



Strategies for sustainable mangrove ecotourism development in Lembung, Pamekasan

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Abstract

Tourism is a key sector that contributes significantly to regional economic growth and national development, particularly as a source of foreign exchange. This sector generates income by utilising the beauty of nature and cultural diversity without directly exploiting natural resources. However, the rapid growth of tourism often leads to challenges such as environmental degradation, ecosystem disruption, and unsustainable tourist behaviour. Ecotourism has emerged as an alternative model for sustainable tourism development, emphasising environmental conservation, local community empowerment, and the preservation of socio-cultural values. Mangrove forests hold great potential for Ecotourism due to their critical ecological functions and economic value if managed wisely. Sustainable tourism is essential for mangrove ecotourism development, focusing on maximising positive impacts while minimising negative ones on the environment, culture, and local communities. This study aims to identify ecotourism practices in the mangrove area of Lembung Village, Pamekasan, and formulate strategic concepts for sustainable ecotourism management based on the local economy. A qualitative descriptive approach was employed, involving stakeholders such as ecotourism managers, village officials, local entrepreneurs, community members, and tourists. The results of this study are expected to serve as a reference for developing integrated mangrove ecotourism that balances environmental conservation, community empowerment, and the preservation of local cultural heritage in a sustainable manner. These insights contribute to the literature on community-based Ecotourism and offer practical guidance for sustainable mangrove tourism management. The results of the SWOT analysis indicate an aggressive strategy that focuses on utilising internal strengths and external opportunities, including the establishment of BUMDes and cooperatives as the management institutional framework.

Keywords: community empowerment; ecotourism; lembung village; mangrove; sustainable tourism.

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Introduction

The strategic role of the tourism sector in national development is evident in the 2015-2019 National Medium-Term Development Plan (RPJMN), which outlines five focus areas for development over the next five years, namely Infrastructure, Maritime Affairs, Energy, Food, and Tourism (IMEPP). Among these five sectors, tourism has been designated as the leading sector, and the Ministry of Tourism is striving to make a significant contribution to Indonesia's economy. This is evidenced by the achievements of the tourism sector and the Ministry of Tourism's performance in 2019, which generated foreign exchange earnings of Rp280 trillion, up from Rp229.50 trillion in 2018 (Kemenparekraf, 2019)

Liap *et al.* (2019) states that one of the sectors that can be relied upon for national and regional development is natural resource tourism, which encompasses forests, rivers, mountains, and coastal and marine areas, playing a crucial role in driving national or regional economic and business growth. Currently, Ecotourism has become one of the options for introducing well-preserved natural environments and tourist destinations. The potential of Ecotourism lies in the concept of environmental

development based on nature preservation and conservation. Mangroves have great potential for use in Ecotourism. This is because mangroves have unique characteristics, and the development of these areas as tourist destinations prioritises the authenticity of the forest and the organisms living within it. An area that offers something distinctive and unique to see and experience holds greater value and becomes a unique attraction for visitors. This principle guides the development of tourist destinations.

The concept of Ecotourism is not new in the world of development. It has been around for quite some time, especially since the emergence of various problems in the tourism industry, such as environmental damage, tourist behaviour that threatens ecosystems, and the sustainability of socio-cultural existence.

In other words, genealogically speaking, the concept of Ecotourism emerged as a response by many parties to the various natural and social damages caused by tourism activities that did not consider the natural ecosystem. Linguistically speaking, Ecotourism is a translation of the word Ecotourism. In turn, the concept of Ecotourism has evolved along with the tourism industry itself (Chafid, 2000). According to ecotourism, it is a contemporary concept that has emerged as a sustainable form of tourism based on natural resources. The main principle of ecotourism activities lies in experiencing and learning about nature, which is managed in a way that minimises impact, is non-consumptive, and, most importantly, is oriented towards promoting local values.

The objectives of Ecotourism in its management (Arida, 2016). For some regions, such as Madura, the idea of strengthening sustainable economic development through Ecotourism based on local wisdom is a logical and highly strategic consideration. This is based on the significant natural and social potential of Madura, which possesses a wealth of local wisdom, including social and cultural, social and religious, and natural exoticism, all beautifully preserved within it (Dzulkarnain, 2016).

