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Sustainable Mangrove Ecotourism Management Model: A Case Study of Berau Regency, East Kalimantan

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Abstract:
Berau Regency in East Kalimantan possesses significant mangrove forest resources with high biodiversity and ecosystem value, yet their utilization for ecotourism has remained suboptimal, leading to limited economic benefits and insufficient community engagement in sustainable development. Recognizing this gap, the study was designed to analyze and propose a sustainable mangrove ecotourism management model that integrates economic, environmental, and social dimensions to ensure long-term viability. The research employed a mixed-methods approach combining qualitative techniques such as in-depth interviews, focus group discussions, surveys, and stakeholder analysis, with quantitative tools including financial feasibility analysis, SWOT analysis, and business canvas modeling. Data were collected from 30 key informants, 200 respondents, and extensive field observations, supported by secondary statistical and planning documents. The findings reveal that Berau Regency's mangrove ecotourism has substantial development potential, with an estimated revenue of Rp 9.8 billion by the fifth year, a positive Net Present Value of Rp 8,650 million, an Internal Rate of Return of 18.5%, and a payback period of 4.2 years, confirming financial feasibility. Furthermore, the proposed collaborative governance model, involving local government, communities, private sector actors, and NGOs, is projected to increase community income by 66.7%, create 450 new jobs, and enhance ecosystem conservation through structured monitoring. The study concludes that sustainable mangrove ecotourism in Berau Regency can be effectively achieved through integrated multi-stakeholder collaboration, balanced financial mechanisms, and adaptive management strategies, thereby contributing directly to local welfare improvement, biodiversity protection, and the advancement of Sustainable Development Goals.

Keyword: Ecotourism, Mangroves, Sustainable Management, Collaborative Governance

INTRODUCTION

Mangrove ecosystems are among the most productive and biologically diverse ecosystems on Earth, providing vital ecological services such as shoreline protection, carbon sequestration, biodiversity conservation, and support for local livelihoods. In Indonesia, which possesses approximately 23% of the world's mangroves, these ecosystems play a particularly critical role in sustaining coastal communities (Friess et al., 2019). Despite their importance, many mangrove areas have been degraded or

underutilized, leaving significant potential for sustainable development untapped. Within this context, mangrove ecotourism has emerged as a promising pathway to balance environmental protection and socio-economic growth.

The issue examined in this study concerns the sustainable management of mangrove ecotourism in Berau Regency, East Kalimantan, a region with rich natural resources but limited effective utilization for tourism and conservation. Current management practices often lack integration, community participation, and long-term financial planning, resulting in suboptimal outcomes. This problem reflects broader challenges in ecotourism management across developing regions, where opportunities for growth are frequently constrained by weak governance and fragmented strategies (Weaver, 2008; Bramwell & Lane, 2011).

Previous research has highlighted the potential of mangrove ecotourism in enhancing community livelihoods while promoting conservation. For instance, studies in Bangladesh and China demonstrate that community-based mangrove ecotourism can increase local incomes by up to 40% and generate sustainable revenue streams for conservation programs (Rahman et al., 2022; Zhang et al., 2021). However, the transferability of such models depends heavily on context-specific governance frameworks, financial feasibility, and stakeholder participation. This study contributes originality by focusing on Berau Regency and proposing a collaborative governance model tailored to its conditions.

The urgency of addressing this issue stems from both environmental and socio-economic perspectives. Environmentally, mangroves face pressures from coastal development, aquaculture, and climate change, which threaten their ecological integrity and resilience (Brown et al., 2023). Socio economically, communities in Berau rely heavily on extractive livelihoods such as fishing, which are vulnerable to resource depletion. Developing mangrove ecotourism provides an alternative economic pathway while ensuring that ecosystems are preserved for future generations (Das & Chatterjee, 2015).

From a policy perspective, the Indonesian government has emphasized sustainable tourism as a national priority, aligning with global commitments to the Sustainable Development Goals (SDGs). Specifically, goals such as SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 14 (Life Below Water) intersect with the objectives of sustainable mangrove ecotourism. Therefore, a study addressing governance and management frameworks for mangrove-based tourism is not only regionally relevant but also globally significant in contributing to sustainable development (United Nations World Tourism Organization, 2023).

The literature on ecotourism management underscores the need for holistic approaches that integrate economic, environmental, and social considerations. Weaver (2008) emphasizes that sustainability in ecotourism requires adaptive management capable of responding to evolving challenges. Similarly, Bramwell and Lane (2011) argue that governance frameworks must be participatory and inclusive, involving diverse stakeholders in decision-making. While existing studies propose frameworks such as the quintuple helix model (Susanto et al., 2023) or collaborative governance (Chen & Liu, 2024), empirical applications in Indonesian mangrove contexts remain limited, highlighting the originality of this article.

Financial feasibility is another crucial dimension. Scholars have demonstrated that mangrove ecotourism can generate high economic returns when properly managed, with positive net present values and strong internal rates of return (Patel & Singh, 2023). Yet, financial planning often receives inadequate attention in ecotourism projects, leading to failures in implementation and sustainability. This study directly addresses this gap by incorporating rigorous financial analysis alongside stakeholder and environmental considerations.

