

A Tourist Destination and Conservation Area for Mangroves in Karangsong Mangroves Ecotourism, District Karangsong, Indramayu Regency, West Java Province

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Abstract

*In order to remain sustainable, tourist sites and conservation areas must live in harmony. The suitability of the Karangsong mangrove area as coastal tourism management is examined in this study. The community and local government's use of coastal regions has not always been or is still below-optimal, inspired by this study. Mixed methods research is a research approach that combines or associates qualitative and quantitative forms. This research is located in Karangsong Mangrove Centre in Karangsong Village. Data analysis used is an analysis of mangrove ecosystem potential and suitability analysis for mangrove ecotourism. Some conclusions are included in these papers. First, the Karangsong Indramayu mangrove area is around 25 Ha. This area's mangroves are *Avicennia marina*, *Rhizophora mucronata*, and *Rhizophora stylosa*. Karangsong's mangrove forest is classified as deteriorated due to low tree density (trees per hectare). Fish, crabs, molluscs, reptiles, and birds are among the species found in the 17 types of mangrove forests. Second, the suitability index for mangrove ecosystems is particularly beneficial for research sites that might become tourist attractions. Karangsong's Mangrove Ecotourism Index is 83.7 %, making it a great tourist destination. Due to this rating, Karangsong mangrove tourism has become a tourist destination. With adequate measurement of their values, there is a high risk that these unique ecosystems will receive the appropriate level of protection and conservation.*

Keywords: Sustainable; Tourist Destination; Conservation; Mangrove; Ecotourism.

Introduction

The nation's 17,504 islands, 81,000 kilometres of coastline, and 3.1 million square kilometres of sea will be an embarrassment if the Indonesian government does not invest significantly in the marine science and tourism industry. The number of islands in Indonesia that have been registered and ratified by the United Nations is 13,455 islands. Additionally, 60% of all Indonesians live in coastal regions (Rudiarto et al., 2018). Commercial fishing, trade, aquaculture, transportation, oil drilling, and tourism all contribute to the economic growth of coastal areas. Both land and water affect coastlines.

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In contrast to the Longshore, the Crossshore is oriented at right angles (Dahuri, 2003 in Prihadi, 2015). Tourism, namely in the marine industry, is one of the many resources the coastal region offers that may be utilized in various ways (Jonas et al., 2019). Many things, such as marine tourism, may be found along the coast.

The most extensive mangroves in the world are found in Indonesia. Most excellent mangrove forest on earth. Indonesia contains 30,000 km² of mangroves, which, excluding invasive species, have 45 of the 75 valid mangrove species found worldwide (Spalding, 2010). Mangrove environments have advantages for the tourist industry. Mangroves cover 150,000 km² of land. South Africa, Australia, the Middle East, South and North America, and Southeast Asia are all included in the global distribution. Indonesia and Malaysia have the most mangroves in Southeast Asia. Malaysia, Indonesia, Vietnam, the Philippines, Australia, and several African countries have fostered mangrove ecotourism. Indonesia has a rich mangrove forest reserve. The country offers numerous mangrove ecotourism locations known to local and international tourists. A type of tropical coastal vegetation called mangroves can be found in lagoons, river estuaries, and secluded beaches with mud or sandy mud bottoms.

Mangroves, animals, and other living things depend on one another to function correctly in the mangrove ecosystem (Ministry of Environment and Forestry Regulation, 2019). The tropics are dominated by mangroves (Prihadi et al., 2018). Within the mangrove ecosystem, there are interactions between animals, plants, and other species (Keputusan Menteri Negara Lingkungan Hidup No. 201, 2004). Mangroves are critical markers of coastal change, according to Sanderman et al. (2018). Mangrove protection has led to conflicts of interest, overexploitation of coastal resources, and environmental deterioration of the mangrove ecosystem, according to Blanco and Peter Saenger (1996).

