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FOREST-BASED ECOTOURISM IN INDONESIA: A COMPREHENSIVE REVIEW OF POLICY CHALLENGES, DIVERSE PRACTICES, STAKEHOLDER ENGAGEMENT, CONSERVATION EFFORTS, AND SOCIOECONOMIC ASPECTS

Moh. Andika LAWASI [1*], Ndoheba KENDA [1], Tri Rizkiana YUSNIKUSUMAH [2], Boby Bagja PRATAMA [3], Dian PRATIWI [2], Ane Dwi SEPTINA [4], Enkin ASRAWIJAYA [1]

[1] National Research and Innovation Agency (BRIN), Research Center for Society and Culture, Jakarta, Indonesia; andika.lawasi@gmail.com, moha072@brin.go.id (M.A.L.); ndoh001@brin.go.id (N.K.); enki001@brin.go.id (E.A.)
[2] National Research and Innovation Agency (BRIN), Research Center for Ecology and Ethnobiology, Bogor, Indonesia; trir005@brin.go.id (T.R.Y.); dian078@brin.go.id (D.P.)
[3] National Research and Innovation Agency (BRIN), Research Center for Conservation of Marine and Inland Water Resources, Bogor, Indonesia; boby002@brin.go.id (B.B.P.)
[4] National Research and Innovation Agency (BRIN), Research Center for Population, Jakarta, Indonesia; anedwiseptina@gmail.com (A.D.S.)

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Abstract: Forest-based ecotourism in Indonesia has great potential to support conservation and economic growth. However, the multidimensional dynamics surrounding it remain poorly mapped. This study fills this gap by conducting a comprehensive literature review of 71 articles from Scopus and Google Scholar (2014–2024) and critically examining several key dimensions, including the interplay between policy issues, management practices, stakeholder engagement, conservation initiatives, and socio-economic impacts. Findings show that previous research remains fragmented on partial aspects such as policy issues (overlapping regulations), inconsistencies in management practices, and inequalities in stakeholder participation. While forest-based ecotourism can enhance community livelihoods and biodiversity protection (particularly in mangroves, tropical rainforests, and peri-urban settings), its development is hindered by fragmented governance, infrastructure disparities (notably between western-central and eastern regions), land tenure conflicts, urbanization, and stakeholder disputes. The study also identified three important policy pillars from the literature synthesis: (1) collaborative adaptive governance through a penta-helix approach (government, community, academia, private sector, media); (2) incentive-based eco-label certification schemes for sustainable practices such as waste management and habitat restoration; (3) environmental education programs for tourists and operators. In addition, the review highlights the importance of spatial justice, participatory planning, and ecological carrying capacity, especially in mangrove and forest village contexts. Local culture, wellness-based tourism, and conservation education are also identified as transformative elements for long-term sustainability. Empirical examples show how diversified ecotourism models (from urban forests to wildlife-based tourism) can promote inclusive development and local resilience. Community empowerment, benefit-sharing, and green infrastructure investment are repeatedly emphasized as drivers of sustainability. The conclusion confirms that the success of forest-based ecotourism depends on balancing ecological regeneration and tourism use. Multidimensional policy synergies are needed to position ecotourism as a catalyst for achieving the Sustainable Development Goals (SDGs), particularly biodiversity conservation and poverty alleviation.

Keywords: forest-based ecotourism, sustainable tourism, forest conservation, cultural heritage, literature review

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INTRODUCTION

In recent years, Indonesia has witnessed a notable advancement in its forest-based ecotourism sector, coinciding with the mounting recognition among the global community of the paramount significance of environmental conservation (Insani et al., 2024). Indonesia, which is among the top 10 countries worldwide in terms of forest area, has also been identified as one of the 10 countries with the highest potential for ecotourism development. This potential is evidenced by the presence of 172 ecotourism sites dispersed across numerous islands, including Sumatra, Jawa, Kalimantan, Bali, Nusa Tenggara, and Papua (Sisriany & Furuya, 2024). A significant proportion of these sites are situated within protected areas, such as national parks and protected forests, which are home to a diverse array of endemic species. While this growth in ecotourism offers considerable promise, it also poses a critical question: how can these forest areas, which possess high ecological value, be managed sustainably without repeating the exploitative mistakes of the past?

The paradigm shifts in forest management, from the exploitation of timber products to the utilization of environmental services, position forest-based ecotourism as a strategic option. This transition is not solely driven by economic interests to

* Corresponding author

augment regional income, but also by the imperative to preserve biodiversity (Sisriany & Furuya, 2024). This concept is in alignment with global trends that currently support movements to restore ecosystem functions as the primary life support system and to encourage the creation of opportunities for local communities to be more involved in the maintenance and utilization of forests in a responsible manner (Ginantra et al., 2021; Mulyadi & Hamidy, 2021).

The involvement of local communities in forest management under the paradigm of ecotourism has the potential to yield multifaceted impacts and benefits, encompassing not only environmental sustainability but also the optimization of local cultural potential. For instance, communities situated in forest areas can leverage their indigenous knowledge and expertise to offer services as traditional tour guides, provide accommodations imbued with local cultural nuances, and promote and market local handicrafts (Ernawati et al., 2018). This, in turn, is expected to positively impact on the sustainability of local culture, which is anticipated to become the focal point of ecotourism, bolstered by the distinctiveness of the surrounding landscape. However, it is crucial to judiciously balance the imperatives of cultural preservation and tourism. In certain locales, concerns have been raised that the high influx of tourism may result in the excessive modification of cultural practices, thereby jeopardizing the authenticity of local traditions (Andarani et al., 2018).

The challenges are further compounded when associated with environmental aspects, as ecotourism activities must not only address cultural dynamics, but also ensure ecological sustainability. Well-managed tourism activities can serve as a viable alternative livelihood, thereby deterring destructive practices such as illegal logging and hunting (Hartanti et al., 2018). However, in certain regions, the implementation of environmental sustainability principles remains underdeveloped due to inadequate regulations and oversight (Yarhamdhani et al., 2024). Adverse consequences such as erosion, sedimentation, and water contamination persist in ecotourism destinations that demonstrate insufficient regard for environmental capacity and are inadequately managed.

Within the context of governance, forest-based ecotourism in Indonesia still confronts numerous structural challenges. The various institutions involved in forest management, ranging from the central government and local governments to conservation agencies, can trigger overlapping policies and slow down the coordination process (Hengky & Kikvidze, 2018; Satyatama et al., 2020). On the other hand, community participation is uneven due to varying managerial capacity and conservation literacy. These constraints are further compounded by external pressures, including climate change, natural disasters, and competition with more advanced overseas nature tourism destinations (Sumarmi et al., 2022).

While the potential of forest-based ecotourism in Indonesia to support conservation and stimulate local economies is evident (Insani et al., 2024; Sisriany & Furuya, 2024), the multidimensional dynamics surrounding it have yet to be comprehensively mapped. Prior studies have identified several aspects, including policy issues (Hengky & Kikvidze, 2018; Satyatama et al., 2020), inconsistencies in management methods (Ginantra et al., 2021; Yarhamdhani et al., 2024), and inequalities in stakeholder engagement (Ernawati et al., 2018; Sumarmi et al., 2022). However, there is a paucity of research that systematically links the various dimensions of policy, field practice, stakeholder engagement, conservation initiatives, socio-economic impacts, and the integration of local wisdom in governance. Indeed, the interaction between these factors is critical to understanding the long-term sustainability of forest-based ecotourism (Sisriany & Furuya, 2024; Zainal et al., 2024).

Therefore, this article seeks to systematically outline and analyze the evolution of forest-based ecotourism in Indonesia through a critical review of various existing field studies to understand several aspects, including policy challenges that hinder cross-sector coordination, such as regulatory overlaps and suboptimal institutional capacity; analyzing the diversity of practices in ecotourism management, including community-based models, mangroves, urban forests, and local wisdom, as well as identifying the driving and inhibiting factors; evaluating the level of stakeholder engagement, particularly the role of local communities, local governments, and NGOs, in designing inclusive and equitable ecotourism schemes, considering the dynamics of resource conflict; assessing the effectiveness of conservation efforts integrated with ecotourism activities, including mitigating environmental impacts such as erosion, changes in forest cover, and urbanization pressure; as well as measuring the socioeconomic contributions of forest ecotourism to community welfare, and the tensions between cultural commercialization, unequal benefit distribution, and the preservation of local wisdom.

MATERIALS AND METHODS

The method used in this study is a literature review (Snyder, 2019) aimed not only at comprehensively understanding the development of research on forest-based ecotourism in Indonesia but also at critically evaluating and synthesizing the existing body of work. This approach began with a systematic search of two primary databases, Scopus and Google Scholar (GS), to optimize the breadth of scientific resources. The technical specifications of the document search are presented in Table 1 and 2 below.

Table 1. Summary of document search and selection in Scopus

Parameters	Note
Keywords	forest AND ecotourism AND Indonesia
Boolean Search Query	TITLE-ABS-KEY(forest AND ecotourism AND Indonesia) AND PUBYEAR > 2013 AND PUBYEAR < 2025 AND (LIMIT-TO (EXACTKEYWORD,"Ecotourism") OR LIMIT-TO (EXACTKEYWORD,"Tourism Development") OR LIMIT-TO (EXACTKEYWORD,"Sustainable Tourism") OR LIMIT-TO (EXACTKEYWORD,"Tourism Management") OR LIMIT-TO (EXACTKEYWORD,"Tourist Destination") OR LIMIT-TO (EXACTKEYWORD,"Eco-tourism Areas") OR LIMIT-TO (EXACTKEYWORD,"Ecotourism Management") OR LIMIT-TO (EXACTKEYWORD,"Eco-tourism") OR LIMIT-TO (EXACTKEYWORD,"Tourism Village") OR LIMIT-TO (EXACTKEYWORD,"Community-based Tourism")
Range	2014–2024
Document Founds	**73 articles**

Table 2. Stages of document search and selection in Google Scholar

Search Stages	Numb. of Documents
First screening by keywords "ecotourism in Indonesia"	96.300
Unchecked Citation	83.500
Citation range (2014–2024)	17.900
Screening title	320
Screening title (with at least one word 'forest')	25
Results	**25 articles**

Subsequently, from the total of 98 gathered articles (73 from scopus, 25 from GS), exclusion criteria were implemented to eliminate duplication/redundancy, exclude studies that do not explicitly address forest ecotourism, and discard articles that concentrate solely on narrow facets (such as laboratory studies or specific biological entities) that lack relevance. After that process, the number of articles that satisfied the final criteria totaled 71. The data were examined using descriptive and qualitative methods and are reported in the subsequent section (see Figure 1).

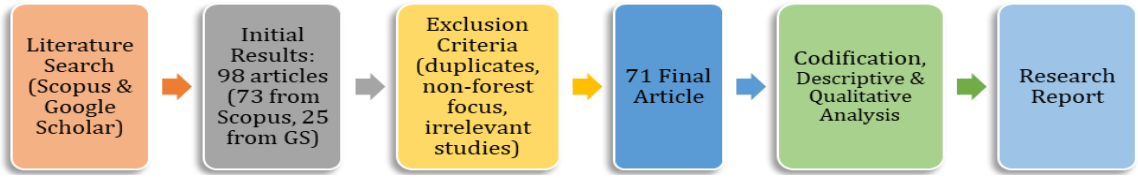

Figure 1. Steps of conducting reviews

RESULTS AND DISCUSSION

1. Challenges and Policy Dynamics

1.1. Challenges and Strategies for Developing Forest-Based Ecotourism

The development of forest-based ecotourism in Indonesia shows various interconnected challenges and development strategies. Table 3 below summarizes the main aspects that emerge in the literature review, including regional disparities, infrastructure limitations, stakeholder conflicts, and the need for an integrated approach.

