

Assessment of Ecotourism Potential of Mangrove Park Pekalongan Central Java and its Development Strategy

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Abstract

The purpose of this study was to analyze the feasibility of mangrove forests in the Pekalongan Mangrove Park Ecotourism Area in Pekalongan Regency, North Pekalongan City, Central Java as a mangrove ecotourism area and determine a development strategy. This research method used quantitative and qualitative approaches, primary and secondary data obtained from the results of observations, interviews and observations were used as data. The IKW formulation is used as a data analysis technique, and the SWOTL technique is used in the development strategy analysis. The results of the study show that the Pekalongan Mangrove Ecotourism Park which consists of various flora and fauna as well as natural scenery is the main attraction for ecotourism development in Pekalongan City. Based on the results of the suitability analysis, the Pekalongan Mangrove Ecotourism Park has proven to be one of the areas suitable for ecotourism. This is indicated by a swamp suitability index of 68 percent. Alternative Ecotourism Development Strategy SO Mangrove Park Pekalongan will develop all existing groups as an alternative eco-oriented community tourism in Pekalongan City. In the WO Strategy of the Pekalongan City DPRD, provisions are made to maintain and improve the mangrove swamp infrastructure for the Mangrove Ecotourism Area in Pekalongan Park.

Keywords: Ecotourism, Mangrove Park, Pekalongan

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1. Introduction

Currently the tourism sector is Indonesia's mainstay sector, especially in terms of increasing foreign exchange, Indonesia as a country with a high level of biodiversity and tourism potential, both mountain natural tourism and natural tourism in coastal areas. The

mainstay sector of tourism in coastal areas today is the tourism sector managed from mangrove areas or often known as mangrove ecotourism. Indonesia with its territory which is an archipelago, so that the distribution of mangroves in Indonesia is included in the category of mangroves with the highest area for the ASEAN region. Based on the Indonesian mangrove map in 2021, the current mangrove area in Indonesia reaches 3.36 million ha with the largest area in Papua by 32.4%. According to Lewis (2014) mangroves are specialized plants that can adapt to environmental conditions that are constantly changing due to tides. In coastal and marine locations, mangroves are the most significant life-supporting ecosystems because they function as barriers against erosion, storms, and tsunamis, as well as by absorbing trash and preventing saltwater from entering. In addition, mangroves serve an ecological purpose by providing food for aquatic life, serving as breeding grounds, and nurturing a variety of creatures (Ngoma, 2020).

Mangrove ecosystems have their own characteristics and peculiarities, such as the characteristic shape of the roots and various types of fauna associated with mangrove ecosystems, such as birds, snakes, monitor lizards, shrimps, fish, mollusks, and crabs, as well as epiphytic plants such as orchids, for association. Mangrove ecosystems can be developed to improve human welfare and ecological functions, namely developing the potential of mangrove habitats as alternative tourist destinations that are very profitable. Mangrove ecotourism is the idea of ethical travel to locations with mangrove forests to conserve those resources and advance human well-being. (Yoswaty, 2021). According to Seliari (2021), the challenges for ecotourism organizers, stakeholders, and tourists become guidelines for achieving ecotourism and sustainability goals through environmentally friendly activities and behaviors.

Pekalongan City is one of the cities on the north coast of Central Java province. In the north, the city is directly adjacent to the Java Sea. The real threat in the Pekalongan Regency's coastal areas is abrasion, which is increasingly eroding the coastal areas of Pekalongan. Based on Widada's research (2022), the average abrasion of Pekalongan City is 3.98 m, causing coastal embankments and changes in the coastline that result in tidal flooding, according to Miftakhudin's research (2021), tidal flooding is more massive. It has increased significantly, amounting to 37.27% of the area. The Pekalongan City Government, to overcome this problem, rehabilitates mangrove forests. Management of coastal mangrove damage in Pekalongan Regency is tailored to each region. Mangrove planting efforts in ponds and swamps are carried out by making mounds and mounds around the coast planting with mangroves forming a triangle facing the sea, and making breakwater (APO) to protect newly planted mangroves (Widagdo, 2014). To improve the function and usefulness of mangrove areas, the city government developed a mangrove ecotourism area named "mangrove park" so that the surrounding mangroves not only protect the coast from abrasion but also receive economic benefits from environmental services such as being an ecotourism area. This study aims to identify the potential of mangrove areas to be used as tourist attractions and determine their development strategies.

