



STRATEGIC MANAGEMENT OF MANGROVE FOREST ECOSYSTEMS IN THE COASTAL REGION OF TANGKOLAK HAMLET, SUKAKERTA VILLAGE OF KARAWANG REGENCY

PENGELOLAAN STRATEGIS EKOSISTEM HUTAN MANGROVE DI WILAYAH PESISIR DUSUN TANGKOLAK, DESA SUKAKERTA, KABUPATEN KARAWANG

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ABSTRACT

The mangrove forest ecosystem in Karawang Regency is undergoing rapid degradation, thereby threatening its ecological, social, and economic functions, as well as its role in coastal protection. This study aims to formulate a management strategy using a strategic management approach for mangrove ecosystem conservation and ecotourism development in Cilamaya Wetan District. Emphasis is placed on integrating community participation with policy support. Data were collected through participatory methods, including interviews and focus group discussions involving local residents, government officials, and relevant stakeholders. A SWOT analysis was applied to assess internal capabilities and external environmental factors. The results indicate that conservation initiatives undertaken by KUB Kreasi Alam Bahari have made progress in mangrove reforestation, nursery development, and spatial zoning. Ecotourism activities are complemented by cultural events, such as the “Baritan” ritual, which contribute to environmental education and increased income for the local community. The SWOT analysis yielded a strategic position score of (0.11; 0.80), placing the area in Quadrant I of the matrix and supporting an aggressive management strategy. The study concludes that the district’s mangrove ecosystem is well-positioned for sustainable management oriented toward economic growth. Practical implications include strengthening environmental awareness, empowering local institutions, and integrating cultural traditions into tourism planning. This research offers a replicable model for community-led mangrove ecosystem management in other coastal regions facing similar environmental and socio-economic challenges.

Keywords: coastal, conservation, ecotourism, mangrove, SWOT

ABSTRAK

Ekosistem hutan mangrove di Kabupaten Karawang mengalami degradasi yang semakin cepat sehingga mengancam fungsi ekologi, sosial, ekonomi, dan perlindungan pesisir. Penelitian ini bertujuan untuk merumuskan strategi pengelolaan melalui pendekatan manajemen strategik untuk konservasi ekosistem mangrove dan pengembangan ekowisata di Kecamatan Cilamaya Wetan. Penekanan diberikan pada pengintegrasian partisipasi masyarakat dengan dukungan kebijakan. Data dikumpulkan melalui metode partisipatif, termasuk wawancara dan diskusi kelompok terfokus, yang melibatkan penduduk setempat, pejabat pemerintah, dan pemangku kepentingan terkait. Analisis SWOT diterapkan untuk menilai kemampuan faktor internal dan faktor lingkungan eksternal. Hasil penelitian ini menunjukkan bahwa inisiatif konservasi yang digerakkan oleh KUB Kreasi Alam Bahari telah mencapai kemajuan dalam melakukan reboisasi mangrove, pengembangan pembibitan, dan zonasi spasial. Kegiatan ekowisata dilengkapi dengan acara-acara budaya seperti ritual Baritan, yang berkontribusi pada pendidikan lingkungan dan peningkatan pendapatan masyarakat setempat. Analisis SWOT menghasilkan skor posisi strategis (0,11; 0,80), yang menempatkan wilayah ini pada matriks Kuadran I, yang mendukung strategi pengelolaan yang agresif. Studi ini menyimpulkan bahwa ekosistem mangrove di kabupaten ini memiliki posisi yang baik untuk pengelolaan yang berorientasi pada pertumbuhan ekonomi secara berkelanjutan. Implikasi praktisnya meliputi penguatan kesadaran lingkungan, pemberdayaan institusi lokal, dan pengintegrasian tradisi budaya ke dalam perencanaan pariwisata. Penelitian ini menawarkan model yang dapat direplikasi untuk pengelolaan ekosistem mangrove yang dikelola oleh masyarakat di wilayah pesisir lainnya yang menghadapi tantangan lingkungan dan sosial-ekonomi yang serupa.