Table 3. Challenges and strategies in developing forest-based ecotourim in Indonesia (Source: Literature review by authors, 2024)

Challenges and Strategies	Description	Locus	References
Regional Disparities in Forest-Based Ecotourism Development	Development progresses more swiftly in the Eastern region (Papua, Nusa Tenggara) than in the Western and Central regions	Papua, Nusa Tenggara	(Anggraini & Gunawan, 2021; Sisriany & Furuya, 2024)
Limitations of Infrastructure and Facilities	The lack of accessibility, sanitary restrooms, parking facilities, secure hiking trails, and similar amenities diminishes the attractiveness.	Remote ecotourism location	(Ali et al., 2021; Ambarita et al., 2018; Anggraini & Gunawan, 2021; Ariyani & Fauzi, 2022; Basyuni et al., 2018; Harahap & Effendi, 2020; Notohamijoyo et al., 2020; Prihadi et al., 2024; Purwoko et al., 2023; Sulistyorini et al., 2022)
Disaster-Prone Area	Mangrove coastlines are threatened by erosion, requiring a comprehensive mitigation strategy	Mangrove coast	(Insani et al., 2024; Wardhani et al., 2022)
Stakeholder Conflicts	The vagueness of licenses and land disputes among the community, government, and private sector impact conservation and economic allocation.	Multi-stakeholder forest area	(Abdillah, 2023; Hartoyo et al., 2021; Hitchner et al., 2009; Yarhamdhani et al., 2024; Yuwono et al., 2021)
Urbanization and Land Use Change	Urbanization and the increase in tourists without regulation reduce environmental carrying capacity.	Bogor Botanical Garden; Mangrove Bedul, East Java)	(Hengky & Kikvidze, 2018; Sumarmi et al., 2024)
Lack of Environmental Education for Visitors	The lack of education increases the risk of ecosystem degradation in vulnerable areas.	Ecologically sensitive ecotourism destination.	(Afifah et al., 2023; Hakim & Soemarno, 2017; Novianti et al., 2022; Siahaya et al., 2021)
Community-Based Management	The participation of BUMDes and the local community enhances welfare and environmental conservation.	Berjo Village, Central Java	(Fibrianto, 2020)
Development of Eco-Friendly Facilities	Birdwatching towers, educational trails, and information centers support both attraction and conservation.	Destination with interpretation facilities	(Anggraini & Gunawan, 2021; Askar et al., 2021; Harahap & Effendi, 2020; Rahmila & Halim, 2018; Vipriyanti et al., 2024)
Training Program for the Local Community	Training to enhances the capacity for professional destination management	Community around the ecotourism destination	(Arkwright & Kaomaneng, 2018; Setiawan et al., 2021)
Diversification of Tourism Products	The integration of conservation with attractions (tracking, birdwatching) supports biodiversity and tourist appeal.	Bandar Bakau (mangrove); Oelsonbai Forest	(Arfan et al., 2021; Aryantie et al., 2023; Maulana & Pratama, 2021; Mulyadi & Hamidy, 2021)

Challenges and Strategies	Description	Locus	References
The Need for an Integrated Environ-mental-Social Approach	An integrated approach is required that thoroughly addresses environmental and social dimensions	All forest ecotourism development areas	(Farid et al., 2023; Mulyadi & Hamidy, 2021)

Table 3 indicates that the advancement of the forest ecotourism sector in Indonesia exhibits considerable regional disparities. Forest-based ecotourism is more prominent in Eastern Indonesia, particularly in Papua and Nusa Tenggara, than in the Western and Central regions (Anggraini & Gunawan, 2021), despite its comparatively underdeveloped infrastructure. This mismatch not only indicates variations in the emphasis on forest tourist development but also underscores the need for enhanced focus on forest ecosystem management in areas susceptible to deforestation concerns (Sisriany & Furuya, 2024). In general, forest-based ecotourism in Indonesia still encounters numerous intricate obstacles that require significant attention to ensure its sustainability. A primary obstacle is the inadequate support services and tourism/public amenities that impede visitor access to ecotourism sites, particularly in rural areas (Ambarita et al., 2018; Anggraini & Gunawan, 2021; Ariyani & Fauzi, 2022; Basyuni et al., 2018; Notohamijoyo et al., 2020; Purwoko et al., 2023). The absence of public amenities, including sanitary restrooms, parking spaces, and secure trekking routes, aggravates this condition and diminishes the appeal of tourist locations (Ali et al., 2021; Harahap & Effendi, 2020; Prihadi et al., 2024; Sulistyorini et al., 2022). Moreover, disaster-prone areas, including mangrove coastlines at risk of erosion, necessitate thorough mitigation techniques to attain sustainable ecotourism development (Insani et al., 2024; Wardhani et al., 2022). This underscores the pressing necessity for a comprehensive strategy that incorporates environmental and socioeconomic dimensions (Farid et al., 2023; Mulyadi & Hamidy, 2021). Consequently, sustainable infrastructure is essential for facilitating forest-based ecotourism (Anggraini & Gunawan, 2021; Askar et al., 2021; Rahmila & Halim, 2018).

In addition to infrastructure issues, stakeholder conflicts present a substantial obstacle in the management of forest land for ecotourism. The vagueness of permits and land disputes frequently engenders tensions among local populations, the government, and private enterprises. This circumstance impacts the inequitable allocation of revenue and undermines the efficacy of conservation initiatives aimed at safeguarding these regions (Abdillah et al., 2023; Hitchner et al., 2009; Yarhamdhani et al., 2024). The absence of governance coordination further hinders the advancement of ecotourism, particularly in conservation zones of significant biological importance (Hartoyo et al., 2021; Yuwono et al., 2021). This conflict highlights the need for a more integrative management approach to address diverse interests.

Moreover, urbanization around ecotourism destinations adds pressure to the local ecosystem. Land use changes due to urbanization and the increase in the number of tourists, not matched by strict regulations, impact the environmental carrying capacity. Urbanization impacts habitat quality in the Bogor Botanical Gardens, whereas the significant influx of tourists in the Bedul mangrove areas of East Java results in ecosystem degradation (Hengky & Kikvidze, 2018; Sumarmi et al., 2024). The absence of educational initiatives for visitors regarding the significance of environmental preservation exacerbates the threat of ecosystem degradation, particularly in sensitive areas (Afifah et al., 2023; Hakim & Soemarno, 2017; Novianti et al., 2022; Siahaya et al., 2021). Multiple development initiatives have been employed to address this difficulty and improve ecotourism's sustainability. A notable strategy is community-based management, exemplified in Berjo Village, Central Java, where Badan Usaha Milik Desa (BUMDes) actively oversees tourist areas. This approach can substantially enhance the welfare of the local people while prioritizing environmental conservation as a fundamental aspect of ecotourism management (Fibrianto, 2020). In addition, establishing facilities such as educational pathways and information centers has shown to be an effective strategy for attracting tourists while preserving the ecosystem (Harahap & Effendi, 2020; Vipriyanti et al., 2024). Furthermore, training initiatives for the local community also enhance human resource capability for professional destination management (Arkwright & Kaomaneng, 2018; Setiawan et al., 2021).

The ecotourism development approach encompasses the diversification of tourism offerings. One example is disaster mitigation-based mangrove ecotourism in Bandar Bakau, which integrates mangrove conservation with tourist attractions such as trekking and environmental education (Arfan et al., 2021; Mulyadi & Hamidy, 2021). Another example is the growth of birdwatching tourism in Oelsonbai Forest, which promotes visitor appeal and supports biodiversity conservation (Aryantie et al., 2023; Maulana & Pratama, 2021). These models offer a comprehensive perspective on utilizing advancements in forest ecotourism management to tackle current difficulties while still leveraging unique local potential.

1.2. Policies Related to Forest-Based Ecotourism

Regulations and policies governing forest-based ecotourism in Indonesia aim to promote environmental sustainability while delivering economic and social advantages to local communities. The implementation process encounters significant challenges, especially concerning inadequate monitoring and insufficient stakeholder involvement in decision-making (Harahab et al., 2018; Hartanti et al., 2018; Hengky & Kikvidze, 2018). Monitoring constraints frequently result in a policy focus prioritizing economic considerations, while environmental preservation concerns are comparatively neglected (Feti et al., 2020). Consequently, the adaptability and efficacy of the policy framework in addressing changes are deemed crucial for the sustainable management of ecotourism (Ariyani & Fauzi, 2022; Zainal et al., 2024).

A comprehensive strategy for managing forest-based ecotourism is crucial to overcoming the previously identified implementation obstacles. This strategy should integrate ecological conservation, community economic development, and effective governance. Studies indicate that successful management necessitates the active involvement of the community and many stakeholders (Ambarita et al., 2018; Hengky & Kikvidze, 2018). Establishing community-based methods,

exemplified by those executed in Gunung Leuser National Park (GLNP), serves as a model for management that promotes ecological sustainability and local economic advancement (Hartoyo et al., 2021). Furthermore, infrastructure and accessibility are critical factors that affect the efficacy of ecotourism management (Prihadi et al., 2024; Yuwono et al., 2021). In addition, policies focusing on conservation training and community-based economic empowerment are vital to enhance environmental awareness and create new business opportunities (Singgalen, 2020; Utama et al., 2023). For instance, the enactment of Qanun (local regulations) in Aceh has strengthened community involvement in environmental conservation through formal processes, while simultaneously improving their well-being (Zainal et al., 2024).

Policy evaluations from multiple studies provide significant recommendations to address existing challenges. These include infrastructural improvements, upgrades to monitoring systems, and enhanced public communication to reduce societal tensions (Abdillah, 2023; Harahab et al., 2018). Zone-based approaches and Resort-Based Management (RBM) are recommended to balance environmental conservation with economic development (Hartoyo et al., 2021). Furthermore, educational programs and the use of social media are considered effective tools for raising public awareness about the importance of ecotourism sustainability (Ambarita et al., 2018).

These ideas correspond with the evolving dynamics of natural tourist management policies in Indonesia, which have experienced substantial transformations. The original phase (1994–2010) concentrated on acknowledgment and establishing laws, whereas the period from 2012 to 2016 prioritized enhancing technical elements and zoning. From 2019 to 2020, the emphasis transitioned to investment facilitation and the integration of sustainability. This dynamic illustrates the growing complexity and response to issues in the governance of nature tourism in Indonesia (see Figure 2).

