Citation: Daniels, T., & Tichaawa, T. (2025). Towards a framework for resilience building in sport event tourism in the developing context. *Geojournal of Tourism and Geosites*, 61(3), 1969–1979. https://doi.org/10.30892/gtg.61354-1564

Abstract: This paper adds to the existing body of knowledge on sport event tourism by proposing the development of a framework for resilience This paper adds to the existing body of knowledge on sport event tourism by proposing the development of a framework for resilience building and sustainability. The proposed framework draws on previous research on sport event tourism and resilience. Grounding the study is a multidimensional conceptual framework based on the sport tourism framework, stakeholder theory and resilience theory. Using a mixed methods approach, phase 1 of the research gathered in depth qualitative data from 28 key informants in sport event tourism on crisis management and resilience building in the sector. The second phase of the study utilised quantitative methods, gathering responses from 1002 sport event tourists to determine their future sport event tourism behaviour, requirements and willingness to attend future sport events. The proposed framework presented in the study provides guidelines on how resilience can be achieved in sport event tourism. It also illustrates that external shocks can be used as tools to develop and enhance resilience in sport event tourism through sophisticated stakeholder engagement, the development of guiding policy that addresses resilience capacity building, and the reconsideration of the sport event tourism product as one that is adaptable and dynamic. The findings of the study show that the resilience of the sport event tourism sector is dependent on a product that is adaptable and flexible, meets the needs of changing demands, and which is developed through collaborative efforts. Stakeholders must be willing to adapt their previous offerings by using new innovations and developing new relationships along the sport event tourism value chain

Keywords: sport event tourism, resilience, developing context, sustainability, South Africa, stakeholder collaboration

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INTRODUCTION

Sport event tourism is defined as travel for attendance, participation or to spectate at a sport event (Delpy, 1998). The hosting of sport events as a catalyst for tourism growth and development is a notion that has grown substantially over the last decade, gaining recognition amongst academics, governments and event practitioners (Nyikana & Tichaawa, 2020; Vassiliadis et al., 2021). This has been the case due to the potential that these events have to stimulate tourism-related activities, generate profits, promote the development of tourism services, attract international investment, create employment opportunities and encourage urban development and regeneration (Chaigasem & Leruska, 2020; Daniels & Tichaawa, 2021). Hemmonsbey & Tichaawa (2018, 2019) note that in the context of the developing world, destinations have used the hosting of sport events to lure tourists and for destination branding opportunities, as was seen in the hosting of the 2014 FIFA World Cup and 2016 Olympic Games in Rio de Janeiro and the 1995 Rugby World Cup, 2003 Cricket World Cup and 2010 FIFA World Cup in South Africa. The hosting of these events act as a catalyst for these destinations to reap benefits beyond the traditional triple bottom line in terms of improved destination brand awareness, and the cultivation of positive and unique tourism brand messages that stimulate memorable travel experiences (Hemmonsbey & Tichaawa, 2020).

Despite the widely acknowledged impacts of crises and external events such as the COVID 19 pandemic on the global sport event tourism sector, Baum (2020) suggests that these events are merely an amplification of what is considered normal practice in the sector, but that the rapid onset of the pandemic further illuminated the potential negative impacts of these norms. Pandemics, crises and catastrophic events are not new and will continue to be experienced. For the negative impacts of these to be mitigated and to ensure future sustainability, these events should be considered as opportunities for the sport event tourism sector to rebuild, innovative and reinvent itself in order to become more resilient (Prayag, 2020).

Where higher levels of resilience can be achieved, this would result in a sport event tourism sector that is able to adapt to external impacts, coping with these changes without losing the essence of its structure and functions (Adger et al., 2002; Daniels & Tichaawa, 2023). In order to achieve these elevated levels of resilience, this paper presents a framework for resilience building in sport event tourism. The framework, built upon primary data collected for the purposes of the study, as well as the sport tourism framework, the stakeholder theory and the resilience theory, offers a flexible approach which

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can be applied and adapted by the various stakeholders involved in the sport event tourism sector in a range of contexts in order to ensure resilience building. The framework can also be used as a guide for future researchers to further investigate the concept of resilience within sport event tourism development and management.

The sport tourism framework

Early definitions of sport tourism simply combined those of sport and tourism, such as that proposed by Standeven & DeKnop (1999:12), stating that "sport tourism is all forms of active and passive involvement in sporting activity, participated in casually or for business/commercial reasons, that necessitate travel away from home and the work locality".

Although definitions such as these are useful, they incorporate almost all tourism and sport related activities, with little focus being placed on events. To address this, Kurtzman & Zauhar (2003) suggested five categories of sport tourism, namely: sport tourism attractions; sport tourism resorts; sport tourism cruises; sport tourism tours; and sport tourism events. Within these categories, sport event tourism is based around sport activities that attract high numbers of sport tourists for either participation in, or attendance at, a sport event (Getz, 1991). In the sport tourism model presented by Deery et al. (2004), sport events are considered the foundation of sport tourism, encompassing attendees, competitors or officials, all with varying intentional motivations for travel. In this context, sport event tourism is defined as tourism where individuals travel as spectators, fans, supporters or casual observers of a sport event (Gibson, 2006).

Delpy (1998) adds that sport event tourism refers to sporting activities that attract large numbers of visitors or spectators. The type and number of visitors attracted depends on the nature of the sport event, as some are more spectator-driven than are others. In terms of economic impacts, sport event tourism is noted for having the highest impact on host destinations. Many destinations have developed a portfolio of sport events that are held throughout the year to attract visitors and to capitalise on the positive impacts on sport event tourism. The development of a sport event portfolio has a range of potential benefits, such as promoting the sustainability of events, linking a variety of events of varying scale and nature, reaching diverse market segments, increasing the size of the event market, responding to different community issues and concerns, and appealing to different interests (Ziakas & Coasta, 2011; Ziakas, 2020; Salgado-Barandela et al., 2021).

The stakeholder theory and sport event tourism

The stakeholder theory was first introduced by Freeman during the 1980s, at which time a stakeholder was defined as "any individual or group who can affect a firm's performance or who is affected by the achievement of the organisation's objectives". Since then, the theory has evolved to incorporate various groups and individuals, who could potentially affect an organisation, as well as the behaviour of management in response to these groups and individuals (Lewis, 2006; Presenza & Iocca, 2012; Crane, 2020; Lechner & Solberg, 2021). In the identification of stakeholder groups, Tichaawa & Bob (2018) states that employees, customers, persons, groups, neighbourhoods, organisations, institutions, societies and natural environments can be considered as actual or potential stakeholders. Within the domain of sport event tourism, stakeholder theory has often been applied in relation to strategic planning and in terms of the development of sustainability initiatives in the management of tourism destinations (Ritchie & Crouch, 2000; Hardy & Beeton, 2001; Simpson, 2001).

Garrod et al. (2012) note that the stakeholder theory has been incorporated into various tourism planning and policy development activities, and in various collaborative efforts, particularly in the field of destination marketing (Parent, 2019; Lechner & Solberg, 2021). In the domain of sport event tourism, stakeholder theory is clearly a necessity, not only due to the large number of stakeholders involved in the industry, but also due to it being ever changing and requiring a future-ready approach to adaptability to the changing of environmental, social and economic conditions (Lechner & Solberg, 2021; Mollah et al., 2021). Within this context, a sport event tourism stakeholder can be defined as "anyone who is impacted on positively or negatively by a development such as a sport event tourism project" (Aas et al., 2005).

The importance of stakeholders in sport event tourism is presented by Mossberg & Getz (2008), who emphasise that, without effective stakeholder engagement and communication, sport tourism, and particularly sport tourism events, cannot be successfully hosted. Agha et al. (2012), as well as Chang et al. (2020), add that successful sport events are those that demonstrate effective synergy between all stakeholders, so that they can assist each other in achieving their objectives.

In keeping with this, Ruhanen (2004) states that, without meaningful and concerted engagement with all sport tourism stakeholders, including the community, the industry and the relevant authorities, achieving sustainable development in sport event tourism will not be achieved, and that this requires a participatory model to agree on planning direction and goals. Various authors (Hinch & Higham, 2001; McGehee & Andereck, 2004; Currie et al., 2009) support this, by stating that, without stakeholder support, sustainable development in sport event tourism would be extremely challenging, particularly when recovering from crises and external shocks.

Defining resilience

According to Walker et al. (2006) resilience can be defined as the capacity of a system to absorb disturbance and reorganise while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks. The concept of resilience is largely based on the understanding of responses to external shocks that push a system towards change and ultimately innovation, surviving the change and becoming more sustainable (Williams & Vorley, 2014; Hamel & Valikangas, 2003; Fiksel, 2006; Williams & Vorley, 2014). The resilience theory was first proposed by C.F. Holling in 1973, on the basic principle that systems do not evolve in a linear fashion, but, rather, according to a cycle or a loop. The phases of the cycle or loop are often repeated, but the characteristics at each stage are not the same. The theory also states that the speed of recovery from a destabilising or critical event depends on the adaptive capacity of the system, which is

directly related to the amount of capital accumulated during the previous phases. The resilience theory posits that systems fluctuate within domains (Holling, 1973), valleys (Gunderson, 2000) and basins of attraction (Walker et al., 2004). The point at which the system is the strongest is the bottom of the basin. On either side of the basin is a margin, in which systems can fluctuate without losing their inherent function. Within these margins, the degree of instability can be changed without the essential workings of the system becoming impaired. The margins are also considered the adaptive capacity of the system, with the resilience of the system depending on how long it takes to return to its original condition (Cochrain, 2015). f a stress event occurs, the system will override the margins of its basin and change into a different state, where negative outcomes might occur. Understanding how these shifts occur can assist role-players in mitigating negative impacts (Gunderson, 2000). In terms of the adaptive capacity of the system, this can be used as a determinant of its vulnerability.

If a system has a low adaptive capacity, it is considered vulnerable. Despite this, having a high adaptive capacity does not mean that a system is necessarily immune to disruption or disturbance, as this also depends on the nature of the incident concerned (Adger & Vincent, 2005). One of the biggest challenges when considering the adaptive capacity of a system is that it may be latent, and only realised when the system is exposed to a disturbance (Adger et al., 2005; Lemos et al., 2007).

The adaptive capacity can be strengthened and enhanced by investing in information and knowledge; encouraging collaboration; increasing levels of resources and education; and ensuring effective institutional arrangements (Yohe & Tol, 2002). Mithani (2020) posits that the adaptability of a system is affected by several 'modes' that directly contribute to this. These modes are either avoidance, absorption, elasticity, learning or rejuvenation. Absorption is the capacity to deflect shock and divert threats when an event has a high possibility of occurring. The system can remain unharmed by carefully facilitating the disruption or by identifying an alternative path. In the case of reoccurrence, the mode can be initiated immediately once the threat has been experienced. Absorption is when a system is left unharmed by maintaining the status quo.

In this mode, the system absorbs the shock, maintaining its form and functionality. This is most likely to happen with shocks that have a narrower impact as the response takes place immediately once the threat is experienced. Elasticity refers to a system's ability to bounce back from a shock, promptly returning to its previous state. In this mode the status quo is not maintained at all times and recovery only takes place after the displacement of the equilibrium. Elasticity is most commonly experienced in response to events that cannot be avoided or absorbed. The learning node takes place when there are modifications to a system as a result of a threat and its impacts. These modifications include the development of new interactions and relationships. Learning is experienced most commonly for threats that occur frequently and where these threats have resulted in damage to or failure of the system. Finally, the rejuvenation mode occurs after a system has undergone complete desolation of its form and functionality. This does not imply that the system has become incapacitated, but corresponds with the recovery of the system, including its relaunch and redevelopment (Reid & Botteril, 2013).

When considering the adaptive capacity of its system, the various modes and its recovery from external threats, Holloday & Powell (2013) suggest that this be considered within the context of the various domains of resilience, namely the social, governance, economic, and ecological contexts. The key themes of resilience can therefore be summarised as adaptive capacity, adaptive governance and resilience, adaptation in collaboration, adaptational readiness, resilience strategies, resilience indicators, disaster planning and management and resilience index. These themes can be used to identify the level of resilience of a system, as well as its adaptive capacity. These can then be used in resilience planning, and in ensuring the sustainability of the system in the face of future crises and events.

Resilience and sport event tourism has largely been overlooked by previous studies in the field. Existing literature on resilience in sport event tourism largely focusses on the link between sustainability and resilience, viewing resilience as a dimension of sustainability (Filimonau & De Coteau, 2019; Espiner et al., 2017). These studies also present that to achieve resilience in the sector, there is a need for extensive stakeholder collaboration for building both internal and external levels of resilience. In tourism studies, many researchers have used the resilience theory to analyse the industry's recovery from crises (McKercher, 1999; Russel & Faulkner, 1999; Faulkner, 2001; Folke et al., 2002; Larsen et al., 2008; Lepp, 2008), particularly as it is extremely vulnerable to destabilising forces. Despite this vulnerability, the recovery of the global sport event tourism subsector following the impacts of the pandemic indicate that it does already possess a certain level of resilience (Knott & Hemmonsbey, 2023; Kennelly, 2022). This indication highlights the need for studies such as the current research that focus on building and strengthening this resilience and contribute to the limited body of knowledge on resilience and sport event tourism. Prayag (2020) suggests that when considering tourism and resilience and how this can be enhanced, three levels of resilience should be investigated, namely, macrolevel resilience, mesolevel resilience and microlevel resilience. Macrolevel resilience refers to the entire tourism system including its components, structures and relationships; the tourism destination itself and tourism dependent communities in terms of their vulnerability and sustainability. Mesolevel resilience refers to tourism organisations (their size and who owns them), tourism NGO.s, public institutions involved in tourism and other tourism networks.

Finally, microlevel resilience refers to those working in the tourism industry, tourists and local residents residing at a destination (Prayag, 2020). Daniels & Tichaawa (2024) add that in order to effectively achieve resilience within sport event tourism, these levels of resilience must be considered through collaboration between multiple stakeholders involved in the sector with a goal of developing relevant supportive policies and intervention strategies for practical implementation.

DATA AND METHODOLOGY

The current study makes use of a mixed methods research approach which was adopted using a qual-quant sequence as proposed by Creswell & Clarke (2011). The quantitative inquiry built on the results garnered through the qualitative data collection process to support and triangulate these. This mixed methods approach was selected for the study as it

bridges the gap between siloed research and everyday practice in meaningful ways (Mertens, 2012), transcends the conclusions arrived at by either qualitative or quantitative approaches alone (Creswell & Plano Clark, 2011), producing more sophisticated and robust results than would otherwise be obtained (Greene, 2007). A summary of the methodology process is illustrated in Figure 1 below.

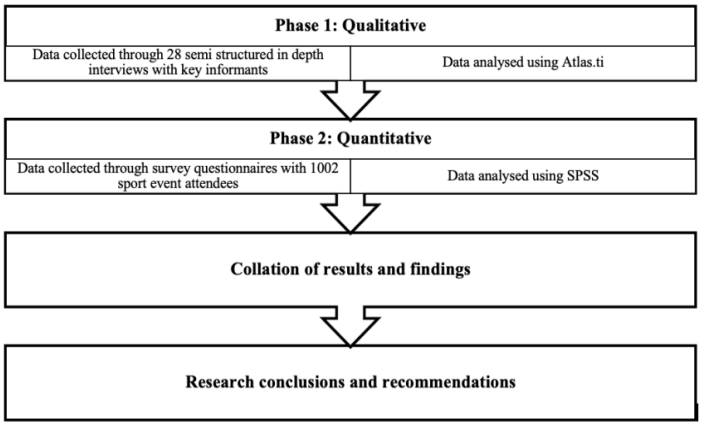

Figure 1. Research methodology

Phase 1: Qualitative

Data collection and analysis

Qualitative data for the study was collected through semi structured in depth interviews with key informants involved in sport event tourism in South Africa. These key informants were specifically selected based on their knowledge and experience in the subsector. In selecting key informants to be interviewed, both purposive and snowball sampling methods were used to reach a sample of 28 respondents. Key informants interviewed included representatives from various spheres of government, sport federations and organisations, sport event organisers and destination marketing organisations (See Table 1). Interviews were conducted both face to face and online using Microsoft Teams using a semi structed interview schedule containing questions relating to topics identified through a review of literature on sport event tourism and the theories underpinning the study. The overall focus of the interview schedule was on crisis management and sport event tourism, with more specific questions framed on resilience building and the development of a resilience building framework for sustainability. Each interview was recorded and transcribed using Microsoft Teams. Using Atlas.ti, the data was coded, producing 15 codes which were later grouped according to emerging themes.