2. Method

This research was conducted in the Mangrove Park Ecotourism Area of Pekalongan City, located in Kandang Panjang Village, North Pekalongan District, Pekalongan City, Central Java Province. Astronomically, the area is located at 60 51' 29.120" South latitude

- 1090 40' 30.116" East longitude. East longitude. The research location is shown in Figure 1.

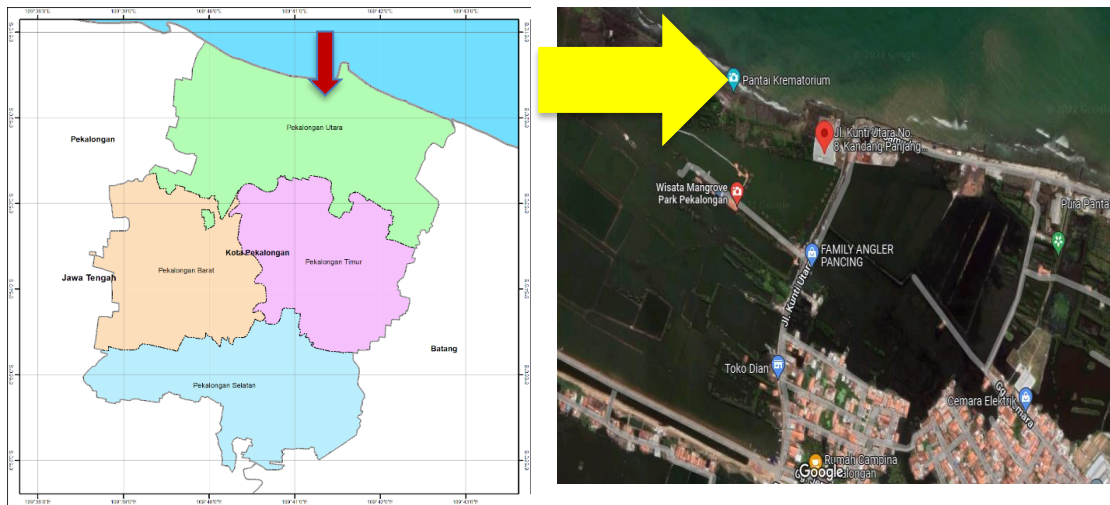


Figure 1. Location of Ecotourism Mangrove Park Pekalongan Central Java

For the analysis of mangrove biota and vegetation using the transect line method. The collection of social data using interview techniques. Primary data used in this study are data on mangrove thickness, mangrove density, mangrove species, mangrove biota, location characteristics, accessibility, and visitor data. The secondary data are tidal data and monographic data of Kandang Panjang Village. Technical data analysis to determine the potential of mangroves as an ecotourism area includes:

A. *Mangrove Thickness*

Measurements were taken using Google Earth satellite imagery to obtain mangrove thickness data. The survey technique was done by drawing a perpendicular line from the mangrove forest at the sea border to land. The value obtained from measuring the thickness of mangrove trees in the field is a measure of the width of mangrove trees.

B. *Mangrove Density*

To analyze mangrove density obtained by analyzing data on mangrove species, population size, and diameter of mangrove trees then used to calculate the density of species referring to (Dharmawan, 2020) as below:

$$D_i = \frac{n_i}{A} \quad (1)$$

Description:

D_i = Species density (ind/m²)

n_i = Total number of stands of the species

A = Total area of sampling area

C. *Mangrove Ecotourism Suitability Index*

To analyze the feasibility of an ecotourism area, it is built based on the significance of each element to support activities in the area. The formulation to determine the ecotourism suitability index refers to Yulianda (2007) as follows:

$$IKW = \sum [N_i / N_{max}] \times 100\% \quad (2)$$

Description:

IKW : Ecosystem suitability index for mangrove ecotourism

S1 : Very suitable, with a value of 80% - 100%

S2 : Suitable, with a value of 60% - < 80%

S3 : Conditionally suitable, with a value of 35% - < 60%

N : Not suitable, with a value < 35 %

N_i : Value of i-th parameter (weight x score)

N max : The maximum value of the mangrove ecotourism category.