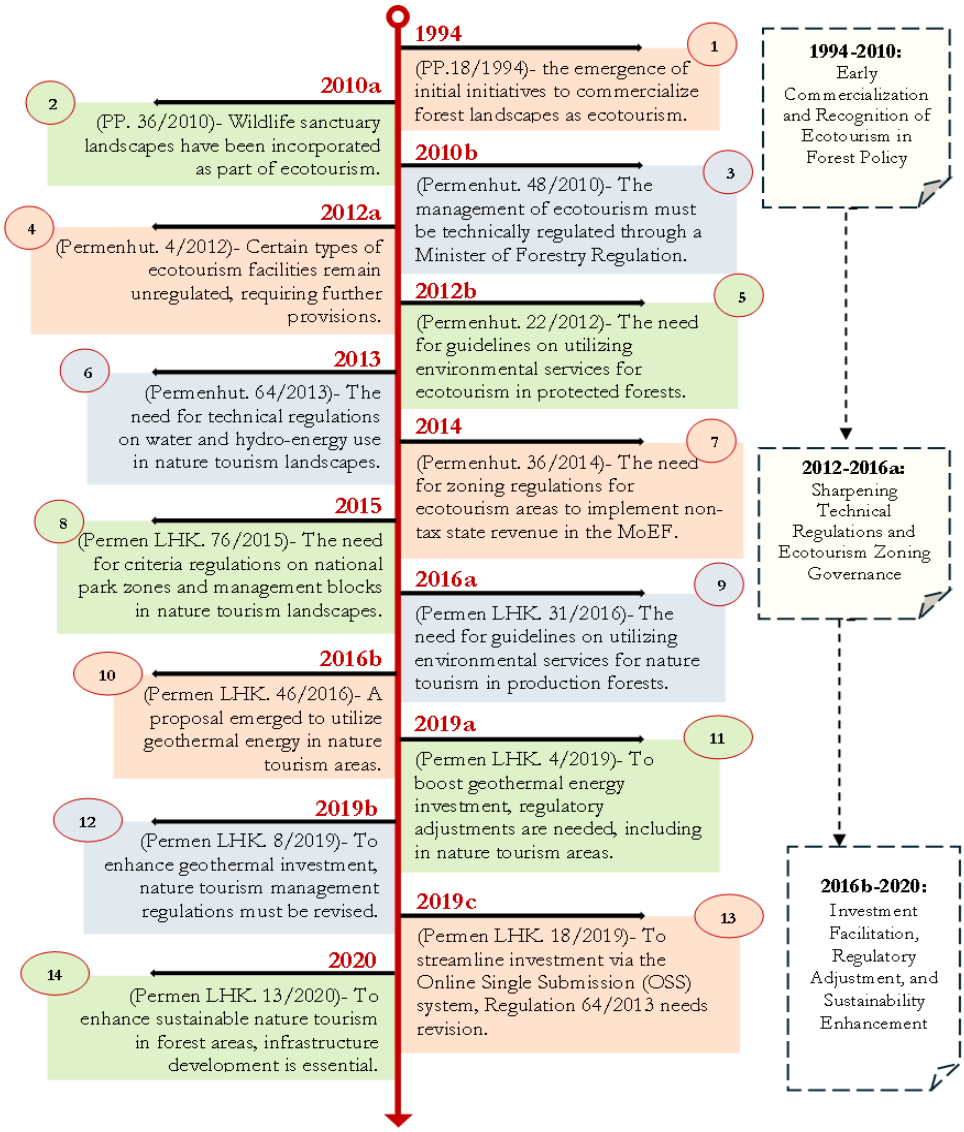

Figure 2. Timeline of nature tourism management policy in Indonesia

2. Varied Form and Practices of Forest-Based Ecotourism

2.1. Natural Forest Tourism for Ecotherapy and Health

Forest-based ecotourism in Indonesia offers a variety of management forms that reflect local potential and extraordinary ecological uniqueness. One of the most prominent models is nature-based forest ecotourism, where the main priority is the

conservation of flora and fauna. Areas like the Gunung Kelam Nature Tourism Park in West Kalimantan are essential examples. Here, forest ecotherapy has been established by leveraging dense vegetation and a microclimate that enhances visitors' physical and emotional well-being (Putri et al., 2024). Another notable model integrates wellness-focused activities to foster both physical and spiritual health. For instance, the Batur Geopark in Bali adopts a "forest wellness" framework, offering meditation, yoga, nature therapy, and guided trekking. These activities not only provide immersive experiences but also educate tourists on the critical role of forest conservation (Choi et al., 2020; Mihardja et al., 2023). The administration of this area underscores the synergy between forest conservation and the enhancement of human health.

2.2. Forest Wildlife Tourism

Wildlife-based ecotourism management in Indonesia also has its appeal, offering excellent opportunities for conservation and tourism. Areas with High Conservation Value (HCV) in Sumatra, for example, have become essential locations providing great opportunities for wildlife observation, including Sumatran elephants, long-tailed macaques, leopards, wild boars, and various bird species (Erniwati & Santosa, 2024; Santosa & Kwatrina, 2024; Setiawan et al., 2021). In other locations, birdwatching activities, such as those conducted in Oelsonbai Forest, Kupang, have become a concrete form of area management that integrates conservation and community empowerment.

This program supports wildlife conservation efforts by providing a safe space for these species and offers direct economic benefits to the local community. Furthermore, this activity also raises visitors' awareness about the importance of biodiversity while encouraging the active involvement of local communities in the sustainable management of the area (Aryantie et al., 2023). Similarly, in West Lombok's Suranadi Ecotourism Area, grassroots efforts have introduced dragonfly observation activities. This initiative highlights lesser-known species' ecological roles while promoting sustainable wildlife-based tourism (Ilhamdi et al., 2021).

2.3. Urban Forest Tourism

Urban forests possess significant potential as tourist sites, particularly amid rapid urbanization. The Bogor Botanical Gardens exemplify prominence. As the city's lungs, this area serves recreational purposes and becomes a center for environmental education and conservation (Hengky & Kikvidze, 2018). Urban forests have also been enhanced in prominent cities, such as Jakarta and Surabaya, to facilitate light leisure activities, educational initiatives, and environmental conservation efforts. Initiatives like tree planting and garbage management have become essential components of ecotourism management (Abdillah et al., 2023). This phenomenon illustrates the contribution of urban green spaces to ecological equilibrium and their provision of social advantages.

2.4. Ecotourism of Mangrove Forest and Coastal Areas

Mangrove forest ecotourism has also become one of the most developed forms, particularly as a nature tourism sector that most extensively involves local communities in its management (Ali et al., 2021; Arkwright & Kaomaneng, 2018; Prihadi et al., 2024; Setyaningrum et al., 2021). For example, the mangrove forests in Bangkalan Regency and Madura Island have been transformed into educational tourism destinations involving the local community in conservation efforts (Wardhani et al., 2022). A similar situation occurs in mangrove ecotourism in Cimalaya Wetan, West Java (Pin et al., 2021), Ayah Mangrove Forest, Kebumen, Central Java (Afifah et al., 2023), and Lembung Mangrove Ecotourism, Madura (Farid et al., 2023), where mangroves become natural tourism spots aimed at environmental education as well as diversifying the income of the local community. In the mangrove areas, tourists can generally participate in activities such as mangrove planting, boating, and birdwatching, which provide a unique experience and support the preservation of coastal ecosystems (Mulyadi & Hamidy, 2021). In addition to being a coastal disaster mitigation tool, the management of this area also increases local income through community-based tourism (Ali et al., 2021; Basyuni et al., 2018; Rahmila & Halim, 2018; Vipriyanti et al., 2024). This model demonstrates how mangrove ecosystems can be sustainably utilized for various conservation and economic purposes. On the other hand, coastal and inland water-based ecotourism in mangrove forest areas also has its unique appeal. Lake Nya'deng in East Kalimantan, for example, offers a unique experience in water tourism, such as boating and enjoying the beauty of the tropical landscape (Sulistyorini et al., 2022).

This area also offers other activities, such as camping and hiking, to provide tourists with an authentic nature experience. The management of Lake Nya'deng not only focuses on environmental preservation but also on empowering the local community, thereby creating an inclusive and sustainable tourism model. Additionally, mangrove ecosystems also play an essential role in supporting the fisheries sector, and some of them have been developed as sustainable fisheries-based ecotourism areas (Arfan et al., 2021; Manullang et al., 2024). This shows that mangrove forest areas in Indonesia have many strategic dimensions related to coastal areas and aquatic areas in their management.

Therefore, many local governments, in collaboration with other stakeholders, have been striving to support the existence of mangrove-based ecotourism to remain sustainable and enduring (Novianti et al., 2022; Rudianto et al., 2021).

2.5. Village Forest Tourism

Forest villages with ecotourism potential have emerged as a primary emphasis in the advancement of community-based tourism in Indonesia. The settlements of Berjo and Sanankerto have effectively established tourist attractions that integrate natural beauty with local customs (Fibrianto, 2020). Development initiatives like the bamboo museum in Sanankerto Village exemplify innovations that amalgamate education, environmental conservation, and regional economic advancement (Maulana & Pratama, 2021). Such initiatives empower residents to engage directly in resource management,

fostering a sense of ownership while improving socio-economic welfare (Fibrianto, 2020). This community-oriented strategy enables village inhabitants to actively participate in local management actively, enhancing their sense of ownership and boosting their welfare. The prospective ecotourism attractions inside forest environments are a primary emphasis in advancing this sector. The Bukit Suligi Forest Area in Riau, featuring attractions like a sea of clouds and natural caves, has become a magnet for adventure-seeking tourists (Harahap & Effendi, 2020).

Likewise, the Sipinsur geosite in Sumatra (Purwoko et al., 2023) and the Cigamea Waterfall, an ecotourism site situated inside the pine forest of Salak II Resort, Halimun-Salak Nature Reserve (Munandar et al., 2020). These areas include stunning vistas that are highly appealing to travelers who like locations characterized by rural landscapes, bodies of water, and expanses of woodland. Effectively managing these forested landscapes facilitates tropical forest conservation and yields beneficial economic outcomes for the local population. These distinctive landscapes entice travelers desiring varied experiences, rendering them the most potential ecotourism locations in the vicinity. In general, various forms and practices of forest-based ecotourism in Indonesia from the literature review can be seen in the following Table 4.

Table 4. Various Forms and Practices of Forest-Based Ecotourism in Indonesia (Source: Literature review by authors, 2024)

Ecotourism Form	Location	Main Activities	References
Nature Forest Tourism for Ecotherapy and Health	- Gunung Kelam Nature Tourism Park, West Kalimantan - Forest Wellness in Batur Geopark	Forest ecotherapy, meditation, yoga, tracking	(Choi et al., 2020; Mihardja et al., 2023; Putri et al., 2024)
Forest Wildife Tourism	- HCV area in Sumatra - Oelsonbai Forest, Kupang - Suranadi Ecotourism Area, West Lombo	Wildlife observation, birdwatching, dragonfly observation	(Aryantie et al., 2023; Erniwati & Santosa, 2024; Ilhamdi et al., 2021; Santosa & Kwatrina, 2024; Setiawan et al., 2021)
Urban Forest Tourism	- Bogor Botanical Garden - Urban Forest in Jakarta and Surabaya	Leisure activities, environmental education, conservation campaigns	(Abdillah, 2023; Hengky & Kikvidze, 2018)
Mangrove Ecotourism and Coastal Area	- Mangrove Forest in Bangkalan and Madura Island - Mangrove Cimalaya Wetan, West Java - Mangrove Lembung, Madura - Nya'deng Lake di East Kalimantan	Mangrove planting, boating, birdwatching, camping, hiking	(Afifah et al., 2023; Ali et al., 2021; Arfan et al., 2021; Arkwright & Kaomaneng, 2018; Basyuni et al., 2018; Farid et al., 2023; Manullang et al., 2024; Mulyadi & Hamidy, 2021; Novianti et al., 2022; Pin et al., 2021; Prihadi et al., 2024; Rahmila and Halim, 2018; Rudianto et al., 2021; Setyaningrum et al., 2021; Sulistyorini et al., 2022; Vipriyanti et al., 2024; Wardhani et al., 2022)
Forest Village Tourism	- Berjo Village and Sanankerto - Bukit Suligi Forest, Riau - Geosite Sipinsur, Sumatera - Cigamea Waterfall, Salak II Resort, Halimun-Salak	Natural attractions (cloud ocean, caves), cultural education (bamboo museum), tracking, adventure	(Fibrianto, 2020; I. Harahap & Effendi, 2020; Maulana & Pratama, 2021; Munandar et al., 2020; Purwoko et al., 2023)

Ecotourism in Indonesia demonstrates a diverse potential that is continually evolving through various management strategies that have been used. Ecotourism areas include natural forests, mangrove ecosystems, and forest-based villages, each presenting distinct attractions reflective of their particular attributes. The government serves as the policy maker and provider of supporting infrastructure, whilst the local community is responsible for ecological conservation and cultural preservation (Purwoko et al., 2023). The business sector contributes by providing investments and ideas that enhance the promotion of ecotourism destinations on a larger scale. The partnership among these entities is essential for the sustainability of ecotourism, considering both environmental and socio-economic factors (Andarani et al., 2018; Siahaya et al., 2021).

