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GLOBAL TRENDS IN TOURISM SCALE CHANGE IN THE 21ST CENTURY

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Abstract: This study aims to identify the settlements most significantly impacted by tourism globally and analyze the underlying reasons behind these trends. By examining 255 locations worldwide, the research provides insights into the territorial distribution of tourism activities and their evolution over time. Given the rapid transformations in global travel patterns due to economic, environmental, and technological changes, understanding these dynamics is crucial for sustainable tourism planning and destination management. The analysis employs advanced statistical techniques, including Variable Clustering (VARCLUS), Principal Component Analysis (PCA), and Factor Analysis of Mixed Data (FAMD), to evaluate the rankings and sub-indicators of the studied locations. These methods allow for a detailed examination of regional and typological patterns, integrating continuous and categorical data to create a comprehensive map of tourism-affected areas. The findings reveal significant regional and typological patterns in global tourism. European coastal and heritage sites are predominantly influenced by international tourism indicators, while North American and Asian urban areas exhibit a stronger reliance on domestic tourism indicators. The study highlights the dominance of certain factors shaping tourism dynamics and offers insights into the varying nature of tourism impacts across regions. The research provides actionable recommendations for policymakers and economic stakeholders to develop more effective regulatory and economic strategies. By addressing the distinct needs of different regions, the study contributes to a better understanding of tourism's evolving scale and offers a foundation for targeted policy interventions. The study separates the problems caused by domestic and international visitors, which is important for economic policy. In places like Venice and Dubrovnik in Europe, which are popular with tourists, higher prices and taxes could help to control tourism and fund efforts to protect the environment. In North America and Asia, planning for cities and managing infrastructure are important to balance tourism growth with the quality of life for locals.

Keywords: overtourism, urban tourism, sustainability, ranking, tourism destinations, VARCLUS method, Principal Component Analysis (PCA)

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INTRODUCTION

The growth of tourism is accompanied by an increased risk of excessive tourist traffic, which has a negative impact on the quality of life of the local population (Smeral, 2019; Doxey, 1975; Postma & Schmuecker, 2017). Congestion, noise pollution and traffic problems all contribute to local dissatisfaction. Furthermore, the environmental damage caused by tourists, such as litter and overuse of resources, is a major concern for cities (Nilsson, 2020; Sadeghian, 2019; Anup, 2018).

Another contemporary issue that has emerged alongside the expansion of tourism is the rise of Airbnb and similar platforms, which have had significant impact on the accommodation market (Celata & Romano, 2020; Calle-Vaquero et al., 2021). Airbnb's economic impact on the tourism industry has positioned it as a significant competitor to the traditional hotel industry (Oskam & Boswijk, 2016; Zmyślony et al., 2020). Such platforms often fail to comply with relevant local regulations, which can lead to an increase in property prices and the displacement of local residents. The increase in short-term rentals has led to a corresponding decrease in long-term rentals in many urban centres, exacerbating the housing crisis to the detriment of local residents (Nilsson, 2020).

There is a direct and statistically significant relationship between house price growth and the likelihood of overtourism in residential areas, as shown by Such-Devesa et al. (2020) using two major Spanish cities (Madrid, Barcelona) as examples. In the context of sustainable tourism development in municipalities, the satisfaction of the local population must be given the highest priority (Oka et al., 2021; Goodwin, 2017), as otherwise conflicts may rise.

In essence, there are many market failures in the tourism sector, making regulation and strategic management essential for sustainability. Society and the environment, rather than tourists or service providers, bear the costs of

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negative externalities such as pollution, overcrowding, and overburdened infrastructure. If everyone has unrestricted access to public goods like beaches and monuments without contributing to their maintenance, excessive use can lead to degradation, a phenomenon known as the tragedy of the commons.

This issue is exacerbated by the lack of information available to tourists, who often remain unaware of the environmental impact of their travel choices or the sustainability of the destinations they visit. Furthermore, in certain segments of the tourism market -such as airlines, online booking platforms, and major hotel chains - monopolies and oligopolies can emerge, leading to reduced competition and potentially higher prices for consumers. Additionally, short-term rental platforms can contribute to housing crises in major tourist hubs, driving up rental prices and displacing local residents. Given these challenges, strong government regulation is necessary to balance economic benefits with social and environmental sustainability. Comprehensive analysis and performance rankings of tourism destinations can provide valuable insights, guiding policymakers in creating more sustainable and equitable tourism policies.

LITERATURE REVIEW

The high level of interest in certain destinations often leads to overcrowding of tourists, a phenomenon commonly referred to as overtourism (Remenyik et al., 2021). Overtourism refers to destinations where local people/guests perceive that the quality of life or experience in the area has deteriorated unacceptably due to the high number of tourists (Goodwin, 2016). A review of the international literature on the subject reveals that overtourism can be defined as a phenomenon of tourism and the presence of tourists to an extent that negatively affects and irritates the parties involved (locals and visitors or tourists) and contributes to conflicts and disagreements between them.

In the early years following the emergence of the overtourism phenomenon, these challenging issues seemed to be of greater concern to smaller destinations. The rationale was that the tourism industry was unable to cope with the increasing demand due to constraints on its carrying capacity. It was assumed that larger cities were better equipped to handle large crowds (mass tourism) and, consequently, overtourism was not considered to be a significant issue in their case (Bouchon & Rauscher, 2019). There is a notable lack of accurate statistical indicators to measure rural tourism. In many cases, evidence of excessive tourist interest in a particular area can be identified by the opposition expressed by local residents. It is clear that rural tourism accounts for a relatively small share of the total GDP generated by tourism, with tourist arrivals remaining significantly lower than those in large cities.