Ecologically, the mangrove ecosystem may help protect waves, wind, and animal habitats like shells, fish, birds, snakes, lizards, and monkeys (Prihadi et al., 2018). Mangroves develop in intertidal environments, beaches, estuaries, and the areas where rivers empty into the sea are transitional zones (Naidoo et al., 2010; Zhao et al., 2010; Azis et al., 2018). Mangrove forests may provide direct and indirect benefits to humans and their environment. According to Saparinto (2007), the following is how the physical function of the mangrove region was expressed: Maintain the coastline; Abrasion protects beaches and cliffs; Reduce or absorb strong winds; Be ready for a tsunami powerful winds; Maintain sediment levels till new landforms arise; As a buffer zone or saline water filter, the water filter becomes unsalted.

According to Waryono (2002), numerous factors may affect mangrove ecosystems: Lack of mangrove ecosystem knowledge and economic strain on impoverished mangrove residents Because economics trump ecology. The mangrove ecology is damaged in three ways: 1. Severe damage marked by The loss of mangroves; Ecosystem damage; Seawater incursion: Degraded soil. 2. Moderately damaged. It is marked with One region that still has mangroves and moderate eco-balance; the breach was minor. 3. Mangrove ecosystems that are undamaged (excellent) and sustained (Ministry of Marine Affairs and Fisheries, 2008).

Yogyakarta's mangrove ecotourism and coastal changes should be adapted, contend Khakhim et al. (2021). Ecotourism encourages education and conservation by utilizing natural ecosystems. Two mangrove ecosystems in Yogyakarta, Indonesia, are protected. Infrastructure demands have impacted these areas. The impacts of mangrove ecosystem alterations were examined in this study. We employed secondary data, observation, and interviews. The conversion of agricultural land for the Yogyakarta International Airport (YIA), increased tourist demand, and modification of mangrove ecosystems for mass tourism could all threaten ecological services and sustainability. Tourism and mangroves may be impacted by aquaculture and mining for iron sand. Mangrove ecotourism may be

harmed by human activity. Through sustainable design, regional spatial initiatives safeguard mangrove habitats.

Mangrove ecosystem adaptability and carrying capacity in West Lombok, Indonesia, according to Sukuryadi (2020). The mangrove habitats in Lembar Village, West Lombok District, Indonesia, offer enormous ecological and economic potential. The region was designated a mangrove tourism area in 2015 to ensure its ecological and financial viability. For ecotourism, mangroves were examined in this study. Data was collected through surveys and observations. After data collection, an estimation of the carrying capacity and ecotourism appropriateness index was made. In Lembar Village, three stations (77.78%) and two (42.2%) are conditionally suitable for mangrove ecotourism. The region can accommodate 2337 people per day, with camping (542 visitors per day), mangrove tracking (33 visitors per day), fishing (137 visitors per day), picnics (1620 visitors per day), and bird watching (6 visitors per day) serving as the main tourist attractions. Adequate land use is necessary for mangroves and coastal economy. Ecological, social, and economic limits must be considered while developing a mangrove ecotourism industry. So this suggests that. Mangroves have an essential role both ecologically and commercially (Satyanarayana et al., 2012; Hidayatullah & Pujiono, 2014; Harahap et al., 2018).

The North Coast of West Java is the location of an abundance of coastal resources that can be used to generate foreign exchange, support the creation of jobs, and raise people's standards of living while still being environmentally friendly. In West Java, especially along the northern coast, the damage to the mangrove environment has reached crisis levels. Mangrove ecosystem damage and degradation in West Java, especially on the North Coast of West Java, have reached alarming levels as a result of the use of or increased conversion of mangrove forests to other uses, such as the opening of ponds, development of industrial areas, and settlements both in coastal areas and off the coast that do not consider sustainability aspects (Cahyaningsih et al., 2022). Indonesia, Province of West Java is home to mangrove ecotourism in Karangsong Village, Karangsong District, and Indramayu Regency. At the moment, it safeguards fish farms and provides a playground for people during the holidays.

The purpose of this study is to investigate tourist destinations and conservation areas, mangrove ecosystem potential, and suitability analysis for mangrove ecotourism. The results of this research are expected to be considered in mangrove tourism management in Mangrove Ecotourism of Karangsong, Karangsong District, Indramayu Regency, West Java Province, Indonesia. Some conclusions are included in these papers.