Technology also plays an increasingly important role in ecotourism management. Recent innovations such as the use of IoT-based monitoring systems and augmented reality applications enhance both management efficiency and visitor experiences (Wang et al., 2021; Lee & Park, 2024). However, most mangrove ecotourism sites in Indonesia have not adopted such technologies, limiting their competitiveness in the global tourism market. By integrating digital strategies into the proposed management model, this study advances discussions on modernizing ecotourism governance.

The core contribution of this article lies in its proposed collaborative governance model for sustainable mangrove ecotourism in Berau Regency. Unlike top-down management approaches that marginalize local communities, this model emphasizes the active involvement of government, private sector actors, NGOs, and communities in shared decision-making. Such an approach ensures proportional risk-sharing, resource optimization, and greater legitimacy in implementation (Johnson et al., 2022).

The article is positioned within a growing body of scholarship that examines the nexus between ecotourism, governance, and sustainability. However, it advances the literature by offering an applied management model with demonstrable financial viability and measurable social and environmental impacts. In doing so, the article bridges theoretical frameworks with practical strategies, contributing both to academic knowledge and to policy debates on ecotourism development (Miller & Josephs, 2009; Ahmed & Thompson, 2022).

The issue of underdeveloped mangrove ecotourism in Berau Regency reflects broader challenges in sustainable tourism management. Addressing this issue is urgent due to ecological threats and socio-economic vulnerabilities. By employing a collaborative governance framework, integrating financial feasibility, and leveraging technology, the article proposes a comprehensive and original approach to sustainable mangrove ecotourism. This introduction thus sets the stage for a detailed exploration of the research objectives, methodology, findings, and implications presented in the subsequent sections.

RESEARCH METHOD

The Research Method section of this study outlines the systematic approach applied to investigate the potential of mangrove ecotourism in Berau Regency, East Kalimantan. The research was conducted over eight months, from January to August 2024, in three districts with high ecotourism potential and accessibility: Derawan, Maratua, and Sambaliung. These locations were selected based on their ecological richness, accessibility, and significance to local development planning. By situating the study in these areas, the research captures a representative picture of mangrove ecotourism opportunities and challenges across the region.

This study employs a mixed-methods design, combining both qualitative and quantitative approaches. The qualitative component seeks to explore stakeholder perceptions, community involvement, and policy perspectives, while the quantitative component is directed toward analyzing the financial feasibility and economic impact of mangrove ecotourism development. The target population includes local government officials, community leaders, tourism managers, tourists, and residents, from which samples were drawn using purposive and stratified sampling techniques. In total, 30 in-depth interviews were conducted with key informants, supported by a Focus Group Discussion (FGD) involving six stakeholder groups, alongside a survey of 200 respondents (100 tourists and 100 locals).

Data collection was carried out through multiple complementary methods to ensure reliability and validity. Primary data were gathered via structured interviews, FGDs, surveys, and direct field observations to assess both existing conditions and ecotourism potential. These were complemented by secondary data sourced from regional development planning documents, statistical records, prior research reports, and scientific literature from accredited journals. The use of diverse data sources provided a holistic perspective and minimized potential biases inherent in relying on a single method.

For data analysis, a combination of qualitative and quantitative techniques was applied. Stakeholder analysis was used to map the interests and roles of different actors, while SWOT analysis helped identify strengths, weaknesses, opportunities, and threats in ecotourism development. Financial feasibility was examined using Net Present Value (NPV), Internal Rate of Return (IRR), and payback period calculations, whereas business canvas modeling was employed to design an ecotourism business framework. Qualitative data were analyzed through content analysis, allowing the extraction of key themes and insights from interviews and FGDs. Together, these techniques ensured the rigor, validity, and replicability of the findings, supporting a comprehensive evaluation of mangrove ecotourism in Berau Regency.

RESULTS AND DISCUSSION

1. The Potential of Mangrove Ecotourism in Berau Regency

The mangrove ecosystem in Berau Regency represents one of the most valuable natural resources in the region, not only in terms of biodiversity conservation but also in supporting sustainable socio-economic development. Mangroves are widely recognized as crucial ecosystems that provide a wide range of ecological services, such as acting as natural barriers against coastal erosion, mitigating the impacts of sea-level rise, serving as breeding grounds for marine species, and playing an essential role in carbon sequestration. At the same time, they also hold great potential for tourism development, particularly for ecotourism activities that combine environmental preservation with economic opportunities for local communities. By promoting mangrove ecotourism, Berau Regency can strengthen its environmental resilience while diversifying its local economy.

The urgency to develop mangrove ecotourism in Berau has become more apparent in light of current global trends in tourism and environmental conservation. Tourists in recent years have shown increasing interest in destinations that offer authentic and educational experiences, where leisure activities are combined with

opportunities to learn about local biodiversity and conservation practices. Ecotourism has thus emerged as one of the fastest-growing tourism sectors worldwide, and Berau's mangroves are well-positioned to become a flagship attraction in this domain. The region's unique combination of diverse flora and fauna, cultural heritage, and natural beauty makes it a highly competitive destination in both national and international markets. Furthermore, the promotion of ecotourism in mangroves aligns with Indonesia's broader commitment to sustainable development and climate change adaptation strategies.