However, many villages threatened by overtourism still receive a significant number of visitors relative to their local population. A variety of attractions can attract tourists to these locations, including fishing villages – Corfu, Greece (Goodwin, 2016), traditional events – Venice, Italy (Visentin & Bertocchi, 2019), Christmas fairs – Meran, Italy (Brida et al., 2016) , film locations – Matamata, New Zealand (Zhang & Ryan, 2022), and places that have inspired films – Hallstatt, Austria (The New York Times, 17.01.2020,3), special natural treasures – Cinque Terre, Italy (Vegnuti, 2020), and unique architectural heritage – Mont Saint-Michel, France (Forbes, 25.06.2023, 1).

However, in the second half of the 2010s, based on the results of various studies (Peeters et al., 2018; Popescu et al., 2023; Amore et al., 2020; Nádasi et al., 2024; Smith et al., 2021), it became clear that urban destinations also faced a significant challenge of overtourism, which refers to an unsustainable level of tourism (Bouchon & Rauscher, 2019). Consequently, a range of studies are being conducted on the phenomenon of overtourism in both small destinations (Krajickova et al., 2022) and urban destinations (Dodds & Butler, 2024; Jover Báez & Díaz Parra, 2022).

Infrastructure in rural destinations is limited, employment opportunities are restricted, the economy is rapidly becoming one-sidedly dependent on tourism, and the supply of real estate is low (Drápela, 2023). These factors indicate that price rises will have a disproportionately negative effect on the local population. The issue of increasing house prices is further complicating by the increasing popularity of short-term rentals, which has led to a situation where local residents are unable to purchase homes or rent long-term properties due to the high cost (Gyódi, 2023; Smigiel, 2023). Congestion, infrastructure overload, increasing pressure on the environment, over-dependence on tourism, and rising house prices are all problems felt in both rural and urban destinations.

Wall (2020) confirmed that the phenomenon of overtourism is not a new, as a similar process has already been initiated. The author pointed to the example of American national parks, where carrying capacity assessment has a long-standing and well-documented history. It is relatively unusual in academic circles for experts to undertake comprehensive statistical analyses of tourism in urban areas around the world. Much of the research in this area was focused on specific countries or continents. Van Truong & Daisuke (2022) presented a study focusing on the phenomenon of overtourism in 12 European and 16 Asian cities that reported overtourism. The study used a combination of qualitative and quantitative indicators, including tourist density, tourism intensity, seasonal distribution of tourists, day-night distribution of tourists, and occupancy of accommodation facilities, to examine the impact of tourism on urban areas. A ranking was developed by comparing the excessive degree of overtourism and policy stringency. This ranking revealed that the group with a very excessive degree of tourists and high policy strictness consists of Dubrovnik, Venice, and Biei-cho.

In 2018, the UNWTO presented 11 strategies for the management of visitor flows to urban destinations. These strategies included dispersing tourists within cities, reducing seasonality, introducing new attractions, and the strengthening of communication with local residents and tourists.

In their 2022 study, Bąk and Brelik used a ranking system to assess the tourism function, level of development, intensity of tourism flows, and development of tourism in EU countries. The following indicators were used: The Defert index, which measures the number of beds per 100 permanent inhabitants, the Schneider index, which measures the number of nights per 100 permanent inhabitants, the Charvat index, which measures the number of nights per 100

permanent inhabitants, and the accommodation capacity utilisation rate, which measures the number of days spent per accommodation unit during the year; the accommodation development index, which is calculated as the ratio between the number of tourists and the number of beds; the tourism density index, which shows the number of tourists per km²; the accommodation density index, which shows the number of beds per 1 km² in the country. The analysis of the period between 2000 and 2019 showed that Cyprus and Malta were the most tourism-oriented countries. The authors also highlighted Hungary's rise in the ranking from 2000 to 2019. The change in ranking reflects not only the development of tourism infrastructure but also the high interest of tourists in the destinations concerned.

The tourism sector has also undergone a number of major changes in recent years, one of the main reasons being the COVID-19 crisis and the subsequent recovery process (Cehan & Iaţu, 2024; Stupariu et al., 2023). During the pandemic, tourism experienced an unprecedented low point, with the number of people employed in the industry dropping dramatically along with the number of tourists (Tomčíková et al., 2021; Pahrudin et al., 2022). Some communities recovered quickly, while others were slower to rebuild their economies (Rogerson & Rogerson, 2021). Among the many changes during the pandemic, it is important to note the shift in focus of tourists' travel preferences. Whereas previously the bucket list destinations were the most popular (e.g. sites visited by influencers (Tomazos, 2022)), the epidemic has led to an increase in the popularity of rural destinations, with certain regions experiencing a state of near overtourism as a result of increased presence of tourists (Steber & Mayer, 2024).

All this justifies the need for further time series analysis of tourism at the global level. A series of analyses have been carried out, distinguishing the municipalities under study according to whether they are overtourism sites, and, if so, the specific category of overtourism site to which they belong. This categorisation is based on the work of Peeters et al. (2018), who have enumerated the overtourism sites that have been identified on a global scale.

In the quantitative assessment of overtourism, tourism intensity and tourism density were the most commonly used metrics. As defined by Van Truong & Daisuke (2022), tourist intensity is the average number of tourists that a resident passively "receives" in a year. Tourism density is a geographical measure of the number of tourists per square kilometre (Manera & Valle, 2018). By using population-based and area-based indices, the research employed a methodology analogous to that of the tourism intensity and density indices. It is clear that such indicators were used in a similar way by other authors, for example, accommodation density (Simancas & Peñarrubia, 2019).

This study aims to identify the settlements most affected by tourism on a global scale and explore the factors driving these patterns. By analyzing various locations worldwide, the research offers insights into the spatial distribution of tourism activities and their changes over time. As global travel patterns continue to evolve due to economic, environmental, and technological shifts, understanding these dynamics is essential for sustainable tourism development and effective destination management. This study also aims to provide practical insights that support tourism professionals and policymakers in making informed decisions. By understanding the spatial distribution and driving forces of tourism, the research contributes to the development of strategies that promote sustainable destination management and responsible tourism practices.