Table 1. Interviewed stakeholders

Participant code	Organisation represented by participant	Location
KI1	Representative from the Western Cape Sport Federation	Cape Town
KI2	Representative from the Stormers	Cape Town
KI3	Representative from the KZN Department of Economic Development, Tourism and Environmental Affairs	Durban
KI4	Representative from the National Department of Tourism	National
KI5	Representative from Durban Tourism	Durban
KI6	Representative from Cape Town Tourism	Cape Town
KI7	Representative from SAT	National
KI8	Representative from the City of Johannesburg Sport and Recreation	Johannesburg
KI9	Representative from SAIL Corporate and Sport Event Management	Johannesburg
KI10	Representative from the Cape Town Sport Council	Cape Town
KI11	Sport event organiser	Cape Town
KI12	Representative from the KZN Sport Confederation	Durban
KI13	Representative from the Blue Bulls Rugby Union	Johannesburg
KI14	Sport and Recreation Western Cape, Department of Cultural Affairs and Sport	Cape Town
KI15	Representative from the Gauteng Tourism Authority (GTA)	Johannesburg
KI16	Representative from the Gauteng Cricket Board	Johannesburg
KI17	Representative from the Moses Mabhida Stadium	Durban
KI18	Representative from the Cape Town Stadium	Cape Town
KI19	Representative from Western Cape Events	Cape Town
KI20	Representative from the KZN Cricket Union	Durban
KI21	Sport marketing agency	Durban
KI22	Sport tourism tour organiser	Durban
KI23	Representative from Stadium Management South Africa	Johannesburg
KI24	City of Cape Town Destination Development	Cape Town
KI25	Representative from The Blue Bulls Rugby Company	Johannesburg
KI26	Representative from Cricket South Africa	National
KI27	Representative from TOM	Cape Town
KI28	Representative from Stadium Facility Management	Johannesburg

Phase 2: Quantitative

Quantitative data collection and analysis

Survey questionnaires were used to gather quantitative data from sport event attendees at two major sporting events in South Africa. The survey questionnaire, which was developed online using Google Forms, consisted of four sections. Section A of obtained demographic information including age, province of origin and employment status. Section B focused on tourism behaviour relating to sport events, including attendance at sport events prior. Section C focused on the impact of a crisis on tourism behaviour relating to sport events, including on participation in events during this time.

Finally, section D focused on resilience relating to sport events in terms of resilience building strategies, the willingness to attend future sport events in South Africa and the requirements for attendance. The development of the survey instrument was informed through the analysis of the qualitative data gathered during Phase 1 of the study by means of in-depth document analysis and literature review and semi-structured key informant interviews. Along with the closed and open-ended questions, the survey also used a five- and four-point Likert scale. The five-point Likert scale included the options of 'strongly agree' (SA), 'agree' (A), 'neutral' (N), 'disagree' (D) and 'strongly disagree' (SD), whereas the four-point Likert scale included the options of 'extremely important' (EI), 'important' (I), 'neutral' (N) and 'not important' (NI).

In selecting a quantitative sample for the study, probability sampling was used, as it is based on random selection, ensuring that every case in a population has an equal chance of being selected for the sample (Shorten & Moorley, 2014). From the two sporting events, a total of 1002 valid responses were received (Table 2 for profile of respondents).

Table 2. Profile of survey participants (n=1002)

Variable	Group	%
Gender	Male	51.5
	Female	47
	Other	1.5
Age range	18-25	22.2
	26-35	30.2
	36-45	24.5
	46-55	14.8
	56-65	5.9
	>65	2.5
Racial classification	White	34.6
	Black African	33.8
	Coloured	21.3
	Asian/Indian	3.3
	No response	7
Province of residence	Western Cape	70.4
	Gauteng	12.6
	KwaZulu-Natal	4.8
	Eastern Cape	4
	Mpumalanga	2.2
	Free State	2
	Limpopo	1.8
	Northern Cape	1.8
	North West	0.5
Highest level of education	Certificate/diploma	32.4
	Postgraduate degree	27.2
	Undergraduate degree	22
	Secondary schooling completed	13.2
	Other	1.8
	No formal schooling	1.7
	Primary schooling completed	1.7
Employment status	Employed full time	55.3
	Self employed	14.3
	Unemployed	13.2
	Employed part time	9.5
	Retired/pensioner	4.6
	Other	2.2
	Home executive	1

RESULTS

The findings of the study are presented according to the themes which emerged from the data collection and which informed the development of the proposed framework. The first subsection presents the findings linked the impact of crises and external shocks on the sport event tourism sector, followed by resilience and crisis management in South African sport event tourism policy and strategy and finally linked to resilience building in the sport event tourism sector.

Theme #1: The impact of crises and external shocks on the sport event tourism sector

Interviews conducted revealed that sport event tourism stakeholders agree that crises and external shocks have

significant and far reaching negative impacts across the tourism value chain as they often result in the shutting down of the sector. This sentiment was articulated by an official working for a national sporting organisation who stated that:

All sport events are cancelled in times of crises. All of these events have a huge international following that visit the city and the country, because the people don't just come for the event. They then stay over for another 14 days, and visit. The fact that we cannot host events impacts [on] the country in a huge way, as well as [on] the peripheral businesses. The tourism impact and the economic impact is then felt right through the value chain. (K26).

Respondents collectively voiced that the impacts of crises and external shocks on the sport event tourism sector are not felt within the sector alone but also influence the economy, unemployment rates, the broader tourism industry, the sports industry in terms of sponsorship and exposure, individual's physical and mental health and social cohesion within the locations where sport events are hosted. This illustrates the large number of stakeholders who are affected by these crises and who should be engaged in recovery there from. The findings of the qualitative data show that during times of crises such as the COVID 19 pandemic, sport event tourism stakeholders have demonstrated unprecedented levels of collaboration with a respondent sharing that: During the last crisis we faced, which was the COVID 19 pandemic, we developed a very sophisticated stakeholder engagement approach, where we would have regular stakeholder engagement sessions online or in person if possible. During this time we would all be able to explain our exact circumstances, exactly where we stood at the time, and what we needed from each other in terms of information and support. We became very good at communicating early and often. There is a new positive synergy in the way we, as stakeholders, interact with each other, which previously did not exist. Even though we had the same issues, previously we did not speak to each other, because we were scared that we would steal each other's ideas. I have now met industry partners that I didn't know of before, and there has been a lot of excellent communication and interaction between us. I think this is because we were forced to work together, as we were all in trouble, and we needed to make things work (KI8).

According to Hammerschmidt et al. (2021), such management of stakeholder relationships is essential in times of crises, to ensure the supply of continuous, long-term support. Mollah et al. (2021) add that for crisis management and resilience building in sport event tourism, collaboration is an essential strategy for purposes of the design and implementation of recovery plans for a sustainable industry. External crises and shocks also influence the behaviour of sport event tourists who are key stakeholders in the sector. When asked how long following a crisis they would wait to once again start attending sport events, most respondents indicated that they would attend a sport event immediately (62.1%), within 2-4 weeks after the crisis (15.5%), within 1 to 2 months after the crisis (10.1%), within 3-6 months after the crisis (7.3%) or after 6 months (4.2%). Only 0.8% of respondents stated that following a crisis they would not consider returning to attending sport events. This result is significant in that is demonstrates the high levels of willingness of sport event tourists to continue attending these events following a crisis.

Peric et al. (2021) propose that it is essential for sport event tourism stakeholders to understand the perceptions of sport event attendees regarding the impacts of a crisis on the hosting of sport events, as they will now have to take the attendees' mindset into consideration, when the events are hosted once again. Based on this, respondents were asked to indicate their perceptions of a crisis on the sport event tourism sector, the results of which are presented in Table 3.

Table 3. Sport event attendee perceptions of the impacts of a crisis on the sport event tourism subsector

V no.	Statement	SD	D	N	A	SA
V1	The sport event tourism sector is negatively impacted by crises	1.6	1.8	4.4	26.4	65.8
V2	The impacts of a crisis on the sport event tourism sector also negatively impact the economy	1.1	1.5	5.2	37.4	54.8
V3	In times of crisis it is right to cancel all sport events	5.4	7.8	21. 5	33.9	31.4
V4	The impacts of a crisis result in unemployment in the sport event tourism sector	1.3	2.8	10.0	38.3	47.6
V5	The impacts of a crisis on the sport event tourism sector also negatively impact the broader tourism industry	1.3	2.3	8.8	34.8	52.8
V6	The impacts of a crisis on the sport event tourism sector also negatively impacts the broader sport industry	1.1	3.3	16.8	39.0	39.8
V7	The cancellation of sport tourism events has a negative impact on social cohesion	1.9	3.6	16.6	37.3	40.6
V8	The cancellation of sport tourism events has a negative impact on the physical well-being of individuals	1.7	4.9	15.1	37.8	40. 5
V9	The cancellation of sport tourism events has a negative impact on the mental well-being of individuals	1.7	4.4	14.9	39.0	40.0
V10	The cancellation of sport tourism events has meant that local communities are less interested in sport than they used to be.	5.6	12. 5	21.9	32.0	28.0
V11	The cancellation of sport tourism events has affected my desire to attend these events in the future.	11.8	19.0	18. 5	28.9	21.9

Notes: Based on a 5 point Likert Scale where SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree

The results presented in Table 3 reveal that sport event attendees share the sentiments of key informants that the impacts of crises on the sport event tourism sector are far reaching, negatively impacting the economy, employment rates, the broader tourism industry, social cohesion and the mental and physical well-being of individuals. Sport event attendees, as key stakeholders in the sector, demonstrate a high level of willingness to return to engaging in sport event tourism related activities following a crisis, which is essential for swift recovery, crisis mitigation and resilience building.

Theme #2: Resilience and crisis management in South African sport event tourism policy and strategy

The overarching theme in key informant responses regarding resilience and crisis management in South African sport event tourism policy and strategy was that this is not effectively addressed, with a respondent from a tourism body stating:

There are no real policies in place to actually deal with the nature of what a crisis brings to sport event tourism. There are also no means available to support stakeholders in these kinds of unexpected events, helping them recover and to prepare for similar situations in the future. (KI5).

This response illustrates the need for guidance, such as that provided in the framework proposed in the current study to address issues of crisis management, recovery and resilience. Despite this, an interview respondent from a national rugby union added that while crisis management strategies do exist in sport event tourism policy and strategy, these are often overlooked and ignored, stating that:

The irony is that South Africa has two overarching pieces of legislation. The first one is the Safety at Sport and Recreational Events Act, which governs the safety and security of attendees at sport events. This places a statutory obligation on venues and event organisers to undertake risk assessments, where necessary. Along with this, mitigation measures have to be put in place to address all risks identified. The second piece of legislation is the Occupational Health and Safety Act, which is exactly the same, except that it governs the workplace environment. This Act looks after workers and places an obligation on the event organiser to identify all potential risks, including [those of] communicable diseases, and then put in place necessary measures. That Act, if it is allowed to continue, would simply see sport events conducting risk assessments, identifying the risks, and taking appropriate responses. (KI13).

This response suggests that while guidelines for crisis management do perhaps exist, these are not being successfully implemented in times of crises and these still do not address the ssue of resilience building in terms of future crises. For there to be one unified response to crises, there is a need for collaboration, particularly in terms of decision-making and the development and implementation of policy and legislation.

Theme #3: Resilience building in the sport event tourism sector

What is essential for future resilience building is collaboration between stakeholders. The importance of this was stated by a respondent a provincial sport council in that: One of the most significant changes we need to make to build resilience in the subsector is that, as stakeholders, we need to reach out to each other a bit more, because, all of a sudden, we are all in the same boat in times of crises. In the past, we might have viewed each other as competition, but we must realise that this is not a competition, and that we can actually help each other grow and be better through challenging stages. (KI10).

The responses provided by key informants indicate that for the sector to reach an acceptable level of future resilience it is pertinent is that previous and new sport event attendees are attracted to attend future events through the use of new and innovative methods, strategies and marketing techniques, addressing how the attendee experience can be improved in light of changing consumption patterns. Further to this, a key informant from a provincial sport federation suggested that:

Going forward, we need to constantly be working to instil destination confidence in sport event tourists. We are moving towards a more client-focused perspective. We need to show them that we will support them in times of crises and [that we] will be truthful and honest with all information that we share with them, although they might not always like what they hear. (KI2).

The change that need to take place in order to achieve resilience, as presented above, clearly demonstrate that what is required is a renewed focus on the sport event tourist. Stakeholders and role-players involved in sport event tourism need to ensure that such tourists are receiving accurate information on all aspects of the sport event experience, from travel to the event to the event itself. Where misinformation is spread, this needs to be mitigated efficiently and effectively, to rebuild traveller confidence in the destination. Slovic (1992) found that, if tourists are well-informed of a potential risk, they tend to have increased perceptions of their control of that risk, with them being more likely to travel. Along with the above, the changing needs of the sport tourist must be clearly understood by the stakeholders to ensure that all their needs are met, resulting in visitor satisfaction and potential repeat visitation.

DISCUSSION

Drawing on the findings of both the quantitative and qualitative inquiries of the study, presented above and underpinned by the conceptual framework a framework for resilience building in sport event tourism is proposed and is presented in Figure 2 below. As presented in Figure 2, although sport, events and tourism have previously operated largely individually in siloes, sport event tourism must be considered holistically within the broader tourism industry.

When viewed through the lens of the resilience theory, the framework proposes that the sport event tourism sector is in fact dynamic and must therefore be open to constant change and adaptation based on lessons learned from previous experiences. This will allow for the development of a new and innovative sport event tourism product that is suited to the changing needs and demands of the sport event tourist. For this product to successfully be developed, the stakeholder theory suggests that there must be a high level of stakeholder engagement through a sophisticated engagement and communication network for the sharing and dissemination of information and for the provision of financial, bureaucratic and structural support in times of crisis. The need exists not only for improved collaboration between stakeholders, but also for these relationships to be formalised and consolidated. A key stakeholder group that is often overlooked within sport event tourism, but which is key in achieving resilience is local communities who must be suitably prepared to deal with future crises. In engaging with the local communities, a bottom-up approach should be employed, focusing on sport event tourism organisations and events, and the community that is involved in sport event tourism activities.

Further to this, the role of sport event tourists as a stakeholder group should not be overlooked as crises and external shocks often result in significant changes in tourist behaviour, demanding the development of new products, offerings and experiences. For resilience to be achieved, this new sport event tourism product should be all-encompassing and readily adaptable to future changing behaviour. The product should be authentic, allowing for sport event attendees to develop and form new connections with like-minded groups and individuals, to immerse themselves in a sport event, to enjoy local products and services, to feed their interests and to use technology to facilitate ease.

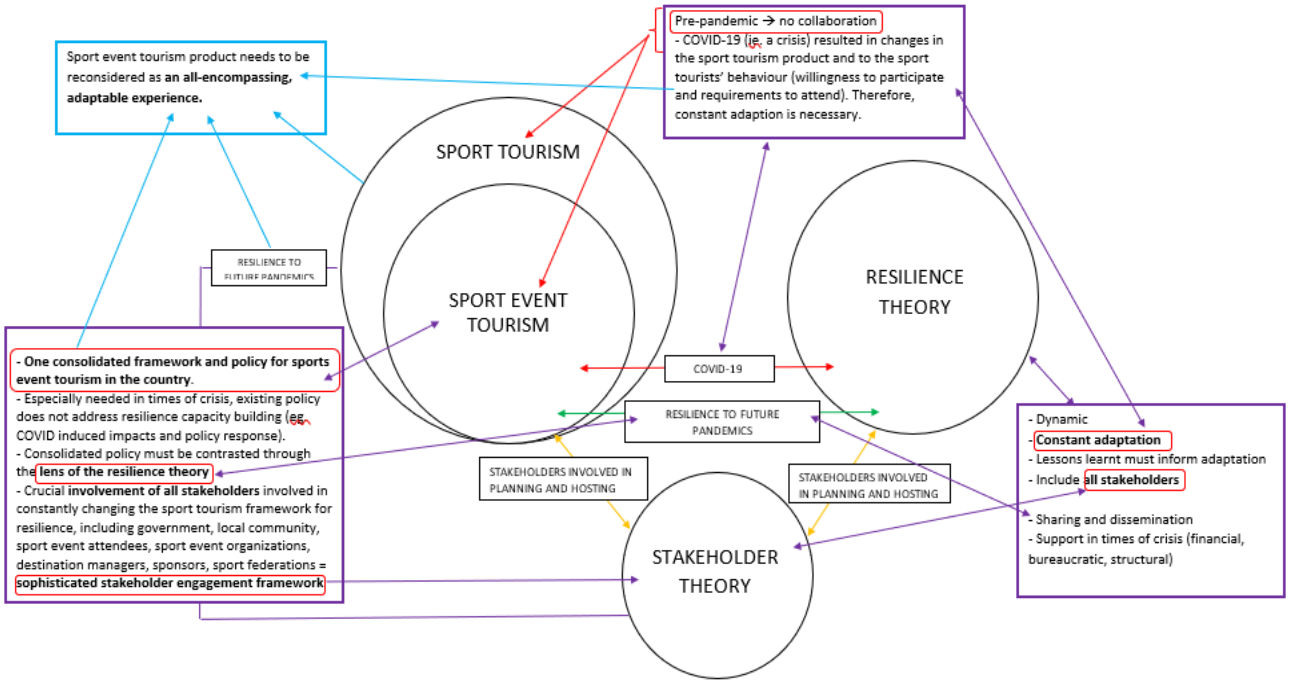

Figure 2. Proposed framework for resilience building in sport event tourism

For successful stakeholder collaboration to take place, an urgent need prevails for the implementation of a consolidated sport event tourism strategy or policy to guide the sector in times of crisis, addressing issues of resilience, crisis management and capacity-building during such times. This policy or strategy should be developed through the lens of resilience, engaging all stakeholders including sport event tourists, local communities, event owners and organisers, private sector representatives, the public sector and various spheres of the government, so as to consolidate strategies, operations and plans, to develop a holistic strategic goal for the sector. This supportive policy environment should also allow for the development of innovative solutions to the challenges experienced during periods of crisis.