This article, therefore, aims to provide a comprehensive analysis of Berau's potential for mangrove-based ecotourism by highlighting ecosystem conditions, exploring unique tourism attractions, and identifying key stakeholders involved in the process. The discussion also examines external and internal factors that influence the sustainability of mangrove ecotourism and proposes strategies to overcome existing challenges. Ultimately, this study emphasizes that mangrove ecotourism is not merely about developing tourist destinations, but also about preserving an invaluable ecosystem, empowering local communities, and creating a model of development that harmonizes economic growth with ecological sustainability.

a. Mangrove Ecosystem Conditions

Assessing the condition of mangrove ecosystems is a fundamental step in determining their suitability for ecotourism development. In Berau Regency, the mangrove ecosystem is home to a remarkable diversity, consisting of 15 true mangrove species and 20 associated species, reflecting the ecological richness of the region. Such diversity not only strengthens the resilience of the ecosystem but also provides a wide range of opportunities for developing nature-based tourism products. Healthy mangrove forests are capable of attracting tourists interested in wildlife observation, ecological research, and environmental education. Thus, understanding the current state of mangroves is essential for ensuring that ecotourism development is based on ecological sustainability rather than short-term exploitation.

The results of the field survey conducted in 2024 revealed that the condition of mangrove ecosystems in Berau varies between locations. Some areas, such as Derawan and Semama, are in good condition, characterized by high tree density and strong ecological capacity to support a range of tourism activities. On the other hand, locations such as Sangalaki and Balikukup are categorized as moderate, which suggests that while they still retain considerable ecological value, they require rehabilitation and careful management before being fully promoted as ecotourism sites. This differentiation highlights the importance of site-specific management strategies that balance conservation with utilization, ensuring that areas in good condition remain well-preserved while degraded areas are gradually restored to higher ecological quality.

Table 1. Mangrove Ecosystem Condition in Berau Regency

Location	Area (Ha)	Condition	Density (ind/ha)	Ecotourism Potential
Derawan	15,600	Good	1,250	High
Sangalaki	8,400	Moderate	980	Moderate
Semama	12,300	Good	1,180	High
Balikukup	6,800	Moderate	850	Moderate

Location	Area (Ha)	Condition	Density (ind/ha)	Ecotourism Potential
Total	43,100	-	1,065	-

Source: Field Survey, 2024

From the table above, it is evident that areas classified as "good" offer strong prospects for flagship ecotourism initiatives. Derawan and Semama, with their relatively high density of mangroves and overall ecological health, are particularly promising as prime destinations. Their capacity to host activities such as mangrove boardwalks, birdwatching, and environmental education programs makes them highly suitable for sustainable tourism development. Furthermore, their strategic locations within Berau's coastal zone add significant value by allowing integration into broader marine and coastal tourism circuits.

Nevertheless, locations categorized as "moderate" should not be overlooked. While their current condition may not be as favorable as that of Derawan or Semama, these sites hold untapped potential that can be unlocked through proper rehabilitation, community engagement, and investment in infrastructure. If managed effectively, Sangalaki and Balikukup can serve as additional ecotourism sites that diversify the region's tourism offerings while reducing pressure on the more established locations. This balanced approach ensures that ecotourism development in Berau Regency not only generates economic benefits but also enhances ecological resilience across the mangrove ecosystem.

b. Ecotourism Attractions

Berau Regency offers a diverse range of ecotourism attractions that make it a unique and competitive destination for mangrove-based tourism. Biodiversity stands as one of its strongest assets, with recorded species including 156 types of birds, 45 types of fish, and 12 types of mammals. This extraordinary richness provides excellent opportunities for specialized forms of tourism, such as birdwatching, ecological photography, and scientific research. International tourists, in particular, are increasingly drawn to destinations that offer authentic interactions with wildlife, and Berau's mangroves have the potential to satisfy this growing demand.

In addition to biodiversity, Berau is also home to fascinating natural phenomena such as nighttime bioluminescence, which can be observed in certain mangrove areas. This rare phenomenon, where plankton emits glowing light in the water, provides a spectacular attraction that enhances the overall tourism experience. When properly managed, bioluminescence tours could serve as a signature attraction for Berau, distinguishing it from other ecotourism destinations. Importantly, these activities must be guided by principles of environmental sustainability to ensure that the ecological processes responsible for this phenomenon remain intact.

Another unique dimension of Berau's ecotourism potential lies in its cultural heritage. Local traditions such as the *sasi* system, which is a temporary prohibition on resource use, highlight the wisdom of indigenous communities in managing their natural environment. Incorporating these cultural practices into ecotourism activities can provide visitors with insights into how local communities maintain harmony with nature. This combination of biodiversity, natural phenomena, and cultural heritage ensures that

Berau's mangrove ecotourism is not only attractive but also holistic, offering educational, recreational, and cultural values simultaneously.