In Table 2, there are seven assessment criteria when deciding mangrove ecotourism.

Table 2. Land suitability matrix for mangrove ecotourism development

No	Parameter	B	S1 category	S	S2 category	S	S3 category	S	N	S
1.	Mangrove Thickness	5	>500	4	>200-500	3	50-200	2	>50	1
2.	Mangrove Density	4	>15-25	4	>10-15	3	5-10	2	>5	1
3.	Mangrove Type	3	>5	4	3-5	3	1-2	2	0	1
4.	Object Biota	3	Fish, Shrimp, Crabs, Mollusks, Reptiles, Birds	4	Fish, Shrimp, Crabs, Mollusks	3	Fish, Mollusks	1	one of the aquatic life	1
5.	Tides	3		4		3		2		1
6.	Area Characteristics	2	4 conditions	4	3 conditions	3	2 conditions	2	1 conditions	1
7.	Accessibility	1	4 conditions	4	3 conditions	3	2 conditions	2	1 conditions	1

Sumber: Yuliyanda (2019)

SWOT analysis was used to analyze Pekalongan Mangrove Park ecotourism's development strategy. According to Rangkuti (2015), SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) identifies various aspects and prioritizes different development options. This analysis is based on internal and external elements to optimize strengths and opportunities and minimize weaknesses and dangers. After identifying strengths, weaknesses, opportunities, and threats, the identification is organized in a SWOT matrix to produce four strategic opportunities in the form of SO, WO, ST, and WT.

3. Results and Discussion

A. General Condition of Pekalongan Mangrove Park Ecotourism Area

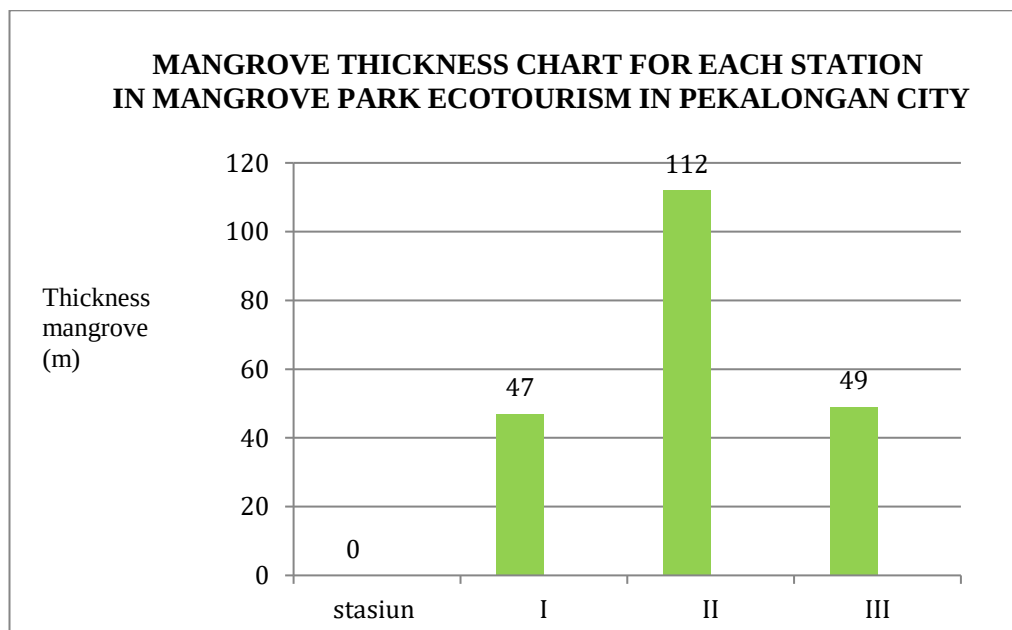
North Pekalongan Regency, Kandang Panjang Village, and Pekalongan City are home to the Pekalongan Mangrove Park. One of the mangrove conservation areas that double as an ecotourism destination is Mangrove Park Pekalongan. Visitors can use

several facilities for training, including walking routes, viewing towers, shelters, and nursery areas. The assessment of area features in the Pekalongan Mangrove ecotourism area is based on two criteria: the presence of exciting elements, both flora, fauna, and physical elements, and the presence of beauty that has an attraction.