Due to the dynamic nature of the sport event tourism sector, these policies and guiding documents should be open for constant adaptation, ensuring that there can be a 'bounce back' in the face of future crises and external shocks (Holling, 1973). Along with these policies and guiding documents, what is pertinent for resilience building is to also develop dynamic contingency plans during times of stability and normal operations, so that the sector will already be established in times of crisis, rather than requiring development in response to a crisis that is already taking place.

In applying the proposed framework, resilience can be achieved if a resilience focussed approach is taken by all stakeholders. This will not only ensure resilience but also empower local communities and smaller scale organisations by facilitating sustainable development (Sharma et al., 2021).

It is recommended that the application of the proposed resilience building framework be done in a staged and controlled fashion, identifying measures that work well and improving on these in the process. For effective implementation, efficient coordination mechanisms are essential, as well as a range of crisis management techniques and relationship management tools.

From the proposed framework it is evident that the inextricable links that exist between sport event tourism, the stakeholder theory and the resilience theory cannot be underestimated or overlooked. The overlapping of these concepts provides valuable opportunities that can be further explored to promote the future sustainability of the sport event tourism sector. For this to be successful, stakeholders in their collaborative efforts must acknowledge the dynamic nature of the sector and be prepared for the ongoing adaptations that are necessary for resilience.

In adapting to changing circumstances and external impacts, lessons can be taken from previous crises, to be able to develop strategies that are proactive, rather than reactive, so as to lessen the effects of the potentially harmful and negative impacts. The development of such strategies must include the input and perspectives of all the stakeholders in the subsector who are involved in sport, event management and tourism.

CONCLUSION

External crises and shocks provide the sport event tourism sector with unique opportunities to reinvent and transform itself, enhancing level of resilience for the future. The objective of the current study was to present a framework for

resilience building in sport event tourism, developed through a conceptual framework grounded in the sport tourism framework, the resilience theory and the stakeholder theory, and guided by primary data collected from both key informants in the sport event sector and sport event tourists. For the sector to inherently possess an acceptable level of resilience in the case of future crises and destabilising events, according to the framework presented, there must be a significant level of preparedness, built on shared lessons learned from previous experiences which are incorporated into formalised strategic plans. These strategies should also include innovative and detailed recovery strategies in the case of events to ensure resilience building. The success of these strategies, the resilience of sport event tourism and its future sustainability is largely dependent on extensive stakeholder collaboration focussed on networking, relationship building, knowledge sharing and resilience capacity building. Through this collaboration, what is also required is the development of a new and innovative sport event tourism product that is dynamic and adaptable to the changing demands and needs of sport event tourists as a result of external shocks and crises.

In summary, the resilience of the sport event tourism sector relies on stakeholders developing a product that is adaptable and flexible, meeting the needs and requirements of sport event tourists whose behaviours can change significantly as a result of a crisis. In developing such products, stakeholders must be willing to adapt their previous offerings by using new innovations and developing new relationships along the sport event tourism value chain. It stakeholders in sport event tourism are unable to adapt and cope with change, there is a low likelihood that these organisations will survive in times of future crises. The current study draws on the case of South Africa. Although the sample is sufficient to be generalised, caution should be taken when doing so as the specific context in which the framework is being test should be taken into consideration, as this may yield different results in different contexts.

Author Contributions: Conceptualisation, T.T and T.D; methodology, T.T and T.D.; validation, T.T and T.D.; data collection, T.D.; data analysis T.T and T.D.; original draft preparation, T.T and T.D; review and editing, T.T and T.D. All authors have read and agreed to the published version of the manuscript.

Funding: It is noted that the authors received funding for the study through the University of Johannesburg Accelerated Academic Mentorship Programme (AAMP) and the Department of Higher Education and Training (DHET) University Staff Development Programme (USDP).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 08.02.2025 Revised: 11.08.2025 Accepted: 08.09.2025 Available online: 24.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1980-1989
DOI 10.30892/gtg.61355-1565

CHARACTERISTICS OF ROCKS BASED ON PETROGRAPHIC AND GEOCHEMICAL ANALYSIS: A STUDY IN THE 'LAND OF A THOUSAND MEGALITHS', INDONESIA

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Citation: Permana, A.P., Mansyur, J., Nadjamuddin, L., Rore, I., Widyastuti, W., Tadeko, N., Zaky, M., Hatta, I., Kasim, A.A., Asrafil, A., & Din, M. (2025). Characteristics of Rocks Based on Petrographic and Geochemical Analysis: A Study in the 'Land of a Thousand Megaliths', Indonesia. *Geojournal of Tourism and Geosites*, 61(3), 1980–1989. https://doi.org/10.30892/gtg.61355-1565

Abstract: The megalithic traditions of Central Sulawesi represent one of Indonesia's most important prehistoric cultural landscapes, widely recognized as "The Land of a Thousand Megaliths." Despite their significance, scientific investigations into the lithological sources of the megaliths remain limited, with most previous research focusing primarily on archaeological and cultural aspects. This study aims to characterize the petrographic and geochemical properties of rocks associated with megalithic artifacts in the Bada and Behoa Valleys of Poso Regency, Central Sulawesi. A total of seven representative rock samples were collected based on lithological diversity and field resemblance to megalithic artifacts. Petrographic analysis was conducted using thin section microscopy to determine mineralogical composition, textures, and structural features, while geochemical analysis was performed through X-ray fluorescence (XRF) to quantify major oxides and support tectonomagmatic interpretations. The petrographic results revealed that five samples belong to plutonic igneous rocks—classified as quartz monzonite and monzonite—while two samples were identified as metamorphic rocks, namely amphibolite and biotite–chlorite schist. Geochemical data indicate that the plutonic rocks are predominantly ferroan, with affinities to both calc-alkaline and tholeiitic magma series, whereas the metamorphic rocks are associated with island arc tholeiite protoliths. Weathering assessments show that most samples remain fresh, except for one moderately weathered monzonite. The results demonstrate that megalithic builders utilized locally available rocks that possessed suitable durability and mechanical strength for carving and construction. The findings further suggest a strong geological–cultural connection, as the communities strategically selected rock materials that ensured long-term preservation of the monuments. This study provides new insights into the raw material sources of megalithic artifacts in Central Sulawesi and contributes to broader discussions on lithic technology, resource procurement, and heritage conservation. By integrating petrographic and geochemical approaches, the research establishes a scientific foundation for future geoarchaeological studies and supports conservation strategies for safeguarding Indonesia's megalithic heritage.

Keywords: central sulawesi, geochemical analysis, megalith, petrographic, rock characteristics

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INTRODUCTION

Megalithic cultural heritage stands as a monumental expression of how prehistoric humans interacted with their natural surroundings. Different locations around the world have megalithic sites that have become the focus of scientific research which unites archaeology with anthropology and geoscience approaches at places like Stonehenge in the United Kingdom, Carnac in France and Göbekli Tepe in Turkey. The research investigates both the religious and social aspects of the monuments and their stone origins as well as construction methods and site network dynamics (Freire-Lista, 2021; Sanjuán et al., 2023). The advancement of material-based analytical research during the last decade has emerged from petrographic and geochemical methods including X-ray fluorescence (XRF). The analytical techniques prove useful for tracking stone material origins and studying manufacturing methods while understanding human-geological resource interactions (Štrba, 2015; Ali et al., 2017; Tibbits et al., 2023). The techniques generate empirical data about rock mineralogical and chemical compositions that enhances archaeological interpretations which previously relied on observations of form and context (Wang et al., 2022). Geoscientific approaches gain increased significance in megalithic research because evidence-based cultural heritage preservation has become a worldwide priority. The conservation of cultural sites built from

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natural stone requires both understanding their geological features and assessing their exposure to weathering processes (Viles, 2013; Visone et al., 2025). Stone material durability against erosion together with climate change and human activity determines the physical survival of heritage sites in many cases. The combination of petrographic and geochemical information serves both academic research needs and enables the creation of efficient conservation strategies (Pereira, 2023).

The use of archaeology-geology integrated approaches at different sites across the world remains infrequent in Indonesia according to Kirleis et al. (2012) and Ansori et al. (2024). The application of integrated archaeological and geological methods in Indonesian megalithic research is relatively rare because the discipline has traditionally focused on cultural and chronological studies (Bonatz et al., 2008; Kealy et al., 2018). This situation is concerning because Indonesia hosts numerous megalithic sites which stretch from Sumatra and Nias to Sumba and Sulawesi (Steimer, 2018).

Studies of megalithic structures now focus on material stone properties in addition to their symbolic value and historical context. The El Pozuelo dolmens in Spain and the Wietrzychowice site in Poland show that megalith builders commonly obtained their rocks from local sources (Linares-Catela et al., 2023; Pawlikowski et al., 2020). Modern analytical methods that include petrographic mineralogical and geochemical studies have analyzed megalithic stones such as Stonehenge sarsens to determine their composition and properties (Nash et al., 2021). Research studies reveal information about the origin of raw materials used in construction alongside techniques for building megaliths and their relationship with the surrounding landscape (Wheatley et al., 2010). The study of stone texture in addition to tool production mechanics has been conducted by researchers (Tilley, 2004; Wadley & Kempson, 2011). Through multidisciplinary research scientists obtain a deeper understanding of prehistoric landscapes and megalithic phenomena (Columbu et al., 2023).

The Bada and Behoa and Napu Valleys in Poso Regency Central Sulawesi represent the primary megalithic area of Indonesia. The region stands out because of its abundant megalithic artifacts which include stone figures and dolmen structures and engraved rock art distributed throughout an unperturbed natural environment (Kirleis et al., 2012). The area within Lore Lindu National Park contains cultural landmarks together with natural scenery and diverse species (Rahim et al., 2023). Since the beginning of the 20th century this site has attracted archaeological interest because of its special megalithic forms together with its complex prehistoric cultural associations. The evaluation of rocks through petrographic and XRF geochemical analysis has become extensive in various fields to establish provenance and composition as well as determine suitability for megalithic material applications. Scientists who studied the Bualemo area of Gorontalo used petrographic and XRF analysis to discover that the rocks belonged to andesite and basaltic andesite groups with tholeiitic island arc basalts that originated from subduction tectonic settings (Marfian et al., 2023; Permana et al., 2023). The fossilized wood from the Tohupo River showed that silica recrystallization formed a dominant quartz mineral structure. The XRF and petrographic methods proved that amorphous silica in the form of chalcedony exists in the rock which explains its resistance to weathering (Permana, 2019). The same techniques used in Otanmäki, Finland and Gua Musang, Malaysia have identified the physical–mechanical properties of gabbro and granite rocks as well as mineral compositions of granite and tuff rocks which could serve as construction and ornamental materials. The evaluation of rock weathering resistance depends on High SiO_2 content along with plagioclase and K-feldspar presence and rare earth elements (REEs) trace element ratios (Aladejare, 2021; Ismail et al., 2023; Oudy et al., 2023; Sebbab et al., 2024; Shafiee et al., 2024). An integrated analysis of petrographic and XRF data serves to both understand rock characteristics and assess their suitability as megalithic materials in geological and archaeological and engineering applications.

The development of petrographic and XRF analytical techniques provides researchers with strong potential to study material aspects of Central Sulawesi's megalithic sites. The petrographic microscope allows researchers to identify rock minerals and study rock textures yet XRF analysis generates quantitative data about major and minor chemical elements. The integrated analytical approach enables researchers to fully characterize rock samples and link their findings to natural geological settings. Scientific preservation strategies can be designed using the obtained data.

The identification of weathering vulnerabilities or element leaching in rocks enables conservationists to select appropriate protective measures. The data obtained from geochemical analysis enables the creation of exact replicas and digital site reconstructions and science-based educational content for cultural tourism programs.

The integration of petrographic and geochemical data helps minimize the widespread speculative tendencies which commonly affect megalithic studies. The lack of strong material evidence forces researchers to build their interpretations about construction methods and distribution patterns and intersite relationships using unsupported assumptions or cultural analogies. Laboratory-based methods create an unbiased system for testing hypotheses which generates quantifiable results that can be duplicated. Through geochemical analysis scientists can detect distribution patterns which appear in rocks of identical composition to reveal either unified material origins of megalithic groups or new evidence of material transport patterns. The research findings will enhance existing knowledge about prehistoric economic and technological and social networks throughout Central Sulawesi. This research fulfils the essential requirement of material-based studies about megalithic rocks because Indonesia lacks sufficient scientific data about megalithic rocks in the "Land of a Thousand Megaliths." This research uses petrographic and geochemical XRF methods to study rock characteristics while proving material origins and analyzing their geological associations. The research contributes to an extensive project which aims to create an integrated system for cultural heritage preservation throughout the Land of a Thousand Megaliths. Scientific data collection through rock analysis will serve to develop a conservation model that uses empirical evidence.

The research serves as a starting point for developing geoarchaeological methods which will help protect and reposition megalithic sites. The growing environmental threats and rapid social changes demand deep scientific knowledge about megalithic heritage to protect both physical sites and cultural values and community identities.

MATERIALS AND METHODS

Research Location and Materials

The megalithic study sites are located in three valleys within the administrative region of Poso Regency (Figure 1). These three locations are the Bada Valley, the Behoa Valley, and the Napu Valley. Most of the sites especially those in the Behoa Valley are located within Lore Lindu National Park—a conservation area and a biosphere reserve. The park is made of hills and mountains, forests, and rivers that drain the area. There are various types of megalithic sites studied in the area which include Kalamba (stone vats), megalithic statues (menhirs), stone mortars, batu dakon (perforated stones), and dolmens.

It was a representative sampling in the "Land of a Thousand Megaliths" with focus on rocks used as raw material for megalithic artifacts. Samples were collected based on two criteria: physical integrity (nonweathered condition) and lithological variation. The rock samples for characterization analysis were collected from areas that were suspected to be sources of artifact production. These were based on physical resemblance to the existing artifacts and the presence of many stone fragments in certain areas. This was done in both Bada and Behoa Valleys. Three samples were collected from the Bada Valley for analysis and labeled BD-01, BD-02, BD-03, whereas four samples from the Behoa Valley were designated BH-01, BH-02, BH-03, and BH-04. However, rock sampling was not possible in the Napu Valley due to the fact that the megaliths are scattered across the area and there are no places that the heritage custodians or the local communities consider as artifact production sites such as those in Bada and Behoa Valleys. The samples were not taken directly from the artifacts as the petrographic and XRF analyses require destructive sampling which is not allowed for cultural heritage objects. The research team consulted and sought recommendations from the local heritage custodians to access the areas and to select potential rock samples that could be related to artifact production. The rock samples that were selected were not located within the boundaries that had been demarcated by the Cultural Heritage Preservation Office.