MATERIALS AND METHODS

In the first stage of the analysis, variable clustering (VARCLUS) (Vigneau & Qannari, 2003) was employed to eliminate redundant dimensions and represent the data in a lower-dimensional space. The method is closely related to both principal component analysis and cluster analysis. The algorithm identifies groups of variables that exhibit the greatest possible correlation with one another and the least possible correlation with variables in other clusters. The objective of the procedure is to create latent components (optimal representatives) for each correlated set of variables as linear combinations of the given variables. The procedure initially uses a K-means (agglomerative) cluster analysis for an initial grouping, after which latent components are assigned to each cluster. In the final stage, new clusters are formed on the basis of the squared Pearson correlation coefficient between the variables and the latent component. The procedure is iterative and ends when the cluster structure has reached a state of stability.

The aggregation strategy is based on the observed variances and the merging of two clusters depends on the minimum decrease of the total explained variance after the aggregation. A major advantage of a VARCLUS over a simple Principal Component Analysis (PCA) is that the resulting structure is clearer and easier to interprete. Furthermore, Kruskal-Wallis analysis was applied to the latent components formed by VARCLUS in order to detect differences in latent component scores with regard to region, location, and type of overtourism. In addition, the authors attempted to develop a single, general index of overtourism that included all the variables studied. To this end, the authors also applied a simple PCA and formed a single principal component from all the overtourism indices.

In the second stage of the analysis, the factor analysis of mixed data (FAMD) technique (Pagès & Pagès, 2014) was used to create a map representing the locations together with both continuous and categorical data. The continuous data included international and domestic overnight visits, international and domestic nights in paid accommodation, and international and domestic travel spends. The categorical data included region: The regions of Africa, Asia, Australia, Europe, and North and South America were considered, as well as the type of overtourism, such as coastal, heritage, urban, and not-exposed. The map thus serves to highlight and summarise all the relationships that exist within the data set. All calculations were performed using the R 4.2.3 software (2023-03-15) (R Core Team, 2023).

All figures were created using R Studio 2022.02.2 (Build 485) and subsequently enhanced using Inkscape 1.0.1, a vectorised image editor. The FAMD was performed using the FactoMineR package. See Figure 1 for a summary of the methodology of primary and secondary research.

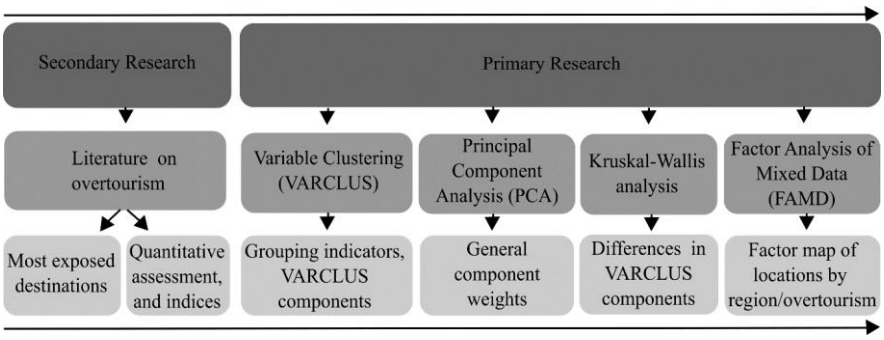

Figure 1. Flow chart of the methododlogy (Source: Authors)

RESULTS AND DISCUSSION

The VARCLUS method was applied with the objective of determining the clusters of the studied overtourism indicators and of forming latent components for each cluster, with the aim of reducing the dimensionality of the data. The VARCLUS method is a more practical approach to clustering overtourism indices, as it allows for the selection of the most correlated measures and the creation of subgroups and latent components from them. The initial cluster is subdivided into five distinct clusters, each comprising two or three indicators (Figure 2).

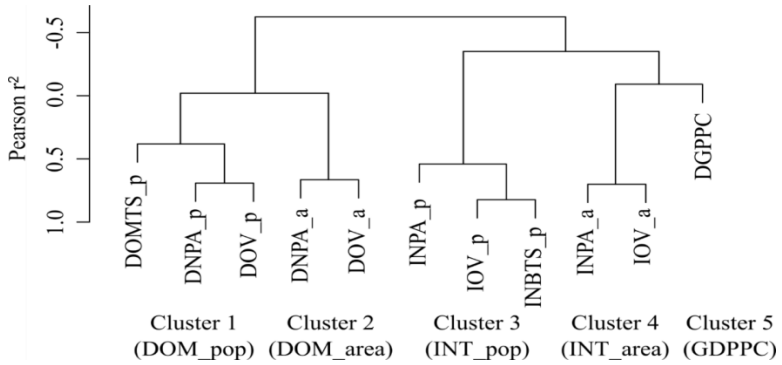

Figure 2. Cluster and correlation structure of the overtourism indicators (Source: Authors)

Note: Area based indices are denoted by „_a", population based indices are denoted by „_p". DNPA: Domestic Nights in Paid Accomodation; INPA: International Nights in Paid Accomodation; DOV: Domestic Overnight Visits; IOV: International Overnight Visits; DOMTS: Domestic Travel Spends; INBTS: Inbound Travel Spends; GDPPC: GDP per capita

Figure 2 illustrates the five clusters identified as exhibiting characteristics of overtourism. Domestic indices were calculated using area and population data and included in the first and second clusters. The third and fourth clusters comprise international indicators based on area and population. The final cluster comprises solely GDP per capita. The Pearson r-squared measure provides an indication of the degree of correlation between the indicators within a given cluster and the cluster's underlying latent component. Table 1 illustrates the five clusters and the correlation of each indicator with the cluster's latent component.