B. Mangrove Characteristics in Mangrove Ecotourism in Pekalongan

1) Mangrove Thickness

To build mangrove ecotourism, mangrove thickness is a determining factor (Mas'ud, 2020). Figure 2 explains the data from each station based on mangrove thickness measurements at the research site. Based on Figure 2, it can be seen that station II, with a mangrove thickness of 112 m, is included in the S3 category. In contrast, stations I and III, with mangrove thickness, are included in the N category (unsuitable).



Source: Results of analysis in 2020

Figure 2. Mangrove Thickness Diagram at each observation station

2) Mangrove Species Composition And Density

Based on observations, the Mangrove Park ecotourism area of Pekalongan City has seven different mangrove species. *Rhizophora* sp. and *Avicennia* sp. are the main mangrove species. This aligns with the research results by Usman (2013), which states that on the north coast of Java with sandy mud, *Rhizophora* sp., and *Avicennia* species become dominant in the region. The diversity of mangrove species is one of the attractions for tourists to visit ecotourism areas. This is in line with the research results from Susi (2018). The diversity of mangrove species greatly supports the diversity of biota in the area and is the primary habitat for other biota. Types of mangroves found in Pekalongan mangrove park ecotourism are shown in Table 4.

Table 4. Types and distribution of mangrove vegetation in Pekalongan mangrove ecotourism
Pekalongan mangrove ecotourism based on observation

No.	Species	Regional Name
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1.	<i>Avicennia marina</i>	Sia-sia putih, sie-sie, api-api, pejapi, nyapi, api, sia, hajusa, pai
2.	<i>Rhizophora stylosa</i>	Bakau, bako-kurap, slindur
3.	<i>Rhizophora apiculata</i>	Jangkah, slengkren, tinjang, bakau
4.	<i>Nypa fruticans</i>	Buyuk, buyuh, nipah, niu-nipa, nypa
5.	<i>Avicennia lanata Ridley</i>	Sia-sia, api-api
6.	<i>Bruguiera gymnorhiza</i>	Lindur, tanjang-merah, salak-salak, totongkek, tancang, tumu, tanjang
7.	<i>Sonneratia alba</i>	Prapat, bropak, padada bogem

Source: Results of field observations in 2020

The density of mangroves in Mangrove Park ecotourism in Pekalongan City is presented in Table 5.

Table 5. Mangrove density for each station

Station	Species	Number of trees	Area	Density
I	- <i>Avicennia marina</i>	3	100	0,03
	- <i>Rhizophora stylosa</i>	23	100	0,28
Total		26	100	0,31
Average			100	0,155
II	- <i>Avicennia marina</i>	3	100	0,03
	- <i>Rhizophora apiculata</i>	11	100	0,11
	- <i>Rhizophora stylosa</i>	20	100	0,20
	- <i>Nypa fruticans</i>	3	100	0,03
Total		37	100	0,37
Average			100	0,0925
III	- <i>Avicennia lanata Ridley</i>	3	100	0,03
	- <i>Bruguiera gymnorhiza</i>	8	100	0,08
	- <i>Sonneratia alba</i>	7	100	0,07
Total		18	100	0,18
Average			100	0,06

Source: Field observation results, 2020

3) Mangrove Biota

One of the attractions of mangrove tourism is the presence of mangrove fauna (Agussalim, 2014) because with the many existing fauna tourists can enjoy and observe the variety of fauna that exists. Based on the results of observations of fauna found in mangrove park ecotourism as shown in Table 5.