2. Stakeholder Analysis

The success of mangrove ecotourism development in Berau Regency depends heavily on the involvement and collaboration of multiple stakeholders. Each stakeholder group possesses unique interests and varying levels of influence, which collectively determine the effectiveness of ecotourism management. A clear understanding of these dynamics is essential to create a governance structure that is inclusive, equitable, and sustainable. Without coordinated efforts, the development process risks becoming fragmented and unsustainable.

The local government occupies a central role as both regulator and facilitator. Their responsibilities include enacting regulations, providing infrastructure, and creating institutional frameworks that enable ecotourism to flourish. Meanwhile, local communities form the backbone of implementation, as their direct involvement ensures that ecotourism activities are both culturally authentic and environmentally sustainable. Empowering local communities not only strengthens ownership of ecotourism projects but also guarantees that economic benefits are distributed more equitably among residents.

Private sector actors and environmental NGOs bring additional dimensions to the stakeholder network. The private sector contributes through capital investment, technological expertise, and marketing initiatives, which are crucial for scaling up ecotourism ventures. NGOs, on the other hand, provide independent oversight, advocate for environmental protection, and share scientific and technical knowledge that enhances the quality of tourism management. Together, these stakeholders balance profit-oriented goals with the overarching need for ecological sustainability.

Table 2. Stakeholder Analysis Matrix

Stakeholder	Interest	Influence	Role	Engagement Strategy
Local Government	High	High	Key Player	Active partnerships
Local Communities	High	Medium	Context Setter	Empowerment
Private Sector	Medium	High	Key Player	Mutual investment
Environmental NGOs	High	Medium	Context Setter	Consultation
Academia	Medium	Medium	Crowd	Joint research
Media	Medium	High	Subject	Promotion
Tourists	High	Low	Subject	Satisfaction surveys
Central Government	Medium	High	Key Player	Policy coordination

Source: Researcher Analysis, 2024

Academia, the media, and tourists also play important roles, albeit with varying levels of influence. Academic institutions contribute by conducting research that supports evidence-based decision-making and offering capacity-building programs for local actors. Media organizations are instrumental in promoting Berau's ecotourism attractions to national and international audiences, thereby increasing visibility and tourist inflows. Finally, tourists themselves through feedback mechanisms such as satisfaction surveys help identify strengths and weaknesses in current ecotourism

practices. Collectively, this diverse array of stakeholders forms an interdependent network where collaboration is key to long-term success.

3. SWOT Analysis

A SWOT analysis was conducted to evaluate the internal strengths and weaknesses, as well as the external opportunities and threats, associated with the development of mangrove ecotourism in Berau Regency. This analytical tool provides a structured framework that allows policymakers and stakeholders to design strategies based on a holistic understanding of both enabling and constraining factors. By mapping out these dimensions, decision-makers can determine how to best capitalize on existing strengths and opportunities while addressing weaknesses and preparing for potential threats.

The significance of using a SWOT framework lies in the complexity of ecotourism, which spans ecological, economic, social, and political dimensions. Unlike conventional tourism development, ecotourism requires a more delicate balance between conservation and economic utilization. Hence, identifying the interplay of factors through SWOT analysis is critical for ensuring that Berau's ecotourism development not only attracts visitors but also sustains ecological integrity and community well-being in the long run.

Table 3. SWOT Analysis Matrix

Strengths	Weaknesses
High biodiversity	Limited infrastructure
Strong local government support	Shortage of skilled tourism HR
Rich local wisdom	Difficult transportation access
Strategic location	Limited capital
Opportunities	**Threats**
Growing ecotourism trend	Climate change
National policy support	Environmental degradation
Digital technology adoption	Competition from other sites
Expanding international market	Conflicts of interest

Source: Researcher Analysis, 2024

The SWOT analysis results suggest that Berau Regency possesses several strong comparative advantages that can be leveraged to promote ecotourism. Its rich biodiversity, combined with government support and local cultural practices, provides a unique foundation for developing tourism packages that appeal to both domestic and international markets. The region's strategic location also facilitates integration into wider marine and coastal tourism networks, further enhancing its attractiveness.

At the same time, weaknesses such as limited infrastructure, insufficient human resource capacity, and restricted access to capital could hinder progress if not addressed systematically. Moreover, external threats like climate change, ecosystem degradation, and competition from other destinations present ongoing risks. To overcome these challenges, Berau must adopt a strategy that integrates environmental conservation, human capital development, and technological innovation. By doing so, the region can transform potential vulnerabilities into opportunities for building a resilient and competitive ecotourism model.

4. Financial Projections of Mangrove Ecotourism

Financial projections play a vital role in evaluating the feasibility of any development initiative, including ecotourism based on mangrove ecosystems. A sound financial analysis not only identifies the level of investment required but also highlights the potential revenue streams, payback period, and profitability of the project. In the case of Berau Regency, the development of mangrove ecotourism requires careful planning to ensure that economic benefits align with environmental sustainability goals. The following subsections present a detailed breakdown of investment requirements, projected revenues over a five-year period, and an assessment of financial feasibility using standard evaluation indicators.

a. Investment Estimation

Developing mangrove ecotourism infrastructure in Berau Regency demands significant upfront investment, covering a wide range of components from physical infrastructure to human resource training. The analysis of investment requirements reveals that the largest portion of expenditure must be allocated to basic infrastructure, accounting for more than one-third of the total cost. This includes boardwalks, observation towers, docking areas, and essential facilities that allow tourists to access and enjoy mangrove areas safely while minimizing ecological disturbance.