Kata kunci: ekowisata, konservasi, mangrove, pesisir, SWOT

INTRODUCTION

Mangrove ecosystems are integral to sustaining coastal resilience, biodiversity, and the livelihoods of coastal communities. At the regency level in Karawang, however, these ecosystems are already severely degraded. According to statistics from the Central Bureau of Statistics, the total area of mangrove forest is about 9,979.93 ha, with 5,400.31 ha in degraded status, 3,953.96 ha in moderate status, and only 625.66 ha in good status (Kurniawansyah *et al.* 2023).

The decline of mangroves in Karawang is associated with numerous anthropogenic activities, such as the conversion of land to agricultural and industrial uses and overexploitation (Suwanto *et al.* 2021). Inadequate management and weak collaboration among stakeholders further contribute to these problems and impede long-term strategic planning for mangrove ecosystem conservation and restoration (Nopiana *et al.* 2020). The decline in the quality and extent of mangrove ecosystems in Karawang is also driven by coastal abrasion and recurring tidal flooding phenomena that are increasing in intensity. Meanwhile, government interventions have yet to effectively address these problems. Current conditions increasingly threaten the livelihoods of coastal communities in Sukakarta Village, Karawang. Moreover, local communities that derive economic benefits from mangroves and depend on sustainable conservation practices face threats not only to the environment, but also to their own long-term livelihoods (Suwanto *et al.* 2021).

In addition to their economic value, mangroves function as vital carbon sinks and contribute to climate change mitigation, the regulation of water quality, and the support of the extensive biodiversity of mangrove-associated marine fauna (Hagger *et al.* 2022). Efforts to achieve both conservation and community-based ecotourism goals in mangrove ecosystem management, if pursued in parallel without synergy, risk yielding suboptimal ecological and socio-economic outcomes. For instance, ecotourism activities conducted without strict controls can generate waste and litter that undermine ecological management objectives; consequently, the area may become degraded and unsightly due to poorly managed visitor-generated refuse.

Sustainability in the management of mangrove ecosystems is vital. A trend has emerged in the literature encouraging the integration of conservation with community-

based ecotourism development that aims to improve both ecological outcomes and local-level economic returns (Suwanto *et al.* 2021). In Karawang, research has focused on the role of such integrated approaches in rehabilitating the degraded mangrove ecosystem and restoring its ecological function, highlighting both the need for cooperation among stakeholders and the need for supporting policies (Nopiana *et al.* 2020).

The purpose of this research is to identify and analyze internal and external factors in order to formulate recommendations for effective mangrove ecosystem management strategies using an Internal-External (IE) matrix and a SWOT analysis. The objective of this strategic assessment is to develop strategies that support and advance conservation efforts, sustainable tourism, and community involvement. This study also contributes to practical lessons on the participatory and integrated management of mangroves by offering a case study of mangrove management experience. The novelty of this study lies in a mangrove ecosystem management model that integrates the cultivation of local wisdom, the blue economy, citizen science, edu-ecotourism, and community-scale public participation, alongside the involvement of government and private sector entities. Sustainable tourism and community involvement in its management are crucial for preventing damage to the functions of mangrove areas, through the application of environmental, socio-cultural, and economic management principles.

METHODS

Theoretical framework

The involvement of the KUB Kreasi Alam Bahari Joint Business Group indicates that a locally-based approach is key to conservation, highlighting the influence of local government and community engagement as an aspect of ecosystem governance (Fatimatuzzahroh *et al.* 2020; Afifah *et al.* 2023). Stakeholder participation has been found to foster ecological governance and the sustainability of conservation interventions in the long run (Fatimatuzzahroh *et al.* 2020; Nuraeni and Kusuma 2023). Effective management of mangrove forest ecosystems requires a harmonious network characterized by the synergistic involvement of the government, the community, and the private sector. It is essential for all three parties to fulfill their

respective roles in accordance with their specific capabilities and authority.

Scope of discussion

Mangrove ecosystem conditions with regard to area, species diversity, and degradation status were derived from field observations and are critical for establishing ecological baseline data and initiating local conservation action (Aipassa *et al.* 2023; Koda 2023). Furthermore, the focus on primary and secondary data collection allows a thorough understanding not only of the socio-economic but also of the institutional contexts in which mangrove ecosystem management occurs.