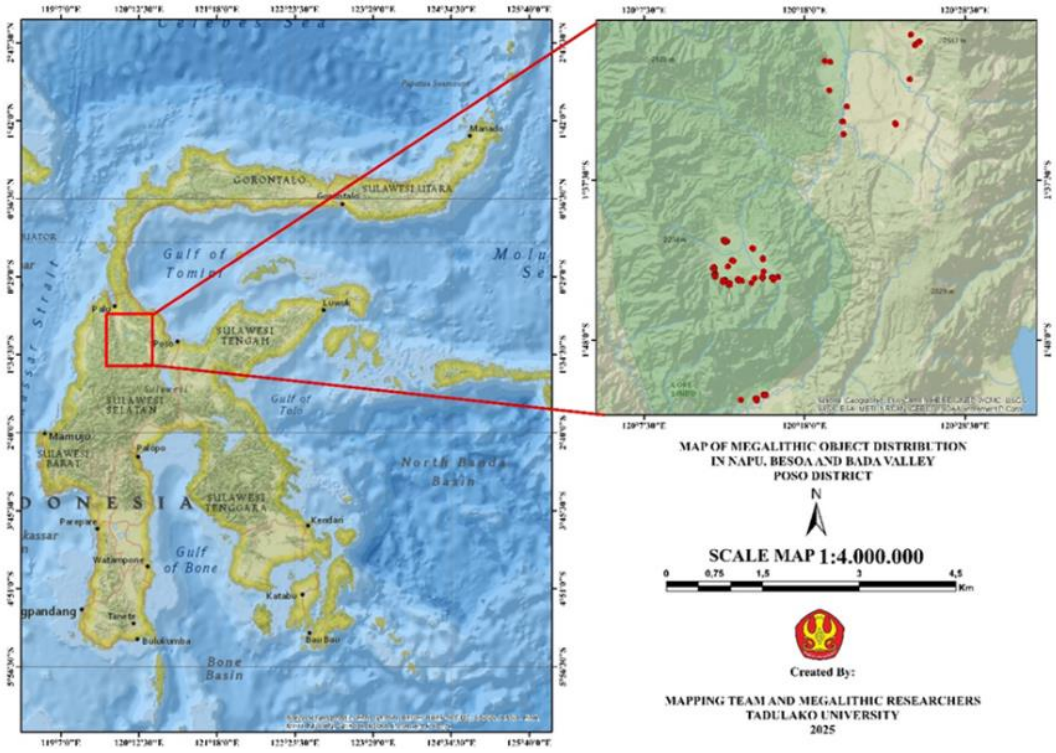


Figure 1. Map of the megalithic site distribution in the research area

Research Method

The research methodology includes two major components: a field survey and laboratory analysis. The fieldwork involved observation of rocks at several places in the study area as well as collection of rock samples for further laboratory analysis. A total of seven rock samples were analyzed in terms of petrographic characteristics and geochemical composition through XRF. The rock samples were analyzed petrographically using a polarizing microscope to identify the rock types, mineral composition and texture of both the rock and its constituent minerals.

Each sample was thin sectioned and then analyzed at the Petrography Laboratory of the Geological Engineering Program, Department of Earth Sciences and Technology, Universitas Negeri Gorontalo. The goal of petrographic analysis was to identify the minerals based on their optical properties and textural characteristics and to estimate the major minerals in weight percentages using the point counting technique (Azzam et al., 2024; Permana et al., 2024; 2025). XRF geochemical analysis was performed to quantify the major oxide elements such as SiO_2, Al_2O_3, FeOt, MgO, CaO, Na_2O, K_2O, TiO_2, MnO, and P_2O_5. Ten major oxides were quantified in weight percent (normalized to 100%) and were used to support interpretations of rock genesis based on its chemical composition. This analysis is aimed at categorizing rock types by total alkali silica content and magma series (Lozano & Bernal, 2005; Bloise et al., 2020). Additionally, the major element data was subject to

additional geochemical modelling using the GCDkit software, which is based on the R programming language. GCDkit provides a systematic framework for interpreting whole-rock geochemical data through statistical functions, normalization routines, and a wide range of discrimination diagrams. In this research, the software was applied for data validation and screening, geochemical visualization, rock classification, and multivariate analysis (Janoušek et al., 2006).

RESULTS

Field Survey: The Bada Valley extends across two subdistricts South Lore and West Lore with elevations between 750 and 850 meters above sea level (Table 1). The megalithic sites in South Lore are distributed across Gintu, Bulili, Bakekau, Bomba, Pada-Pada, Bewa, Badangkaea, and Runde villages. The villages of Langkeka, Lelio, Kolori, Kageroa, Tomehipi, and Tuare in West Lore contain megalithic archaeological sites. The Tawailia River runs through the valley as a major watercourse which belongs to the Lariang River system together with its tributaries including Mulalawa, Halu Taba, Halu Tomoeda, Halu Mangilu, Halu Ntanaono, Halu Tamahingki, Halu Baloli, Halu Betaua, Halu Haroawu, Halu Kalinunu, Halu Kasirau, Halu Karape, Halu Nonghawa, Halu Tiko, Halu Busunga, and Halu Lebo rivers. The megalithic sites in this region exist within Quaternary lake deposits (Ql) geological formations which consist mainly of clay, sand and gravel.

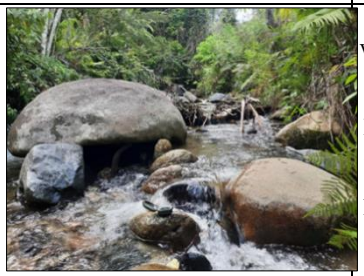
The Behoa Valley which locals also call Besoa Valley exists as a highland basin that reaches elevations between 1,200 and 1,300 meters above sea level (Table 2). The administrative area of Lore Tengah Subdistrict exists within Poso Regency. The entire area falls within Lore Lindu National Park (TNLL) boundaries where megalithic sites exist in Doda, Bariri, Hanggira, Lempe, Baleura, Torire, Rompo and Katu villages. Topographic maps show that this region serves as a meeting point for various river branches (uwei) which flow from different directions before uniting to form the main river Uwei Torire.

Napu Valley is administratively located within three subdistricts: North Lore, centered in Wuasa; East Lore, centered in Maholo; and Lore Peore, centered in Watutau. Topographically, this region is a highland plateau with elevations ranging from 1,100 to 1,200 m above sea level. The research team did not obtain any rock samples from this area.

Table 1. Locations of Megalithic Sites in the Bada Valley

Sample Code and Location	Photograph	Remark
BD-01 and North of the Manitu-Mpoime megalith site		The rock samples were obtained from the western area of the Halu Iso megalithic statue. This location is locally known as Tokalaea, a name attributed to its past morphological resemblance to a pregnant figure.
BD-02 and Suso megalith Site		A sample provided by the Megalith Custodian was collected from the area surrounding the *Kalamba* megalithic site.
BD-03 and Topopo-nono megalith site		A sample provided by the Megalith Custodian was collected from the area surrounding Tomompanana or Topoponono, located within the paddy field zone.

Table 2. Locations of Megalithic Sites in the Behoa Valley

Sample Code and Location	Photograph	Remark
BH-01 and Wineki megalith site		The rock sample was collected from a presumed workshop area, characterized by the presence of large stone fragments thought to be unfinished or unworked materials intended for mega-lithic production.
BH-02 and Wineki megalith site		The rock sample was obtained from the western section of the presumed workshop zone, situated within a hilly landscape.
BH-03 and the river area south of the Wineki megalith site		The rock sample was collected from a river boulder identified by the Megalith Custodian as likely originating from the same lithological material used in megalith construction.
BH-04 and The river area south of the Wineki megalith site		The sample was taken from a river boulder, which, according to the Megalith Custodian, is part of the same type of stone used in the production of megalithic objects.

Petrographic Analysis

The analysis involved studying rock microscopic features to better understand structural and mineralogical characteristics which served as essential information for following geochemical research. The study analyzed five plutonic igneous rock samples and two metamorphic rock samples through petrographic observations.

A. Plutonic Igneous Rock Group

Sample BD-01

The microscopic evaluation shows fresh rock contains phaneritic–porphyritic texture and holocrystalline crystallinity with inequigranular crystal relationships and euhedral–subhedral crystal forms measuring between 0.08 and 1.2 mm. The rock presents a massive structure. The mineral composition includes plagioclase (33%), K-feldspar (19%), quartz (9%), hornblende (7%), biotite (5%), titanite (6%), opaque minerals (3%), sericite (8%), and microlite (10%). Thin section examination reveals albite twinning in plagioclase with an An-35 composition that confirms andesine type (Figure 2A-B). Travis (1955) classifies this rock as monzonite.

Sample BD-02

The microscopic study exposed fresh rock material with phaneritic–porphyritic texture and holocrystalline crystallinity alongside inequigranular crystal relationships and euhedral–subhedral crystal forms measuring between 0.08–1.6 mm. The rock has a massive structure. The rock contains plagioclase (35%) and K-feldspar (20%) and quartz (11%) along with hornblende (3%) and biotite (6%) and titanite (3%) and opaque minerals (2%) and sericite (10%) and microlite (10%). Plagioclase reveals albite twinning with an An-40 composition that indicates the rock has andesinity (Figure 2C-D). The rock classification follows the definition of quartz monzonite (Travis, 1955).

Sample BD-03

The microscopic study of fresh rock material displayed phaneritic–porphyritic texture together with holocrystalline crystallinity and inequigranular crystal relationships and euhedral–subhedral crystal forms. The massive structure contains crystals measuring between 0.08 and 1.6 mm. The rock composition consists of plagioclase (37%), K-feldspar (19%), quartz (11%), hornblende (9%), biotite (6%), titanite (1%), opaque minerals (2%), sericite (8%), and microlite (7%). Plagioclase displays albite twinning with an An-42 composition which indicates andesinity (Figure 2E-F). The rock receives its identification as quartz monzonite from Travis (1955).

Sample BH-01

Fresh rock under microscopic observation showed a phaneritic–porphyritic texture and holocrystalline crystallinity along with inequigranular crystal relationships and euhedral–subhedral crystal forms. The massive rock structure contains crystals with sizes spanning between 0.02 and 1.72 mm. The mineral composition of the sample consists of plagioclase (37%), K-feldspar (19%), quartz (11%), hornblende (8%), biotite (6%), titanite (3%), sericite (8%), and microlite (8%). The plagioclase exhibits albite twinning with an An-40 composition indicating andesinity (Figure 2G-H). The rock falls under the category of quartz monzonite according to Travis (1955).

Sample BH-03

The microscope shows the rock to be fresh with a phaneritic–porphyritic texture, holocrystalline crystallinity and inequigranular crystal relationships. The crystals display euhedral to subhedral shapes while their dimensions span between 0.08 and 1.2 mm. The structure is massive. Plagioclase (37%) and K-feldspar (19%) and quartz (11%) and hornblende (10%) and biotite (10%) and sericite (9%) and microlite (4%) make up the mineral composition. Plagioclase displays albite twinning with an An-36 composition which points to andesine (Figure 2I-J). The rock classification follows the definition of quartz monzonite (Travis, 1955).

B. Metamorphic Rock Group

Sample BH-02

The microscopic inspection of the fresh rock sample shows nematoblastic texture alongside subhedral to anhedral crystal forms and crystal dimensions between 0.02 and 1 mm and a foliated structure. The mineral composition includes plagioclase (25%), K-feldspar (10%), quartz (20%), and hornblende (45%). The thin section shows plagioclase with albite twinning that indicates the An-57 composition and thus labradorite type (Figure 2K-L). The rock falls under the category of amphibolite according to O'Dunn & Sill (1986).

Sample BH-04

The microscope shows the rock as fresh with lepidoblastic texture, subhedral to anhedral crystal forms, general crystal sizes of 0.02 to 1 mm and a schistose foliation structure. The rock contains plagioclase (10%) and K-feldspar (7%) and quartz (15%) and biotite (38%) and chlorite (27%) and opaque minerals (3%). The thin section shows plagioclase displaying albite twinning with an An-54 composition which indicates labradorite (Figure 2M-N). Biotite-Chlorite Schist represents the rock classification according to O'Dunn & Sill (1986).

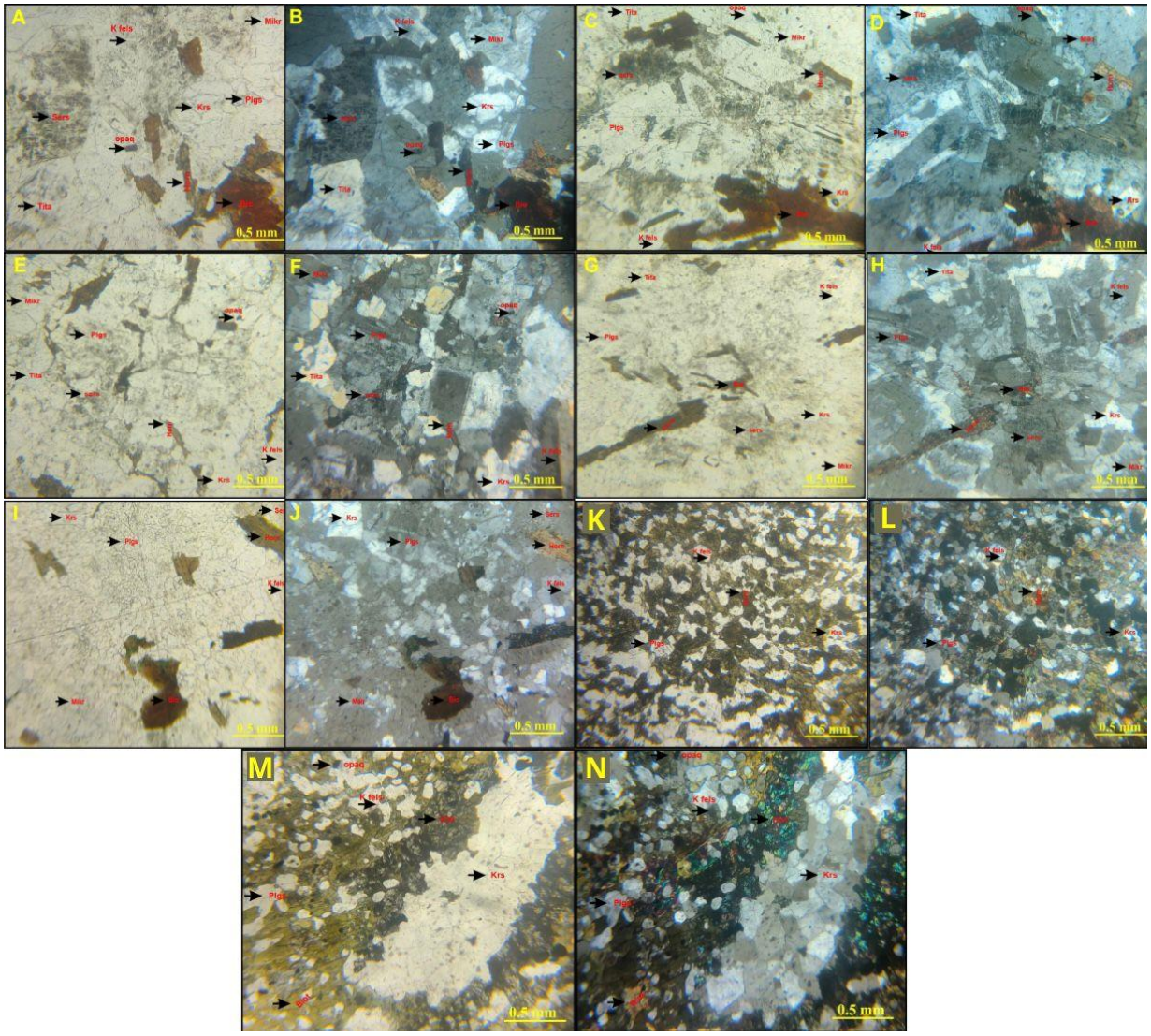


Figure 2. Photomicrographs of five plutonic igneous rock samples and two metamorphic rock samples
Left: plane-polarized light (PPL); right: cross-polarized light (XPL)

Geochemical Analysis

All seven rock samples examined through petrographic analysis were subject to geochemical analysis to determine their major element composition (Table 3). Major oxide data was normalized and then plotted onto various geochemical diagrams in order to interpret the geochemical characteristics of the samples.

Several plot methods were employed for characterization including the FMW weathering index diagram (Ohta & Arai, 2007), TAS plutonic diagram (Middlemost, 1994), TAS volcanic diagram (Le Bas et al., 1986), ferroan–magnesian classification diagram (Frost et al., 2001), AFM diagram for magma series classification (Irvine & Baragar, 1971), and geotectonic setting diagram (Mullen, 1983).