METHOD

Materials

This research was conducted from January 2020 to August 2022 located in Mangrove Ecotourism Karangsong, Karangsong district, Indramayu Regency. The findings of the study on Karangsong's mangrove tourism are legitimately verified. In the Province of West Java, however, not many people are aware of its presence. Specifically, sampling at the eight stations considers existing areas of mangrove tourism activities. The respondents are all users of Mangrove Karangsong services and that often have tourist activities, which is around 75. The respondents selected using Simple Random Sampling of 20%, i.e. 15 respondents.

Methods

The method used in this study is mixed methods research, which is a method of carrying out research that associates or blends qualitative and quantitative aspects, claim Johnson and Cristensen (2007). The process of gathering, assessing, and combining quantitative

and qualitative approaches in a single study or a collection of studies is known as "mixed methods," according to Creswell (2016) and Clark (2017). Through direct interviews and surveys, socioeconomic observations of the neighborhood were made. Document analysis, interviews, and observational data collecting were used.

The Matrix Index of Mangrove Suitability for Tourism

Data Analysis used are analysis of mangrove ecosystem potential and suitability analysis for mangrove ecotourism. This study describes and considers land suitability parameters using a land suitability matrix for beach tourism in the category of mangrove tourism and the carrying capacity parameters of the beach recreation category area, which is modified from Yulianda, (2007) in Table 1 below.

Table 1. The Matrix Index of Mangrove Suitability

No	Criteria	Weights	Score 4	Score 3	Score 2	Score 1
1	Density (ind/100 m ²)	3	>15-25/100 m ²	>10-15/100 m ²	5-10/100 m ²	<5/100 m ²
2	Mangrove species	5	>5	3-5	1-2	0
3	Thickness Mangrove (m)	3	>500 m	>200-500 m	50-200 m	<50 m
4	Association biota	5	4	3	2	1
5	Long River (km)	1	>3 km	3 km	2 km	1 km
6	Wide River (m)	1	>500 m	201-500 m	4-200 m	<4 m
7	Depth of River (m)	3	>3-5 m	>2-3 m	1-2 m	<1 m
8	Substrate	1	Rugged, medium and fine sand	Rugged, and medium sand	Fine sand	Common sand
9	Tourist Facility	3	Toilet, Restaurant, Accessories shop, Meeting point, Resting point/ praying room	Toilet, Restaurant, Meeting Point, Resting Point/ praying room	Toilet, restaurant, meeting point	Toilet, meeting point
10	Tourism Attributes	2	Information board, map of location, sign direction, lighting.	Information board, map of location, sign direction	Information board, map of location	Information board

Maximum value = 98

S1 = Very suitable, with value 80 - 100 %

S2 = Suitable, with value 60 - < 80 %

S3 = Conditional fit, with value 35 - < 60 %

N = Not suitable, with value < 35 %

Ni = Criteria values to - i (Weight x Score).

Nmax = maximum value from mangrove tourism category (98).

The objective of the descriptive research technique, according to Creswell (2016), is to gain more knowledge of the current condition. In order to have a better understanding of the evolving values of mangrove ecosystem location in relation to tourist participation, interviews with questionnaires were conducted.

RESULTS AND DISCUSSION

Conservation Mangrove

The Karangsong mangrove forest reserve is believed to be roughly 25 hectares in size. The condition of the mangrove ecosystem in mangrove ecotourism Karangsong suffered from severe damage. Many mangrove trees were damaged because water into the location was not enough. In 2014, the area was open to the public and many tourists came to the site. According to the observations, the post-rehabilitation state of the mangrove ecosystem is not the best for growth. Following the study, only three species: *Avicennia marina*, *Rhizophora mucronata*, and *Rhizophora stylosa* were identified. Officers from Pantai Lestari were interviewed, and they reported that only three types of mangroves were initially planted since they could grow quickly and properly. *Avicennia marina* species were found at all stations, while *Rhizophora mucronata* was only found at station 2 and *Rhizophora stylosa* was found at station 2, 3 and 4. The distribution of mangroves may change as a result of mangrove rehabilitation. The research site underwent repair by the planting of *Avicennia marina* species. According to Husnaeni (2013), *Avicennia marina* is a promising pioneer mangrove to plant in regions undergoing rehabilitation. The observation of mangrove potential was conducted on 8 station as seen in Figure 1 below.