The case study demonstrates the importance of community participation in the management of mangrove ecosystems and the need for it to be harmonized with mangrove ecosystem conservation interventions. Communities can be involved in development planning processes initiated by either the government or the private sector. Furthermore, during the actual development phase, communities should be engaged in discussions and participate in supervision and monitoring to ensure optimal utilization of the outcomes. Conservation programs such as community education and economic incentives can further increase stakeholders' commitment, ensuring that mangrove ecosystem conservation supports local needs (Fatimatuzzahroh *et al.* 2020). Moreover, results from previous studies have also indicated that building partnerships between local interest groups and strengthening institutional frameworks can significantly enhance the sustainability of mangrove ecosystem management (Mardianton *et al.* 2024).

Research location and time

This study was undertaken in 2021 in the community of Tangkolak hamlet, Sukakarta village, Cilamaya Wetan district, the coastal region of Karawang regency, West Java province, which is well known for its mangrove ecosystem (Figure 1).

Types and methods of data collection

The study used a non-probability sampling approach to obtain a representative spectrum of perceptions from stakeholders such as local government officials, NGOs, fishermen, women farmers, and academia. The techniques of data collection, such as structured interviews, focus group discussions (FGDs), and participatory rural appraisal (PRA), encourage grassroots inclusion, ensuring that local wisdom is incorporated into mangrove ecosystem management (Maulidah *et al.* 2023). This study employed a qualitative research method with a case study approach. A total of 10 informants were interviewed, comprising one mangrove ecosystem management figure, one village head, five fishermen, one representative from a tourism agency, one representative from a marine affairs agency, and one academic. Interview data were collected from informants using the snowball method. Snowball sampling is a data collection technique that proceeds in a chain-like manner from an initial informant to other informants. While primary data capture first-hand stakeholder perspectives and direct documentation of activities, secondary data retrieved from government reports and other pre-existing academic research contribute to the findings by providing broader contextual understanding (Fatimatuzzahroh *et al.* 2020; Natsir *et al.* 2023).



Figure 1. Mangrove ecosystems: (a) fish-shrimp-crab farming pond, (b) mangrove seedling nursery area, (c) educational-tourism jogging track and visitor footpath.

Data analysis

An analysis of these data using the Strengths, Weaknesses, Opportunities, and Threats (SWOT) framework clarifies the internal strengths and weaknesses and external opportunities and threats of mangrove ecosystem management in the region (Koda 2023; Ramli *et al.* 2024). Weighting and rating were determined based on the magnitude of the role and influence of factors relevant to the proposed strategies, established through discussions with management authorities and government officials. Based on a quantitative analysis of these factors, the research develops practical implications that contribute to strategic management advice (Koda 2023). In light of the important ecosystem services provided by mangrove ecosystems, which include carbon sequestration and fisheries support, such participatory and strategic approaches are now crucial for striking an appropriate balance between ecological integrity and community livelihoods (Afifah *et al.* 2023; Fatimatuzzahroh *et al.* 2020).

RESULTS AND DISCUSSION

Mangrove ecosystem conservation as a strategic asset

The mangrove ecosystem in Tangkolak hamlet is important ecological infrastructure, providing protection against saltwater tidal surges and erosion and supporting the preservation of biodiversity. This ecosystem is situated on state-owned accreted land managed by community groups. These benefits are highly valued by the local community, which is heavily involved in reforestation and preservation projects. In 2019, 4,000 mangrove seedlings were planted in an initiative symbolically launched by the Regent of Karawang. However, in 2021, a major tidal flood lasting eight days caused the death of the mangrove seedlings. In 2023, the KUB replanted using the Spaced Cluster Method. To date, the planted *Rhizophora* sp. seedlings have successfully survived. This Joint Business Group (KUB) represents a community committed to the conservation and management of the mangrove ecosystem. It is largely community-supported, with the government providing better infrastructure and enabling policies (Koda 2023).