Table 3. Results of the XRF Geochemical Analysis of Rock Samples, Presented in Normalized Weight Percent (wt.%)

Sample Code	SiO_2	TiO_2	Al_2O_3	FeOt	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5
BD-01	54.30	0.96	19.15	5.09	0.97	0.72	4.97	1.19	5.07	0.97
BD-02	66.84	0.56	14.33	2.85	0.5	0.54	3.98	1.53	6.43	0.39
BD-03	66.87	0.40	13.24	3.60	0.31	0.65	3.15	1.7	7.54	0.24
BH-01	66.46	0.40	14.48	3.06	0.25	0.53	4.40	1.63	6.28	0.25
BH-02	43.23	3.22	13.07	17.78	0.57	3.6	11.3	1.03	0.31	0.58
BH-03	64.33	0.13	14.82	3.94	0.8	0.15	3.97	1.06	7.19	0.26
BH-04	42.88	4.07	12.18	18.21	0.66	3.21	10.94	1.42	0.54	0.86

A. Weathering Trend

Rock condition verification was conducted to assess the degree of freshness and to ensure that the samples had not undergone intensive weathering processes that could compromise the accuracy of the geochemical analysis results. Based

on the FMW diagram (Figure 3A), six (6) samples are classified as fresh rocks, except sample BD-01, which has moderate weathering characteristics (Table 4). The total major oxide content of sample BD-01 is less than 95%, suggesting a high loss on ignition (LOI) value. Although the sample appears fresh macroscopically, the geochemical data indicate more significant alteration than the other samples do. Loss on ignition (LOI) in geochemical analysis refers to the mass loss observed after a sample is subjected to high-temperature heating (typically at 1,000°C). This loss results from the volatilization of components such as moisture, and organic matter present in the rock.

Table 4. Sample Distribution and Weathering Classification Based on the FMW Diagram

Sample Code	Description
BD-01	The samples show moderate weathering, as most of the mobile elements (M) have been leached, resulting in a relative enrichment of Al and Fe.
BD-02, BD-03, BH-01, BH-03	The fresh rock samples cluster closely near the field adjacent to the F apex.
BH-02, BH-04	The fresh rocks exhibit a slight reduction in mobile elements, although not yet dominant, reflecting a mafic-derived original rock composition.

B. Classification of Plutonic Igneous Rocks

The TAS diagram (SiO_2 vs. $Na_2O + K_2O$) was used to classify the plutonic igneous rock types of five (5) samples (BD-01, BD-02, BD-03, BH-01 and BH-03) as proposed by Middlemost (1994). The five plutonic samples contain silica (SiO_2) content of 54.30 – 66.87 wt.%. The $Na_2O + K_2O$ (total alkali) content varies from 6.26 wt.% to 9.24 wt.% relative to the SiO_2 (silica) content (Figure 3B). From the TAS diagram, four (4) of the rock samples fall within the quartz monzonite field in the intermediate plutonic rocks category, while one sample is in the monzonite field also in the intermediate category. BD-01 is in the monzonite field and is an intermediate plutonic rock with a nearly balanced plagioclase and orthoclase and minor quartz content. Samples BD-02, BD-03, BH-01, and BH-03 fall in the quartz monzonite field, which are felsic plutonic rocks that are silica and alkali enriched, with more quartz than monzonite, along with plagioclase and orthoclase.

C. Protolith of the Metamorphic Rocks

The protolith (original rock) interpretation of two (2) metamorphic rock samples (BH-02 and BH-04) was carried out using the TAS diagram (SiO_2 vs. $Na_2O + K_2O$), as proposed by Le Bas et al. (1986). Both metamorphic samples have silica (SiO_2) contents of 42.88 – 43.23 wt.%. The alkali content ($Na_2O + K_2O$) ranges between 1.34 – 1.96 wt.% relative to the silica composition (Figure 3C). Based on the TAS diagram, the protoliths of these metamorphic samples are classified as picrobasalts due to low silica and very low total alkali content.

D. Ferroan–Magnesian Properties

The ferroan–magnesian affinities of five plutonic igneous rock samples (BD-01, BD-02, BD-03, BH-01, and BH-03) were interpreted using the FeOt/(FeOt + MgO) vs. SiO_2 diagram proposed by Frost et al. (2001). The relationship between the silica (SiO_2) content and total iron (FeOt) content was analyzed to assess the geochemical trend. All samples in the FeOt/(FeOt + MgO) vs. SiO_2 plot (Figure 3D) are in the ferroan field above the dividing line showing an iron enriched relative to magnesium composition. The SiO_2 content ranges from approximately 60 to 68 wt.%. The FeOt/(FeOt + MgO) ratio is about 0.88 for sample BD-01 which has the lowest SiO_2 content of 54.30 wt.%. The remaining samples (BD-02, BD-03, BH-01, and BH-03) have relatively high silica contents (64–67 wt.%) with FeOt/(FeOt + MgO) ratios ranging from 0.84 to 0.96. Sample BH-03 has the highest FeOt/(FeOt + MgO) ratio (0.96) which indicates that it has the strongest ferroan affinity among the analyzed samples.

E. Magma Series

Magma series classification using the ternary AFM diagram (Irvine & Baragar, 1971) indicates that three (3) rock samples fall within the tholeiitic series, whereas four (4) samples belong to the calc-alkaline series (Figure 3E). The three tholeiitic samples included BD-01, BH-02, and BH-04. Sample BD-01 lies in the center of the tholeiitic field which has a moderate FeO content. The FeO apex in the upper part of the tholeiitic field of BH-02 and BH-04 indicates high iron content. The four samples classified as the calc-alkaline series are BD-02, BD-03, BH-01, and BH-03. BD-02 plots in the calc-alkaline field with moderate alkali content and BD-03 is close by also in the calc-alkaline domain. BH-01 is in the lower part of the calc-alkaline field, and BH-03 is in the upper part of the calc-alkaline field indicating a greater alkali trend.

F. Magma Origin Based on Major Element Geochemistry

The trilinear diagram was used to determine the origin of the magma based on the weight percentage values of TiO_2, 10×MnO, and $10 \times P_2O_5$. Mullen (1983) defines five tectonomagmatic settings using this diagram that include MORB (Mid-Ocean Ridge Basalt), IAT (Island Arc Tholeiite), Island Arc Calc-alkaline Basalt, Oceanic Island Tholeiitic Basalt, and Oceanic Island Alkaline Basalt. The tectonic discrimination diagram from Mullen (1983) shows that five (5) plutonic igneous rock samples (BD-01, BD-02, BD-03, BH-01, and BH-03) lie in the Island Arc Calc-alkaline Basalt field (Figure 3F). Magmas of the calcalkaline type are mainly generated in subduction zones and are typical of convergent margins. The tectonic discrimination diagram also indicates that two (2) metamorphic rock samples (BH-02 and BH-04) plot in the Island Arc Tholeiite (IAT) field (Figure 3F).

IAT represents a basaltic magma type that formed in island arc settings along subduction zones. The magma type is characterized by its tholeiitic composition, which is typically enriched in Fe and low in K_2O. Major elements such as TiO_2, MnO, and P_2O_5 show distinct values that differentiate IATs from both MORBs and OIBs.

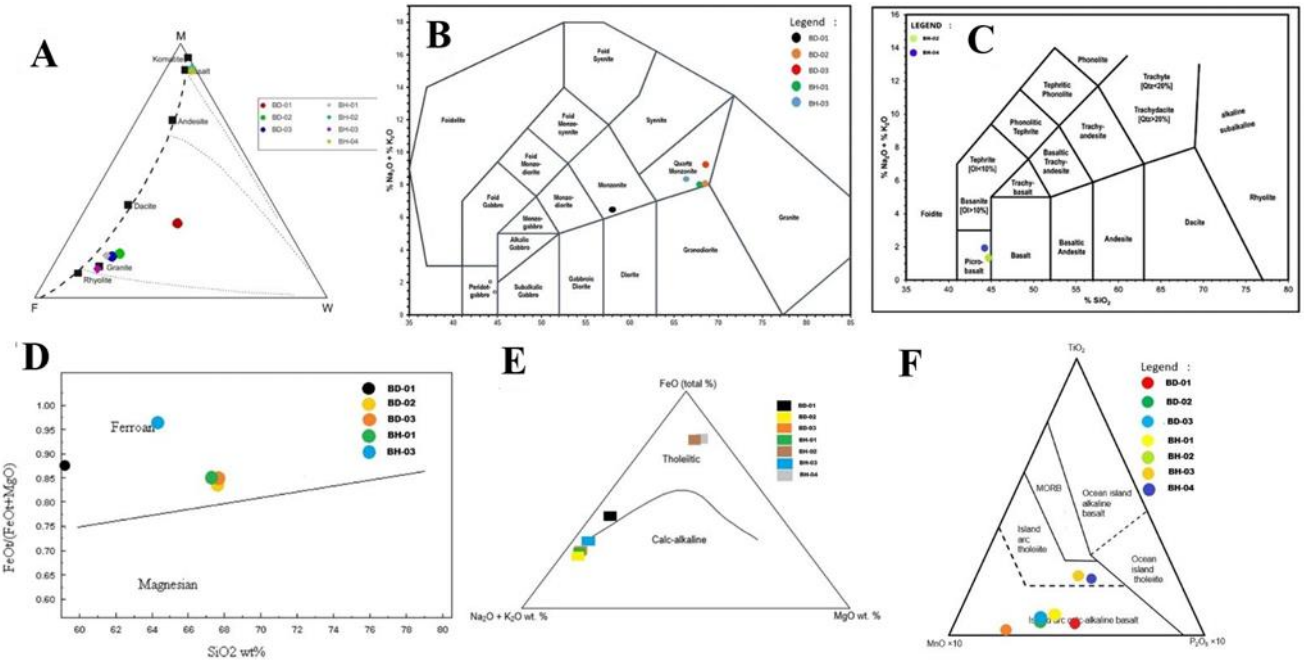


Figure 3. Geochemical data analysis using Geochemical Data Toolkit (GCDkit)

DISCUSSION

The Bada Valley contains two kinds of plutonic igneous rocks: quartz monzonite and monzonite according to field survey analysis that is supported by petrographic and XRF geochemical examinations. The Bada Valley plutonic rocks share an age with the Kumbo Granite Formation (Tpkg) which is dated to the Pliocene at approximately 3.35 million years ago (Sukamto, 1975; Simandjuntak et al., 1997). The Behoa Valley contains three main rock formations which include quartz monzonite plutonic rocks along with amphibolite metamorphic rocks and biotite–chlorite schist. The quartz monzonite of Behoa Valley shares the same age as Kumbo Granite Formation and its age corresponds to the Pliocene epoch at 3.35 Ma. The amphibolite metamorphic rocks share a correlation with the Latimojong Formation (Kls) which exists from the Late Cretaceous period (ca. 100–66 Ma) through the Eocene period (ca. 56–34 Ma) (Simandjuntak et al., 1997). The Pompangeo Complex (MTmp) covers the time span from Early Cretaceous (ca. 100 Ma) through late Miocene (ca. 10 Ma) based on Simandjuntak et al. (1997) and Parkinson (1998). Table 5 displays a compilation of rock characterization methods obtained from petrographic and major element geochemical investigations.

Table 5. Summary of Rock Characterization Based on Petrographic and Geochemical Analysis

Megalit Site Location	Sample Code	Rock type	Rock Name	Protolith (Specific to Meta-morphic Rocks)	Weathering Trend	Fe-Mg Characteristics (Specific to Plutonic Igneous Rocks)	Magma Series	Magma Origin	Rock Age
Bada Valley	**BD-01**	Plutonic igneous rock	Monzonite	-	Moderate weathering	Ferroan	Tholeiitic	Island calc-alkaline basalt	*Pliocene*
	BD-02		Quartz Monzonite	-	Fresh	Ferroan	Calc-alkaline		
	BD-03		Quartz Monzonite	-	Fresh	Ferroan	Calc-alkaline		
Behoa Valley	**BH-01**		Quartz Monzonite	-	Fresh	Ferroan	Calc-alkaline		
	BH-02	Metamor-phic rock	Amphibo-lite	Picrobasalt	Fresh	-	Tholeiitic	Island arc tholeiite	*Last Cretaceous-Eocene*
	BH-03	Plutonic igneous rock	Quartz Monzonite	-	Fresh	Ferroan	Calc-alkaline	Island calc-alkaline basalt	*Pliocene*
	BH-04	Metamor-phic rock	Biotite-Chlorite Schist	Picrobasalt	Fresh	-	Tholeiitic	Island arc tholeiite	*Early Cretaceous-Last Miocene*

CONCLUSION

The megalithic structures in "The Land of a Thousand Megaliths" are predominantly composed of quartz monzonite and monzonite (plutonic igneous rocks), with a minor presence of metamorphic rocks such as amphibolite and biotite–chlorite schist. The source materials for these megaliths were derived from locally available rocks distributed around the sites, which exhibited physical and chemical properties suitable for megalithic artifact production.

This study provides significant insights into the lithic technology, resource utilization, and material selection strategies employed by the megalith-building communities in the Poso region. Furthermore, the findings support ongoing efforts to conserve geological and cultural heritage within Lore Lindu National Park.

Author Contributions: Conceptualization, A.P.P., J.M., and A.A.; methodology, A.P.P. and A.A; software, A.P.P.; validation, A.P.P. and A.A; formal analysis, L.N., I.R. and A.A.K; investigation, J.M., W.W., I.H., A.A., N.T and M.Z; data curation, W.W., A.A. and M.D.; writing - original draft preparation, A.P.P and J.M.; writing - review and editing, A.P.P., J.M., L.N., and I.R.; visualization, A.A.K., N.T., and M.Z; supervision, I.H and N.T; project administration, M.D and MZ. All authors have read and agreed to the published version of the manuscript.

Funding: This research was conducted with funding from the Sustainable Development Research Grant (Pendanaan Riset Pembangunan Berkelanjutan, PRPB) and the Indonesia Endowment Fund for Education Agency (Lembaga Pengelola Dana Pendidikan, LPDP), with contract number: 031/E5/PG.02.00/PRPB.INKLUSIVITAS/2024.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: This study was supported by the Ministry of Education, Research, and Technology of the Republic of Indonesia and the Indonesia Endowment Fund for Education Agency (Lembaga Pengelola Dana Pendidikan, LPDP) through PRPB funding under Contract Number 095/E5/PG.02.00.PL/2024. The study also received support from the Central Sulawesi Provincial Government through the Central Sulawesi Tourism Office.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 29.04.2025 Revised: 12.08.2025 Accepted: 09.09.2025 Available online: 25.09.2025

Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1990-2001
DOI 10.30892/gtg.61356-1566

COLLABORATIVE MANAGEMENT OF WILDLIFE FOR PROMOTION OF TOURISM IN AFRICA: A CASE OF SEMULIKI NATIONAL PARK, WESTERN UGANDA

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Citation: Nabalegwa, M. W., Namulemo, A., Asaba, J., & Tweheyo, R. (2025). Collaborative management of wildlife for promotion of tourism in Africa: A case of Semuliki national park, western Uganda. *Geojournal of Tourism and Geosites*, 61(3), 1990–2001. https://doi.org/10.30892/gtg.61356-1566

Abstract : Collaborative management of natural resources has overtime received overwhelming support in developing countries after decades of colonial preservative approach. It is considered as the most appropriate management practice for all-natural resources including wildlife resources. The aim of this study was to identify the management strategies used and their performance in promoting sustainability of wildlife and tourism around Semuliki National Park, South Western Uganda. Across-sectional research design was used in the study. Methods of data collection included interviews, focus group discussions, observation, questionnaires and document review. A sample of 199 households living around the protected area were randomly and selected. The key informants were purposively selected. The findings indicated that strategies used in the area included : resource harvesting, problem animal management and land use planning, revenue sharing and sensitization. The local communities perceived resource harvesting, land use planning and problem animal management as the most effective strategies in managing the protected area. The community appreciated that some success had been recorded and these include among others ; reducing encroachment to the protected area and illegal resources harvesting, and improvement in park–community relationship. However, the problem animal management strategies had not performed well and therefore affecting sustainable wildlife management and tourism development in the area. This calls for reassessment of the strategy with the aim of strengthening community involvement in the management of the protected area. It was concluded that there a mix in the perception of the community around the protected area as far as collaborative management was concerned. Many believe that their level of participation is mainly passive though there is small level active involvement and participation. It was recommended that the participation of local communities need to be enhanced and the successful strategies should be strengthened and cascaded to other protected areas in the country and in Africa as a whole.