Sustainable Tourism is a rapidly growing industry, including an increase in accommodation capacity, local population and the environment, where tourism development and new investments in the tourism sector should not have a negative impact and can blend in with the environment, if we maximise the positive impact and minimise the negative impact (Arida, 2016).

The mangrove forest area in Lembung Village, Galis Subdistrict, Pamekasan, Madura. This mangrove forest area was opened in 2019. Additionally, the area serves as a source of income for residents through the harvesting of oysters. The majority of the community in the area harvests oysters using a technique that involves cutting down mangrove trunks to facilitate the collection of oysters attached to the trunks. This technique has the potential to harm the structure of the mangrove community, as the mangrove population decreases due to deforestation, which is a byproduct of the oyster harvesting process. Therefore, it is crucial to implement proper management policies to preserve the mangrove ecotourism area, ensuring the sustainability of the ecosystem in that region as a coastal protector, habitat for various species of wildlife, and a nursery ground for many types of marine fish, while also serving to protect the coastline from erosion or abrasion. However, mangrove ecotourism research in Indonesia, particularly in Madura, remains limited to ecological conservation aspects. Studies on local economy-based development strategies that are integrated with community empowerment have not been found. This research fills the void by analysing sustainable management strategies through the SWOT approach and community involvement.

Ecotourism cannot be equated with other forms of tourism. Ecotourism requires specific management to achieve sustainability goals in economic, social, and cultural aspects (Islam & As, 2025). The focus of ecotourism management is on how to preserve and protect irreplaceable resources so that current and future generations can utilise them. In ecotourism management, it is crucial to integrate both environmental and cultural components. Additionally, resource management must be conducted wisely, considering both ecological and economic values, to ensure sustainability.

This study aims to identify and analyse the driving attributes in sustainable Ecotourism at the Lembung Mangrove Ecotourism Site in Pamekasan. Furthermore, the researcher aims to identify effective policy strategies for managing sustainable Ecotourism at the Lembung Mangrove Ecotourism Site in Pamekasan.

Literature Review

Ecotourism

Based on Minister of Home Affairs Regulation No. 33 of 2009, the principles of ecotourism development include: 1) Suitability of the type and characteristics of Ecotourism, 2) Conservation, which involves the protection, preservation, and sustainable use of natural resources for Ecotourism, 3) Economic benefits, which provide advantages for local communities and drive regional economic development, ensuring the sustainability of ecotourism businesses, 4) Education, which includes educational elements that change public perception to positively impact environmental and cultural conservation, with a focus on awareness, responsibility, and commitment, 5) Providing visitor satisfaction and experience, 6) Community involvement, meaning community participation in planning, utilisation, and control of ecotourism activities while upholding the social, cultural, and religious values of the surrounding community, and 7) Incorporating local wisdom.

Data from the Ministry of Tourism and Creative Economy (Kemenparekraf, 2023) notes that Ecotourism in Indonesia accounts for approximately 35% of total visits to nature-based tourism destinations, with a direct economic impact that includes a 20% increase in local income in coastal areas with ecotourism sites. According to the Tourism Office report (2022), the number of visits to mangrove areas in Pamekasan has increased by 15% per year since 2019, resulting in a positive impact on the household income of the surrounding community.

According to the International Ecotourism Society in 2015, Ecotourism is defined as responsible travel to natural areas that conserves the environment, supports the well-being of local communities, and involves environmental interpretation and education. Ecotourism aims to integrate three key elements: the conservation of nature, the empowerment of local communities, and the promotion of environmental awareness. Not only are visitors involved, but local communities are also involved. Additionally, ecotourism is a type of travel that focuses on environmental improvement and is usually conducted in natural environments. Ecotourism is not just about enjoying natural beauty; it's also about preserving it. It also involves education, understanding, and support for nature conservation and the economic growth of local communities. Legally, Ecotourism is defined as visits by individuals or groups to enjoy the beauty of natural resources, while being responsible towards the environment and understanding the importance of the ecological chain of natural resources for the future well-being of humans, flora, and fauna.

