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The Ecotourism Mangrove Suitability Assessment in Reroroja Village, Magepanda District, Sikka Regency, East Nusa Tenggara, Indonesia

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ABSTRACT

The mangrove area of Reroroja Village has the potential to be developed into an ecotourism area, because mangroves grow along the coast. This study aimed to determine the suitability of mangrove areas as ecotourism areas from April to May 2023. The mangrove area was divided into two observation stations using the purposive sampling method. The study assessed various mangrove tourism suitability parameters, including mangrove thickness, species, density, debris, tides, mangrove fauna, distinctiveness, law/legality, accessibility, visitor presence, facilities, and private-owned institutions. The data was analyzed using the Tourism Suitability Index (TSI) formula, and the average suitability score for Stations I and II was 71.5%. This value falls in the S2 (Suitable) category, indicating the potential for ecotourism development in the area. The study found that the mangrove area has a rich biodiversity, including fish, crabs, molluscs, reptiles, and birds, and is well-suited for ecotourism development.

Keywords: Ecotourism, Tourism Suitability Index, Mangrove, Reroroja Village.

ABSTRAK

Kawasan mangrove Desa Reroroja berpotensi dikembangkan menjadi kawasan ekowisata, karena di sepanjang pantainya ditumbuhi mangrove. Penelitian ini bertujuan untuk mengetahui kesesuaian kawasan mangrove sebagai kawasan ekowisata yang dilaksanakan mulai Bulan April hingga Mei 2023. Kawasan mangrove dibagi menjadi dua stasiun pengamatan dengan metode purposive sampling. Penelitian ini mengkaji berbagai parameter kesesuaian wisata mangrove, termasuk ketebalan mangrove, spesies mangrove, kepadatan mangrove, keberadaan sampah, pasang surut, fauna mangrove, kekhasan, hukum/legalitas, aksesibilitas, keberadaan pengunjung, fasilitas, dan kelembagaan. Data dianalisis menggunakan formula Indeks Kesesuaian Wisata (IKW). Skor kesesuaian rata-rata untuk Stasiun I dan II adalah 71,5%. Nilai ini masuk dalam kategori S2 (Sesuai), menunjukkan potensi pengembangan ekowisata di daerah tersebut. Studi ini menunjukkan bahwa kawasan mangrove Reroroja memiliki keanekaragaman hayati yang kaya, termasuk ikan, kepiting, moluska, reptil, dan burung, dan cocok untuk pengembangan ekowisata.

Kata kunci: Ekowisata, Indeks Kesesuaian Wisata, Mangrove, Desa Reroroja.

1. Introduction

The local government, in collaboration with the community, can leverage tourist attractions while conserving mangrove forests (Alfiandri & Irawan, 2023). Desa Reroroja is one of the coastal villages located in the northern region of Sikka Regency. It boasts a diverse mangrove forest and is considered a conservation area. The functions of the mangrove forest in Desa Reroroja include preventing erosion and tidal waves, providing shelter for marine life, and serving as an ecotourism destination. The mangrove forest in this area is now being utilized by both the local community and the government to establish an ecotourism area. This is evident from various facilities provided by the community, such as bamboo bridges for exploring the mangrove forest (Apelabi et al., 2019).

The Mangrove forest ecosystem has a very important function in ecology and economy, local, regional, national, and global communities (Untari

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et al., 2020). The presence of various fauna closely related to the mangrove ecosystem, such as various types of birds, snakes, monitor lizards, shrimp, fish, mollusks, crabs, and serving as a habitat for plants like orchids. This mangrove ecosystem, with its great potential, is excellent for development into an ecotourism destination for tourists (Agussalim & Hartoni, 2014; Sodikin et al., 2023).

Mangrove ecotourism development is very influential on mangrove forests and human survival as well as preventing damage to the seaside area (Setiawan et al., 2017). Ecotourism supports the economy of local communities by providing employment, and additional income while focusing on environmental protection (Chandel & Mishra, 2016). The ecotourism development concept essentially seeks to encourage cooperation among the parties concerned. More synergistic and adaptive cooperation among the actors of ecotourism is essential for the ecotourism development in Indonesia. The development of ecotourism should be able to provide satisfaction and original experiences to the visitors; create a sense of security and comfort; and support the sustainability of the ecotourism business (Butarbutar & Soemarno, 2012; Chan & Baum, 2007).