Table 4. Estimated Investment in Mangrove Ecotourism Development

Component	Cost (Rp Million)	Percentage
Basic Infrastructure	2,500	35.7%
Tourist Facilities	1,800	25.7%
Equipment & Technology	1,200	17.1%
HR Training	800	11.4%
Promotion & Marketing	500	7.1%
Initial Operating Costs	200	2.9%
Total Investment	7,000	100%

Source: Researcher Analysis, 2024

Beyond infrastructure, substantial investments are also necessary for tourism facilities such as visitor centers, signage, and accommodation facilities that meet eco-friendly standards. The integration of equipment and technology is equally important, especially for digital marketing systems, booking platforms, and environmental monitoring tools. Training local human resources ensures that guides, homestay operators, and community members possess the necessary skills to deliver high-quality tourism services. Meanwhile, funds allocated to promotion and marketing are crucial for introducing Berau as a leading ecotourism destination. Finally, initial operating costs cover the basic financial requirements of launching the project.

b. Projected Revenue

Revenue projections are essential to determine the economic viability of the project. In Berau's case, revenue is largely dependent on the number of tourists visiting the mangrove ecotourism sites and their average spending per visit. Projections have been made over a five-year period, with assumptions of a steady increase in visitor

numbers coupled with gradual increases in average expenditure. In the first year, the project is expected to attract around 8,500 tourists, each spending approximately Rp 250,000, resulting in a total revenue of Rp 2,125 million. By the fifth year, the number of visitors is projected to rise significantly to 28,000, with average expenditure increasing to Rp 350,000, thereby generating nearly Rp 9,800 million in revenue. This steady growth reflects the potential of mangrove ecotourism to establish itself as a sustainable income generator for the local economy, especially if supported by effective marketing and community-based management.

Table 5. Five-Year Revenue Projection

Year	Number of Tourists	Average Expenditure (Rp)	Total Revenue (Rp Million)
1	8,500	250,000	2,125
2	12,000	275,000	3,300
3	16,500	300,000	4,950
4	22,000	325,000	7,150
5	28,000	350,000	9,800

Source: Researcher Analysis, 2024

These projections indicate a strong upward trend in both tourist arrivals and revenue generation. If properly managed, this growth will not only cover operational costs but also provide significant profit margins, ensuring that the initiative remains attractive to both investors and local stakeholders.

c. Financial Feasibility Analysis

To further evaluate the economic viability of mangrove ecotourism development in Berau, a financial feasibility analysis was conducted using several standard indicators: Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period, and Profitability Index (PI). The results are summarized in the following table.

Table 6. Results of the Financial Feasibility Analysis

Indicator	Value
Net Present Value (NPV)	Rp 8,650 million
Internal Rate of Return (IRR)	18.5%
Payback Period	4.2 years
Profitability Index (PI)	2.24

Source: Researcher Analysis, 2024

The financial results clearly demonstrate that the project is feasible and promising. The positive NPV of Rp 8,650 million indicates that the projected revenues will exceed the costs when discounted to present value. Furthermore, the IRR of 18.5% significantly surpasses the assumed discount rate of 12%, making the investment attractive to potential investors. The payback period of just over four years suggests that the initial investment can be recovered within a reasonable timeframe, while the profitability index of 2.24 indicates that for every rupiah invested, more than two rupiah of value will be generated. These indicators confirm that the mangrove ecotourism initiative in Berau Regency is not only ecologically desirable but also financially sound.

5. Collaborative Governance Management Model

The complexity of mangrove ecotourism development in Berau Regency necessitates a management model that is both inclusive and adaptive. Based on the results of data analysis and an extensive review of relevant literature, the most suitable approach is the Collaborative Governance Model. This model emphasizes the active participation of multiple stakeholders, including government institutions, local communities, the private sector, and civil society organizations. Unlike conventional top-down governance, collaborative governance is built upon dialogue, trust, shared responsibilities, and the integration of diverse resources and capacities. In the context of Berau, where ecological, cultural, and economic considerations must be carefully balanced, collaborative governance provides a framework that ensures sustainability while also fostering local empowerment.