3. The Role of Stakeholders and Socio-Cultural Value in Ecotourism

3.1. Collaboration of the Community, Government, and Stakeholders

The collaboration between communities, the government, and stakeholders in managing forest-based ecotourism in Indonesia demonstrates a multifaceted and synergistic relationship (Ariyani & Fauzi, 2022). Local communities often play a key role as the main drivers through a community-based approach that integrates traditional values, local culture, and conservation practices (Insani et al., 2024). According to Ernawati (2018), community engagement signifies their recognition of the significance of conservation while concurrently generating economic prospects through various ecotourism initiatives. This dynamic illustrates that the community's participation serves as a foundational element that may be integrated with the functions of other stakeholders in establishing sustainable ecotourism management.

Conversely, the government is responsible for establishing regulations, constructing infrastructure, and providing technical assistance. Afifah (2023) observes that the government promotes tourist areas and rehabilitation initiatives, while prioritizing local communities as the primary managers. The co-management framework (Novianti et al., 2022), utilized in the administration of mangrove ecotourism in Karangsong (Feti et al., 2020), exemplifies effective collaboration between the government and the community, resulting in coordinated and sustainable resource management (Arfan et al., 2021). The participation of the commercial sector and NGOs enhances this relationship through funding, promotion, and community empowerment assistance (Arfan et al., 2021). Sulistyorini's (2022) research in Lake Nya'deng underscores the significance

of multi-stakeholder engagement in improving infrastructure quality and bolstering the sustainability of ecotourism initiatives. Consequently, collaboration among diverse stakeholders is a crucial factor in the administration of ecotourism.

The involvement of local communities is a vital component in the technical administration of ecotourism. Their activities encompass jobs as tour guides, administration of non-timber forest products, and the creation of handicrafts utilizing local materials (Insani et al., 2024; Sumarmi et al., 2022). Utama (2023) identifies that the motivation for community involvement is driven by financial needs, conservation awareness, and idealism towards environmental preservation. This contribution illustrates the community's active participation in forest protection and the promotion of local economic sustainability (Ginting & Triska, 2020; Hartoyo et al., 2021; Siahaya et al., 2021). The community's inadequate technical capacity and restricted access to education are the primary concerns that necessitate intervention (Abdillah et al., 2023; Andarani et al., 2018). Conflicts of interest and inequities in benefit distribution (Sowards, 2021) often arise as impediments. According to Ernawati (2018), community training and capacity-building initiatives are crucial measures to address these challenges while enhancing the community's engagement in ecotourism.

The penta-helix approach offers a comprehensive solution by integrating the roles of academics, government, business, society, and media in ecotourism management. Maulana & Pratama (2021) emphasized that this approach is effective in accelerating the development of ecotourism-based tourist villages. This coordination is evident in diverse operational activities and strategic planning involving numerous stakeholders (Ariyani & Fauzi, 2022; Hakim & Soemarno, 2017; Satyatama et al., 2020). Utama's studies (2023) at several forest-based ecotourism sites indicate that effective coordination can facilitate adaptive and sustainable management, tackling the issues encountered by local communities.

3.2. Elements of Culture, Local Wisdom and Tradition

Cultural elements, local wisdom, and traditions play a central role in the management of community-based forest ecotourism in Indonesia (Farid et al., 2023). Local culture functions as a means for the community's adaptation to the natural environment, embodying ideals of conservation and forest resource management. Zainal et al. (2024) explains that local knowledge passed down through generations serves as an ethical guide in utilizing and protecting the forest. Customary standards, such as Qanun (village regulations in Aceh), govern the sustainable utilization of natural resources and reinforce the community's sense of ownership of the forest as an integral aspect of their cultural identity (Anggraini and Gunawan, 2021). This approach fosters a strong connection between culture and conservation, providing a foundation for sustainable ecotourism management. The connection between local culture and ecotourism management is becoming increasingly apparent through traditions and cultural values that generate a distinctive appeal for tourists. Within the Gayonese community in Aceh, traditions and customary values constitute the fundamental link between the people and the forest, which is essential to their identity (Zainal et al., 2024). This tradition protects the spiritual bond with nature and enhances sustainable forest management. On Buano Island, the Higaro tradition serves as a social mechanism that facilitates the prudent utilization of forest resources by the community (Singgalen, 2020). This mechanism illustrates the adaptability of societal norms to promote practical conservation activities while accommodating governmental policy changes, all without compromising fundamental cultural values. Cultural components, including traditional dwellings, ancestral graves, and customary ceremonies, enhance the tourist experience. The close relationship between tradition, culture, and forest ecosystems forms a rich narrative in community-based ecotourism, positioning tradition as the primary driver of sustainability.

Despite the significance of culture and tradition, ecotourism management based on local wisdom often faces challenges in integrating indigenous knowledge into the modern framework of forest management. Alfitri (2022) identified that the primary limitation is the absence of documenting of local expertise, predominantly retained in the memory of traditional elders. A further difficulty is the insufficient technical capability among indigenous groups to properly manage ecotourism, hindering their ability to compete with contemporary management techniques. An inclusive strategy that engages indigenous people at every phase of development has demonstrated efficacy in bridging this gap. This stage facilitates the intergenerational and cross-sectoral transfer of information, hence enhancing the significance of indigenous knowledge in ecotourism management. The efficacy of local wisdom in forest environmental conservation has been demonstrated in numerous case studies. Purwowibowo (2020) observed that community engagement in mangrove conservation rooted in local understanding in Wringinputih yielded ecological, social, and economic advantages. This method entails the restoration of mangrove forests by the use of traditional knowledge, hence establishing a sustainable conservation framework (Ambarita et al., 2018; Arkwright & Kaomaneng, 2018; Basyuni et al., 2018; Harahab et al., 2018; Mulyadi & Hamidy, 2021; Putri et al., 2023; Rudianto et al., 2021). In the Bur Telege Forest area of Central Aceh, the implementation of customary norms by the local community effectively safeguarded the habitat of endemic avian species and protected species, while simultaneously enhancing the community's economic sustainability through ecotourism (Zainal et al., 2024). The active participation of the local community fosters a sense of ownership over the forest area, establishing a management model that is adaptive and pertinent to local requirements (Anggraini & Gunawan, 2021).

The use of cultural components, local wisdom, and traditions in forest-based ecotourism fosters a strong connection between humans and the environment. Alfitri (2022) asserts that the integration of traditional norms with contemporary management practices can enhance the sustainability of forest ecosystems. In many regions, indigenous societies utilize the forest not simply as a means of sustenance but also as a focal point of spirituality and culture. Tradition-based management, exemplified by practices in Bur Telege, illustrates the adaptation of traditional values to facilitate conservation and simultaneously bolster the local economy (Farid et al., 2023; Zainal et al., 2024). The community's active participation in forest ecotourism management and adherence to local knowledge frequently serves as a crucial element in promoting environmental conservation and sustainable management (Hakim & Soemarno, 2017; Hartoyo et al., 2021; Hidayat et al.,

2024; Insani et al., 2024). Local wisdom, which includes customary norms, traditions, and environmental knowledge passed down through generations, helps create forest management practices that align with the ecological and social needs of the local community. In general, the description of the functions, flows, and interconnections of each stakeholder element in forest ecotourism management in Indonesia can be illustrated as follows (Figure 3):

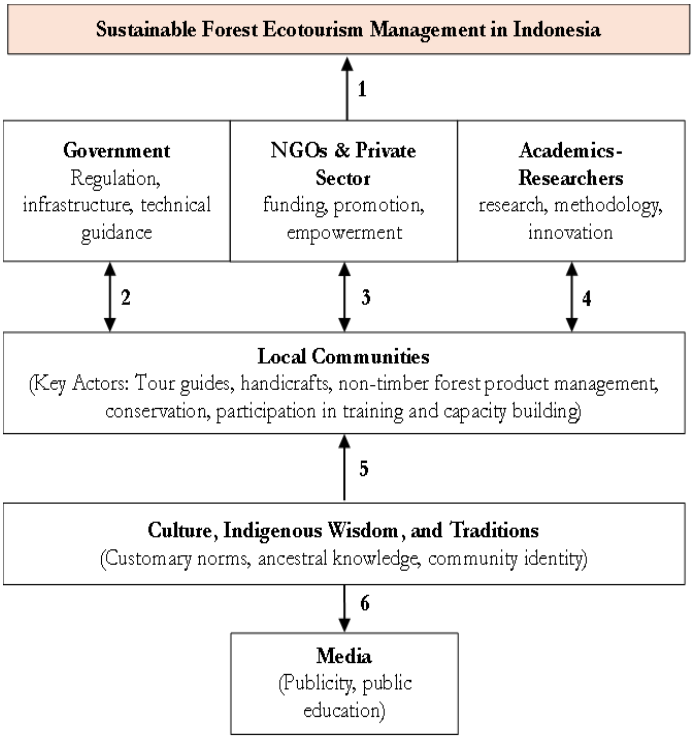

Figure 3. Relationships among stakeholders in forest ecotourism in Indonesia (Description: 1 = Interaction and coordination; 2 = Support, collaboration; 3 = Partnership; 4 = Knowledge, recommendations; 5 = Foundational values and ethics; 6 = Visibility, education, awareness-raising) (Source: Author's analysis based on literature review)

4. Conservation, Biodiversity and Environmental Carrying Capacity

4.1. Conservation and Biodiversity in Ecotourism

Forest-based ecotourism in Indonesia has great potential to support conservation and biodiversity preservation efforts (Abdillah, 2023; Feti et al., 2020; Hakim & Soemarno, 2017; Santosa & Kwatrina, 2024; Siahaya et al., 2021). In this context, conservation includes sustainable management of natural resources that allows for the preservation of ecosystems while also providing economic benefits to local communities. Biodiversity has become one of the main attractions in the development of ecotourism, especially in mangrove ecosystems, tropical forests, and other conservation areas. The educational tourism experience gained from interactions with local flora and fauna can enhance understanding and awareness of the importance of environmental conservation (Afifah et al., 2023; Rudianto et al., 2021).

Mangrove forests are one of the most prominent ecosystems in the development of conservation-based ecotourism. This ecosystem not only supports the sustainability of coastal ecosystems but also serves as an essential habitat for various species (Basyuni et al., 2018; Harahap et al., 2021; Hidayat et al., 2024; Ilhamdi et al., 2021; Pin et al., 2021; Vipriyanti et al., 2024). For example, in the Bandar Bakau area, 17 species of mangroves have been found, which serve as habitats for various fauna, such as birds, reptiles, and crustaceans (Mulyadi & Hamidy, 2021).