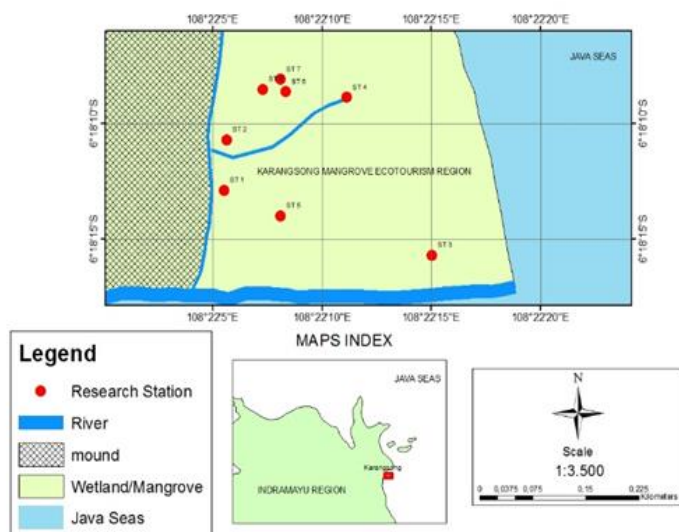


Figure 1. Map of Research Location

Following interview to Pantai Lestari officers, the area of mangrove ecosystem in coastal area of Karangsong is damaged due to the abrasion of sea level rise. The community and government only took action to rehabilitate the Karangsong coast because of the severe erosion that had previously been a shrimp and milkfish pond. Last but not least, collaboration between the local population and the government is necessary so that decision-makers can employ a variety of planting strategies to plant mangroves in the area, which is watery as a result of abrasion. The utilization of land and trees from the mangrove ecosystem by the community caused the non-functioning of the rehabilitated mangrove ecosystem in 2008 as seen in Figure 2 below.



Figure 2. The Condition of Karangsong before Mangrove Planting in June 2008

Source: (BPS Indramayu Regency, 2019)

In Karangsong, abrasion occurs frequently and quickly from year to year. The community's ponds are flooded as a result of the sea water's erosion, which overflows to the ground. The process of eroding soil or land is known as abrasion, and it is mostly caused by sea wave causes. Frequent contact between land and seawater will result in abrasion, which will cause the land to erode and narrow more and more. It reduces the amount of land and makes it simple for sea water to ascend to the surface. Therefore, this forms the core of my research: up to now, mangrove ecotourism zones have been developed and operated in coastal areas that have been eroded. Therefore, thanks to the economic benefit from the Karangsong mangrove tourist area, those who have lost their income from shrimp and milkfish production may still meet their necessities. Last but not least, collaboration between the local community and the government is necessary so that decision-makers can plant mangroves using a variety of planting strategies because the land is wet owing to abrasion, as shown in Figure 3 below.



Figure 3. The Techniques for Mangrove Planting During Abrasion in 2008

Source: (BPS Indramayu Regency, 2019)

According to the zoning map for ecotourism, the planting in Figure 3 above is modified so that the mangrove plants can live and not be destroyed by the waves since they are connected by bamboo. Because of the changes in this damaged area, researchers seek to determine what the benefits of the mangrove tourist area are and how to maintain it sustainably. The calculation results show that *Avicennia marina* species in the tree category have perfect scores for all stations. *Avicennia marina* is a pioneer mangrove species used for rehabilitation and is usually found at the forefront or closest to the sea in the mangrove ecosystem (Natividad et al., 2015). The species *Rhizophora mucronata* was already in the area before the mangrove rehabilitation was carried out. The *Rhizophora* genus can grow and develop well on muddy substrates (Anwar and Mertha, 2017).



Figure 4. The Development of Mangrove Ecotourism Area in 2008-2014

Source: (BPS Indramayu Regency, 2019)

As shown in Figure 4 above, mangroves were successfully planted in places that had previously suffered from abrasion in order to create sites for mangrove ecotourism beginning in 2008 to 2014. In addition to the local community, the central government, local governments, and the private sector are working together to complete this coastal area plan for ecotourism mangroves so that it can benefit the area, the environment, and especially the surrounding community. Mangrove ecotourism development aims to improve the socioeconomic conditions of coastal communities through the sustainable use of ecotourism potentials. Residents in the area planted *Avicennia* sp. and *Rhizophora* sp. to supplement the mangrove trees' natural defence against seawater erosion. Key decision-makers should support the long-term survival of mangrove ecosystems if the general public is more aware of them (Spalding & Parrett, 2019).