Table 5. Fauna species in the Pekalongan mangrove park ecotourism area

Type		Local Name	Latin Name
	1.	Trinil Kaki Merah	<i>Tringa tetanus</i>
	2.	Kuntul Kecil	<i>Egretta garzetta</i>
	3.	Blekok Sawah	<i>Ardeola speciosa</i>
	4.	Kokokan Laut	<i>Butorides striatus</i>
Reptile	1.	Biawak	<i>Varanus salvator</i>
Ikan	1.	Bandeng	<i>Chanos chanos</i>
	2.	Belanak	<i>Liza melinoptera</i>
Crustacea	1.	Kepiting	<i>Metopograpsus latifrons</i>
	2.	Kepiting Bakau	<i>Scylla olivacea</i>
	3.	Udang Dogol	<i>Metapenaeus ensis</i>
	4.	Kerang Dara	<i>Anadara granosa</i>
Molusca	1.	Keong Bakau	<i>Telescopium telescopium</i>

Source: Field observation results, 2020

4) Accessibility to Ecotourism Mangrove Park Pekalongan City

There are two requirements for assessing the accessibility of a location, including a proper road to the place, and the existence of several other alternative routes. The Pekalongan Mangrove Park Ecotourism Area, based on the results of observations, is relatively easy to access. Public transportation or private cars can be used to get to the area. Paved access roads in good condition can generally be used to reach this destination. In addition, several signboards have been made to facilitate tourist access to mangrove ecotourism.

C. Suitability Analysis for Ecotourism Areas

Based on the results of the analysis, the condition of Mangrove Park ecotourism in Pekalongan City is in the appropriate category (S2) with a total score of 60 and an ecological suitability index of 68%, which indicates that the tourist attraction is in the appropriate category for mangrove ecotourism areas. Mangrove thickness is one of the tourism feasibility factors that must be improved. While the ideal mangrove thickness for tourism is more than 500 meters, based on the measurement of mangrove thickness in Pekalongan Mangrove Park, Ecotourism ranges from 45 -118 meters. The thickness of mangrove trees is of great concern in mangrove monitoring activities, which affects the formation of monitoring roads and the area's carrying capacity to accommodate visitors (Rodiana, 2019). Managers continue to strive to increase mangrove thickness through mangrove planting, namely planting mangroves in different places. This is expected to increase the thickness of mangroves in the area—more details regarding indicators of the suitability of mangrove ecotourism areas as presented in Table 6.

Table 6. Suitability Analysis of Ecotourism Mangrove Park Pekalongan

No	Parameter	Station			Average	Score	Total
		1	2	3			
1	Mangrove thickness (m)	47	118	49	71,3	2	10
2	Mangrove density (100 m ²)	15 ind	9 ind	6 ind	10 ind	2	8
3	Mangrove type	- Avicennia marina	- Avicennia marina	- Avicennia officinales	7	4	12

		- Rhizophora Stylosa	- Rhizopora apiculata - Rhizophora Stylosa - Nypa fruticans	- Bruguiera gymnorhiza - Soneratia alba			
4	Object biota	- Mollusca, fish, crabs, birds	- Mollusca, shrimp, fish, crabs, birds, monitor lizards	- Mollusca, shrimp, fish, birds	6	4	12
5	Tides		0,56 m	0,56 m		4	12
6	Area characteristics	2 Condition 1. The existence of interesting objects, such as flora, fauna, or physical aspects 2. There is a panorama or beauty that has a certain attraction			2	2	4
7	Accessibility	2 Condition 1. Good road to reach the location 2. Many alternative roads to reach the location			2	1	2
			Total				60
			Indeks kesesuaian Ekosistem (%)				68%
			Ecosystem suitability index (%)				(Sesuai)S2

D. *Pekalongan Mangrove Park Ecotourism Development Strategy*

To optimize the existing ecotourism area, an appropriate development is needed, so that the existing mangrove ecotourism area continues to develop and provide added value for community and regional development while preserving the environment. SWOT analysis of the development of Ecotourism Mangrove Park Pekalongan is described in Table 7.

Table 7. SWOT Matrix for Ecotourism Development of Magrove Park Pekalongan

IFAS	Strengths (S)	Weakness (W)
EFAS	3. The potential for mangrove vegetation that supports the development of mangrove ecotourism.	1. Marketing and promotion carried out so far is felt to be less effective
	4. There are supporting facilities for mangrove tourism forests, such as mangrove information centers, sitting pavilions, observation bridges, observation towers, and boats.	2. good coordination between stakeholders has not been implemented properly
	5. There are already several mangrove management community groups under the Marine Office	3. Community and community group participation is still low
	6. There is a commitment from the Indonesian government and the Pekalongan City Government to develop mangrove ecotourism	4. Existing facilities are still lacking and not well maintained.
		5. Insufficient funds for ecotourism development.