In addition, economic benefits can also be obtained through the environmental services provided by the mangrove ecosystem, including increased income for local communities through tourism activities (Hastuti & Yuliati, 2017; Purwowibowo et al., 2020). Biodiversity in mangrove ecosystems, such as the species Rhizophora mucronata and Avicennia marina, plays an essential ecological role (Askar et al., 2021; Prihadi et al., 2024). Functions such as coastal protection and soil fertility enhancement make mangroves a vital element (Ali et al., 2021; Novianti et al., 2022). Fauna species such as crabs and water birds also indicate that this ecosystem is healthy, making it one of the main attractions for nature-based educational tourism (Ginantra et al., 2021; Manullang et al., 2024; Purify et al., 2019). However, threats to the preservation of mangrove ecosystems, such as land conversion and uncontrolled human activities, pose challenges that require serious attention (Hastuti & Yuliati, 2017; Purify et al., 2019; Purwowibowo et al., 2020; Putri et al., 2023).

Besides mangroves, tropical forests are also important locations for the development of biodiversity-based ecotourism. The forests of Gunung Leuser National Park (TNGL), for example, have a very high level of biodiversity, both in terms of flora and fauna. Plant species from the Dipterocarpaceae family, as well as various types of birds and mammals, are the main attractions that support the development of environmentally based tourism (Aryantie et al., 2023; Hartoyo et al., 2021). The interaction of tourists with the environment in this area also provides an opportunity to enhance understanding of the importance of biodiversity conservation (Sisriany & Furuya, 2024).

Conservation-based ecotourism programs often involve local communities as the main actors in the management and maintenance of the area (Ginting & Triska, 2020). In the Wringinputih area, community-engaged mangrove restoration initiatives have effectively enhanced the quality of the local ecosystem. The habitat, abundant in flora and wildlife, has been well restored, concurrently offering economic advantages to the adjacent community through ecotourism initiatives (Afifah et al., 2023; Purwowibowo et al., 2020). This method illustrates the significance of community engagement in the administration of sustainable ecotourism. Nonetheless, it cannot be ignored that negative impacts can arise from poorly managed ecotourism activities (Hitchner et al., 2009). An example is the alteration of natural animal behavior resulting from unregulated contact with tourists. This effect has been seen in Komodo dragons at Komodo National Park, where heightened human engagement has induced alterations in the animal behavior (Anggraini & Gunawan, 2021). This scenario illustrates the necessity of meticulous planning and management to prevent ecotourism activities from harming the ecosystem that underpins its appeal (Ridwan et al., 2022; Sowards & Banerjee, 2021).

Biodiversity is also a primary focus in protected forest areas and national parks that serve as habitats for endemic and charismatic species. The bird of paradise has emerged as a primary attraction for tourists in the Rhepang Muaif forest. This species depends on large trees for perching and sustenance, illustrating the interdependence of flora and fauna diversity in the area (Lahallo et al., 2022). Ecotourism activities centered on birdwatching not only generate economic benefits but also support habitat conservation efforts (Erniwati & Santosa, 2024). The development of ecotourism based on biodiversity shows how conservation areas can be managed to support ecosystem preservation while also providing economic and educational advantages. The interplay of biodiversity, ecological functions, and the involvement of local communities become an essential element in creating sustainable ecotourism and serve as an effective conservation tool.

4.2. Environmental and Ecosystem Carrying Capacity: Insights from Mangrove Ecotourism Cases

4.2.1. Ecotourism Environmental Carrying Capacity

Environmental carrying capacity is a crucial factor in the management of forest-based ecotourism, as the sustainability of the ecosystem relies significantly on its capability to support human activities without inflicting ecological harm (Ariyani & Fauzi, 2022). Hartanti's (2018) research on mangrove tourism areas like Blanakan reveals a physical carrying capacity (PCC) of 77,000 daily visitors, while relative carrying capacity (RCC) and ecological carrying capacity (ECC) values drop sharply to 2,750 and 825 visitors per day, respectively. This drastic decline reflects constraints arising from environmental preservation needs, visitor experience quality, and managerial factors such as site accessibility and operational hours. This highlights the necessity of limiting visitor numbers and the intensity of tourism activities in accordance with the ecosystem's potential to sustain ecological balance (Harahap et al., 2021; Satyatama et al., 2020). Furthermore, inadequate management might elevate the danger of significant ecosystem degradation, as evidenced in certain mangrove areas that have suffered deterioration due to excessive tourism activities (Harahab et al., 2018; Lahallo et al., 2022).

4.2.2. Carrying Capacity and Ecological Suitability of Ecotourism

Mangrove ecosystems have limited carrying capacity, thereby emphasizing the significance of environmental capacity in the advancement of sustainable ecotourism. In many locations, including Kunkun Village, the maximum carrying capacity is limited to 235 individuals per day, but Lubuk Kertang has an even lower capacity of merely 36 individuals per day to maintain ecosystem sustainability (Basyuni et al., 2018; Harahap et al., 2021). The restrictions are affected by several aspects, including environmental quality, biodiversity, and the extent of human disturbance, such as unregulated tourism operations (Ginantra et al., 2021). Nonetheless, areas such as Karangsong, possessing a suitability index of 83.7%, demonstrate that proficient management can augment environmental carrying capacity. Efforts such as mangrove rehabilitation, visitor number control, and ecosystem-based management contribute to optimizing ecotourism benefits without exceeding the environmental carrying capacity, while also preserving the area's biodiversity and ecological functions (Ali et al., 2021; Prihadi et al., 2024). From the perspective of ecological suitability, the mangrove forest ecosystem in Indonesia also has great potential for ecotourism development (Yuwono et al., 2021). Vipriyanti (2024) reports that the ecological suitability index of the mangrove tourism area is 74.36%, signifying that the area is classified as S2 (Very Suitable) for ecotourism development. The primary determinants of appropriateness encompass the thickness and density of mangrove vegetation, alongside ambient physical conditions like soil pH and salinity that are conducive to the proliferation of the mangrove ecosystem (Askar et al., 2021; Wardhani et al., 2022). Nevertheless, areas with lower suitability levels require rehabilitation-based interventions, such as replanting mangroves to increase the thickness and density of vegetation, while also improving the ecosystem's resilience to the pressures of tourism activities (Rahmila & Halim, 2018; Wardhani et al., 2022). Such efforts can also enhance the habitat of water birds, which are the main attraction of ecotourism, thereby supporting ecological balance and the sustainability of tourism activities.

4.2.3. Human Pressure on The Ecosystem

Human pressure on forest ecosystems often arises from tourism activities and land conversion, which can significantly disrupt ecological balance (Abdillah et al., 2023; Rudianto et al., 2021). In mangrove areas, for example, resource exploitation and infrastructure development have caused habitat degradation, where 51.2% of waterbird habitat areas are considered threatened by human disturbances (Purify et al., 2019). This pressure is further increased by the development of ecotourism that does not take into account the environmental carrying capacity, such as in the coastal area of Bangkalan, where a population growth of 0.9% per year contributes to increased pressure on the ecosystem through land conversion into settlements and fishponds (Wardhani et al., 2022). As a result, the quality of the environment, such as biodiversity and

the functions of mangrove ecosystems, declines, reducing the carrying capacity for species like water birds and typical mangrove plants (Ginantra et al., 2021; Lahallo et al., 2022). To address this challenge, mitigation strategies based on ecosystem rehabilitation and measured management are needed to balance human needs and environmental sustainability.

4.2.4. Sustainability and Development of Forest-Based Ecotourism

The sustainability of forest-based ecotourism depends significantly on management that effectively integrates conservation and tourism development. The mangrove ecosystem serves as a crucial carbon sink, a shield against erosion, and a significant habitat for biodiversity, rendering it an ecological and economic resource that necessitates sustainable management (Hidayat et al., 2024). Nonetheless, the impact of human activities and inadequate management has led to a substantial decrease in mangrove coverage, exemplified by Bedul, where the area diminished from 1,703.99 hectares in 2020 to 947.46 hectares in 2022 (Sumarmi et al., 2024). This reduction indicates the necessity for management solutions that account for environmental carrying capacity, including mangrove rehabilitation to restore ecosystems and visitor number limitations to preserve a balance between tourism exploitation and environmental sustainability (Ali et al., 2021). This method enables ecotourism to evolve as an economic sector that fosters environmental conservation and mitigates the risk of future ecosystem degradation (Arfan et al., 2021; Munandar et al., 2020).

4.3. Education and Environmental Awareness through Ecotourism

Forest-based ecotourism in Indonesia has become an effective means of raising tourists' environmental awareness by combining recreational activities and education. Mangrove ecotourism sites, such as Wringinputih in East Java, provide guests the chance to participate in conservation efforts, including mangrove planting. This engagement not only provides direct experience about the importance of preserving the mangrove ecosystem but also broadens their understanding of the ecological and economic functions of the area (Mulyadi & Hamidy, 2021; Purwowibowo et al., 2020). Conversely, locations like mangrove ecotourism including reading gardens, such as those in Karangsong, West Java, have effectively heightened tourist engagement, particularly among students, in environmental literacy. This reading garden offers comprehensive information on flora, animals, and conservation initiatives, thereby enhancing tourists' understanding of the significance of environmental sustainability (Sukaesih et al., 2021). The integration of recreational activities and educational components in ecotourism offers fresh perspectives and fosters a profound comprehension of the necessity to preserve the balance of forest ecosystems (Ali et al., 2021; Choi et al., 2020; Rudianto et al., 2021).

Forest-based ecotourism in Indonesia not only raises environmental consciousness but also serves as an effective educational tool for environmental protection. This role is apparent due to its influence on enhancing tourist awareness following engagement in several educational activities provided. Research indicates that tourists engaging in ecotourism activities, such as hiking and agricultural practices, often have a heightened awareness of the significance of environmental conservation (Insani et al., 2024). The integration of recreational and educational activities yields a substantial positive effect, particularly for visitors from environmentally conscious demographics, such as the cohort of European and Asian travelers. Tourists in this group are prepared to endorse ecotourism by providing financial donations for conservation efforts (Choi et al., 2020; Putri et al., 2023). These data demonstrate that ecotourism offers leisure advantages while also fostering active engagement from tourists in environmental conservation initiatives.

Forest-based ecotourism significantly influences various aspects of environmental education, including ecological literacy and local community involvement. Participatory rural appraisal research in villages adjacent to protected forests indicates that the community has heightened its understanding of environmental conservation and has actively engaged in forest protection initiatives. This excitement is evident in the adoption of sustainable practices, including the 3Rs (Reduce, Reuse, Recycle) and compost management, which have been disseminated through educational tourism initiatives (Andarani et al., 2018). These activities not only enhance the community's understanding of the importance of preserving forest ecosystems but also strengthen the role of ecotourism as a cross-generational learning medium that supports environmental sustainability (Notohamijoyo et al., 2020; Sukaesih et al., 2021). While forest-based ecotourism possesses considerable promise for improving environmental education and awareness, the difficulties in maximizing its effectiveness continue to pose a substantial problem. A primary issue is the insufficient understanding among tourists about ecological cleanliness and the inadequate sanitary facilities in many ecotourism areas. For instance, while mangrove tourism can offer an educational experience, the actual realization of tourists' environmental consciousness frequently falls short of expectations. This suggests that a more inventive strategy in ecotourism management is essential to provide a more significant and sustainable educational impact (Arfan et al., 2021; Sumarmi et al., 2022). Forest-based ecotourism also significantly contributes to supporting global conservation efforts, including the implementation of the REDD+ program in Bali. Environmentally conscious tourists contribute to this project, so indirectly enhancing the economic value of protected environments. This situation presents strategic opportunities to employ ecotourism as a global educational instrument, which not only deepens tourists' comprehension of conservation significance but also fortifies collaborative efforts in preserving forest sustainability in Indonesia (Ali et al., 2021; Choi et al., 2020; Mulyadi & Hamidy, 2021).