Table 1. Correlations of indicators with their own and next closest clusters, and general component weights (Source: Authors)

Cluster (explained variance%)***	**Type of claculation**	**Indicators**	Abbreviation	$r^2_{(OWN)}$	$r^2_{(CLOSEST)}$	**1-r² ratio***	**General component weights****
DOM_pop (82%)	Population based	Domestic Nights in Paid Accomodation	DNPA_p	0.897	0.304	0.149	0.741
		Domestic Overnight Visits	DOV_p	0.820	0.364	0.284	0.674
		Domestic Travel Spends (Million US dollars)	DOMTS_p	0.731	0.212	0.341	0.729
DOM_area (91%)	Area based	Domestic Nights in Paid Accomodation	DNPA_a	0.908	0.318	0.135	0.679
		Domestic Overnight Visits	DOV_a	0.908	0.330	0.138	0.671
INT_pop (88%)	Population based	International Nights in Paid Accomodation	INPA_p	0.810	0.035	0.197	0.516
		International Overnight Visits	IOV_p	0.915	0.199	0.106	0.629
		Inbound Travel Spend (Million US dollars)	INBTS_p	0.908	0.097	0.102	0.546
INT_area (92%)	Area based	International Nights in Paid Accomodation	INPA_a	0.919	0.156	0.097	0.567
		International Overnight Visits	IOV_a	0.919	0.133	0.094	0.570
GDPPC (100%)		GDP per capita (Billion US dollars)	GDPPC	1.000	0.047	0.000	0.262

*: 1- r^2 ratio is calculated according to formula (1), **: general component weights were calculated by PCA analysis, ***: Overall explained variance = 89%.

The method serves to identify the variables that have been assigned to each cluster. Furthermore, the indicators are selected for a given cluster in a manner that ensures the highest correlation with their own cluster $r^2_{(OWN)}$ and the lowest correlation with the closest clusters $r^2_{(CLOSEST)}$.

The 1 - r^2 ratio is calculated as follows (SAS Institute Inc., 2013):

$$1 - r^2\ ratio = \frac{1 - Pearson\ r^2_{(OWN)}}{1 - Pearson\ r^2_{(CLOSEST)}} \quad (1)$$

A given indicator is strongly correlated with its own cluster ($r^2_{(OWN)} \rightarrow 1$) and uncorrelated with the closest cluster ($r^2_{(CLOSEST)} \rightarrow 0$), thus the 1-$r^2$ ratio is close to 0 (Sanche & Lonergan, 2006).

Therefore, an indicator with the lowest 1 - r^2 value is likely to be the most representative for the cluster. The explanatory power of the clusters is considerable. The area-based clusters demonstrate relatively high proportions of variance explained, with 91% for domestic indicators and 92% for international indicators, respectively. The proportions of variance explained in the population-based clusters are comparatively lower, at 82% for domestic indicators and 88% for international indicators, respectively. In total, the latent components account for 89% of the variance. The correlation coefficients for each indicator exceed 0.7, indicating a stronger correlation with its corresponding latent component. The domestic indicators are related to the general overtourism indicator with a relatively larger weight. The population-based domestic nights in paid accommodations and domestic travel spending have the largest weights, with correlation coefficients of 0.741 and 0.729, respectively. The lowest weight (0.262) is attributed to GDP per capita on the general component. The VARCLUS clustering results yielded five synthetic components, created according to the given indicator clusters. Consequently, each VARCLUS component represents a distinct cluster of indicators with a single score. These components are more disparate and easier to interpret than the rotated principal components, which is the primary advantage of the VARCLUS method.

Figure 3. examines the pattern of overtourism in different locations by calculating the average VARCLUS component scores for each group. In coastal areas and islands, international population-based indicators are high, as well as the general overtourism component. However, the other indicators have lower values. In urban areas, GDP per capita is higher, and the general overtourism component and international area-based indicators are the highest. In the case of heritage and attraction sites, the international indicators are relatively modest, while the domestic indicators are the lowest. The Kruskal-Wallis analysis revealed a statistically significant difference for all studied indicators at the 5% significance level.

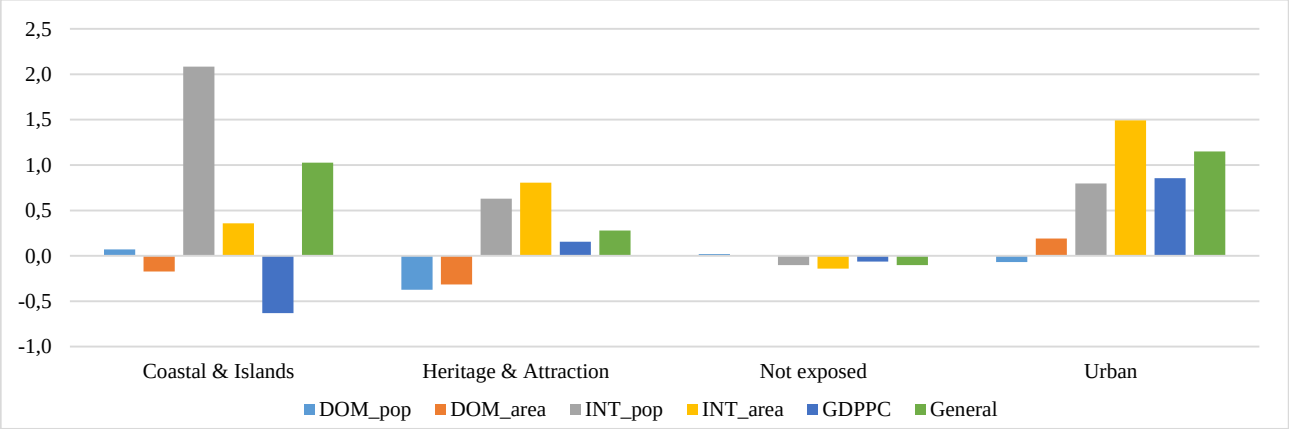

Figure 3. Differences in VARCLUS components by the type of overtourism. (Source: Authors)