This model is particularly relevant because ecotourism projects often face challenges such as conflicting interests, limited financial resources, and the need for consistent environmental protection. Collaborative governance offers a platform for addressing these challenges by ensuring that no single actor dominates decision-making processes. Instead, it facilitates the pooling of expertise, capital, and community knowledge, creating synergies that enhance both conservation outcomes and economic viability. The model also reflects the principle of participatory development, which is essential in gaining long-term community support and avoiding the pitfalls of externally imposed projects that often fail to resonate with local realities.

a. Organizational Structure

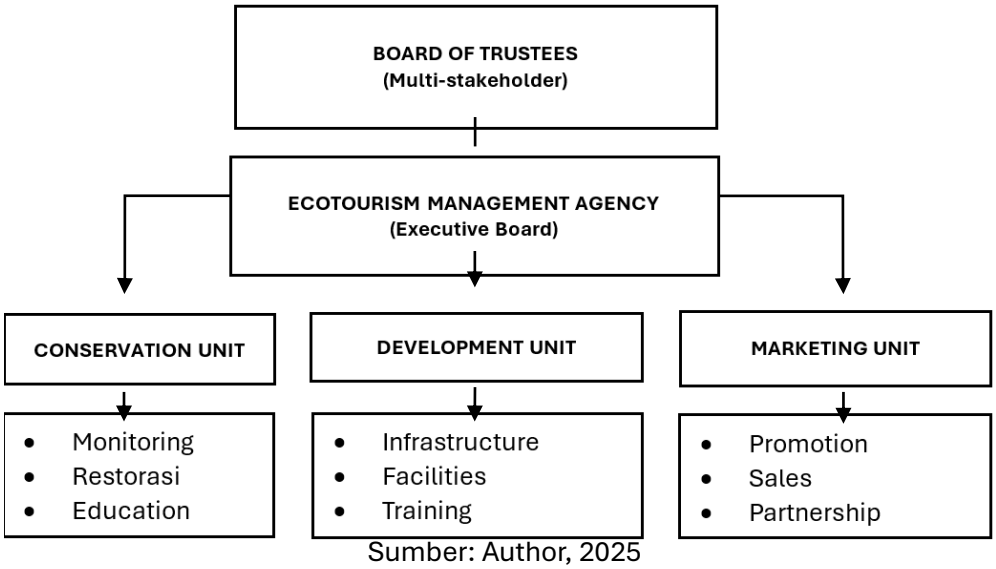
The proposed organizational structure for collaborative governance in Berau's mangrove ecotourism sector is designed to be inclusive and functional. At the highest level, a Board of Trustees composed of multi-stakeholder representatives oversees the overall direction of ecotourism development. This body functions as the guardian of the shared vision, ensuring that ecological, economic, and cultural objectives remain aligned. Beneath the Board of Trustees, an Ecotourism Management Agency serves as the executive arm, responsible for translating policies and strategies into operational actions.

The agency is divided into three specialized units: the Conservation Unit, the Development Unit, and the Marketing Unit. The Conservation Unit focuses on ecological monitoring, mangrove restoration, and environmental education programs. The Development Unit manages infrastructure, facilities, and capacity-building initiatives, particularly in training local communities and strengthening human resources. Meanwhile, the Marketing Unit handles promotion, sales, partnerships, and digital outreach to expand Berau's visibility in domestic and international markets. This tripartite structure ensures that the ecological, infrastructural, and promotional aspects of ecotourism development are managed systematically and without neglecting any critical dimension.

This organizational arrangement not only provides clarity in terms of division of labor but also fosters accountability. Each unit has clearly defined functions, which reduces the risk of overlapping responsibilities or administrative inefficiencies. More importantly, the structure institutionalizes collaboration by embedding diverse stakeholders within the decision-making and operational framework. As such, it

represents a practical mechanism for sustaining long-term cooperation across different sectors of society.

Figure 1. Collaborative Governance Organizational Structure



Sumber: Author, 2025

b. Division of Roles and Responsibilities

One of the most critical components of collaborative governance is the fair and functional division of roles and responsibilities. In Berau's mangrove ecotourism context, each stakeholder group brings unique resources and competencies to the table. The local government assumes the role of regulator and facilitator, tasked with drafting policies, providing infrastructure, and issuing licenses. By establishing clear legal and institutional frameworks, the government ensures that ecotourism operates within the boundaries of sustainability and accountability.

The local communities act as operations managers, directly engaging in activities such as guiding tours, managing homestays, practicing traditional conservation, and ensuring cultural authenticity. Their contribution of labor and local wisdom is indispensable, as it anchors the ecotourism model in the lived realities of the people most affected by its success or failure. The private sector, on the other hand, functions as both investor and marketer, contributing financial capital, technological expertise, and promotional networks. Their involvement helps elevate the professional standards of tourism services while also ensuring that the initiative remains economically viable.

Table 7. Role Sharing in Collaborative Governance

Stakeholder	Main Role	Contribution	Responsibility
Local Government	Regulator & Facilitator	Policy, Infrastructure	Licensing, Supervision
Local Communities	Operations Manager	Labor, Local Wisdom	Management, Conservation
Private Sector	Investor & Marketer	Capital, Technology	Investment, Marketing
NGO	Advocacy & Monitoring	Expertise, Networks	Supervision, Education

Source: Researcher Analysis, 2024

Lastly, non-governmental organizations (NGOs) provide advocacy and monitoring functions. Their contributions lie in their expertise, external networks, and ability to offer independent oversight. NGOs strengthen transparency, hold stakeholders accountable, and enrich ecotourism programs with specialized conservation knowledge and educational outreach. Together, this multi-stakeholder arrangement ensures that all key dimensions regulation, implementation, investment, and advocacy are adequately addressed.