Overall, forest-based ecotourism in Indonesia plays an essential role in enhancing environmental education and awareness. This is accomplished by a synthesis of direct tourist engagement in conservation efforts, comprehensive environmental education, and collaborative partnerships among managers, local communities, and various stakeholders. This combination renders ecotourism an efficacious method to promote behavioral change at both individual and group levels, hence aiding environmental conservation and ecosystem sustainability (Putri et al., 2023; Sukaesih et al., 2021).

5. Socio-Economic and Tourist Preferences

5.1. The Impact of Forest-Based Ecotourism on the Economy, Society, and Environment

Forest-based ecotourism in Indonesia provides diverse economic contributions (Askar et al., 2021; Ginting & Triska, 2020; Ridwan et al., 2022; Satyatama et al., 2020), both through job creation (Mihardja et al., 2023; Novianti et al., 2022) and increasing local community income (Ambarita et al., 2018; Singgalen, 2020). Activities such as boat rentals, the sale of local products, and tour guide services have become major sources of income in certain areas (Afifah et al., 2023; Sumarmi et al., 2022; Utama et al., 2023). However, this contribution is often limited in certain areas, such as in the Dumai forest tourism, which has a Keynesian multiplier of only 0.02, indicating minimal economic impact on the local community's income (Abdillah, 2023; Feti et al., 2020). On the other hand, in locations such as Berjo Village, the synergy between ecotourism and the agricultural sector shows that community-based management can significantly enhance the local economy (Fibrianto, 2020; Harahap & Effendi, 2020). Challenges such as limited access to business opportunities for the community and investment constraints remain obstacles that need to be addressed to strengthen the economic impact of ecotourism (Andarani et al., 2018; Santosa & Kwatrina, 2024). The development of forest-based ecotourism not only contributes to the economic aspect but also has significant social impacts (Zainal et al., 2024). Empowerment programs such as tour guide training and craft product creation open new job opportunities for local communities, helping them reduce dependence on environmentally damaging activities (Prihadi et al., 2024; Siahaya et al., 2021).

Additionally, ecotourism supports the preservation of local culture through activities such as mangrove batik production, which simultaneously attracts tourists (Aryantie et al., 2023; Hidayat et al., 2024). However, the unequal distribution of social and economic benefits remains a significant issue (Sumarmi et al., 2022). The benefits from this sector are often enjoyed more by external managers than by the local community, highlighting the importance of a more inclusive management approach to ensure social justice (Anggraini & Gunawan, 2021; Hitchner et al., 2009; Sowards and Banerjee, 2021). Moreover, forest-based ecotourism also plays a pivotal role in environmental preservation through various conservation activities involving local communities (Ernawati et al., 2018; Zainal et al., 2024). For example, mangrove ecotourism in Lembung Village not only provides economic benefits but also maintains the sustainability of the mangrove forest ecosystem (Putri et al., 2023; Vipriyanti et al., 2024). This community-involved management not only encourages them to actively protect natural resources but also strengthens awareness of the importance of environmental preservation (Purwowibowo et al., 2020; Setyaningrum et al., 2021). In an effort to enhance this sustainability, the integration of ecolabel schemes has become one of the significant approaches. This scheme provides guidance for ecotourism managers to ensure sustainable environmentally friendly practices and support ecosystem conservation. Experiences from countries like New Zealand and Korea show that ecolabels can strengthen local traditions while maintaining ecosystem balance (Notohamijoyo et al., 2020). In Indonesia, the integration of ecolabels also encourages collaboration between the government, the community, and the private sector in preserving vulnerable forest ecosystems. However, the surge in the number of tourists often brings new challenges to the forest ecosystem (Hartanti et al., 2018). Resource exploitation and environmental degradation due to inadequate infrastructure have become issues that need to be addressed comprehensively (Lahallo et al., 2022; Purwoko et al., 2023). In this context, the implementation of ecolabels not only serves as a management guideline but also as an instrument to maintain ecosystem sustainability amidst the increasing pressure from tourism activities. In general, forest-based ecotourism in Indonesia shows a close relationship between economic, social, and environmental impacts (Ernawati et al., 2018; Ridwan et al., 2022; Zainal et al., 2024). An approach that actively involves the community and the application of sustainability principles, such as the integration of ecolabels, becomes an essential foundation in optimizing the benefits of ecotourism without sacrificing ecosystem preservation (Sisriany & Furuya, 2024).

5.2. Tourist Motivation and Preferences

5.2.1. Motivation and Tourist Attraction

Tourist motivation to visit forest-based ecotourism areas is strongly tied to the uniqueness of their attractions. For instance, the Telogo Warno Telogo Pengilon Nature Tourism Park (TWA TWTP) draws visitors through its striking and distinctive landscapes, which create visually immersive experiencesvisitors (Satyatama et al., 2020). Beyond scenery, interactive programs like beekeeping and honey harvesting at the Aek Nauli Elephant Conservation Camp (ANECC) further elevate the site’s appeal by blending education with recreational value (Ginting & Triska, 2020). Additionally, the mangrove areas’ rich biodiversity, particularly avian species, supports specialized activities such as birdwatching and nature photography, thereby boosting visitor engagement (Rahmila & Halim, 2018). Crucially, the accessibility of these locations transforms forests from mere destinations into holistic spaces that offer both adventure and fulfillment, enriching the overall tourist experience (Munandar et al., 2020).

5.2.2. Tourist Preference and Statisfication

Tourist preferences in forest-based ecotourism are greatly influenced by a combination of adequate facilities and the unique experiences offered by the destination. Most visitors expressed satisfaction with the available infrastructure, although there are still shortcomings in accommodation aspects at some locations, such as seen at Lake Sipinsur, indicating the need for improvements in certain service quality (Purwoko et al., 2023). Tourist preferences are also shaped by the sources of information they access (Trišić, 2024), with family and friends being the dominant sources, especially for visitors traveling in groups, whether for recreational or social purposes (Purwoko et al., 2023). Additionally, their level of satisfaction is also influenced by opportunities to participate in environmental conservation, such as through simple yet impactful practices like reducing the use of single-use plastics. This participation reflects tourists' awareness of

environmental sustainability, which is one of the core values of forest-based ecotourism (Basyuni et al., 2018). The integration of facilities, experiences, and active participation makes forest-based ecotourism an attractive and meaningful choice.

5.2.3. Factors Driving Tourist Visit

Tourists are drawn to forest-based ecotourism for diverse objectives, including the pursuit of health, the appreciation of natural beauty, and the enhancement of social connections with family or friends (Choi et al., 2020). Market segmentation reveals clusters of environmentally conscious visitors, including Asian travellers who frequently journey in family units and European tourists who pursue wellness through natural experiences (Choi et al., 2020). Alongside individual motivation, external elements like cross-border advertisements enhance the attractiveness of ecotourism, enabling local places to access a wider worldwide market (Hitchner et al., 2009). The COVID-19 pandemic presented a substantial challenge, resulting in a marked reduction in visitor numbers owing to mobility restrictions and the limitations of tourism locations (Hidayat et al., 2024; Sukaesih et al., 2021). Nonetheless, the trend of tourist visits is beginning to rise due to the relaxation of policies, suggesting the possibility for the revitalization of forest-based ecotourism, bolstered by more strategic promotions and the sustainability of the area's attractions (Notohamijoyo et al., 2020; Yarhamdhani et al., 2024).

5.2.4. Willingness to Pay Ecotourism Services

Tourists' willingness to pay (WTP) for ecotourism services not only signals their commitment to environmental preservation but also quantifies the economic potential of conservation efforts. This dynamic is exemplified by case studies at Cigamea Waterfall and Salak Resort II, which highlight how visitor perceptions of environmental and facility quality shape financial contributions. At Cigamea Waterfall, a survey of 342 respondents revealed that 59.1% of tourists were willing to pay additional fees for area management, reflecting strong conservation awareness (Munandar et al., 2020). In contrast, Salak Resort II demonstrates even greater economic potential: visitors are willing to pay an average of Rp15,000 (exceeding the official entrance fee) indicating substantial revenue opportunities for conservation funding. This disparity between the two sites likely stems from differences in facility quality, accessibility, or attraction uniqueness, underscoring how experiential value directly influences WTP. Together, these cases emphasize the need for destination-specific management strategies that align visitor experiences with conservation objectives while leveraging WTP as a financial mechanism to support sustainable ecotourism development (Munandar et al., 2020).

CONCLUSION

This study hypothesizes that forest-based ecotourism in Indonesia will emerge as a strategic model with all its multiple potentials to achieve three key development goals: economic prosperity, social equity, and environmental sustainability. This study critically assesses the evolution and development prospects of forest-based ecotourism in Indonesia across diverse ecosystem landscapes, including mangrove forests, tropical forests, and forest areas in urban settings.

This study is a comprehensive critical review of existing research that addresses the theme of nature tourism connected to forest ecosystems. The findings of this study, based on an extensive review of the existing literature, reveal that structural challenges, including overlapping policies, inadequate infrastructure, and conflicting stakeholder interests, continue to hinder its development. In addition, unequal distribution of economic benefits and urbanization pressures pose significant threats to its development, especially in fragile ecosystems such as mangroves and protected forests. Despite these challenges, forest-based ecotourism in Indonesia has considerable potential to grow rapidly, due to the natural beauty of the region and the local culture that supports it. The natural beauty inherent in forest-based ecotourism in Indonesia is reflected in the variety of forest-based ecotourism models offered, ranging from forest therapy (ecotherapy) to wildlife monitoring and urban nature tourism, reflecting the high potential for forest-based ecotourism development in Indonesia.

However, the sustainability of these models is still highly dependent on external interventions or approaches that are expected to contribute to maintaining the resilience of the local ecology and culture that surrounds them. Specifically, these interventions are intended to prevent ecological damage due to excessive tourism and cultural erosion due to modifications made to meet tourist expectations. These interventions can be carried out through cross-sectoral policy alignment, increasing conservation literacy, and reducing anthropogenic pressures. With this multisectoral approach, it is hoped that it can encourage the development of forest-based ecotourism in Indonesia to be more sustainable.

Our review of existing studies also highlights that there are three policy strategies recurrently emphasized in scholarly discourse to ensure the sustainability of Indonesia's forest ecotourism. First, literature underscores the critical need for adaptive governance, particularly through streamlining conflicting regulations and enhancing cross-sector coordination between central and regional authorities. Previous research has demonstrated the effectiveness of multi-stakeholder collaboration models (often termed penta-helix partnerships) in integrating scientific data, community knowledge, and policy frameworks for ecosystem-sensitive planning, especially in vulnerable regions like mangrove habitats. Second, scholars widely advocate for strengthened sustainability standards, including mandatory ecolabel certification systems. These should be coupled with incentive mechanisms for communities actively engaged in conservation practices, such as participatory waste management and habitat restoration initiatives, as evidenced by successful case studies across Indonesia. Third, systematic integration of environmental education into ecotourism operations emerges as a consensus recommendation. This includes capacity-building programs for tourism operators and interpretive activities for visitors, which multiple studies correlate with reduced ecological footprints and heightened conservation awareness. Finally, regular monitoring of environmental carrying capacity using geospatial technology, coupled with inclusive community participation in

decision-making, is critical to balancing tourism growth with ecosystem regeneration. By integrating these measures, forest ecotourism can foster equitable economic progress while safeguarding Indonesia's biodiversity and cultural heritage.

Limitation of study: The articles reviewed in this study generally focus on specific cases, thus not yet representing the overall reality of forest ecotourism in Indonesia. The lack of field data also limits the depth of analysis, especially in assessing the effectiveness of policies and the potential for conflicts of interest in each region.