One of the mangrove ecosystems that plays a significant ecological and economic function is the one in Karangsong Village, Karangsong District, Indramayu Regency. From an ecological standpoint, the Karangsong mangrove area serves as a heavy metal absorber from fishing boat wreckage, a refuge for many bird species, and a coastline guardian against erosion. From a financial standpoint, the Karangsong mangrove region is a valuable ecotourism destination that helps the local community's economy. The Karangsong mangrove area serves as a suitable habitat for a variety of aquatic biota, particularly fish species, in addition to its ecological and economic benefits.

There are five main types of biota in Indramayu's Karangsong, and each of them is associated with mangroves. Direct observation of mangrove ecosystem biota objects can satisfy tourists and increase the value of a mangrove ecotourism location. Only by recording the fauna, such as crustaceans as mud shells discovered on the floors of

mangrove forests, can terrestrial wildlife be studied. The 17 subgroups that make up the five categories are listed in Table 2 below.

Table 2. The types of biota associated with mangroves in Indramayu's Karangsong

No.	Categories	Type of Biota
1	Fish	Gelodok fish (<i>Periophthalmus</i> sp) Mullet fish (<i>Mugil dosumieri</i>)
2	2 Crustacean	Mangrove crab (<i>Scylla serrata</i>) Violin crab (<i>Uca</i> sp)
3	Mollusc	Conus shell (<i>Conus</i> sp) Cassidula aurisfelis Cerithidea cingulate Cerithidea Pomacea Telescopium sp Mangrove shell (<i>Polymesoda bengalensis</i>)
4	Reptile	Monitor lizard (<i>Varanus salvator</i>) Mangrove snake (<i>Chrysopelea</i> sp.) Lizard (<i>Emoia crotostata</i>)
5	Bird	White Heron (<i>Bubulcus ibis kuntul</i>) Blekok (<i>Ardeola speciose</i>) Curek (<i>Calidris ruficollis</i>) Kuntul (<i>Egretta intermeding</i>)

The mangrove ecosystems in Karangsong Indramayu have benefited from the addition of this species. According to Prihadi et al., (2018), there are two types of aquatic wildlife: those that live in or on water, like fish and shrimp, and those that live on or in substrates, like crabs and invertebrates. The development, reproduction, feeding, and spawning of the biota, as well as the nourishment of wildlife, depend on the mangrove community (Prihadi et al., 2018). Commodities economies are common in coastal human communities. Natural or man-made coastal environments are both possible. According to Nugraha et al., (2013), and Muliya et al., (2016) all agree that for ecotourism to succeed, it must do more than just attract tourists; it must also teach people about the area's unique history and culture.

Tourist Destination

According to Nikijuluw (2003), it has defined coastal communities as groups of people who live in coastal areas and whose economic well-being is directly correlated with the use of marine and coastal resources, including fish and shrimp farmers, fish processors, fish traders, and suppliers of inputs for the fishing industry. Ecotourism in mangrove areas is now assisting coastal communities in becoming more financially secure. Thus, this area needs to be sustainable and well-maintained. The purpose of Karangsong Mangrove Ecotourism is to educate. The general public is informed about the richness of the mangrove ecosystem, including the lifestyles, reproduction, habitat creation, aesthetics, and forms of the animals and plants that inhabit it (Prihadi et al., 2018). Mangrove Karangsong in Karangsong Village can be used as a destination for nature tourism due to the biodiversity found there and the conditions of the surrounding mangrove region.

Basically, a resource's potential and designation should be taken into account when developing an activity's usage. Because each activity associated with tourism has resource and environmental needs suited for the tourist product being generated, the suitability analysis issue is an examination of resource potential to be developed as a marine ecotourism object (Yulianda, 2007). Ecotourism may potentially have an impact on the size of the mangrove environment. Remote sensing studies carried out identified a number of direct reasons for mangrove degradation that may be related to tourism operations. First, mangroves have to be cleared in order to make a place for a hotel and visitor accommodations. Second, the development of jetty caused the loss of mangroves because there was an excessive demand for boat tours and a rise in the number of tourists. Increased boat traffic caused ship wake, which deteriorated and undercut the mangrove riverbanks, having a corresponding effect.