The division of roles ensures that governance is not concentrated in a single entity but distributed across actors with complementary strengths. This arrangement not only mitigates the risks of mismanagement or overdependence but also strengthens the legitimacy of ecotourism initiatives. By embedding collaboration into the governance structure, Berau's mangrove ecotourism model exemplifies how inclusive management can serve as a foundation for both ecological sustainability and socio-economic prosperity.

6. Economic Impact on Local Communities

The economic impact of mangrove ecotourism development in Berau Regency extends beyond the immediate benefits to investors or government stakeholders; it directly transforms the livelihoods of local communities. Ecotourism serves as a vehicle for inclusive economic growth by providing income opportunities to households that were previously dependent on extractive activities such as fishing, logging, or small-scale trade. By diversifying income sources, ecotourism reduces economic vulnerability and creates a more resilient local economy. Furthermore, the integration of cultural traditions, local cuisine, and handicrafts into tourism activities ensures that the financial gains are distributed broadly across various community sectors rather than being concentrated in a few industries.

Equally important is the way ecotourism redefines the economic role of communities. Instead of being passive beneficiaries, community members become active participants in the tourism value chain. Through their involvement as guides, homestay operators, food vendors, craft makers, and transport providers, they directly capture the benefits of ecotourism development. This participatory model helps foster a sense of ownership among residents, which in turn enhances their commitment to protecting the mangrove ecosystem as the very foundation of their livelihoods. Thus, the economic impact of ecotourism is not limited to income growth but also encompasses long-term socio-ecological sustainability.

a. Increased Revenue

The financial analysis indicates that the establishment of mangrove ecotourism generates a substantial increase in household income across different community sectors. For instance, the average income of tour guides is projected to increase by nearly 87%, from Rp 1,500,000 per month to Rp 2,800,000 per month. Similarly, households engaged in the homestay sector can expect income growth of 75%, while those in the local culinary industry are projected to see increases of 50%. Even sectors such as handicrafts and local transportation, which are often considered supplementary, experience significant improvements in revenue.

Table 8. Projected Increase in Local Community Income

Sector	Previous Income (Rp/month)	Income After (Rp/month)	Increase (%)
Tour Guide	1,500,000	2,800,000	86.7%
Homestay	800,000	1,400,000	75.0%
Local Cuisine	1,200,000	1,800,000	50.0%
Craft	600,000	1,000,000	66.7%
Transportation	1,000,000	1,500,000	50.0%
Average	1,020,000	1,700,000	66.7%

Source: Field Survey, 2024

This projected rise in income demonstrates the capacity of ecotourism to address local poverty while strengthening community-based economic systems. The integration of local services into ecotourism packages ensures that financial benefits remain within the community rather than being diverted to external actors. Moreover, the diversification of income opportunities reduces the risks associated with dependence on a single economic activity, making communities more resilient in the face of economic or environmental shocks.

b. Job Creation

Apart from boosting income, ecotourism development is also expected to generate new employment opportunities across a variety of sectors. The projections suggest the creation of approximately 450 new jobs, ranging from tour guiding and homestay management to culinary services, handicrafts, transportation, and administrative support. Tour guiding emerges as the largest job sector, accounting for 26.7% of the total, reflecting the growing demand for trained individuals who can provide educational and culturally sensitive experiences to tourists.

Table 9. Job Creation Projections

Job Type	Number (People)	Percentage
Tour Guide	120	26.7%
Homestay Manager	80	17.8%
Culinary Service	100	22.2%
Crafts & Souvenirs	60	13.3%
Tourist Transportation	50	11.1%
Administration	40	8.9%
Total	450	100%

Source: Researcher Analysis, 2024

The significance of job creation extends beyond the sheer number of positions available. It lies in the qualitative shift from traditional subsistence-based livelihoods to more formalized, service-oriented employment. This shift not only enhances income stability but also provides skill development opportunities, particularly for youth and women, who often face barriers in accessing conventional employment. In this way, mangrove ecotourism contributes to social equity by broadening participation in the labor market and ensuring that the benefits of tourism are shared inclusively.

7. Management Model Implementation Strategy

The implementation of a collaborative governance model for mangrove ecotourism in Berau requires a phased approach that balances preparation, development, and long-term operations. Such a phased strategy ensures that the initiative does not merely focus on rapid growth but prioritizes sustainability, inclusiveness, and resilience. By gradually establishing institutions, strengthening human resources, and building physical and digital infrastructure, the project can adapt to challenges while maintaining consistency in its objectives.

The proposed implementation strategy is divided into three main stages: the Preparation Stage, the Development Stage, and the Operational Stage. Each stage is designed to build upon the achievements of the previous one, ensuring a coherent and progressive trajectory. The preparation stage focuses on laying the foundation for institutional and community readiness. The development stage concentrates on infrastructure building, tourism product diversification, and digital marketing integration. Finally, the operational stage emphasizes continuous management, monitoring, evaluation, and sustainable innovation.

a. Preparation Stage (6 months)

The preparation stage is the cornerstone of successful ecotourism development. It begins with the establishment of a management board and the creation of the Berau Mangrove Ecotourism Management Agency, which will serve as the central coordinating institution. During this period, standard operating procedures (SOPs) must be developed to guide daily activities, and clear organizational structures with defined roles and responsibilities should be established.