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REFERENCES

Abdillah, N. (2023). The sustainable forest tourism management strategies: Case study in Dumai City. *International Journal of Sustainable Development and Planning*, *18*(6), 1649–1658. https://doi.org/10.18280/ijsdp.180601

Abdillah, N., Thamrin, T., Nofrizal, N., & Wijayanto, G. (2023). Quantifying ecological, economic, social, and governance attributes for urban forest eco-tourism using MDS-RAPFISH approach. *International Journal of Sustainable Development and Planning*, *18*(8), 2369–2378. https://doi.org/10.18280/ijsdp.180807

Afifah, R. N., Putri, A., Hartanti, A. N., Negari, S. I. T., Pratama, M. S. R., Zuaini, P. A. K., Al Madani, A. R., Muryanto, B. S., Muhammad, F., Astikasari, L., Indriyani, S., Kurniawati, I., Kusumaningrum, L., Budiharta, S., Flores, A. B., & Setyawan, A. D. (2023). Ecotourism development as a community-based conservation effort in Ayah Mangrove Forest, Kebumen, Central Java, Indonesia. *Asian Journal of Forestry*, *7*(1), 37–44. https://doi.org/10.13057/asianjfor/r070105

Alfitri, A., Alfatih, A., Lionardo, A., Kholek, A., Saraswati, E., Izzudin, M., & Santoso, A. D. (2022). The complexity of integrating indigenous knowledge for ecotourism planning: a case of Mude Ayek's customary forests, Indonesia. *International Journal of Tourism Anthropology*, *9*(1), 76–97. https://doi.org/10.1504/IJTA.2022.128057

Ali, M., Sulistiono, Imran, Z., & Simanjuntak, C. P. H. (2021). The potential development of ecotourism based on mangrove ecosystem in Ujung Pangkah of Gresik Regency, East Java Province, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *800*(1), 012054. https://doi.org/10.1088/1755-1315/800/1/012054

Ambarita, S. T. P., Basyuni, M., Sulistyono, N., Wati, R., Fitri, A., Slamet, B., Balke, T., Bunting, P., & Munir, E. (2018). Landscape planning and economic valuation of mangrove ecotourism using GIS and Google Earth image. *Journal of Theoretical and Applied Information Technology*, *96*(19), 6306–6317.

Andarani, P., Lestari, D. F., Rezagama, A., & Sariffuddin, S. (2018). Sustainable ecotourism development based on participatory rural appraisal: A case study of Thekelan Village, Central Java, Indonesia. *E3S Web of Conferences*, *73*. https://doi.org/10.1051/e3sconf/20187302019

Anggraini, R. I., & Gunawan, B. (2021). Ecotourism development in national parks: A new paradigm of forest management in Indonesia. *E3S Web of Conferences*, *249*, 03010. https://doi.org/10.1051/e3sconf/202124903010

Arfan, A., Nyompa, S., Rakib, M., & Juanda, M. F. (2021). The analysis of mangrove area as a marine eco-fisherytourism area in Luwu Regency South Sulawesi, Indonesia. *Journal of Physics: Conference Series*, *2123*(1), 012009. https://doi.org/10.1088/1742-6596/2123/1/012009

Ariyani, N., & Fauzi, A. (2022). A policy framework for sustainable tourism development based on participatory approaches: A case study in the Kedung Ombo tourism area-Indonesia. *Geojournal of Tourism and Geosites*, *40*(1), 129–135. https://doi.org/10.30892/GTG.40115-811

Arkwright, D., & Kaomaneng, I. S. (2018). Mangrove ecotourism development on Kakaralamo Island North Halmahera: Community perception, participation and development strategies. *IOP Conference Series: Earth and Environmental Science*, *175*(1), 012232. https://doi.org/10.1088/1755-1315/175/1/012232

Aryantie, M. H., Fauzi, R., Saragih, G. S., Junaidi, E., Kayat, & Hidayat, O. (2023). Ecotourism in the city: A strategy to promote sustainability. *IOP Conference Series: Earth and Environmental Science*, *1177*(1), 012006. https://doi.org/10.1088/1755-1315/1177/1/012006

Askar, H., Tahang, H., Sutinah, S., Fakhriyyah, S., Bahar, A., Tresnati, J., & Tuwo, A. (2021). Short communication: Using ecological parameters to assess the sustainability of mangrove ecotourism in Jeneponto, South Sulawesi, Indonesia. *Biodiversitas*, *22*(8), 3571–3577. https://doi.org/10.13057/BIODIV/D220858

Basyuni, M., Bimantara, Y., Siagian, M., Wati, R., Slamet, B., Sulistiyono, N., Nuryawan, A., & Leidonad, R. (2018). Developing community-based mangrove management through eco-tourism in North Sumatra, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *126*(1), 012109. https://doi.org/10.1088/1755-1315/126/1/012109

Choi, G., Kim, J., Sawitri, M. Y., & Lee, S. K. (2020). Ecotourism market segmentation in Bali, Indonesia: Opportunities for implementing REDD+. *Land*, *9*(6), 186.

Ernawati, N. M., Torpan, A., & Voda, M. (2018). Geomedia role for mountain routes development. Mesehe and pisoiu waterfall comparative study. *Geographia Technica*, *13*(1), 41–51. https://doi.org/10.21163/GT_2018.131.05

Ernawati, N. M., Voda, M., Sudhana, I. G. P. F. P., & Sudarmini, N. M. (2018). Forest environment supports for community-based tourism development. *Journal of Environmental Management and Tourism*, *9*(8), 1635–1641. https://doi.org/10.14505/jemt.v9.8(32).01

Erniwati, & Santosa, Y. (2024). High Conservation Value area in oil palm landscape as a potential ecotourism destination for birdwatching activity. *IOP Conference Series: Earth and Environmental Science*, *1366*(1), 012029. https://doi.org/10.1088/1755-1315/1366/1/012029

Farid, A., Arisandi, A., Faridy, A. F., & Priyanto, M. W. (2023). Development of mangrove ecotourism based on the tourist perspective in Lembung Village, Indonesia. *Journal of Environmental Management and Tourism*, *14*(2), 425–434. https://doi.org/10.14505/jemt.v14.2(66).12

Feti, F., Hadi, S. P., Purnaweni, H., & Sudarno. (2020). Does the intervention of regional authorities contribute to sustainable mangrove eotourism? Case Study on Mangrove Management at Karangsong, West Java, Indonesia. *Ecological Questions*, *31*(3), 7–14. https://doi.org/10.12775/EQ.2020.017

Fibrianto, A. S. (2020). Management model of ecotourism-based forest village community land to increase local economic in Karanganyar, Indonesia. *Geojournal of Tourism and Geosites*, *37*(3), 934–942. https://doi.org/10.30892/gtg.37327-729

Ginantra, I. K., Muksin, I. K., & Joni, M. (2021). Crab diversity as support for ecotourism activities in Pejarakan mangrove forest, buleleng, bali, indonesia. *Biodiversitas*, *22*(10), 4139–4145. https://doi.org/10.13057/biodiv/d221003

Ginting, N., & Triska, E. (2020). Developing tourism attractions based on ecotourism in Aek Nauli Indonesia. *IOP Conference Series: Earth and Environmental Science*, *452*(1), 012033. https://doi.org/10.1088/1755-1315/452/1/012033

Hakim, L., & Soemarno, M. (2017). Biodiversity conservation, community development and geotourism development in Bromo-Tengger-Semeru-Arjuno biosphere reserve, East Java. *Geojournal of Tourism and Geosites*, *20*(2), 220–230.

Harahab, N., Riniwati, H., & Abidin, Z. (2018). The vulnerability analysis of mangrove forest status as a tourism area. *Ecology, Environment and Conservation*, *24*(2), 968–975.

Harahap, I., & Effendi, I. (2020). The potential forest ecotourism in Suligi Hill, Riau Province, Indonesia. *Journal of Physics: Conference Series*, *1655*(1), 012148. https://doi.org/10.1088/1742-6596/1655/1/012148

Harahap, Z. A., Sahleni, W., Bakti, D., & Leidonald, R. (2021). Study of development of mangrove forest potential for ecotourism in Kunkun Village, Mandailing Natal Regency, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *912*(1), 012057. https://doi.org/10.1088/1755-1315/912/1/012057

Hartanti, U., Patria, M. P., & Utomo, S. W. (2018). The physical carrying capacity of mangrove ecotourism in Blanakan, Subang Regency, West Java, Indonesia. *E3S Web of Conferences*, *74*. https://doi.org/10.1051/e3sconf/20187402001

Hartoyo, A. P. P., Sunkar, A., Fadillah, A., Hidayati, S., Winata, B., & Hadi, A. N. (2021). Vegetation cover analysis and ecotourism business model for sustainable forest management in Gunung Leuser National Park, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *771*(1), 012001. https://doi.org/10.1088/1755-1315/771/1/012001

Hastuti, T. K., & Yuliati, U. (2017). A model for mangrove forest management based on community empowerment in Bantul regency. *Journal of Environmental Management and Tourism*, *8*(6), 1232–1237. https://doi.org/10.14505/jemt.v8.6(22).10

Hengky, S. H., & Kikvidze, Z. (2018). Tourism sustainability in the Bogor Botanical Gardens, Indonesia. *Urban Forestry and Urban Greening*, *30*, 8–11. https://doi.org/https://doi.org/10.1016/j.ufug.2018.01.007

Hidayat, A., Budiastuti, M. T. S., Trihatmoko, E., Danardono, D., & Ainurrohmah, D. (2024). The potential of community-based ecotourism development with an ecosystem service approach: a case study of Kaliwlingi Village, Brebes, Indonesia. *Environment, Development and Sustainability*, *26*(12), 31099–31119. https://doi.org/10.1007/s10668-023-04380-w

Hitchner, S. L., Apu, F. L., Tarawe, L., Aran, S.G.S.N, & Yesaya, E. (2009). Community-based transboundary ecotourism in the Heart of Borneo: a case study of the Kelabit Highlands of Malaysia and the Kerayan Highlands of Indonesia. *Journal of Ecotourism*, *8*(2), 193–213. https://doi.org/10.1080/14724040802696064

Ilhamdi, M. L., Al Idrus, A., Santoso, D., Hadiprayitno, G., & Syazali, M. (2021). Species richness and conservation priority of dragonflies in the suranadi ecotourism area, Lombok, Indonesia. *Biodiversitas*, *22*(4), 1846–1852. https://doi.org/10.13057/biodiv/d220430

Insani, N., Ridhoi, R., Hidajat, H. G., A'rachman, F. R., Darmendra, I. P. Y., Ardiyanti, R. N., & Veronica, A. (2024). Pro-environmental tourism: Lessons learned from adventure, wellness and eco-tourism in Padusan Village, Mojokerto, East Java. *IOP Conference Series: Earth and Environmental Science*, *1313*(1), 012043. https://doi.org/10.1088/1755-1315/1313/1/012043

Lahallo, W., Tanjung, R. H. R., & Sujarta, P. (2022). Diversity, composition and important tree species for Cenderawasih bird activities in Rhepang Muaif ecotourism forest, Jayapura, Papua, Indonesia. *Biodiversitas*, *23*(2), 741–749. https://doi.org/10.13057/biodiv/d230219

Manullang, H. M., Lubis, Z., & Sabrina, R. (2024). The potential of mangroves in supporting fisheries tourism in Banyak Island, Langkat Regency, Indonesia. *AACL Bioflux*, *17*(4), 1357–1363.