In certain attractions, the tour guide also acts as an interpreter and demonstrator. Guidance's role in understanding tourist attractions and things depends heavily on tourism. Typically, tour guides' expertise contributes to environmental education. Tourists can learn about the ecosystem through this technique, which also generates cash for people who live nearby. A local tour guide has an advantage over outside tour guides in that they are more knowledgeable about the environment, natural history, and local culture (Place, 1998 in Buchsbaum, 2004).

A tourism area's carrying capacity refers to the maximum number of visitors that may be accommodated while still maintaining long-term sustainability for local residents, the environment, and the local economy. Based on the research results of Oni et al. (2019), the economic impact of the existence of the Karangsong mangrove ecosystem is able to increase labor absorption and economic structure in Karangsong Village. There are 20 workers in the ecotourism management sector, 50 people at the entrance gate to the area which are managed by Karang Taruna on a shift system. Economic activity is growing around the mangrove ecotourism area in the form of the construction of 58 kiosks. Apart from that, the participation of the community, especially kiosk owners around the area, is in protecting mangrove resources because the presence of mangroves influences mangrove ecotourism visits. The presence of tourists is under more pressure, according to Cooper et al. (1998), in Umar (2013) and Akliyah (2014) because, in his opinion, the level of attendance is more appropriate to be used as an approach to several elements, such as the duration of the visit (length of stay), tourist characteristics, concentration of tourists in specific geographic locations, and the degree of seasonality of tourist visits.

Table 3. The suitability matrix of mangrove tourism in Karangsong Indramayu

No	Criteria	Weight	Result	Score	Weight X Score
1	Density (ind/100m ²)	3	8.25	3	9
2	Mangrove species	5	3 jenis	3	15
3	Thickness Mangrove (m)	3	>500m	4	12
4	Association Biota	5	5 species biota (fish, Crustacea, Moluska, Reptil, bird)	4	20
5	Substrate	1	Coarse, medium sand and fine sand	4	4
6	Long river (km)	1	2 km	2	2
7	Wide river (m)	1	4-200 m	2	2

8	Depth of river (m)	3	>2-3 m	3	9
9	Tourist Facility	3	Toilet, meeting point	1	3
10	Tourist attributes	2	Information board, Map of location, sign directions,	3	6
Total				82	
IKW= $\Sigma(N_i/N_{max}) \times 100\%$ =				83,7 %	

The suitability of mangrove tourism in Karangsong Indramayu is suitable

$$IKW = \Sigma (N_i/N_{maks}) \times 100 \% = \Sigma (82/98) \times 100\%$$

IKW = Suitability Matrix for Mangrove Ecosystem on tourism is 83,7 %

As shown in Table 3 above, the suitability index for mangrove ecosystems is particularly beneficial for research sites that might become tourist attractions. Karangsong's Mangrove Ecotourism Index is 83.7 %, making it a great tourist destination. Due to this rating, Karangsong mangrove tourism has become a tourist destination. Additionally, tourists who engage in mangrove ecotourism activities gain advantages (Puah et al., 2018). The importance of tourism in vital coastal areas is reviewed and followed by a study of environmental issues (Prihadi et al., 2021). The successful rehabilitation of the mangrove ecosystem at Karangsong district began with a series of planning activities and efforts to implement mangrove rehabilitation. The fish farming community enjoys the impact of rehabilitation of the mangrove ecosystem, economic growth in mangrove ecotourism locations, and increasing types of aquatic biota and water birds that live in mangrove areas (Oni et al., 2019). Tourists can relax and enjoy themselves and hopefully become more knowledgeable about regional socioeconomic and environmental challenges. The accessibility of the environment to tourists will also significantly increase. The likelihood that these distinct ecosystems will not receive the proper amount of protection and conservation is significant with effective quantification of their values.