Comparative studies show that the success of mangrove ecotourism in Bali and Banten is influenced by active community involvement and regional regulatory support (Susanto, 2021). However, in other areas, such as East Kalimantan, challenges arise due to a lack of collaboration between stakeholders, which hampers the sustainability of ecotourism (Hidayat, 2020). This provides an important lesson for Lembung: that the success of mangrove ecotourism management is largely determined by local institutional capacity and support from local government policy.

Mangrove ecotourism is a type of natural Ecotourism regulated by law, both in terms of its protected status and its utilisation in mangrove ecotourism management. Additionally, mangrove ecotourism activities always consider the sustainability of forest resources and their environment in tourism management, which is also related to the principle of prioritising effectiveness and efficiency in business operations. Commercial principles cannot be separated from ecotourism activities.

Local Economy

Local Economic Development (LED) is a process in which the community, government, and private sector work together to create better conditions for local economic growth and job creation (Nurhalisa,

2020). Local economic development is aimed at enhancing the quality of life for the population, and, operationally, it involves a direct effort to build economic strength, thereby improving the economic situation and quality of life for the population. In the process of local economic development, the government plays a crucial role and can also drive development by engaging the community and private sector to collaborate in developing the local economy. This means that if the government wishes for its region to be competitive, its development programmes must be based on leveraging the region's unique economic potential. Through the development of these leading economic potentials, it is hoped that economic growth can be increased. Thus, regional economic development that focuses on the utilisation and optimisation of regional resources and competencies in driving the regional economy will be able to overcome the problems of poverty and unemployment, creating sustainable development. Additionally, the right regional economic development strategy is expected to identify and explore productive economic opportunities that are competitive and leveraged from regional resources.

Suparmoko (2002) states regional economic potential refers to the economic capabilities that exist in a region, which are feasible and viable to develop, thereby continuing to grow into a source of livelihood for the local population and driving the overall regional economy to develop independently and sustainably. The development of the region's leading sectors is reflected in the region's vision and mission, as outlined in the Regional Long-term Development Plan (RPJPD) and the Regional Medium-term Development Plan (RPJMD) (Sumihardjo, 2008). The RPJPD and RPJMD highlight priority areas in each district/city regional programme to strengthen the development of leading sectors.

Development Strategy

As explained by, the mangrove management strategy is as follows: i) the economic value of a single resource component is often important, although it is not always clear; ii) the ecological relationships between various mangrove components are also important, although they are often fraught with uncertainty. These two factors alone suggest that the improper management of one resource component, such as forestry, can result in significant economic losses in other sectors, including deep-sea fishing. This suggests that the use of some form of economic analysis, capable of integrating ecological relationships, can provide important insights into the optimal utilisation of the entire mangrove resource base in general, which brings many benefits and value to local communities. Therefore, it is essential to address local needs and capacities, or preferably, to contract mangrove management directly with these stakeholders. (Fithor et al., 2019) stated that mangrove ecosystem management requires coordination to avoid overlapping efforts, which can be achieved by maximising mangrove growth. The rehabilitation of mangrove forests can enhance the flora and fauna within the ecosystem.

The orientation of coastal and marine utilisation, along with various supporting environmental elements, is a form of integrated and mutually supportive planning and management of an area as a marine tourism destination. A good and successful tourism area is optimally based on four aspects, namely: a) Maintaining environmental sustainability; b) Improving the welfare of the community in the area; c) Ensuring visitor satisfaction; and d) Enhancing the integration and unity of community development around the area and its development zones. In addition to these four aspects, several other things need to be considered for the development of marine Ecotourism, including: Ecological Aspect: Ecological carrying capacity is the maximum level of use of an area; Physical Aspect: Physical carrying capacity is the maximum number of uses or activities that can be accommodated in an area without causing damage or a decline in quality; Social Aspect: Social carrying capacity is the maximum level of use in terms of quantity and intensity that can be accommodated in a tourist area without causing a decline in the quality of the experience or satisfaction; Recreational Aspect: Recreational carrying capacity is a management concept that places recreational activities within the capacity of the area.