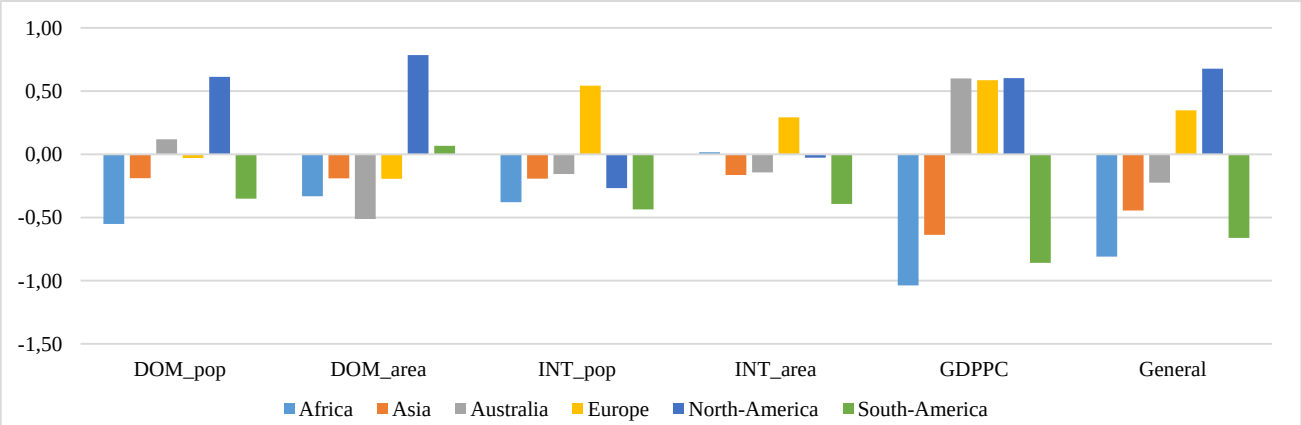

Figure 4. Differences in VARCLUS components by region. (Source: Authors)

Figure 4 illustrates the mean VARCLUS component scores for each region. In particular, North America exhibits relatively high domestic indicators, including area- and population-based metrics, as well as GDP per capita. However, other indicators display lower values. In Europe, locations with higher GDP per capita tend to demonstrate the highest international population-based indicators and a notable general component, largely due to coastal and heritage locations. Heritage and attraction sites exhibit modest international indicators, while domestic indicators remain low. The Kruskal-Wallis analysis revealed a statistically significant difference for all studied indicators at the 5% significance level.

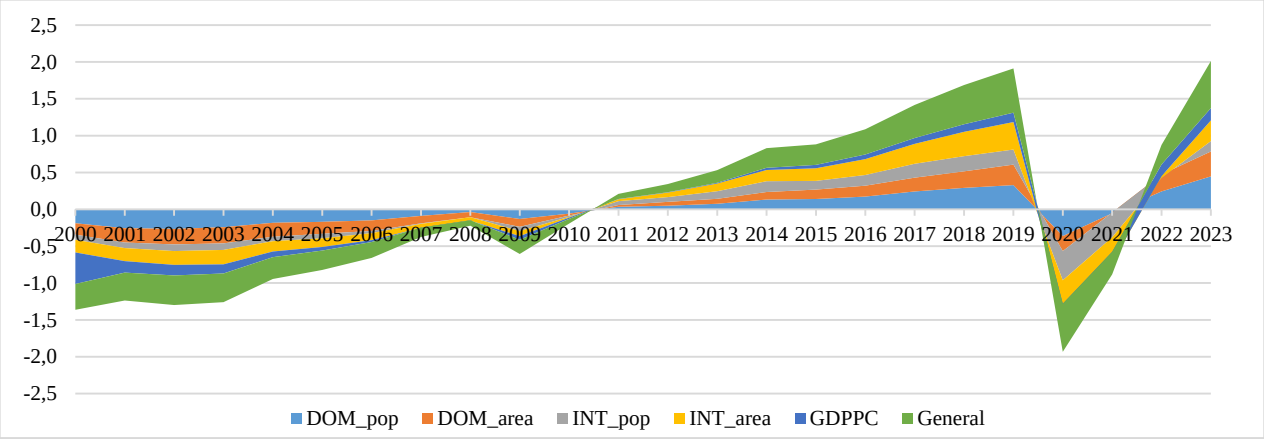

Figure 5. Development of VARCLUS components by year. (Source: Authors)

There is a consistent upward trend in all indicator groups until 2019, when a sudden shift occurs due to the impact of the global pandemic (Figure 5). It is evident that following the pandemic, international tourism recovers from the initial shock and resumes its pre-crisis trend. Figure 6 and 7 presents the results from the FAMD and highlight the main relationships within the data set from different viewpoints (with respect to region and type of overtourism).