Maulana, F. I., & Pratama, F. C. (2021). Suistainable development planning of tourist village using participatory mapping (Case study: Sanankerto Village, Malang, Indonesia). *IOP Conference Series: Earth and Environmental Science*, *794*(1), 012244. https://doi.org/10.1088/1755-1315/794/1/012244

Mihardja, E. J., Alisjahbana, S., Agustini, P. M., Sari, D. A. P., & Pardede, T. S. (2023). Forest wellness tourism destination branding for supporting disaster mitigation: A case of Batur UNESCO Global Geopark, Bali. *International Journal of Geoheritage and Parks*, *11*(1), 169–181. https://doi.org/https://doi.org/10.1016/j.ijgeop.2023.01.003

Mulyadi, A., & Hamidy, R. (2021). Development of mangrove ecotourism in Bandar Bakau Dumai based on disaster mitigation. *International Journal of Sustainable Development and Planning*, *16*(7), 1359–1367. https://doi.org/10.18280/ijsdp.160716

Munandar, A., Gunawan, A., Nurazizah, G. R., & Kusumoarto, A. (2020). Analysis on willingness to pay at the ecotourism destination, cigamea waterfall, halimun-salak national reserve. *Journal of Environmental Management and Tourism*, *11*(2), 403–416. https://doi.org/10.14505/jemt.11.2(42).19

Notohamijoyo, A., Abdul Hakim, A., Billah, M., & Setya Wiyata, A. (2020). Integration of ecolabelling and ecotourism schemes: Case study of forest honey in Indonesia. *E3S Web of Conferences*, *211*. https://doi.org/10.1051/e3sconf/202021101010

Novianti, R., Afandi, A. Y., Tampubolon, B. I., Rahmadya, A., & Sulawesty, F. (2022). Mangrove resource and ecotourism development in Karangsong, Indramayu Regency, West Java, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *1062*(1), 012039. https://doi.org/10.1088/1755-1315/1062/1/012039

Pin, T. G., Supriatna, J., Takarina, N. D., & Tambunan, R. P. (2021). Mangrove diversity and suitability assessments for ecotourism in cimalaya wetan coast, karawang district, indonesia. *Biodiversitas*, *22*(2), 803–810. https://doi.org/10.13057/biodiv/d220234

Prihadi, D. J., Zhang, G., Lahbar, G. M., & Pasaribu, B. (2024). Integration of community-based tourism (CBT) index and biophysical assessment for sustainable ecotourism mangrove: A case study of Karangsong, Indonesia. *Sustainability*, *16*(7), 2806. https://doi.org/10.3390/su16072806

Purify, A., Nurdin, N., Maulani, R. I., & Lanuru, M. (2019). Water bird habitat suitability analysis in an urban coastal wetland (case study: Lantebung mangrove ecotourism area). *IOP Conference Series: Earth and Environmental Science*, *370*(1), 012042. https://doi.org/10.1088/1755-1315/370/1/012042

Purwoko, A., Zaitunah, A., Samsura, D. A. A., Sibarani, R., Muda, I., & Faustina, C. (2023). Assessing the development potential, feasibility and visitor assessment in the Sipinsur Geosite natural tourism area, Toba Caldera Global Geopark, Indonesia. *Geojournal of Tourism and Geosites*, *49*(3), 1075–1086. https://doi.org/10.30892/gtg.49323-1107

Purwowibowo, Santoso, B., Hendrijanto, K., Hariyono, S., & Nufus, B. H. (2020). Local wisdom for mangrove conservation and ecotourism: Case study from Wringinputih, Muncar, Banyuwangi. *IOP Conference Series: Earth and Environmental Science*, *485*(1), 012092. https://doi.org/10.1088/1755-1315/485/1/012092

Putri, E. P., Putra, B. R. S. P., & Puteri, A. H. A. (2023). Mangrove forest conservation-based tourism industry development in Indonesia. *International Exchange and Innovation Conference on Engineering and Sciences*, *9*, 161–167. https://doi.org/10.5109/7157967

Putri, V., Wijayanti, L. R., & Hidayati, N. I. (2024). Ecotherapy healing forest concept in natural tourism park (NTP) Mount Kelam Sintang Regency West Kalimantan, Indonesia. *International Journal of Geoinformatics*, *20*(1), 53–71. https://doi.org/10.52939/ijg.v20i1.3031

Rahmila, Y. I., & Halim, M. A. R. (2018). Mangrove forest development determined for ecotourism in Mangunharjo Village Semarang. *E3S Web of Conferences*, *73*. https://doi.org/10.1051/e3sconf/20187304010

Ridwan, R., Ma'rifatin, Z., & Rahmawaty, R. (2022). Ethnobotanical study and conservation strategy of medicinal plants in the ecotourism area of Kedah Rainforest Lodges in Aceh, Indonesia. *Biodiversitas Journal of Biological Diversity*, *23*(12), 6227–6237. https://doi.org/10.13057/biodiv/d231218

Rudianto, Dwi Ari Sanda, L., Chairi Vina, R., Putri Olivia, N., Ester, & Nur Habibah, E. (2021). A sustainable ecotourism conservation model based on biodiversity analysis of Tambaan Coast, Pasuruan City, East Java Province. Indonesia. *IOP Conference Series: Earth and Environmental Science*, *718*(1), 012003. https://doi.org/10.1088/1755-1315/718/1/012003

Santosa, Y., & Kwatrina, R. T. (2024). The potential of HCV areas as ecotourism destinations: Preliminary identification in Sumatra oil palm plantation. *IOP Conference Series: Earth and Environmental Science*, *1366*(1), 012031. https://doi.org/10.1088/1755-1315/1366/1/012031

Satyatama, T., Wijayanti Faida, L. R., Purwanto, R. H., & Fandeli, C. (2020). Carving the future of nature ecotourism in Indonesia: Case of Taman wisata alam telogo warno telogo pengilon. *Jurnal Manajemen Hutan Tropika*, *26*(1), 80–89. https://doi.org/10.7226/jtfm.26.1.80

Setiawan, A., Charles, Y. O. B., Rustiati, E. L., Ruciyansah, Y., & Anwar, Z. (2021). An assessment of Sumatran elephant presences (Elephas maximus sumatranus) in Kotaagung Utara (Lampung, Indonesia) as a potential tourism attraction. *Biodiversitas Journal of Biological Diversity*, *22*(12), 5397-5407. https://doi.org/10.13057/biodiv/d221222

Setyaningrum, E. W., Erwanto, Z., Prapti, K. P., Jayanti, A. L., Dewi, A. T. K., & Susanti, H. D. (2021). Development of sustainable mangrove areas based on empowerment of coastal communities in Cemara Beach, Pakis, Banyuwangi, East Java, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *718*(1), 012053. https://doi.org/10.1088/1755-1315/718/1/012053

Siahaya, M. E., Matius, P., Aipassa, M. I., Rayadin, Y., Ruslim, Y., & Aponno, H. S. E. S. (2021). Ecotourism development through biodiversity potential identification and community perception in the protected forest on buano island, western seram, Maluku, Indonesia. *Biodiversitas*, *22*(6), 3179–3191. https://doi.org/10.13057/biodiv/d220621

Singgalen, Y. A. (2020). Mangrove forest utilization for sustainable livelihood through community-based ecotourism in kao village of north halmahera district. *Jurnal Manajemen Hutan Tropika*, *26*(2), 155–168. https://doi.org/10.7226/JTFM.26.2.155

Sisriany, S., & Furuya, K. (2024). Understanding the spatial distribution of ecotourism in Indonesia and its relevance to the protected landscape. *Land*, *13*(3), 370. https://doi.org/10.3390/land13030370

Sjaifuddin, S. (2020). Sustainable management of freshwater swamp forest as an ecotourism destination in Indonesia: A system dynamics modeling. *Entrepreneurship and Sustainability Issues*, *8*(2), 64–85. https://doi.org/10.9770/jesi.2020.8.2(4)

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, *104*, 333–339. https://doi.org/https://doi.org/10.1016/j.jbusres.2019.07.039

Sowards, S. K., & Banerjee, P. (2021). Ecotourism as leisure and labor in the experience of the "great" Outdoors. *Frontiers in Communication*, *6*. https://doi.org/10.3389/fcomm.2021.736762

Sukaesih, S., Winoto, Y., & Septian, F. I. (2021). Pioneering public space reading park in the Karangsong Mangrove Forest Ecotourism Area, Indramayu Regency, West Java Province, Indonesia. *Library Philosophy and Practice*, *2021*.

Sulistyorini, I. S., Allo, J. K., Edwin, M., & Rosdianto. (2022). Assessment of lake tourism object as ecotourism destination in Merabu, Berau Regency, East Kalimantan. *Jurnal Sylva Lestari*, *10*(1), 155–166. https://doi.org/10.23960/jsl.v10i1.554

Sumarmi, S., Bachri, S., Purwanto, P., Mutia, T., Sholeha, A. W., Rahmasyah, P. I., & Shrestha, R. P. (2024). Mangrove forest management strategy in Bedul, Banyuwangi: Collaboration between community and Alas Purwo National Park for sustainable ecotourism. *GeoJournal of Tourism and Geosites*, *52*(1), 85–97. https://doi.org/10.30892/gtg.52108-1185

Sumarmi, S., Bachri, S., Purwanto, P., Zubaidah, S., Shrestha, R. P., & Sholiha, A. W. (2022). Assessing Bedul Mangrove Ecotourism using green and fair strategy empowerment to fulfill SDGs 2030 agenda for tourism. *Environmental Research, Engineering and Management*, *78*(2), 73–87. https://doi.org/10.5755/j01.erem.78.2.31006

Trišić, M. (2024). Managing digital marketing visibility of ecotourism, sustainable and green tourism. *Tourism International Scientific Conference Vrnjačka Banja-TISC*, *8*(1), 258-268. https://doi.org/10.52370/TISC24258MT

Utama, I. G. B. R., Junaedi, I. W. R., & Krismawintari, N. P. D. (2023). The Bali ecotourism destination management to create small local business. *International Journal of Sustainable Development and Planning*, *18*(11), 3439–3447. https://doi.org/10.18280/ijsdp.181109

Vipriyanti, N. U., Semadi, I. G. N. M. D., & Fauzi, A. (2024). Developing mangrove ecotourism in Nusa Penida Sacred Island, Bali, Indonesia. *Environment, Development and Sustainability*, *26*(1), 535–548. https://doi.org/10.1007/s10668-022-02721-9

Wardhani, M. K., Rosyid, D. M., & Armono, H. D. (2022). Land use change of mangrove forest for eco-tourism in the South Coastal, Bangkalan, East Java-Indonesia. *International Journal of GEOMATE*, *23*(98), 136–146. https://doi.org/10.21660/2022.98.1221

Yarhamdhani, Y., Hamdani Harahap, R., Humaizi, H., & Kusmanto, H. (2024). Community-based sustainable ecotourism at Tangkahan Tourism Destination, Langkat Regency. *WSEAS Transactions on Environment and Development*, *20*, 203–214. https://doi.org/10.37394/232015.2024.20.21

Yuwono, E., Maulany, R. I., & Barkey, R. A. (2021). Site suitability evaluation for ecotourism development: A case study in Bulue Village, Soppeng District, Indonesia. *Journal of Sustainability Science and Management*, *16*(1), 129–140. https://doi.org/10.46754/jssm.2021.01.012

Zainal, S., Nirzalin, Fakhrurrazi, Yunanda, R., Ilham, I., & Badaruddin. (2024). Actualizing local knowledge for sustainable ecotourism development in a protected forest area: insights from the Gayonese in Aceh Tengah, Indonesia. *Cogent Social Sciences*, *10*(1), 2302212. https://doi.org/10.1080/23311886.2024.2302212

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