Keywords: collaborative management, natural resources, wildlife, management strategies and tourism

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INTRODUCTION

Background

Collaborative management refers in general, to efforts that bring together all stakeholders with diverse influence and experience to bargain and seek a way of reconciling their conflicting interests. It is an approach to natural resources management that works well due to the failure of uncertainty and complex, conventional administrative and court processes that have failed to produce satisfactory results (Hossu et al., 2018). It is also called co-management or collaborative governance in public administration (Sentanu et al., 2023, Reina-usaga, 2024, Lukman et al., 2024, & Westberg et al., 2024). Some or all the stakeholders like local communities, private and public institutions around any natural resources are involved in the management. The involvement of communities enhances tourism and fosters agreement between the conservation authorities and local resource user groups for effective management of a certain resource or resources at the same time meeting the livelihoods of the local people. It also promotes tourism sustainability especially with the application of coastal ecosystem service approach (Sholeha & Sumarmi, 2025; Foggin, 2012).

In developing countries, the original model of managing national parks (NP) during and postcolonial era was through the use of the existing colonial administrative structure that involved policies made by top administrators and passed on to the lower structures for implementation (Mwesigye, 2012; Kagwana & Mako, 1997). Therefore, there was lack of awareness about the importance of wildlife. The restricted access to resources by park authorities led to negative perceptions towards wildlife conservation. This phenomenon created a fertile ground for conflicts between the park authorities and the local communities living near them (Spierenburg, 2002). In 1970 and 1980s there was widespread degradation of forests and wildlife in the developing countries due to increased population, political instability, inadequate

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technical staff and insufficient funding of the concerned departments. This led to increased illegal activities like poaching and destruction of wildlife (United Nations Environmental Programme [UNEP], 2013).

The exclusion of the local people created resentment among them and reduced the effectiveness of conservation practices. This contributed to the re-occurrence of illegal activities. The ineffectiveness of the protective model led to the introduction of a new approach that puts emphasis on the involvement of the local people in the management of the Protected Areas (PA) and tourism (Saito, 2007). In the 1980s, community led conservation and development approaches were spearheaded with support from international agencies such as the United Nations Educational Scientific Cultural Organization (UNESCO), donors, Non-Government Organizations (NGOs) with the effort to link sustainable use of resources and conservation of the biodiversity and to improve rural livelihoods (Khwaja, 2004).

One such approach meant to mitigate conflicts between the local communities and conservation entities is collaborative management which emphases access for communities to key ecosystem services and economic benefits (Fynn et al., 2016; Kansky, 2022). The rationale behind collaborative approach is that by working together, people are able to share knowledge and achieve more than organizations working on their own. Involving affected communities is likely to induce cooperation by the local people towards conservation activities and more acceptable solutions (Forgie et al., 2001). The desired outcomes such as increased awareness about wildlife programs, rural development, eco-tourism, land use planning, good park - community relationships, diverse exchange of knowledge and improved livelihood can in turn propel the local people's positive perception towards biodiversity conservation (Livingstone et al., 2024; Ferrie et al., 2011). This is a generalization, because it does not apply everywhere. Nevertheless, community support significantly improves the chances of sustainable resource management (Wu & Singh, 2024). Globally, a number of management plans have been put in place in an attempt to conserve wildlife through involving local communities in wildlife conservation. Such strategies have been adopted by several countries for example: Nepal, Brazil, Pakistan and India. In parts of the world, governments established a variety of programs for example: creation of buffer zones, regular resource harvesting, establishment of Community Based Anti-Poaching Units (CBAPUs), awareness programs, regular conduct of wildlife population and habitant assessment in order to manage wildlife and tourism sustainably (Poudel, 2018; Fatina et al., 2024).

In Africa many countries have adopted the methodology of Collaborative Wildlife Management (CWM). Among others they include Communal Area Management Program for Indigenous Resources (CAMPFIRE) in Zimbabwe, Administration Management Design for Game Management (ADMADE) in Zambia and Community Based Natural Resource Management {CBNRM] in Botswana (Mbaiwa, 1999). In Zimbabwe it involves the sale of rights to wildlife enterprise who in turn market safaris to hunters and eco-tourists. It was designed specifically to stimulate the management and sustainable use of resources in Zimbabwe's communal farming areas. Resident communities were given custody over responsibility for managing wildlife resources and the right to benefit directly from their use (Marunda & Chaneta, 2014).

However, in Malawi, the system created powerful groups which marginalized the weak (Zuka & Zuka, 2024). This contrast with principles of collaborative management. It has led to exclusion of some members of the community. In East Africa community programs have been implemented in Kenya under the Kenya Wildlife Services (KWS) and Tanzania under Tanzania National Park Authority (TANAPA). In Tanzania the Protected Area Outreach Initiatives were developed by TANAPA in the management of NP areas like, Tarangire and Serengeti NP.

The policy promotes wildlife management at village level by allowing rural communities and private land holders to manage wildlife and land for their own benefit. These areas always act as buffer zones around the NP which can increase wildlife habitat along borders and keep human activities away from the park (Wilfred, 2010).

In Uganda, CWM started from the forest reserve conservation in Bwindi Impenetrable Forest in 1988 (Namara, 2006). In 1996 it was implemented in Mountain Elgon National Park (MENP) among others. The program was carried out in support of Mountain Elgon Conservation and Development Projects and World Conservation Union (IUCN) in conjunction with other institutions that provided technical support (Chhetri et al., 2003). All conservation authorities in the country have adopted the CWM approach in their management plans to enhance natural resource sustainability (UWA, 2014). But the limited funds from protected area authorities to implement the revenue sharing principle has made the local communities to develop resentments hence limiting sustainability of resource management and tourism (Twinamatsiko et al., 2024).

The emergence and rapid growth of tourism models like: ecotourism, sustainable tourism, ecological and nature-based tourism as a shift towards environmentally and culturally conscious forms of tourism have increased tourism flows and consequently increased anthropogenic impacts on the ecosystems of natural areas (Esparza-Huamanchumo et al., 2024; Artemyeva et al., 2025). Therefore, is need to develop ecotourism that requires specialised green parks with aim of attaining green economy (Gulnur & Kamshat, 2025). The management of Semuliki National Park (SNP) adopted Collaborative management in 1996 when the government of Uganda realized that without local people involvement, management of wildlife would be very difficult. It was formally implemented through a program called Collaborative Resource Management (CRM) rolled out in 1997 following the enactment of UWA's statute of 1996 that recognized local people's contribution to conservation and management of park resources (The Constitution of Republic of Uganda 1995).

Collaboration functions in protected areas are increasingly popular for tourism as well as providing livelihood support for the surrounding communities, they also improve on the sharing problems and developing common ground to capture prospects for tourism (Birendra, 2024). However, in Uganda, since the adoption of collaborative management approach in the 1990s, the protected areas have experienced challenges such as: unclear and irregular maintenance of some parts of the boundaries, invasive tree species, poaching and illegal harvesting of resources, inadequate parameters to monitor resource use, inadequate revenue share, inadequate awareness programs and insurgency caused by intermittent rebel attacks to tourist and tourism infrastructure (Chege, et al., 2002; Mackenzie, 2012, UWA, 2017; Barrow et al., 2003; Twinamatsiko et

al., 2024; Iradunkunda, 2021). These conditions have created the need for re-evaluation of the existing collaborative management approach with a view of addressing the unresolved challenges that limit the subsequent change of perceptions of the local people towards wildlife management. It is therefore, against this background that this study was conducted. The aim of this study was to identify the collaborative strategies used in managing wildlife and tourism and to assess the effectiveness of these strategies in promoting sustainable wildlife and tourism around Semuliki National Park.

METHODOLOGY

1. Description of the study area

Semuliki National Park is located in Bundbugyo district, Bwamba and Bughendera counties. It covers an area of 220km^2. The Park lies on the border of Uganda-Democratic Republic of Congo (DRC) within the western arm of East African rift valley. It stretches 00^o 44^o- 00^o 53^o N, 29^o 57^o- 30^o 11^{o}E. It is surrounded by five sub counties that is Bubukwanga, Burondo, Ntandi Town council, Ntotoro and Tokwe (Bundubugyo local government, 2017).

It is bordered by the Rwenzori Mountain ranges on the south east, Democratic Republic of Congo to the west, Toro-Semuliki wildlife reserve, Rwangara community wildlife reserve and Lake Albert in the north east. The collaborative zone consists of two kilometers (2km) wide strip along the boundary in the areas surrounded by the Ugandan communities.

It overlaps the restoration zone parts at Ntandi and Bumaga. The restoration zone is the area infested by the invasive species along Fort-Portal Bundibugyo Road (UWA, 2017). The park comprises of sedimentary rocks deposit that have produced alluvial clay soil with alkaline (pH > 8.0) and are infertile. It occupies a flat, gently sloping undulating relief ranging from 670 – 750 metres above sea level with approximately 10 km^2 lying above 750 meters. The Park is drained by various rivers such Semuliki, Lamia, Tokwe, Nyahuka, Rwigo and Kirumia. Other drainage features include: the female, the male and son hot springs, the warm lake and ox- bow lakes (UWA, 2017). The area experiences a bimodal rainfall pattern.

The annual rainfall is 800 mm-1600 mm with an average of 1250 mm which is mainly influenced by altitude. The annual mean temperature ranges from 18^{o}C to 30^{o}C maximum with relatively small range (UBOS, 2012). The park is the only low lying natural high forest in Uganda. The forest is moist and semi deciduous, dominated with a hard iron wood tree species (*Cynometra Alexandrii),* savannah grass land vegetation to the north-east, swamp vegetation along river Semuliki and towards Lake Albert. There are various tree species recorded in SNP, some species are restricted, endemic and others are endangered.

The endangered species includes: Muvule, Mahogany and Loviasppcordia SSP. The restricted species includes: Euphorbia SSP, *Chrysophyllum Begui, Ficus Vogeliana, Nauclea Diderrichii, Nesogordonia Kabingaensis, Isolania Congolana, Baphia Capparidifolia, Nauclea Diderrichii, Lecaniodiscus Cupaniodes, Afzelia Bipindensis, Millettia Eetvldeania, Millettia Psilopetala and Eleais Guineensis* (UWA, 2017). The Park is a home of variety of mammals such as the African Elephants, African Buffalos, Chimpanzee, Hippopotamus, Crocodile, Leopard, Lowland Bong, Baboons, Okapi and Wild Pig.

A map of Semuliki National Park showing the study area (Figure 1). Species such as Mona Monkey, Forest Buffalo, Bay Duiker, Bee-Crofts, Flying-squirrel, Pygmy Flying-squirrels, little collared Fruit Bat, Water Chevrotain and target Rat occur nowhere in East Africa. While species such as Dwary Honey and Purple Breasted Sunbird are endemic. Reptiles and amphibians are also abundant (UWA, 2017). The Park has a habitant of 400 bird species of which the White-Tailed Hombill, Capuchin, Babbler Blue headed Crested Flycatcher and the Orange Weaver are of limited ranges (UWA, 2017).

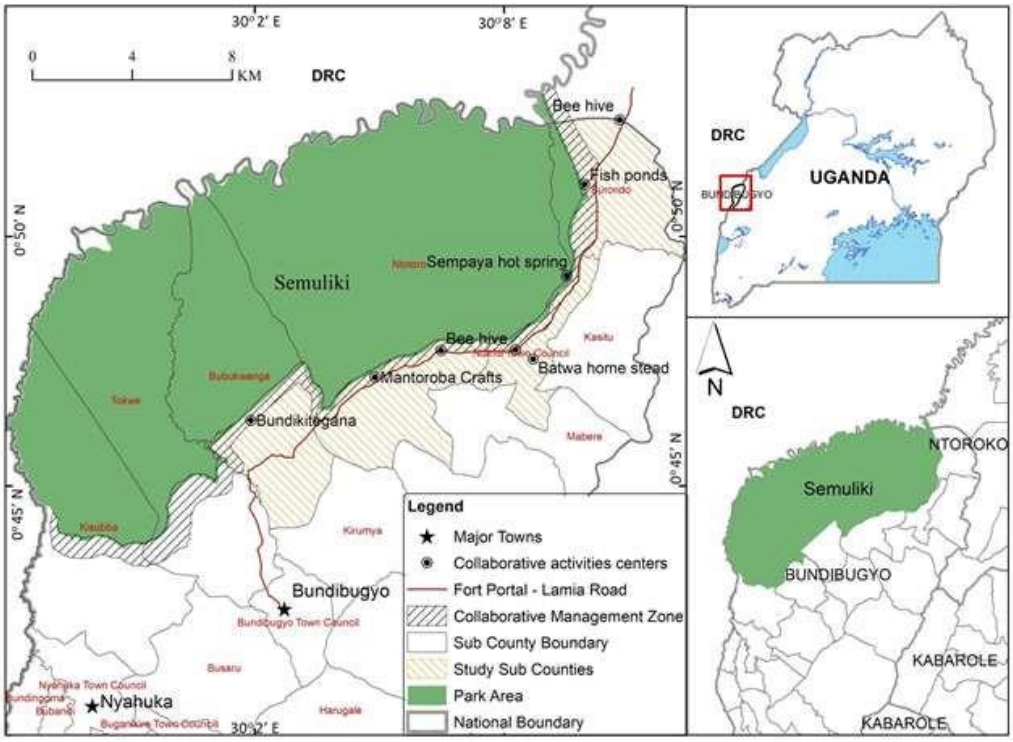

Figure 1. Location of the study area Sources: UBOS, Google Earth engine and field survey 2019 and UWA, Geographical survey 2019

2. Research design and sample size

A cross-sectional research design was used in the study. Out of five sub counties surrounding the park four were selected for the study and two parishes adjacent to the park was selected purposively. Information was got from different community groups in the area. They included: the resource users like the Bamaga anti–poaching group, Mantoroba Rattan cane users, the Batwa indigenous group, Mantoroba MDD group and Burondo farmer group.

The local community leaders and the Warden Community Conservation of SNP (WCCSNP) were also interviewed. Both qualitative and quantitative methods were used. Structured and unstructured questionnaires were used to collect data, and in-depth interviews were also administered to key informants to express their experience regarding CWM. The data were processed using descriptive and exploratory approach. A total of 199 household heads were selected from a population of 398 households using Taro Yamani 1964 formula. The methods of data collection included: questionnaire administered to household heads and community leaders, interviews with resource user community groups, observations and document review. The Methodological flow of the study is presented in Figure 2.

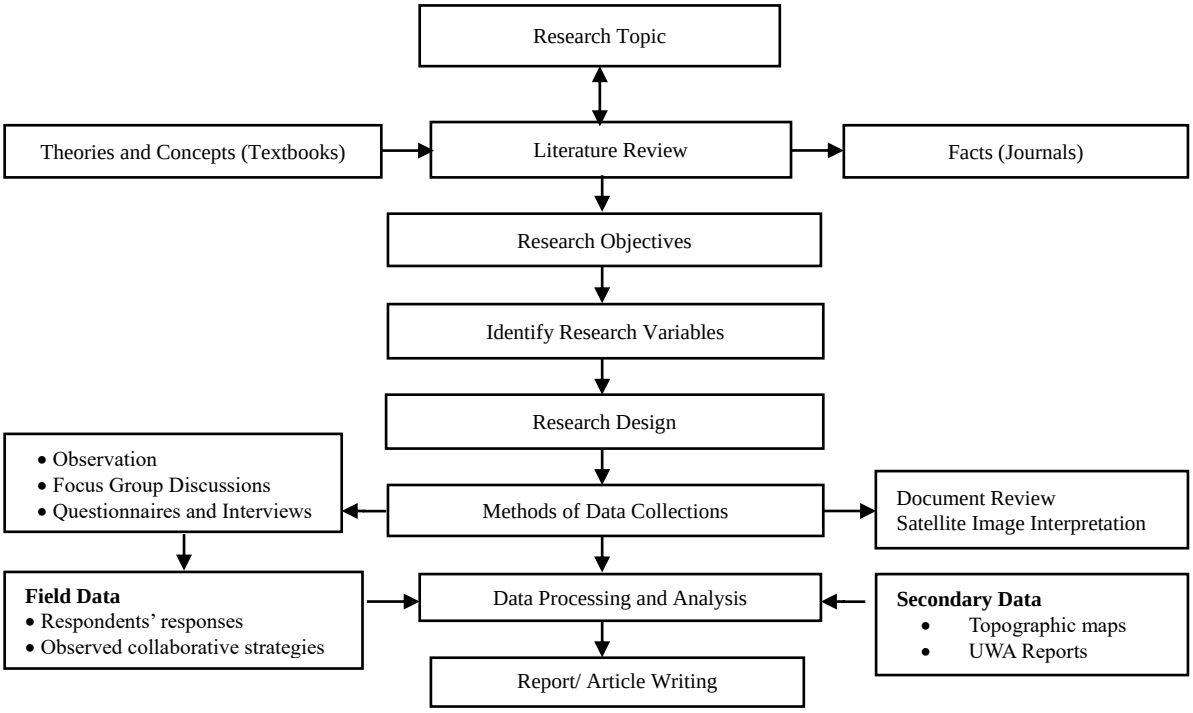

Figure 2. Flowchart for the methodology followed in the study

RESULTS

1. Collaborative strategies used in the study area

The collaborative strategies that were identified in the study area included: problem management strategy, land use planning strategy, revenue sharing and community sensitization strategy. Within these strategies, there were activities that were being implemented in the local communities around the protected area.