Tourist satisfaction is the level of satisfaction felt through tourism activities by comparing the performance (or results) they experience with their expectations or the tourists' assessment of what they feel (Prihadi et al., 2021). Recognizing, appreciating, and fully internalizing how ecosystems sustain outdoor recreation and the rapidly expanding ecotourism sector could significantly contribute to eradicating poverty, especially in poor nations where the majority of the world's natural tourism resources are found. An analysis of the critical elements of mangrove ecotourism was conducted to determine the distribution of the parameters and suitability criteria for the industry based on the observation criteria.

Mangrove tourism is a terrific choice for drawing tourists from all over the world. Activities include bamboo path hikes, bird watching, beach trips, biota research, and boat excursions (Prihadi et al., 2018). Ecotourism combines sustainable tourism with natural resources to benefit the environment and the economy. While raising money, ecotourism may promote traditional culture and the environment. Participation in environmental and natural resource conservation activities may benefit local communities (Idajati et al., 2016). Karangsong mangrove tourism is really suitable for tourist activities. The mangrove ecotourism area is very suitable for tourism. Many tourism activities are local, such as walking, seeing biota, going to the beach, seeing birds, and using a boat. Each activity has a resource requirement, and suitable environmental tourism sites will be developed (Spalding & Parret, 2019). The density and thickness of mangroves must be increased through mangrove restoration in order to raise the value of the appropriateness index of mangrove ecotourism regions. Mangrove ecosystem initiatives, which are an

aspect of ecotourism, must be protected, maintained, and managed with the help of the community. It is anticipated that it will also aid in sustaining community livelihoods in addition to this tourist activity. According to Nugroho (2021), economic, social, and environmental concerns are all significantly impacted by the rise of tourism.

The potential of resources and allocations must be taken into account when developing tourism activities. Marine ecotourism is a type of resource management for coastal fisheries, and strategies for marine conservation have been established (Ketjulan, 2011). The history of ecotourism development is inseparable from the existence of the environment or protected area (Nugroho, 2021). The idea of tourist development and sustainability for coastal environments and tourism activities, namely through route planning and media interpretation of coastal tourism by showcasing the owned coastal resources as an integrated unit.

Marine ecotourism is another name for a type of tourism based on the sociocultural and environmental sustainability of coastal communities. According to the Declaration of Quebec, Canada, in 2002, Nugroho (2021) states that ecotourism is sustainable tourism which includes explicitly efforts: Active contribution to nature and cultural preservation; involvement of locals in the development, planning, and management of tourism-related activities, as well as participation in welfare; providing visitors and tourists with information on the cultural and natural treasures; a small-group or independently operated travel style.

The implementation of ecotourism management in mangrove ecosystems often hits roadblocks owing to a lack of communication between members, divergent interests, and the failure of certain members to take responsibility for their assigned tasks and responsibilities. As PW explains: "Obstacles, yes, obviously there are. Then the SOP is also not fully implemented, only part of it has been implemented".

The administration of ecotourism in mangrove forests has challenges not only inside the organization but also from the outside. The ecotourism management of the Karangsong mangrove ecosystem faces resistance from a number of neighbouring villages. What follows is a summary of PW's explanation of the obstacles to establishing ecotourism management in the Karangsong mangrove forest: "Obstacles from outside, yes, there must be, one or two communities who are less cooperative, so they lack the sensitivity to maintain cleanliness or like they don't care about this mangrove forest ecotourism".

Karangsong mangrove forest ecotourism management is aided in part by internal supporting forces. This component is a helping hand from inside the Karangsong mangrove forest tourist management group itself. In his own words, PW explains: "As for the supporters, it is clear from the community who are involved in the management who voluntarily take turns every 5 years. The people who take part as managers here are very open people, so if there are new ideas, we are actually happy because we can further develop this mangrove forest ecotourism. Basically, we want to keep learning, too".

Successful ecotourism, according to Wang (2000), is dependent on the caliber of the management. Ecotourism operators in the mangrove forests are often hired from within the local community, providing a source of internal support. Managers of ecotourism in mangrove forests face challenges from several sources external to the organization. The mangrove forest ecotourism manager has managed to get the support of the majority of the local people, but there is a vocal minority that does not.