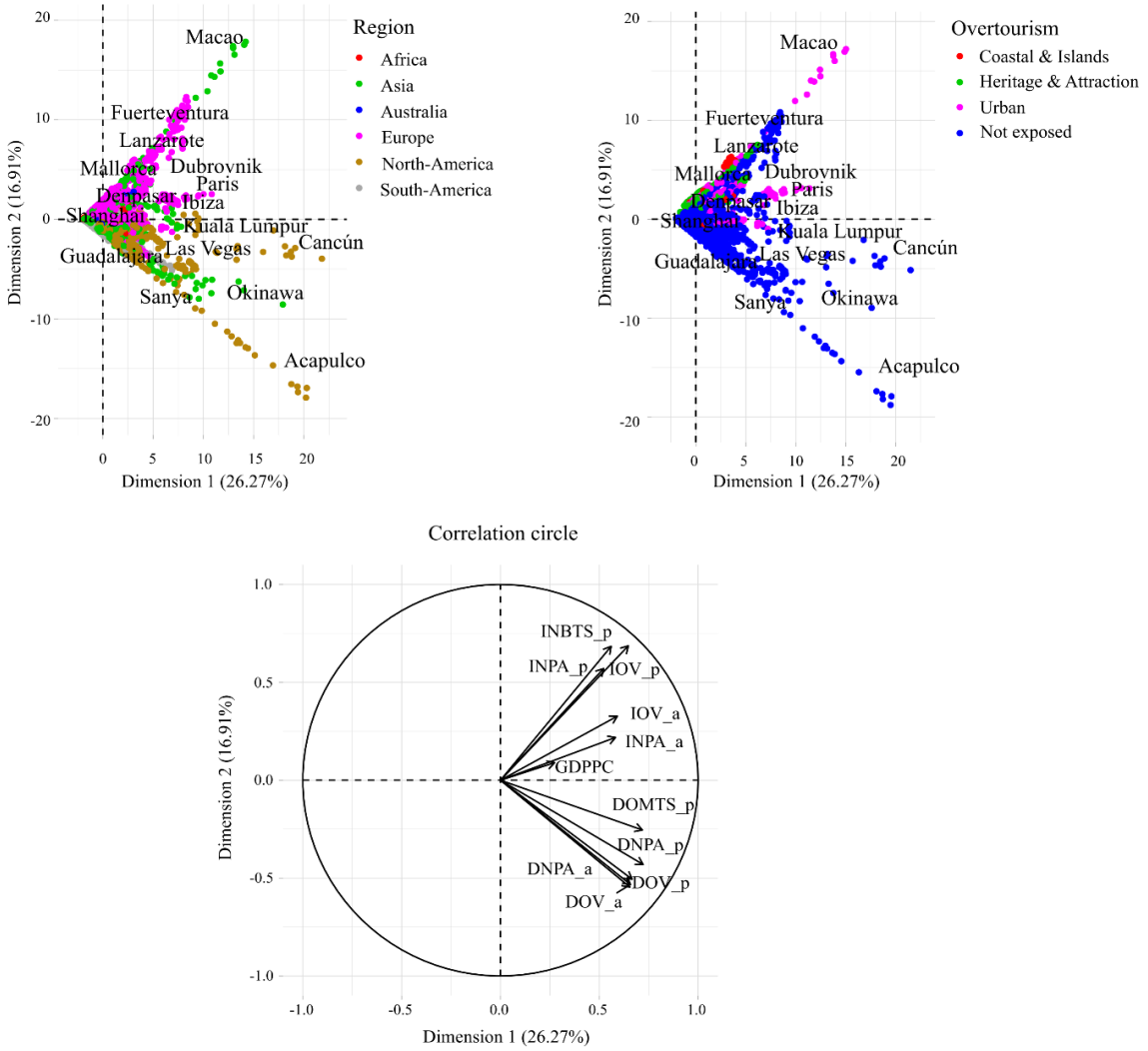

Figure 6. Correlation circle and factor map (dimension 1 and 2) of the locations by region and type of overtourism. (Source: Authors)

The first two dimensions accounted for 43.2% of the total variance (Figure 6). The first dimension accounts for the largest proportion of the variance (26.27%) and can be interpreted as a tourism intensity index. This is due to its relationship with both international and domestic indicators, which are based on area and population data. The second dimension separates the international indicators, which are located in the first quadrant, from the domestic indicators, which are located in the fourth quadrant. As illustrated in the factor map, the first quadrant comprises a significant number

of European destinations, including Mallorca, Lanzarote, Fuerteventura, Dubrovnik, Paris and Ibiza. Additionally, it features several Asian locations, such as Macao, Denpasar and Shanghai. These are primarily heritage, urban and coastal types. These locations are most affected by high international interest. The fourth quadrant comprises North and South American locations (Acapulco, Cancún, Guadalajara, Las Vegas) and some Asian locations (Kuala Lumpur, Sanya, Okinawa) with higher domestic interest and less exposure to overtourism.