2. Problem Animal Management Strategy

The aim of problem management strategy was to reduce the frequency of problem animals to destroying crop, attack livestock, injure or even kill people. The animals that were identified under this group included elephants, buffalos, bush pigs, baboons and vervet monkeys. The activities under this strategy included: scare shooting, planting of Mauritius thorn hedges (*Ceasalpanea Decapitate*) along the boundary and erection of elephant deterrent board walk, planting other unpalatable crops like hot paper and agroforestry trees to create a buffer zone. Mauritius thorn hedges (*Ceasalpanea Decapitate*) planted along the park boundaries were able to deter wild animals from invading the community lands.

This project was funded by Kibale Semuliki Conservation Development Project (KSCDP) and World Vision. Local communities living near the park provided the labour and were only paid an allowance of 0.44 US dollars per day towards their labour contribution and a lunch allowance of 0.11 US dollars every day. Examples of these hedges are presented in Figures 3a and 3b in Burondo parish; Burondo II village. The hedge in Figure 3a is well maintained and has thorns that can deter animal while one in 3b has no thorns and animal can easily go through to the gardens. Besides the Mauritius thorn hedge, the farmers are also encouraged to plant unpalatable crops to problem animals like hot paper around the park.

Many problem animals do not eat the hot paper plants and fruits. These scare them away. Some of the local communities were allowed to grow eucalyptus trees in the buffer zone which they are allowed to harvest when they mature. Another activity under problem animal management strategy was scare shooting. This is an emergency activity which was carried out by park rangers after the local people reporting cases of invasion by elephants or buffalos. Local people are supposed to report to the local councils who alerts the WCCSNP before scare shooting was carried out in order not to cause panic in the community.

Figure 3a. Mauritius thorn hedges in good conditions

Figure 3b. Lacking Mauritius thorn hedges (Source: Field data)

There were also elephant deterrent boards erected by national park management. These can deter elephants from crossing to the garden. Beehives are put on these boards and wires are connected to the beehives such that when the elephants hit the wires the bees buzz, which scares the elephants from crossing into the community. On average deterrent covers a distance of one kilometer (1km) in Ntotoro Sub County and one and a half kilometer (1½) in Ntandi Sub County.

Field observations revealed that, the board walk way in areas of Bubulongu village Ntotoro sub county are in good conditions (Figure 4a) but in a few isolated cases were found destroyed (Figure 4b). In the same line the beehives were not in existence as the bees had swarmed away and the hives lay in pieces.

Figure 4a. Elephant deterrent in good conditions

Figure 4b. Elephant deterrent in bad conditions deterrent (Source: Field data)

3. Land use Planning

Land use planning as a collaborative management strategy in Semulik National Park involved the repositioning and demarcating the park boundaries. The aim of land use is to control and minimize land disputes but also facilitate law enforcement. Besides planting Mauritius thorn hedges, the community was also encouraged to establish buffer zone by planting acacia and eucalyptus trees and erecting pillars at agreed points.

Trees such as; Maesposis (*Maesposis Eminaii)*, silk oak (*Grevilla Robasta*), albizia (*Albizia Zgyia*), timer markhania (*Markhania Platycalptus*), cordia (*Cordia Milenis*), calliandra (*Calliandra Calathynsus Eqasetiyalia*), crota (*Crota Maaestch*), terminalia (*Termalia Superba*), sesbaia (*Sesbania Sesban)* and fig tree (*Ficus Nantalensis*) are planted in the cocoa farms in all the sub counties surrounding the park. This has promoted agroforestry and reduced pressure on the protected area for firewood. Unpalatable crops like chili are also planted to deter animals and farmers can earn income.

4. Revenue Sharing

The National Park annual reports 2014-2018 indicates that, the local communities living near and around the park got 20% of the tourism entry fee. The aim was to enable the local people living adjacent the park to invest in sustainable activities that would reduce illegal activities in the park. A total of about 60 million Uganda shilling (over USD 165,961) was given to existing projects in Bundibugyo District in the financial year 2017-2018. The sub-counties that benefited included; Bubukwanga, Ntoroko, Ntandi town council, Burondo, Tokwe and Kisuba.

The projects that benefited in that financial year included; Beekeeping, agroforestry, and goat keeping. Some other projects had benefited from this strategy in the previous years. they included; art and craft (skill training) and tree planting by the Mantoroba, Rattan cane group, fish farming in Bubulongu, farmers development group in Ntotoro Sub County and the Bamaga cultural group (Ant-poaching group) in Ntandi town council.

4.5 Effects of collaborative strategies in the area

Opinions of the local people were sought on the effectiveness and benefits of the strategies used in collaborative wildlife management around SNP from the communities and technical staff of the park. The results are presented in Figure 5.

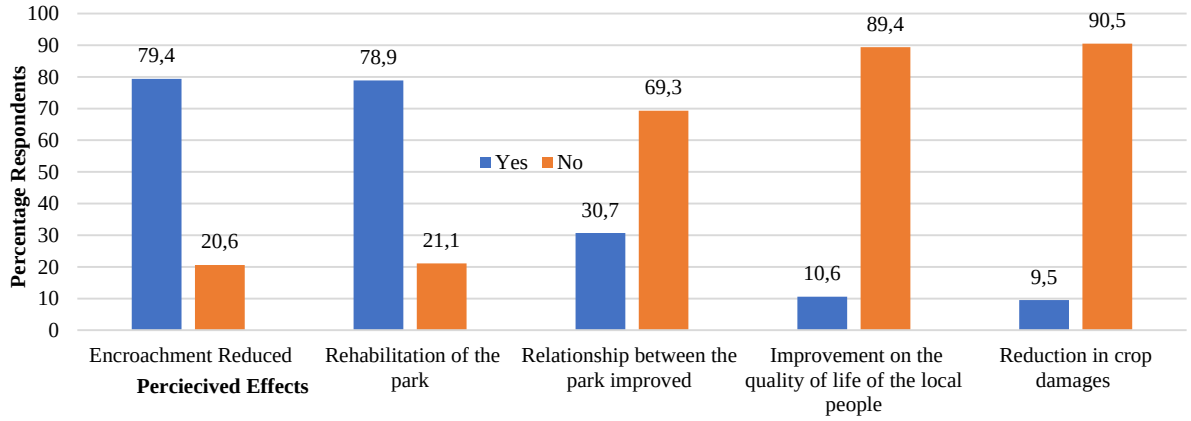

Figure 5. Perceived Effects of Collaborative Managrmrnt by communities (N=199) (Source: field data 2019)

Figure 5 shows that, 79.4% of the community indicated that collaborative approach had helped to reduce encroachment on the park. Developing agroforestry by planting of trees and woodlots by local people has helped to reduce encroachment on the park. The local people are involved in maintaining the boundaries and this has motivated them to reduce on the encroachment. Where buffer zones agroforestry is absent, alternative land uses such as unpalatable crops like chili had been used to reduce crop damages. A resource user in Ntandi town council noted the unfair treatment is still existing among the resource managers. He stated that: "*Wildlife officials* (*UWA) care more about wild animals. When a ranger finds you on the side of the park they harass, cane or make you pay fine or arrest you but when wild animals destroy your crops the park does nothing. Many young people have been sent in prison because of green pigeons (kapapala)".*

It was established that the local people who are involved in growing woodlots had benefited through sale of trees for poles, fodder crops and firewood. This had improved on their incomes and general livelihoods. It was also noted that some trees planted in agroforestry around the park are medicinal (herbs). For example, the eucalyptus trees used in the treatment of flu and regulation of blood circulation and Albizia Zgyia (*mulongo*) which heals stomach pain and tooth ache.

However, there was resentment by some local community members planting more trees because it was increasing on the area for the wildlife to cross to their gardens. Collaborative strategies had enabled the protection and rehabilitation of the park (79.9%). Collaborative activities included; removal of invasive tree species of (exotic trees), maintenance of the board walk and construction of the trails. The local people were involved in the felling of the invasive tree species (exotic trees) and noninvasive trees for timber such as; *Terminalia Superbia*, *Senna Spectabilis*, Senna *Siamea*, and *Cedrella Ordurata* around the park boundaries. The local communities are also involved in the de-barking of selected exotic trees, up root young wildling and sapling of the exotic trees. The youth are involved in the maintenance and rehabilitation of the board walk to the female and male hot springs and maintaining the trails used for forest nature walk and bird watching around Sempaya area. It was revealed that boggy conditions and the seasonal floods lead to continuous decay of the wood thus regular maintenance. These activities have promoted tourism in the protected area.

Regulated resource harvesting strategy has reduced tension between the National Park and the local community. The resource users such as the rattan cane users and the Bamaga anti-poaching unit volunteers to monitor resource harvesting through reporting of illegal activities. They also report unknown people found in the park, remove snares, hunting traps and arrest offenders. The warden confirmed by availing data on damaged snares, wild wires and bird net snares. It was established that illegal activities in the protected area were on decline. This can be observed in Figure 6. However, there is a challenge in that during the harvesting days the number of people in most cases was more than the agreed upon and this causes tension.

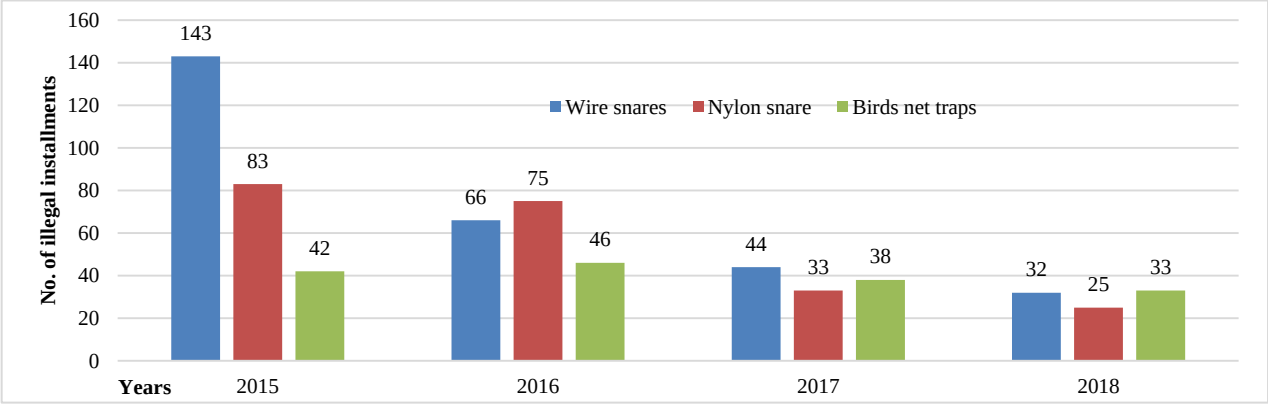

Figure 6. Trends in illegal activities in the park between 2015 to 2018 (Source: UWA Annual Reports 2015 to 2018)

Although the local people have benefited from resource harvesting, they still have negative perceptions towards the monthly subscription fee, Uganda shillings 25,000 (Ugx 2500) for rattan cane users and Ugx, 1000 for fire wood which

restricts them from accessing the resources in park even on the days when they are supposed to harvest resources. The long process required to get permit to harvest timer and the corruption by rangers have increased the negative perception of the community towards the protection of the resources. As far as improvement on livelihoods of the local communities is concerned, it was established that it had generally improved. During FGD with Community groups, they indicated that they had benefited from the revenue sharing arrangement. An interview with the secretary of the rattan cane users said that;

"Art and craft project had helped to develop skill that had enabled them to create employment which provides an alternative source of income. Through making furniture they are able to pay tuition fee for their children at the university."

Chairperson of rattan cane users said that:

"He was able to acquire land and plant woodlot (Eucalyptus trees) which provides timber, fire wood and medicinal herbs. This has increased our income through sale of furniture, timber and timber products".

The anti-poaching and the farmers group were happy with the fish farming projects which they were soon going to start harvesting. This was going to improve on their diet and income. However, there were groups which had not benefited in the revenue projects claiming funds were limited to make meaningful investment.

Due to lack of sensitization and training, the established projects had failed. For example, goat rearing in Ntandi sub county which were sold off and bee-keeping in Burondo sub county. A member of the Burondo11 farms group explained *that*;

"Provision of the bee-hives was not followed by provision of equipment like the protective gears such as gloves and helmets. this discouraged the farmers from caring for the bees."

It was also established that revenue share was too small and irregular. Not all villages around the park had the MoU to share the revenue in a given period. This was confirmed by the park authority that they keep on alternating the villages because they receive less revenue due to few tourists that visit the park. This was compounded by insecurity that scare the tourists away.

This situation undermines sustainability of collaborative management approach. Some members of the local community feel the revenue share benefit the sub county officials. They feel the revenue share has not helped to improve the quality of life.

A member of resource user indicated the following;

"we are living in poverty. My family only has one meal a day, sometimes we take porridge because all the crops grown are destroyed by the wild animals. We buy food from other areas. If you have no money, you cannot eat".

However, some local communities had benefited from free tap water supply. This included communities like Ntandi, Burondo and Ntotoro Sub Counties. The rivers and streams flowing from the park taped to provide safe and clean water to the community. This has improved on their quality of life and reduced encounter of local people with the wild animals in search of water. However, a local leader in Bundikutenganwa had this to say:

"Although some community have clean water, we have not benefited from the project. We draw water from unprotected wells which is unsafe. The children and women suffer especially during the season looking for water in the park. This create a high risk of being attacked by animals.

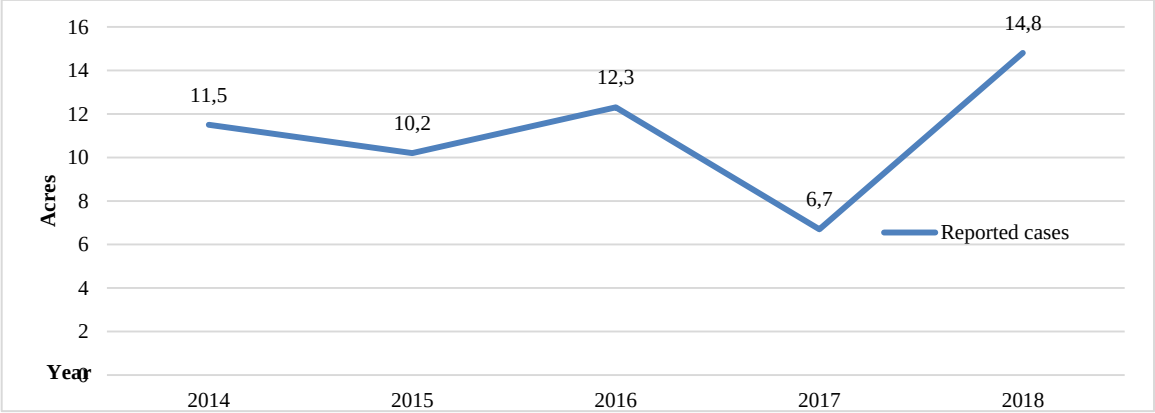

Figure 7. Shows acres of crop land destroyed between 2014 – 2018 (Source: Semuliki National Park annual Reports)

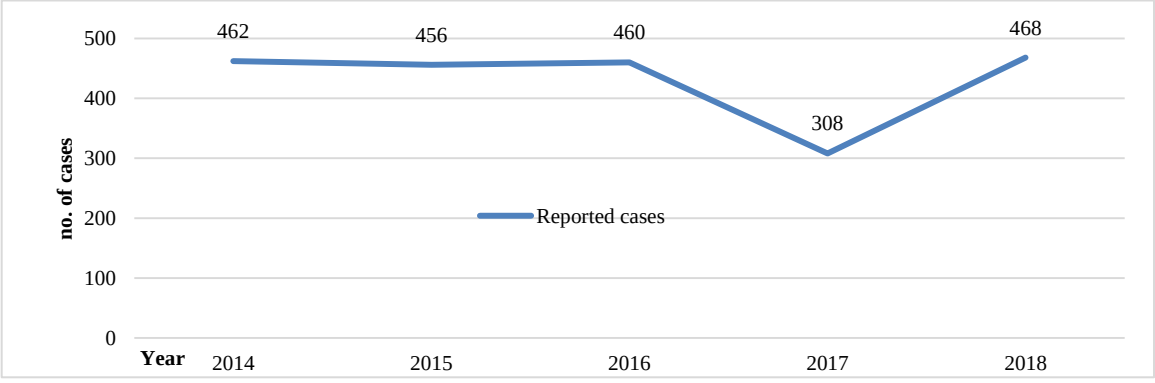

Figure 8. Showing cases of crop damages reported to UWA between 2014 - 2018 (Source: Semuliki National Annual Reports)

Majority (90.5%) of the respondents indicated that crop damage had continued to occur. Therefore, the strategy of managing problem animals has not worked well. The reported trend in crop damage is presented Figure 7 and 8.