The mangrove forest in Lembung Village has land conditions that are suitable for the survival and growth of a wide variety of flora and fauna. The potential of natural resources to obtain support from

the government, in the form of capital, emotional, and participatory support, makes Lembung mangrove ecotourism quite promising for development. Community organisations are one of the key assets for Lembung mangrove ecotourism. The leadership of these organisations has been established for some time and receives support from the local government, specifically the Village Head of Lembung, who oversees the organisation. Another potential is the involvement of the local community in the development of mangrove ecotourism and the availability of supporting facilities and infrastructure, such as paved roads, vehicles, communication, parking, payment counters, piers, shops, public toilets, mosques, gazebos, and cafes, as well as access signs to various facilities.

Methodology

This research, located in the Pamekasan district, is of particular interest to academic researchers, environmentalists, and policymakers like yourselves. The approach used in this research is qualitative, as it leads to a detailed and in-depth description of the conditions that actually occur in the field. This research will observe and examine Mangrove Ecotourism and social entrepreneurship as integrated solutions for Sustainable Community Development. This research utilises informants, including four ecotourism managers, two village officials, five businesspeople involved in ecotourism, four villagers, and four ecotourism visitors. Sampling will be done using the snowball sampling technique (Santos, 2010).

Data were collected through semi-structured in-depth interviews and focus group discussions (FGDs). Interview guides were developed based on conservation themes and development strategies. Informants were selected for their direct involvement in ecotourism management and for representing various stakeholders, including Green Belt managers, village officials, and local businesses.

The validity of this research was measured using source triangulation and theory triangulation. Source triangulation, which is comparing information from different sources (Bachtiar, 2010). For example, interview results can be compared from various informant angles. In addition, this study employed theory triangulation, which involved comparing the theory used with the data obtained.

Reaserach Result

Geographically, Lembung Village is located in Galis Subdistrict, Pamekasan Regency. Lembung Village itself has a population of 1,353 people, comprising 674 men and 679 women. The village consists of four hamlets: Lembung Tengah Hamlet (where the majority of residents work as farmers or manage rice fields and salt farms), Lembung Utara Hamlet (where residents are primarily farmers). The other two hamlets, Bangkal Hamlet and Bengkaleng Hamlet, have residents who not only work as fishermen but also serve as mangrove forest conservators and utilise mangrove coffee. (BPS, 2015). Data from the Pamekasan Forestry and Plantation Service in 2020 shows that the total area of mangrove forest is 1,174 hectares, with 714.53 hectares in good condition, 42 hectares in fair condition and 418 hectares in poor condition.

The mangrove planting centre in Lembung Village, Galis Subdistrict, Pamekasan, is situated in Bangkal Hamlet, where a 3.8-hectare mangrove forest plot (61A) with an approximate length of 4 kilometres and an estimated 30,000 mangrove trees are planted on the land. Meanwhile, in Bungkaleng Hamlet, there is Plot 61B, spanning 25.0 hectares, with 260,000 mangrove trees already planted in the area. The mangroves in the Lembung Mangrove Ecotourism Area consist of four species: *Rhizophora Mucronata*, *Rhizophora Apiculata*, *Rhizophora Stylosa*, and *Avicennia Marina*. These various types of mangroves have different functions and uses for their fruits. Also, explain that mangrove trees (including their fruit) have high economic value and potential for development.

The Forest Farmers Group (KTH) SABUK HIJAU, established in 2009 in Lembung Village, Galis Subdistrict, Pamekasan District, aims to preserve the environment and support small and medium-sized enterprises, which are crucial for maintaining economic stability in the community. Equally important,

it serves as a means for the community to achieve self-reliance and independence through creativity and skill in production, ensuring their livelihood and fostering stronger bonds of solidarity. The Green Belt KTH has 22 members who engage in the conservation, utilisation, development, and monitoring of approximately 290,000 mangrove trees spanning an area of 46.00 hectares.