The KUB Kreasi Alam Bahari has stimulated mangrove planting, seedling nurseries and appropriate zoning to maintain the conservation area. These

integrative approaches also contribute to the generation of local knowledge about the roles of mangrove ecosystems and may even increase the management capacity for restoration projects (Su *et al.* 2021; Villarreal-Rosas *et al.* 2024). Community wisdom and participatory approaches are beneficial for improving management and establishing ecological sustainability.

Furthermore, these are not merely conservation projects with spillover effects on ecological restoration; they also generate socio-economic benefits for the community. Encouraging the use of non-timber forest products, such as mangrove-ecosystem-associated foods and herbal resources, will promote household-based enterprises. This linkage between environmental stewardship and poverty reduction schemes is critical for maintaining these practices and encouraging wider community participation (Lahjie *et al.* 2019). Community-based conservation has proven successful for both the local economy and the mangrove ecosystem (Suraningsih *et al.* 2021; Mardianton *et al.* 2024).

In sum, the mangrove ecosystem conservation model in Tangkolak hamlet shows how local initiatives and government interventions can be combined to good effect. Such integrated initiatives not only preserve the ecological value of mangrove ecosystems, but also enhance social and economic resilience, illustrating the holistic benefits of long-term conservation approaches.

Mangrove ecotourism and cultural integration

The diverse mangrove ecosystem in Tangkolak hamlet has grown into a remarkable ecotourism and educational site, which contributes significantly to ecological preservation and local participation. Ecotourism activities include learning about mangrove flora and fauna species, understanding the ecological connections between the environment and the lives of animals and humans, and exploring the silvofishery model. Visitors can learn how to manage mangrove seedlings and produce food and beverages from mangrove fruits, or simply enjoy the fresh air and relaxation. Schools, universities, and research institutions often bring groups of students and researchers for environmental education programs and field trips, and the site offers guided nature walks, bird-watching tours, mangrove planting, and traditional fishing experiences (Kurniawati *et al.* 2022; Afifah *et al.* 2024). This practical education demonstrates to students the

importance of mangrove ecosystems for the conservation of coastal habitats and for the enhancement of biodiversity, helping visitors to value these vital resources.

Culture is also well embedded in the Tangkolak ecotourism experience. Baritan, which is held annually, is a symbol of identity and social cohesion and is attended by both the local population and tourists (Rahmadi *et al.* 2023). Baritan (or *babarit*) is a traditional *sedekah bumi* (earth offering) ceremony aimed at seeking safety, warding off misfortune, and expressing gratitude for blessings or the harvest. This tradition is commonly observed by Javanese and Betawi communities on specific occasions, such as the eve of 1 Suro (Muharram) or following the harvest. This incorporation of cultural heritage into ecotourism adds to the visitor experience and helps to preserve traditional customs and beliefs, which increases the value of ecotourism.

Moreover, the tourist area has a tourism suitability index of 82.95%, indicating good prospects for sustainable development. This high rating reflects key aspects of ecotourism sustainability, such as good natural conditions and a pleasant, accessible, and rich environment (Lai and Hitchcock 2017).

The interweaving of conservation, education, and cultural values in Tangkolak establishes a holistic example of community-based tourism. Mangrove seedling production in Tangkolak reaches 150,000 saplings annually; no fewer than 10,000 are used for mangrove ecosystem conservation in Tangkolak, while the remainder are distributed to neighboring villages. Each week, the site attracts around 200 to 300 visitors, including the general public, educational institutions, and government agencies. This has promoted local ownership and a sense of pride in natural resources and at the same time, economic diversification through ecotourism (Ali *et al.* 2021; Elfiondri *et al.* 2021; Mustain and Ariyanti 2024).