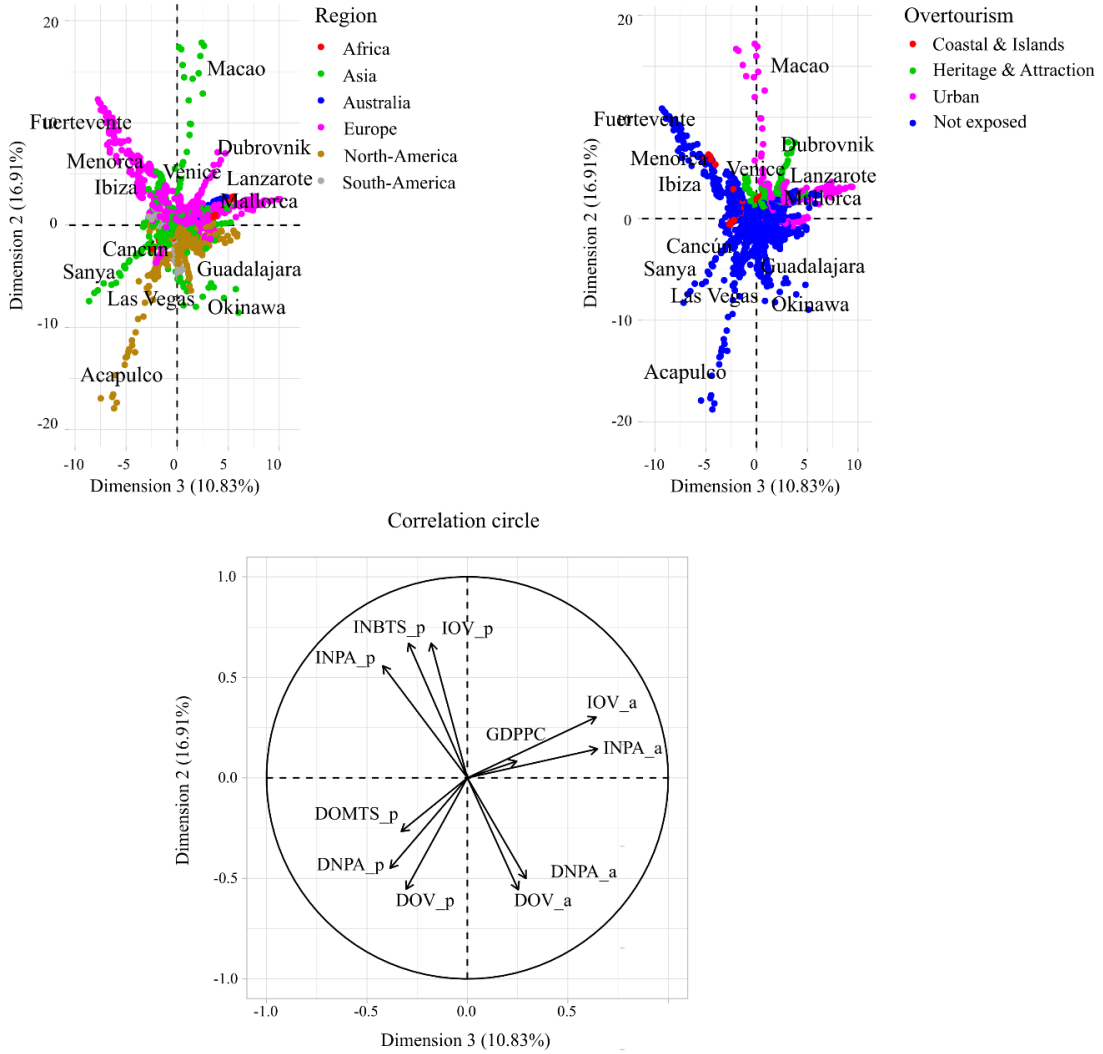

Figure 7. correlation circle and factor map (dimension 2 and 3) of the locations by region and type of overtourism (Source: Authors)

The third dimension was also investigated, and it explained a reasonable amount of variance (10.83%). The first three dimensions collectively explained 54% of the variance (Figure 7). It is crucial to create a factor map with these two dimensions, as this enables the VARCLUS components to be clearly distinguished. The first quadrant comprises area-based international indicators (INT_area cluster), while the second quadrant represents population-based international measures (INT_pop cluster). The third cluster comprises population-based domestic indicators (DOM_pop cluster), while the fourth quadrant is associated with area-based domestic indicators (DOM_area cluster). The second dimension allows for the separation of international and domestic indicators. The third dimension provides further differentiation between area-based and population-based indicators. It is evident that European coastal locations and islands, such as Mallorca, are the most affected by a relatively higher international interest compared to their population. It is also notable that Asian urban sites, such as Macao, experience a relatively higher level of international interest compared to both their area and population. The domestic area-based indicators are the largest for North American urban sites (Guadalajara) and some Asian locations (Okinawa) not exposed to overtourism. In contrast, the population-based domestic indicators are the largest for North American (Las Vegas, Acapulco, Cancún) and Asian (Sanya) locations not exposed to overtourism.

Table 2 provides the best and worst locations with respect to the given VARCLUS component (the ten cities attaining the highest and lowest scores for each indicator). Macao attained the highest score on the general indicator, whilst Malacca positioned at the lowest rank (–1.65).The findings indicate that the highest-ranking cities, including Las Vegas, Okinawa and Paris, are typically tourist hotspots that attract visitors from both domestic and international markets. Conversely, cities such as Nairobi and Hyderabad received lower scores and are considered less appealing tourist destinations. In terms of domestic overnight stays per population (DOM pop), Las Vegas demonstrates the highest level of strength (8.12), while Malacca and Luanda exhibit the lowest scores (1.11).

Table 2. The 10 locations with the highest and lowest VARCLUS component scores (Source: Authors)