7. Easy accessibility from the city center, sub-districts, and Pekalongan districtOur thanks go to the manager of Mangrove Park ecotourism in Pekalongan City, who has given permission and helped during the research process.		
Opportunity (O)	SO strategy	WO Strategy
8. Potentially high demand for recreation among Pekalongan residents.	1. Develop all existing potential, such as increasing vegetation diversity and supporting facilities for mangrove tourism forests as an alternative to environmentally-based tourism to meet the tourism needs of Pekalongan City residents.	1. The Pekalongan government encourages the promotion of mangrove tourism in Pekalongan by capitalizing on national and international commitments to preserve mangroves in Pekalongan's urban areas.
9. Strong national and international commitment to mangrove conservation in Pekalongan	2. Strengthen the commitment of the Government of Indonesia and the Pekalongan City Government to protect mangrove ecosystems following international commitments.	2. Allocate a special budget and increase cooperation with the provincial government and the private sector in funding ecosystem conservation. Planting mangrove trees and adding mangrove tourism support services to Pekalongan's mangrove park ecotourism.
10. Cooperation between the Pekalongan city government and several agencies (Ministry of Forestry, NGOs, Unikal)	3. Create income opportunities for the surrounding community by developing knowledge about mangrove forests for those who manage them.	3. Facilitate government cooperation with various agencies to provide counseling on the benefits of mangroves and increase community participation.
11. Income opportunities, can create employment and business opportunities for the community so that it can indirectly increase people's income because it does not depend on one type of livelihood and can increase regional income	4. Optimizing the maintenance of existing infrastructure by utilizing the role of community resources in the surrounding area.	
12. Number of community resources that have the potential as labor		
Threat	ST strategy	WT Strategy
1. Coastal abrasion	1. Increase mangrove plants to overcome coastal abrasion.	1. Increase community involvement in the importance of protecting mangroves to reduce coastal abrasion.
2. Mangrove ecotourism is adjacent to other attractions such as sand Kencana beach	2. Improve unique supporting facilities such as tracking bridges, mangrove aisles, viewing towers, etc. as a uniqueness that offers the beauty of mangroves that can only be visited in Pekalongan.	2. Establish good coordination between stakeholders to jointly protect the environment, by minimizing pollution, minimizing the use of mangroves only for personal gain, etc.
3. Environmental pollution, especially around the tourist area caused by the smoke of burning bodies from the crematorium which is close to the mangrove area	3. Create a clear legal system that prohibits illegal pond development and massive mangrove logging for private interests.	
4. Development of shrimp ponds by farmers around the area.		
5. Logging of mangrove trees for personal purposes such as housing, household needs, etc.		

4. Conclusion

Mangrove Park Pekalongan also offers ecotourism. There are seven different types of mangroves here. *Rhizophora* and *Avicennia* species are the two most common mangrove species. This tourist area has four types of wildlife: reptiles, fish, crustaceans, and mollusks. According to the findings of the suitability analysis, Mangrove Park Pekalongan appears to be an appropriate destination for ecotourism purposes. The ecological suitability index of 68% reflects this. The mangrove park tourism area will be developed to maximize the existing possibilities, such as the potential vegetation and supporting facilities of mangrove forests as ecotourism opportunities for the tourism needs of Pekalongan City. Pekalongan City will provide a special budget and strengthen cooperation with the central government, government, provinces, and the private sector to fund the protection of mangrove ecosystems and improve Pekalongan mangrove ecotourism supporting services for mangrove tourism, improve unique supporting services such as observation bridges, mangrove trails, To maintain the existing mangrove ecosystem jointly, stakeholders need to work well together to reduce pollution and utilization of mangroves for personal gain. It is hoped that local governments can make policies for managing mangrove areas so that the management of existing mangrove ecotourism can continue to be sustainable. Suggestions for future researchers are expected to examine the environmental valuation of the Pekalongan City Park mangrove ecotourism area.

Our thanks go to the manager of Mangrove Park ecotourism in Pekalongan City, who has given permission and helped during the research process.

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