Importantly, studies from other regions emphasize the necessity of coupling suitability assessments with carrying capacity calculations. For example, Sitompul *et al.* (2025) in Kampung Nipah, North Sumatra, applied the Tourism Suitability Index (TSI) together with carrying capacity analysis and found that while the TSI values were low (1.87–1.97; S3 category), the maximum sustainable visitor load was 200 people per day across tracking, boating, and ATV activities. The general situation is somewhat different; there is no entrance fee at Tangkolak visitors only need to pay for vehicle parking. Although ecologically similar, Tangkolak attracts fewer visitors, and some

of the gazebos there are in disrepair. Culinary options are also more limited than those at Kampung Nipah ecotourism area in North Sumatra. This comparison highlights that even when Tangkolak scores highly on suitability, a formal carrying capacity assessment is essential to avoid ecological degradation. Incorporating such calculations would help ensure that ecotourism in Tangkolak remains both economically viable and environmentally sustainable (Sitompul *et al.* 2025).

The Tangkolak mangrove ecosystem embodies the interplay of ecological fitness and community participation. Its ecotourism value remains modest and has not yet seen rapid growth. The viability of such a model also indicates that synergizing local customs and cultural values with conservation is likely to yield better ecological results, with the improvement of local livelihoods.

Strategic SWOT analysis

The SWOT analysis of mangrove ecosystem conservation in Tangkolak Hamlet is crucial for identifying the appropriate strategic issues. The mangrove ecosystem management strategy is formulated by analyzing strengths, weaknesses, opportunities, and challenges/threats to determine the selected strategy. These issues are based on internal and external environmental factors regarding the management of this ecosystem (Table 1).

The Joint Business Group (KUB) monitors the mangrove ecosystem daily to ensure its sustainability. The management team has designated boundaries for core zones, including areas for nurseries, recreation, fish farming, culinary activities, places of worship, a meeting hall, and vehicle parking. A buffer zone has also been established for crab harvesting.

KUB development is carried out by academics and extension workers. Coaching mainly relates to conservation and the processing of mangrove fruit into food and drinks.

Conservation efforts include mangrove seedling cultivation, replanting to replace dead seedlings, and protection against illegal logging. Residential areas are situated outside the mangrove ecosystem, at a distance of 300 meters. The ecotourism area is being developed through the construction of walkways.

Within the community itself, there are several strengths, such as preserved mangrove ecosystem zones, the organized function of KUB Kreasi Alam Bahari, and zoning arrangements leading to sustainable resource use (Arfan *et al.* 2022; Koda 2023). Combined, these strengths

yield an internal strength score of 2.55.

The analysis points out considerable weaknesses such as poor community participation, limited application of technology, and a lack of training and awareness regarding conservation practices (Table 1), with an overall score of 2.62. These account for the higher weakness score and hence indicate areas for capacity building and educational programs (Afonso *et al.* 2022). Despite the guidance and programs implemented by KUB Kreasi Alam Bahari, these weaknesses imply that greater effort is still required to further stimulate and involve the public in developing the conservation program (Askar *et al.* 2021).

Externally, there are favorable support systems in place for Tangkolak hamlet, involving both rehabilitation programs supported by the government and village regulations conducive to conservation-based activities (Table 1), which yield a relatively high opportunity score of 3.00. Ecotourism opportunities are promising in the region, with increased interest and investment in sustainable tourism that capitalizes on the distinct ecological and cultural characteristics of the mangrove ecosystem (Pin *et al.* 2021;

Asniar *et al.* 2022). On the other hand, threats, such as illegal logging and violation of zoning practices (Table 1), yield a total threat score of 2.00, and these affect conservation actions (Arifanti *et al.* 2022; Nirwana *et al.* 2024).

When these strengths are weighed, on the one hand, against the weaknesses (particularly concerning education and the use of technology) on the other, internal strength is present, but insufficient (yielding a value of 0.11). Moreover, taking advantage of the external opportunities identified (0.80) will support the community in coping with threats and in developing sustainable ecotourism and overall community resilience (Asniar *et al.* 2022; Nirwana *et al.* 2024).

The results of this SWOT analysis suggest that the internal management of the mangrove environment has strengths, but education and the use of technology need to be promoted to minimize the weaknesses identified. These types of actions can enable the community to play a proactive role in conservation and capture economic benefits from external opportunities.

Table 1. SWOT analysis of mangrove ecosystem conservation in the coastal region of Karawang Regency.