However, the main challenges faced by the community include limited access to infrastructure, low managerial capacity among community groups, and exploitation practices such as cutting mangroves for oyster farming. To overcome this, institutional strengthening strategies, including ecotourism management training, increased environmental literacy, and mangrove-based business diversification (e.g., processed mangrove fruit, mangrove coffee), need to be implemented. In the long term, participatory ecotourism management is expected to enhance the economic resilience of the community while preserving the mangrove ecosystem as a natural buffer against erosion.

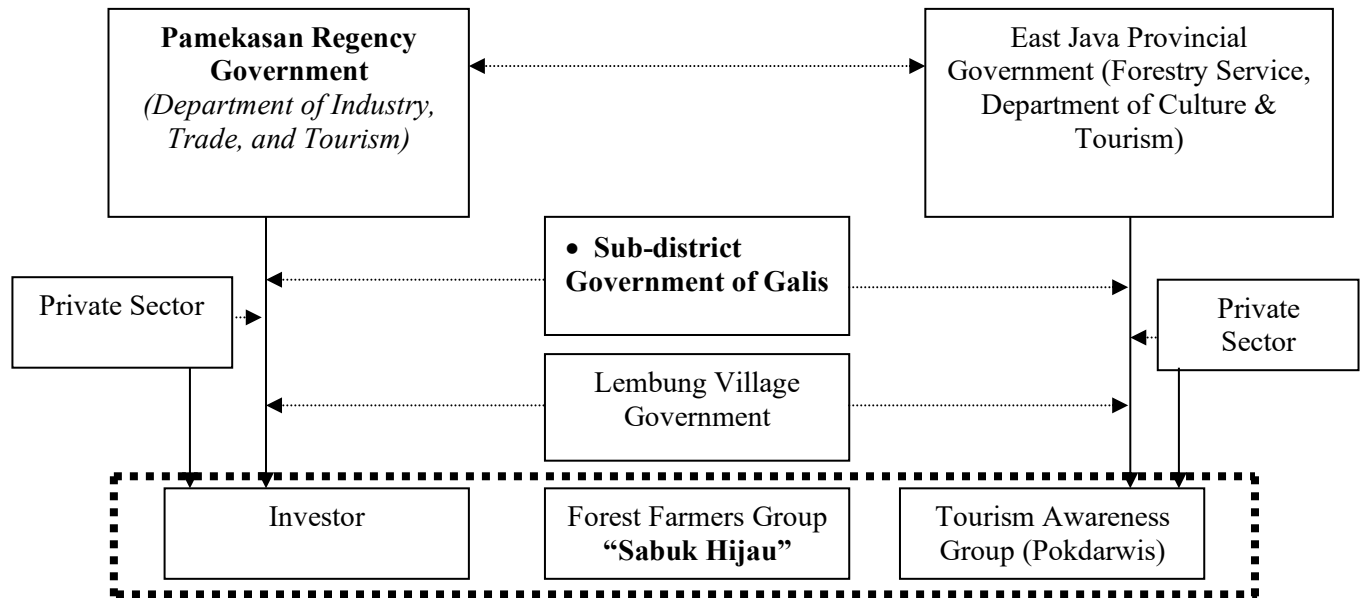
Discussion

Development Strategy

The concept of management in the development of mangrove tourism in Lembung Village, Galis Subdistrict, Pamekasan Regency, is currently still centred on the ‘Sabuk Hijau’ Forest Farmers Group. Meanwhile, the Madura Forest Management Unit (KPH), as the landowner, only monitors and supervises the mangrove forest located in that area. Furthermore, in planning the development of mangrove tourism in Lembung Village, Galis Sub-district, Pamekasan Regency, a management concept is needed to establish a stable management system. The management concept is designed based on the existing management conditions and the needs of all parties involved in the development of tourism in Lembung Village, Galis Sub-district, Pamekasan Regency. Therefore, the issues hindering the implementation of the natural tourism management plan can be addressed effectively.