The efforts of these groups are crucial to the ecotourism management of the Karangsong mangrove forest. PW elaborates as follows: "External supporters, including the people of Karangsong Village, Mr. Village head, RT, RW, the government also supports, especially BLH Indramayu Regency which usually donates mangrove seedlings, the Indramayu Regency Tourism Office also donated wood for bridge construction at that time, if there was no intervention of them yes of course not like this".

Management goals, other tourism options, and bolstering the efficacy of institutions that may be utilized as policy space to foster ecotourism management are what decide whether or not ecotourism management is successful. Different groups and individuals outside of the Karangsong mangrove ecosystem have helped ensure the tourist industry there continues to thrive. According to Sidik et al., (2018), mangrove tourist areas are managed and developed with input from the local community is crucial because its members will have direct contact with visitors and tourists, and because doing so will help them feel more connected to the land through learning how to use it in a sustainable manner. One strategy for the sustainable development of mangrove ecological systems is the establishment of an ecotourism system.

According to Sumaraw et al., (2016) argue that in order for ecotourism firms to operate sustainably, management practices must be able to provide a positive experience for tourists. According to Priono (2012) argues that in order for ecotourism to flourish, it must be capable of making tourists feel safe and at ease while also meeting their expectations and exceeding their expectations. According to Tuwo (2011) argue that the potential benefits of ecotourism areas can be in the form of increased economic opportunities, protection of natural resources and cultural values, and increased quality of life.

The ecotourism manager of the Karangsong mangrove ecosystem has made an effort, in accordance with tourism principles, to highlight the ecosystem's unique features as a tourist attraction. Although not optimal and always in need of improvement, managers also attempt to emphasize cleanliness and health in all kinds of service, including both buildings and services. The potential of tourism as a whole has not been completely fulfilled because of unrealized elements of the tourist concept. Although not optimal and always in need of improvement, managers also aim to emphasize cleanliness and health in all types of services, including facilities and services. Local governments are also responsible for managing and resolving difficulties that emerge during ecotourism implementation. Controlling ecotourism takes into account the area's function, space consumption, development of facilities and infrastructures, technical design needs, and long-term sustainability. Infrastructure and public roadways like pedestrian walkways and bicycle lanes should not harm the location's unique aesthetic and particular qualities. In addition to conserving the natural flora and tree species, the site's original appearance and unique qualities are also preserved (Fang, 2020).

CONCLUSION

According to research, the 25 Ha Karangsong mangrove area in Indramayu contains three different species of mangroves: *Avicennia marina*, *Rhizophora mucronata*, and *Rhizophora stylosa*. The author discovered these three species based on the identification and density of the mangroves found in Karangsong. In the mangrove habitat, all 17 species of the classified fauna, including fish, crabs, molluscs, reptiles, and birds, can be found. The mangrove suitability index aids in identifying potential tourist destinations. Karangsong is a fantastic tourist site because of its Mangrove Ecotourism Index, which is 83.7%. Karangsong mangrove tourism is popular and ideal for tourists as a result of this rating. Understanding, appreciating, and internalizing how ecosystems support outdoor recreation and the growing ecotourism industry could help reduce poverty, especially in poor countries where the majority of the world's natural tourist attractions are found.

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Authors' Contributions

All authors have contributed to the final manuscript. The contribution of each author as follow, DJP and ZG Conception, investigation and study design. ZG: contribution supervision, validation. NSJ and WP: contribution investigation of data, visualization. DJP, SZ and WP: Data analysis and interpretation. DJP and WP: Drafting the manuscript. DJP, WP and NSJ: Revising the manuscript critically for important intellectual content. All authors read and approved the final manuscript.

CONFLICT OF INTERESTS

The authors declare that they have no competing interests.

RESEARCH HIGHLIGHTS

1. Mangrove forests may provide direct and indirect benefits to humans and their environment.
2. The Mangrove Forest in Karangsong district, Indramayu not only functions as a coast guard, but is also used as a tourist attraction and is visited by many people.
3. The 25 Ha Karangsong mangrove area in Indramayu contains three different species of mangroves: *Avicennia marina*, *Rhizophora mucronata*, and *Rhizophora stylosa*.
4. The mangrove suitability index aids in identifying potential tourist destinations. Karangsong mangrove tourism has suitability index, which is 83.7% and is classified as a popular tourist attraction.

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