No.	Factors	Weight	Rating	Score
IFE matrix – internal strengths				
1	Well-preserved mangrove areas	0.30	3	0.90
2	Role of KUB Kreasi Alam Bahari with government collaboration	0.26	3	0.78
3	Zoning division for mangrove forest use	0.24	1	0.24
4	Utilization of non-timber forest products	0.20	1	0.20
Total		1.00		2.12
IFE matrix – internal weaknesses				
1	Low community participation in mangrove management	0.23	3	0.69
2	Lack of appropriate technology	0.16	2	0.32
3	Insufficient training and counseling for mangrove management	0.19	2	0.38
4	Limited ecological knowledge among residents	0.22	1	0.22
5	Community disinterest in practical field activities	0.20	2	0.40
Total		1.00		2.01
EFE matrix – external opportunities				
1	Mangrove rehabilitation programs	0.28	4	1.12
2	Existence of village regulations	0.24	3	0.72
3	High potential for ecotourism development	0.23	2	0.46
4	Community's positive attitude toward mangrove efforts	0.25	2	0.50
Total		1.00		2.80
EFE matrix – external threats				
1	Illegal cutting and misuse of mangrove resources	0.54	2	1.08
2	Disturbances in protected mangrove zoning	0.46	2	0.92
Total		1.00		2.00

Visualization of strategic positioning

Data were collected by gathering information from mangrove ecosystem managers, Perhutani, village authorities, the Ministry of Marine Affairs and Fisheries (KKP), and academic institutions through interviews, observations, documentation, and literature reviews. The data were analyzed using weight and rating calculations associated with the SWOT analysis method. Triangulation was employed to ensure the validity and accuracy of the obtained data; data deemed irrelevant were reduced (Miles and Huberman 1984). The valid and accurate data were presented, and their weights and ratings were analyzed to determine the selected strategic position. The derivation of the aggressive strategy shown in Figure 2 follows Mulyadi (2009).

Figure 2 illustrates the SWOT analysis coordinates (0.11, 0.80), placing the strategy in Quadrant I, indicating a proactive and aggressive growth strategy. The SWOT analysis position in Quadrant I suggests that the mangrove ecosystem management programs in Tangkolak hamlet are in a positive internal and external condition for applying an aggressive development strategy. This quadrant shows that the strengths and opportunities outweigh the internal weaknesses and the external threats experienced by the community (Rizki *et al.* 2021). This implies that KUB Kreasi Alam Bahari, with assistance from the local government, has the potential to sustain and

develop its sustainable mangrove ecosystem management program.

Well-preserved mangrove ecosystem zones, good zoning practices, and a structured operational role for KUB Kreasi Alam Bahari constitute a strong basis for enhancing current conservation and ecotourism efforts (Fajartriyani *et al.* 2019; Sari *et al.* 2023). Additionally, by proactively leveraging these external opportunities, in particular, by complementing efforts to improve eco-education and using regulatory frameworks for sustainability practices, local initiatives can be strategically scaled up to the landscape level in pursuit of combined ecological and economic objectives (Koda 2023; Abubakar *et al.* 2024).

This strategic position in Quadrant I helps to build stakeholder insight into the present landscape while also focusing where investments and policy efforts need to be targeted to amplify and support community conservation efforts. The results confirm the current participatory model (in which local participation in environmental institutions is emphasized) as an effective one that can be used to encourage continued governmental and financial support (Sachin *et al.* 2020; Felicia *et al.* 2024). The strengths and opportunities identified indicate areas that can be strengthened in capacity development efforts, and issues that need to be addressed in terms of community participation and technical training (Khairunnisa *et al.* 2021).



Figure 2. Strategic positioning map for mangrove ecosystem management in Tangkolak, Karawang 2021.

In addition, being situated in Quadrant I also indicates that the group can succeed in managing challenges such as illegal logging or zoning conflicts by capitalizing on its assets, including community strength and local management mechanisms (Henri and Ardiawati 2020; Haidir *et al.* 2023). This strategic vision encourages sustained interest, continued investment, and the strengthening of mangrove ecosystem conservation programs to help ensure long-term environmental, economic, and societal benefits (Natsir *et al.* 2023).