From the Figure 6 it can be observed that, 11.5 acres of crop land were destroyed in 2014, 10.2 acres in 2015, 12.3 acres in 2016 and 6.7 acres in 2017 and 14.8 acres in 2018 due to increase in wild animals. This corresponds with the number of cases reported in Figure 7. As observed from Figure 7, crop damages are rampant in the community lands surrounding the SNP. 462 acres of crop land were destroyed by wild animals in 2014, 456 acres in 2015, 460 acres in 2016, 398 acres in 2017 and 468 acres in 2018. Local communities feel that the park has left the responsibility of managing the wild animals to them through guarding. It was also noted during the FGDs that collaborative wildlife management has not reduced the anger of the local community towards wild animals such as the baboons which are referred to as *Nkukulu* (notorious) or ADF rebels which kill them. There is also lack of active Problem Animal Control Unit (PACU) at the sub counties.

DISCUSSION

1. Collaborative management strategies used in Semuliki Protected area

The collaborative strategies used in the management of wildlife for the promotion of tourism in SNP include: problem animal management, scare shooting, land use planning, revenue sharing, resource harvesting, sensitization and awareness programs. The use of these strategies had reduced severity and frequency of local people to encounter with wild animals. This had increased people's tolerance towards wildlife. These strategies have been identified as being both indirect and indirect for preventive or mitigation of the effects from wildlife (Muthuri, 2005; Treves, 2007).

They are important in coordinating tourism in rural area and in solving wicked problems that are beyond the capacity of the management departments (Sentanu et al., 2023). However, involving tourist in the process has been acknowledged due to the transitory nature of tourism (Reina-Usuga et al., 2024). However, involvement of tourist in management protected areas and tourism in general in Semlik National Park was limited.

2. Problem animal management strategy

Deaths, injuries and crop damage due problem animals are not restricted to communities around SNP. In South Eastern Zimbabwe, the findings by Dhliwayo et al., (2023) show that communities neighboring the Save Valley Conservancy lived under constant fear due to attacks by elephants, buffalos, lions, hippos and crocodiles. The problem animal management measures around SNP include planting Mauritius (*Ceasalpanea decapitate)* thorn hedges along the boundaries, erection of elephant deterrent boardwalk ways and scare shooting. The Mauritus thorn hedges are planted around the park because they are cheap to maintain, ecologically friendly. They also act as habitat for wild animals such as wild pigs and the birds.

These have been reported to be used around Tarangire NP, Amboseli NP, Endarasha near Aberdera NP, Ol Moran in Nyeri and Laikipia where they are effective in preventing wildlife from crop damages and depredation of livestock (Muthuri, 2005).

Scare shooting is another strategy which was used in emergency situations by rangers of SNP to scare away herds of elephants or buffalos which invade the crop farms around SNP. The local communities are expected to report immediately animal that stray to the gardens. Musyoki (2014) noted that exploders or fire crackers were used by a NGOs to scare wild animals in community farms around Sagala, Taita and Tevate in Kenya. Elephant deterrent board walk ways with bee-hives and wires attached are erected such that when the elephants hit the wires, the bees buzz which scares them from the community land. The bees help in the pollination of the plants and provide honey for sale. This improves on people's income. Traditional bee-hives and recorded bee sound were used to scare elephants from Tsavo NP and Tarangire NP from crossing to community land (King et al., 2018; Sosiya, 2016). The land use planning around SNP was being implemented as a strategy. It included demarcating park boundaries, planting woodlots or trees, agro-forestry and planting unpalatable crops. Local people in Burondo Sub County were involved in demarcating park boundaries by planting Mauritius thorn hedges (*Ceasalpanea Decapitate*) to prevent encroachment and minimize disputes between the park and the local people.

Local people around Chtwan Nationa Park in Nepal plant eucalyptus trees and Mauritus thorn hedges to cut off encroachment (Upadhyay, 2013; Chhetri et al., 2003). Also planting unpalatable crops like chili scare wild animals like elephants. Nyashadzasha (2017) noted that chili pepper mixed with elephant dung if thrown in fire produces noxious smock which chocks the animals. Also, in this area, local communities had established woodlots or trees to reduce pressure on the park. This was providing alternative source of wood other than depending on the park for wood supply. Agroforestry was encouraged to improve on soil fertility, provided timber, firewood, fodder and medicinal herbs to the surrounding communities as the case with areas around Mount Elgon National Park (Hinchley et al., 2000).

3. Revenue sharing

Revenue share involved sharing some of the revenue generated from the gate entry fees among the neighboring communities. The aim was to increase the value attached to the park and reduce illegal activities. Sustainable projects were encouraged and were implemented around the park in order to improve on the quality life of the local people around the protected area. This was noted by Sosiya (2016) around Tarangere NP. The aim was to reduce pressure on the park resources. In this area, the share of the revenue collections from the protected area is given to local community groups according to the already existing projects. For example, the Mantoroba rattan cane groups, which is involved in art and craft project and skill training, Bamaga anti-poaching group involved with a fish project and Bubulongu farmers' groups with a bee project and fish ponds. These groups had established projects to improve on their livelihoods, but were bedeviled with financial mismanagement. Moyini et al., (2006) noted that local community groups living around the park with projects have benefited from the revenue shares and improved on their livelihoods. Bedelian & Ogutu (2017) found

that revenue shared with pastoralists around the Maasai Mara National Reserve provides an important, reliable, source of income and prevents households from selling their animals during stress and for cash needs.

However, in Bwindi impenetrable National Park where revenue was allocated to individual household project in instead of the community projects, this did not reduce the unauthorized activities in the park (Twinamatsiko et al., 2024). In Mghahinga National Park in Uganda, the scheme was intended to impower women where it failed (Iradunkunda & Agaba, 2021). Nevertheless, it is considered to be effective and practical choice incentive option (Mackenzie, 2012).

4. Resource harvesting

The local people living around the park were allowed to harvest resources from the park within a radius of 2km (collaborative zone), subject to Collaborative Resource Management (CRM) agreement, negotiation, and request from the park. In turn the resource users volunteers to monitor illegal activities and regulates resource harvesting. Resources harvested include; firewood, (fallen dead wood) exotic trees (eucalyptus and cassia), rattan cane (*Calamus Derratus*), spear grass (*Imperata Cyclidrica*), palm leaves *Phoenix Reclinata*), herbal medicine, mushrooms, water and visiting cultural sites. The resource harvesting increases the value the local people attach to the park and reduce the cost of employing the rangers. In Chitwan National Park resource harvesting was categorized into timber and non-timber including permission to visit cultural sites in the protected area (Upadhyayay, 2013). In Zimbabwe, Botswana and Namibia, local communities living near the parks are permitted to hunt four buffalos and three elephants every year (Sarre, 2017).

In Kenya Pastoral communities around Maasai Mara are allowed access to different areas of the reserve, away from tourist camps, on a rotational basis. This provides them with opportunities for good quality forage especially during the dry season, thereby contributing to community resilience (Bedelian & Ogutu, 2017).

Gravity water systems have been established through the protected area to the local communities by World Vision, Action Aid, and Adventists Development Relief Agency (ADRA). This has made water accessible to communities reducing human-animal interactions as it was the case before collaborative management. This was the case in Tanzania and Kenya where water was made available for livestock hence reducing human encounter with wild animals (Muthuri, 2005).

5. Sensitization program

A variety of sensitization programs are used to convey messages to the local communities around SNP about collaborative wildlife management such as community meetings, radio programs, MDD, after church service meetings, market days and school programs. The use of a variety of methods helps the conservation authorities reach all categories of people such as the young, old, women and men. (2014) also found out that stakeholders carry out sensitization programs to the communities living around the PAs, through media programs, drama, sports icon and documentaries.

The purpose of sensitization is to address issues such as the problem animals, resources to be harvested and their sustainable use, importance of biodiversity, illegal activities, encroachment, family planning, sanitation and the role of community in conservation. This can lead to the co-existence of the local people and wildlife. Namatovu (2015) also noted that communities around MENP were sensitized regularly about the useful of the protected area, and how to manage the park.

Sensitization around SNP is carried out by local community MDD groups, WCCSNP or CCRs, NGOs such as CARE, USAID, Caritus Marie Stopes, World Vision and ESCOM. The different groups involved in spreading the messages embark on other conservation activities for example the Bamaga cultural (the anti-poaching group), Bubulongu development farmers group, have (bee keeping &fish farming) Mantoroba Rattan cane user (art and craft or skill training and tree planting). This has helped to promote wildlife conservation. Shresha (2015) also found out those women groups, NGOs for instance WWF, DNPW and school clubs were involved in promote wildlife conservations through tree planting eco- tourism and bee-keeping around Chitwan NP in Nepal. External stakeholders (government) use strategies like training laws and policies to build capacity in the local communities (Lukman et al., 2024).

6. Perception of the local communities about the strategies used Semuliki National Park

The local people around SNP had various opinions about the performance of the strategies employed in Collaborative Wildlife Management. The performance was determined basing on whether illegal activities in the park were reducing, improvement authority-community relationship, improvement in quality livelihoods, rehabilitation of the park and reduction in crop and property destruction by wild animals.

6.1. Reduction in Encroachment to the protected area

Involving local communities in maintaining the park boundaries, plant crops in protected buffer zone, removing exotic had minimized the rate of encroachment to the protected area and other illegal activities. Chhetri et al., (2003), indicated that allowing local people around Chitwan NP and MENP to plant crops and trees under the boundary trees and harvesting trees periodically motivated local communities to reduce encroachment on the parks. Planting crops like tea in the buffer zone reduced damage to crops by the Baboons and Chimpanzees from Mughinga National Park in Uganda (Akampulira et al., 2015). These activities have not only reduced encroachment, but also protected and rehabilitated the degraded protected areas. This was also noted by Uyadhayay (2013); Whitesell et al. (1997), where the local communities were involved in de-barking, weeding thinning and removal of selected exotic plants. Existence of woodlot and agroforestry activities around the protected area had reduced pressure on the park to provide firewood, poles and medicinal plants. Such activities were also noted to have reduced pressure on the park and increased on bird species in Nepal (Poudel, 2018).

Regulated resource harvesting had reduced tension between the community and Park authorities. This was also the case in Zimbabwe, Caprivi in Namibia, Nepal and Botswana where poaching reduced because funds raised from sale of hunting

licenses has reduced poaching because the money raised from the sale of licenses was shared between the communities and conservation activities (Newton et al., 2016; Amin et al., 2017). Despite sensitization and regular patrols by the law enforcement officers, monitoring the firewood collection is a challenge due to many people who come to harvest on the day of harvesting. Resource users forget their roles of monitoring resources due to controversial issues such as of lack of incentives and failure to follow rules and guidelines as agreed upon. On the contrary, Namatovu (2015) also asserted that the local people near MENP carried out poaching of black colobus monkey to use the skin in cultural circumcision.

6.2. Improved park-community relationship

There is improved park-community relationship because the resource users such as the Mantoroba rattan cane users and the Bamaga anti-poaching unit volunteers to protect wildlife by carrying out activities such as; reporting illegal activities, unknown people found in the park, encroachment, removal of snares and traps and arrest offenders. This has led to increase in wildlife and regeneration of vegetation. The involvement of local communities in managing wildlife and protected area promoted good relationship between the park authorities and communities around in Zambia and Kenya (Lamsal, 2012; Frank & Small, 2016; Niskennen et al., 2018; Moyini et al., 2006). The good relationship led to a regeneration in flora and fauna in the protected area. This in turn boosted tourism. On the other hand, restrictions, denial, heavy punishments and exclusion of local communities leads to resentments and conflicts (Nakakawa et al., 2015; Nyashadzasha, 2017; Twaambo 2007).

6.3. Improvement in the quality of life

Partnership with the local communities has created employment opportunities such as; sale of art and crafts, fish farming, bee keeping, maintaining the board walks, boundaries, and water source, cleaning Bumaga camping site or Banda. These people earn income which has helped them to improve on their standards of living. This has motivated them to support wildlife management programs. Niskanen et al., 2018; Sosiya, 2016; Mbaiwa, 2015 observed that the local people who are employed in tourism related projects in Kenya, Tanzania and Boswana earn salaries or wages which helped them to buy the basic needs. The free tap water from rivers and streams flowing from the park has reduced encounter of local people with the wild animals. Provision of water for livestock or people has reduced encounter of the local people and the wild animals in Kenya and Tanzania (Muthuri, 2005).

6.4. Reduction in crop damages

Crop damages are a great challenge of SNP especially in places where the Mauritius hedges have not been well maintained. They can help to reduce crop damage if well maintained. They can manage to control big animals such as elephants, baboons, and bush pigs, but are less effective in controlling small animals (Akampulira et al., 2014). The elephant deterrent board walk way helps to control the elephants but few parts have been destroyed in some villages. The bee hives along the board walk ways availed honey to the local people. This reduced the incidences of fire outbreak in the protected area due to search of honey by the locals in the park. Fences require large sums of capital for installation, regular monitoring and maintenance. However, they are effective in controlling wild animals (Frank et al., 2016, King et al., 2014; Sisoyi, 2016).

Scare shooting was rarely used due to frequent insecurity by the Allied Democratic Force (ADF) and Rwenzururu inter-tribal conflicts. However, it was said to be a temporary method because its effectiveness can diminish over time as animals such as elephants became habitual to noise (Nakyesa, 2013). It was discouraged around MENP and Kidepo valley National Park as it would cause alarm among people already plagued by periodic rebel activities (Chhetri et al., 2003.

CONCLUSION

A number of collaborative management strategies were used in managing wildlife and promoting tourism around Semulik National Park. These included, animal problem management strategy, land use management, regular resource harvesting, revenue sharing and community sensitization. Within these strategies, a number of activities were implemented in partnership with local communities. These included: boundary maintenance, growing hedges, establishing buffer zones, agroforestry activities around the park, board walk ways fitted with bee hives, removal of exotic and invasive plants, and many others. It was established that resource harvesting was the most effective strategy, followed by problem animal management and land use planning, employment of the local communities and managing wildlife together with the communities. It was established that community-wildlife authority relationship had improved. There was a reduction in illegal activities and encroachment on the protected area. The protected area had registered regeneration of vegetation and increased wild animals. However, there was a challenge of animals still raiding community gardens due lack of a clear buffer zone or lack maintenance of the hedge and board walk ways. Some members of the community still resent park authority activities and view them as being oppressive. The small and intermittent revenue share from the park authority has failed to create the impact. The collaborative approach has fostered cooperation, reducing conflict and these have promoted tourism both locally and internationally.

Author Contributions: Concpyualisation, N.M.W, A.J. and N.A; methodology, N.M.W, A.J. and N.A; Software, N.M.W and N.A; Validation N.M.W, A.J. and N.A; formal analysis, N.M.W, A.J and N.A; writing original draft, N.M.W, A.J and A.J; writing review and editing, N.M.W and T.R, visualization A.J; Supervision N.M.W and A.J; Project administration N.M.W, A.J and N.A. All authors have read and agreed to published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgements: We wish to extend our gratitude to the Uganda Wildlife Authority (UWA) and Semlik National Park staff. We also thank Bundibugyo and Ntoroko District officials and Kyambogo University management that allowed us time to be off station. In a special way, we thank the Dean, Faculty of Arts and Humanity and the Head of Department Geography for encouraging us to publish this work.

Conflicts of Interest: The authors declare no conflict of interest.

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Article history: Received: 15.04.2025 Revised: 12.08.2025 Accepted: 09.09.2025 Available online: 25.09.2025

Geojournal of Tourism and Geosites

Year XVIII, no. 3, vol. 61, 2025

ISSN 2065-0817
E-ISSN 2065-1198