Mangrove natural tourism management is necessary to identify the requirements for the overall development of mangrove natural tourism. The involvement of various parties in promoting mangrove natural tourism is highly essential. Mainly Figure 1: Management strategy for community participation around the site. (Ramadoan et al., 2013) explains that developing forest tourism requires cooperation between the community and the government. In addition, guidance activities from extension workers (from the government) to the community and farmer groups also have a significant effect on the level of participation (Sasmita et al., 2022). The concept of mangrove tourism development management in Lembung Village, Galis Sub-district, Pamekasan District, is illustrated in Figure 2, Which Outlines the Management Strategy. In the development of Ecotourism based on the local economy, several identifications are needed as a reference to ensure that the development is on target. The research results, based on a SWOT analysis, are divided into three categories: first, the identification of strategies for sustainable mangrove ecotourism, considering both local and external factors, as well as the local economy.

Identification of Mangrove Ecotourism Potential in Lembung Village, Galis Subdistrict, Pamekasan Regency. To measure the potential of a tourist attraction, according to Christopher et al. (2008), there are four key components that a tourist attraction must possess: attractions, amenities, accessibility, and ancillary facilities.



Source: Author (2025)

Figure 1: Management Strategy for Community Participation Around the Site

Mangrove Ecotourism Attraction in Lembung Village, Galis Subdistrict, Pamekasan Regency

Lembung Mangrove Ecotourism was built with an educational tourism theme, where tourists can visit the site while learning how to propagate, plant, and cultivate various types of flora and fauna. The majority of ecotourism visitors are members of the general public, as well as students and university students. For the general public, visiting the mangrove ecotourism site is primarily to enjoy the natural scenery available, while students and university students are more focused on education and research. The attraction components of the mangrove forest, located in Lembung Village, Galis Sub-district, Pamekasan Regency, include wood tracking, observation decks, a mangrove gallery, and traditional boats. These attraction components can be developed and adapted to the growth of the Lembung Village ecotourism area in Galis Sub-district.

Ecotourism Amenities in Lembung Village, Galis Subdistrict, Pamekasan Regency

Every tourist attraction manager must provide amenities, including facilities, infrastructure, and accommodations, as these are essential components that enhance tourism capacity. Research findings indicate that the identification of amenities is somewhat lacking, as evidenced by the facilities and infrastructure currently available, which include tracking trails, gazebos, toilets, photo spots, canteens, and parking areas. Therefore, management will continue to explore options to improve facilities and infrastructure, enhancing visitor satisfaction at this ecotourism site. This requires a targeted development strategy and the involvement of local communities and external parties in building supporting facilities. According to Mufid (2019), facilities are an essential component of ecotourism development. Ecotourism destinations must be developed with environmental considerations in mind and provide benefits for visiting tourists. Facilities should be built according to needs while maintaining natural principles.

Accessibility of Mangrove Ecotourism in Lembung Village, Galis Subdistrict, Pamekasan Regency

In tourism, ease of access is the most important thing. In terms of tourism, all types of transportation are important for access. Conversely, transferability—the ease of moving from one place to another—is related to this access. Tourists will not visit an area that lacks good accessibility, such as airports, ports, and highways. If an area has tourism potential, then adequate accessibility must be available. Mangrove ecotourism in Lembung Village offers accessibility, including access to the mangrove area. This accessibility covers all types of transportation, whether by land, sea, or air. However, infrastructure access to the tourist location, both internal and external roads, still needs to be developed.

Ansilari Mangrove Ecotourism Village, Lembung, Galis Subdistrict, Pamekasan Regency

Ansilari is a facility that supports tourism activities, focusing on the availability of public facilities and services that cater to tourism, including banks, ATMs, telecommunications, hospitals, and other essential amenities. On the other hand, Ansilari also includes the existence of various organisations that assist and encourage the growth of tourism and the marketing of relevant destinations. This is in line with Nguyen et al. (. Tourism support activities begin with mapping mangrove potential. The direction of mangrove development will be determined by initial mapping identification, so clear classification is required for each mapping. Because the Lembung Village mangrove ecotourism site is close to, yet still distant from, the city centre, supporting facilities are lacking. Mangrove managers must improve these facilities. Internal and External Factors in the Lembung Village Mangrove Ecotourism Development Strategy.