The strategic insights developed from this SWOT analysis position the mangrove ecosystem in Tangkolak hamlet for potential value addition, supporting collaboration between KUB Kreasi Alam Bahari and the local government and setting out a strategy for sustaining outputs.

Implications for management strategy

The recommended ecosystem development strategy for Tangkolak would be most effective if implemented through an aggressive approach that fosters community-based sustainable development. This strategy entails conducting public awareness programs and environmental education initiatives, as well as engaging the younger generation in conservation efforts. Such initiatives are essential to ensure that the local community values the mangrove ecosystem and is able to participate in its preservation, a necessity highlighted by research underscoring the importance of community involvement and local knowledge in the conservation and management of mangrove ecosystems (Arifanti *et al.* 2022; Koda 2023).

KUB Kreasi Alam Bahari is pivotal in all of this. This community-based organization requires institutional support to develop its ecotourism operation and conservation planning. Up-skilling, access to funding sources, and networking with other environmental organizations can be further strengthened (Arfan *et al.* 2024; Rumondang *et al.* 2024). This capacity development is consistent with findings on the effectiveness of NGOs in raising awareness on mangrove ecosystem management in communities (Arfan *et al.* 2024).

Enhancing coordination and collaboration among government agencies, non-governmental organizations (NGO), and academics can also considerably boost the

efficiency of mangrove ecosystem management implementation. Collaborative efforts are essential for scaling up mangrove reforestation and effectively developing the ecotourism framework (Mahardika *et al.* 2022; Sumarmi *et al.* 2024). The convergence of these sectors not only eases the sharing of resources but also promotes collective action in the management of ecosystem sustainability (Hakim *et al.* 2022; Aryanti and Koestoer 2024).

Infrastructure is also essential for long-term success. Relevant visitor infrastructure such as visitor centers, nature trails, and interpretive signage can be developed while maintaining ecological integrity. Upgrading physical facilities has the potential to improve the ecotourism experience in accordance with the environmental values (Fatimatuzzahroh *et al.* 2020). In parallel, it is important to ensure the conservation of traditional values and rituals, such as local cultural events, to preserve the authenticity of cultural tourism and community identity. Together, these strategies will help to maintain the ecological, economic, and cultural benefits of Tangkolak's mangrove ecosystem (Hochard *et al.* 2019; Kurniawati *et al.* 2022).

The involvement of private and governmental entities in community-based mangrove ecosystem management is key to success. The mangrove ecosystem management policy in Karawang focuses on restoration, conservation of accreted land, and the development of community-based ecotourism to address coastal damage. The implementation of the mangrove ecosystem management policy in Karawang, West Java Province, focuses on conservation, rehabilitation, and sustainable utilization. This is guided by West Java Provincial Regulation Number 6 of 2011 concerning the Management of Mangrove Forests and Coastal Forests. This regulation was issued to regulate the protection, preservation, and utilization of coastal ecosystems to maintain environmental balance, prevent abrasion, and support the continued function of forests for coastal communities (Amrial *et al.* 2015).

The comprehensive management of the mangrove ecosystem in Tangkolak is driven by effective, sustainable approaches that focus on community empowerment, institutional cooperation, and infrastructure development. This multi-faceted approach is consistent with the literature, which identifies the role of local communities in conservation (Lai *et al.* 2022) and advantages of integrated governance for ecological management.

CONCLUSION

This research found that the mangrove forest ecosystem in Tangkolak hamlet, Karawang Regency, serves both as ecological protection and a site for community-led conservation and ecotourism. Through firm leadership by KUB Kreasi Alam Bahari and supportive local governance, the effort has succeeded in promoting environmental education as well as poverty mitigation. The SWOT and IE matrix analysis classified the current strategy (0.11; 0.80) in Quadrant I, which indicates the potential for development through a proactive, growth strategy. Existing achievements can be consolidated and scaled up by investing in community-based education, facilitating institutional development and multi-stakeholder collaboration, and maintaining cultural heritage while promoting environmentally friendly tourism.

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