Location	General indicator	Location	DOM _pop	Location	DOM _area	Location	INT _pop	Location	INT _area
Macao	7.91	Las Vegas	8.12	Okinawa (JP)	10.13	Fuerteventura (ES)	13.14	Paris (FR)	9.91
Las Vegas	7.87	Acapulco (MX)	7.44	Guadalajara (MX)	5.74	Lanzarote (ES)	12.16	Macao	6.67
Okinawa (JP)	7.65	Cancún (MX)	4.78	Acapulco (MX)	4.91	Macao	11.48	Geneva (CH)	6.64
Paris (FR)	7.52	Adelaide (AU)	4.35	Las Vegas	4.50	Ibiza-Formentera (ES)	8.11	Miami	3.89
Lanzarote (ES)	7.06	Okinawa (JP)	3.87	Miami	4.05	Mallorca (ES)	6.37	Dubrovnik (HR)	3.52
Fuerteventura (ES)	6.71	Orlando	3.21	Paris (FR)	3.82	Menorca (ES)	5.44	Kuala Lumpur (MY)	3.37
Acapulco (MX)	6.56	Edinburgh (UK)	3.17	Mexico City (MX)	3.45	Dubai (AE)	4.21	Dublin (IE)	3.07
Cancún (MX)	6.16	Kuala Lumpur (MY)	2.69	Orlando	2.85	Mecca (SA)	3.84	Lisbon (PT)	3.00
Kuala Lumpur (MY)	4.96	Lanzarote (ES)	2.67	Osaka (JP)	2.76	Gran Canaria (ES)	2.82	Bucharest (RO)	2.97
Ibiza-Formentera (ES)	4.51	Honolulu	2.35	Cancún (MX)	2.40	Dubrovnik (HR)	2.73	Nice-Cannes (FR)	2.94
Malacca (MY)	-1.65	Malacca (MY)	-1.11	Malacca (MY)	-0.74	Dhaka (BD)	-0.59	Ehime (JP)	-0.61
Nairobi (KE)	-1.61	Luanda (AO)	-1.11	Manaus (BR)	-0.74	Karachi (PK)	-0.58	Miyagi (JP)	-0.61
Izmir (TR)	-1.58	Kolkata (IN)	-1.08	Izmir (TR)	-0.74	Kolkata (IN)	-0.58	El Hierro (ES)	-0.61
Daegu (KR)	-1.58	Dakar (SN)	-1.07	El Hierro (ES)	-0.74	Nairobi (KE)	-0.58	Izmir (TR)	-0.61
Dar Es Salaam (TZ)	-1.58	Ljubljana (SI)	-1.07	Ljubljana (SI)	-0.73	Lagos (NG)	-0.58	Manaus (BR)	-0.61
Manaus (BR)	-1.56	Lille (FR)	-1.07	La Palma (ES)	-0.73	Daegu (KR)	-0.58	Chengdu	-0.61
La Paz (BO)	-1.54	Daegu (KR)	-1.06	La Gomera (ES)	-0.73	Lahore (PK)	-0.58	Jinan	-0.61
Luanda (AO)	-1.53	Kuwait City (KW)	-1.05	Fuerteventura (ES)	-0.73	Curitiba (BR)	-0.57	Daegu (KR)	-0.60
Hyderabad (IN)	-1.52	Manila (PH)	-1.05	Panama City (PA)	-0.72	Malacca (MY)	-0.57	Oklahoma City	-0.60
Belgrade (RS)	-1.48	Colombo (LK)	-1.04	Daegu (KR)	-0.72	Niigata (JP)	-0.57	Brasília (BR)	-0.60

This indicates that Las Vegas, Acapulco and Cancún are particularly appealing to domestic tourists, while cities with lower scores experience a reduced level of domestic visitor attraction. In the international guest nights per population (INT pop) dimension, Fuerteventura scored the highest (13.14) and Dhaka the lowest (-0.59), suggesting that high scoring destinations (e.g. : Canary Islands, Macao, Balearic Islands, Dubai, Mecca and Dubrovnik) are particularly popular destinations for international tourists, while destinations at the other end of the list (e.g. Dhaka, Karachi, Kolkata and Nairobi) attract fewer foreign visitors. In terms of international tourist nights per INT area, Paris leads the field (9.91), while Ehime is at the bottom of the list (-0.61). This finding serves to reinforce the preeminent international tourist appeal of world cities such as Paris, Macao, Geneva, and Dubrovnik, while cities such as Ehime and Miyagi exhibit comparatively diminished global tourism significance. The comprehensive analysis underscores the economic development and international popularity of high-scoring cities like Paris, Las Vegas, and Okinawa. Cities with lower levels of development and international reputation find themselves less competitive in the global tourism market.

CONCLUSION

The application of the VARCLUS method effectively identified five distinct clusters of overtourism indicators, each represented by latent components that facilitate the interpretation of the data. These components demonstrated a strong explanatory power, accounting for 89% of the variance, with high correlations between the indicators and their respective clusters. The analysis revealed notable regional and typological patterns, highlighting the dominance of international indicators in European coastal and heritage sites and domestic indicators in North American and Asian urban locations. Additionally, the results underlined the impact of area- and population-based metrics in distinguishing overtourism dynamics. The VARCLUS ranking indicates that high-scoring cities, including Paris, Las Vegas and Okinawa, are prominent tourist destinations both domestically and internationally. These cities demonstrate a strong attractiveness in terms of both the number of nights spent in tourist accommodation per capita and the area based indicators. In contrast, low-scoring cities, which are typically characterised by less developed economies, play a less significant role in tourism. The results provided a robust framework for analyzing overtourism patterns and suggest that the VARCLUS method offers a practical and interpretable alternative to traditional approaches to clustering complex tourism data.

As unique factors also play a key role in the perception of being involved in overtourism, it is difficult to express it with different aggregate indicators. The utilisation of a time series approach allowed for the identification of trends, thereby focusing on dynamic processes as opposed to cross-sectional analysis. The present analysis also made it possible to separate the congestion caused by domestic and foreign visitors. This phenomenon also has economic policy implications, highlighting the need for different regulatory mechanisms for domestic and inbound tourism. In European coastal and heritage destinations such as Mallorca, Dubrovnik or Venice, where the balance between international and domestic tourism has been severely disturbed, third-degree price discrimination against foreign visitors can be applied.

In the context of such settlements, it may be worth considering the introduction of "sustainability taxes" or "heritage preservation fees" for visitors, with the proceeds going towards site maintenance and infrastructure improvements. The

focus should be placed on visitor regulation, conservation and dynamic pricing in order to protect fragile resources and ensure sustainability. In North American and Asian urban locations, the focus should be on urban planning, infrastructure regulation, and congestion management to support growing domestic tourism while maintaining the quality of life for local resident. There is also a need to balance the growth of tourism with the improvement of urban liveability. There is a need to strenghten infrastructure and to provide support for sustainable domestic tourism.

Limitations

A number of limitations were identified throughout the research process. The analysis included data from 255 municipalities, but the global scope of the study did not allow for a more detailed examination. The time constraints imposed by the study period (2000-2023) precluded the observation of long-term trends, but it does provide a comprehensive insight into developments in the 21st century. A longer study period could provide a deeper insight into the phenomena studied. The research relied on findings published by other authors several times, such as the classification of overtourism categories by Peeters et al. (2018) and the identification of overtourism locations as given in their research.

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