Another critical aspect of this stage is human resource development. Local communities must be equipped with the necessary skills to participate meaningfully in tourism activities. This includes certified training programs for tour guides, capacity-building workshops for homestay operators, and business management training for small-scale entrepreneurs. Simultaneously, a regulatory framework must be prepared, including regional regulations, technical management guidelines, and an integrated licensing system. Together, these activities form the institutional, human, and legal foundation for sustainable ecotourism.

b. Development Stage

The development stage represents the most resource-intensive phase of the project, focusing on the construction of infrastructure and the establishment of facilities that enhance the tourist experience. Planned developments include boardwalks, viewing platforms, and educational centers that allow visitors to enjoy mangroves without damaging them. Supporting facilities such as toilets, shelters, and resting areas must also be constructed to meet basic tourist needs.

Equally important is the development of tourism products that combine conservation education with recreational value. Examples include integrated ecotourism packages, school outreach programs, and community-based tourism activities that highlight cultural traditions and local wisdom. In addition, this stage involves the establishment of a digital marketing system, which includes an official website, mobile application, and active engagement through social media platforms. An online

reservation system will further professionalize the tourism offering, making it more accessible to national and international markets.

c. Operational Stage (Ongoing)

Once infrastructure and tourism products are in place, the project enters the operational stage, which requires continuous management and improvement. This includes the daily management of tourism activities, regular maintenance of facilities, and provision of quality services to tourists. The smooth functioning of these activities ensures visitor satisfaction, which is critical for sustaining demand over the long term.

The operational stage also emphasizes monitoring and evaluation to track ecosystem health, financial performance, and tourist satisfaction. Regular assessments allow for adaptive management, ensuring that emerging issues are addressed promptly. Finally, sustainable development strategies must be pursued, including continuous tourism product innovation, expansion into new markets, and improvement in service quality. These ongoing efforts guarantee that Berau's mangrove ecotourism remains competitive, resilient, and aligned with its ecological and social objectives.

d. Success Indicators

The success of mangrove ecotourism development in Berau Regency cannot be measured solely by short-term financial gains or the number of tourists visiting the destination. Instead, it must be evaluated through a comprehensive set of indicators that reflect the interconnected dimensions of economic viability, ecological sustainability, and social inclusiveness. These indicators serve not only as benchmarks for measuring progress but also as guiding principles that ensure the project remains aligned with its long-term vision of sustainable development.

Table 10. Management Model Success Indicators

Aspect	Indicator	5-Year Target
Economic	Number of tourists	28,000 people/year
	Community income	Increased 65%
	ROI	≥ 18%
Environmental Milieu	Mangrove cover	Stable / Increasing
	Biodiversity	Preserved
	Water quality	Improved
Social	Community involvement	80%
	Tourist satisfaction	≥ 4.5 / 5
	HR capacity	100% trained

Source: Researcher Analysis, 2024

From an economic perspective, success is determined by the growth in tourist numbers, the level of return on investment (ROI), and the increase in community income. These indicators are essential for proving that ecotourism generates tangible benefits for both investors and local residents. If the financial performance fails to meet expectations, the initiative risks losing the support of key stakeholders. Therefore, monitoring economic outcomes provides assurance that the project is not only ecologically responsible but also economically rewarding.

In terms of the environmental milieu, indicators focus on the health of the mangrove ecosystem itself. Maintaining or increasing mangrove cover, preserving biodiversity, and improving water quality are critical benchmarks that reflect the ecological sustainability of ecotourism activities. Without healthy ecosystems, tourism would lose its foundational resource, and communities would be deprived of the very asset that sustains their livelihoods. These indicators also align with broader environmental commitments, such as climate change mitigation and biodiversity conservation at the national and international levels.

From a social perspective, success indicators highlight the importance of community involvement, tourist satisfaction, and human resource capacity. Active participation of local communities ensures that ecotourism does not become an externally imposed project but rather a locally owned and managed initiative. High tourist satisfaction ratings serve as evidence that the services provided are of high quality and culturally meaningful, thereby enhancing the destination's reputation. Finally, ensuring that 100% of human resources are trained demonstrates a commitment to professionalization, skill development, and capacity building, which are essential for sustaining competitiveness in the global tourism market.

Together, these indicators form an integrated framework that captures the multidimensional nature of success in mangrove ecotourism. By setting clear and measurable targets over a five-year horizon, Berau Regency can systematically monitor progress, identify gaps, and adapt its strategies to achieve both ecological resilience and socio economic prosperity.

CONCLUSION

Conclusion section in a scientific article summarizes the key findings and insights from the research. It should restate the main research objectives, briefly outline the major results, and emphasize the significance of these findings in relation to the research questions. The conclusion should also highlight any contributions the study makes to the existing body of knowledge, as well as its practical implications. Additionally, it is important to mention any limitations encountered during the research process and suggest directions for future studies. A well-crafted conclusion not only reinforces the study's impact but also provides readers with a clear understanding of how the findings can be applied or further explored in subsequent research.

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