The involvement of the local community in activities is one of the efforts to achieve success in regional development. This is necessary because they are the ones who will directly benefit from these activities. Based on the combination of internal and external factors in the SWOT table, aggressive strategies are prioritised. This strategy includes improving road access through district government support, establishing a mangrove-based product centre managed by BUMDes, and implementing visitor education programs to maintain the ecosystem. Additionally, the involvement of local communities is needed to foster a sense of ownership towards existing tourist attractions, so that their benefits are directly felt by them, particularly in terms of increasing income. The involvement of communities in the development and management of tourist attractions will have a positive impact on the sustainability and conservation of the ecosystem surrounding those attractions.

The results of the SWOT analysis show that the Lembung ecotourism development strategy can be directed at optimising strengths through collaboration with various parties. For example, the SO strategy can be implemented by establishing partnerships with local governments and NGOs to expand promotion and improve supporting infrastructure. The WO strategy can be implemented through community capacity-building programs to produce value-added mangrove derivative products. In comparison, the mangrove ecotourism management model in Bedul, Banyuwangi, succeeded in increasing community income by 40% after involving the private sector in providing tourist facilities (Prasetyo, 2020). Learning from this experience, Lembung can adopt a similar approach while emphasising the principles of sustainability and conservation.

Table 1: SWOT Analysis of Internal and External Factors

Strengths	Weaknesses
• Possesses the richness and uniqueness of mangrove species • Possesses beautiful natural scenery • Supports mangrove forest conservation • Main edutourism attraction in Pamekasan Regency • Has processed products from various types of mangroves. • Possesses resources that are beginning to be aware of the importance of mangrove forest conservation • Collaboration with various stakeholders.	• Access to ecotourism sites is still less accessible. • Tracking in mangrove ecotourism is damaged. • The facilities and infrastructure available are still incomplete (toilets, prayer rooms, canteens, etc.). • The parking lot is still too narrow and uncomfortable. • No product stands for processed mangrove species.
Opportunities	Threats
• Increase the economic income of the surrounding community through Ecotourism and the development of processed mangrove products. • Increase employment opportunities for businesses surrounding communities (selling goods and services).	• Competition from similar tourism. • Illegal logging of mangrove forests and reclamation. • Garbage that is disposed of carelessly and garbage that is sent. • Vandalism committed by visitors.

• Policy support and training from the Government. • It can contribute to increasing the village's income. • A government-sponsored ecotourism empowerment program.	• Conflicts between visitors and the surrounding community.
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Source: Author (2025)

Conclusion, Research Limitations, and Suggestions for Further Research

Lembung Mangrove Ecotourism has both positive and negative impacts on the ecology, socio-culture, and economy of the communities surrounding the ecotourism site. These impacts stem from the planning of the management team, as well as the knowledge and awareness of the local community and tourists regarding the preservation of the natural environment. The SWOT analysis on the development of Mangrove Lembung Ecotourism in Strengthening the Socio-Economy of the Community in Lembung Village supports an aggressive strategy, meaning that developing Ecotourism and enhancing the socio-economic conditions of the surrounding community, it is essential to optimise strengths by leveraging available opportunities, such as in the context of developing business units. Additionally, a robust institutional framework is needed to simultaneously develop the socio-economic aspects (social entrepreneurship), such as the concepts of cooperatives and BUMDES (Village-Owned Enterprises). The implementation of aggressive strategies can be achieved through the establishment of tourism cooperatives, the improvement of basic facilities, and community capacity building through training. These steps are expected to increase village income while maintaining the sustainability of the mangrove ecosystem.

Conflict of Interest Statement

The authors declare that there is no conflict of interest in this research. The entire research process and writing of this article were conducted independently, without any personal, commercial, or institutional interests that could influence the results or interpretation of this research.

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