Reroroja Village Mangrove Area is located in Reroroja Village, Magepanda District, Sikka Regency, East Nusa Tenggara Province, Indonesia. The mangrove area of Reroroja Village has the opportunity to be used as an eco-tourism area, but the implementation of the concept of ecotourism with the exploitation of mangrove forests has not been carried out thoroughly. Therefore, researchers are interested in conducting this research to assess the suitability of mangrove areas as ecotourism areas in Reroroja Village, Magepanda District, Sikka Regency.

2. Material and methods

Time and Location of Research

This research was conducted from April to May 2023. The location of this research is the Mangrove Area of Reroroja Village, Magepanda District, Sikka Regency, East Nusa Tenggara (Figure 1). The research was divided into two stations, Station I was located in a large and long mangrove area, while Station II was situated in a smaller mangrove area near the mangrove estuary.

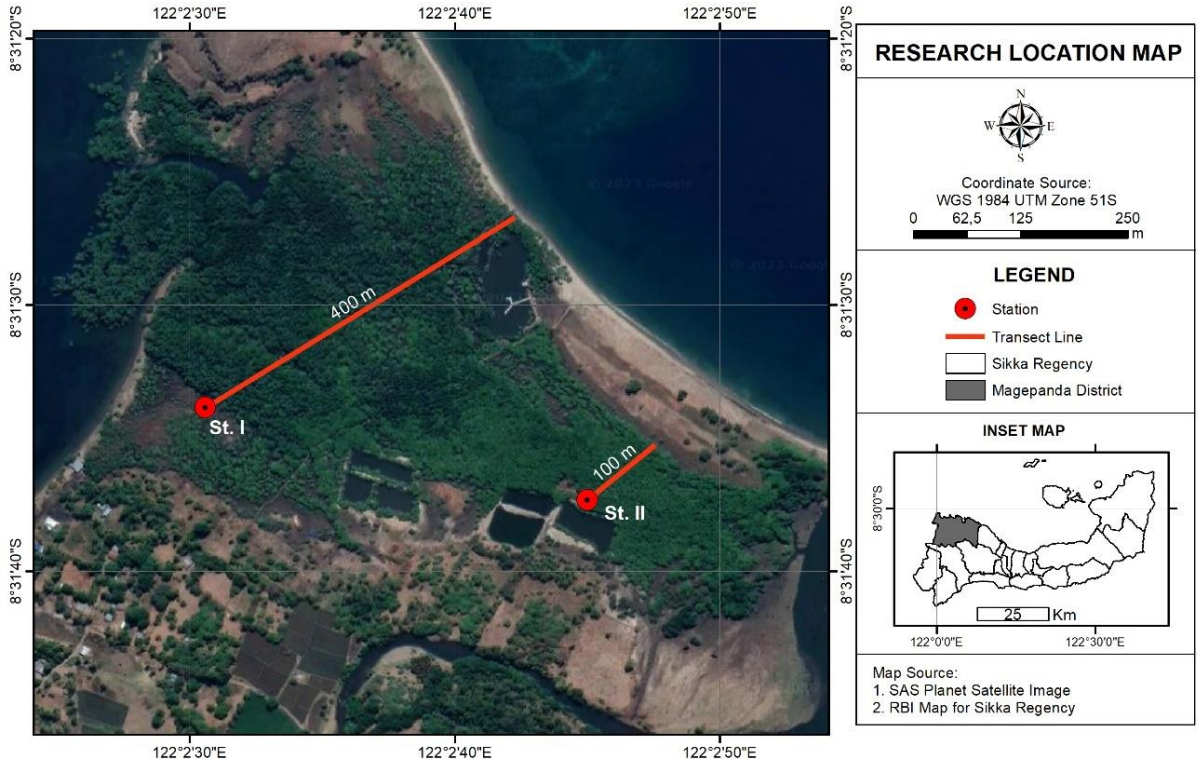


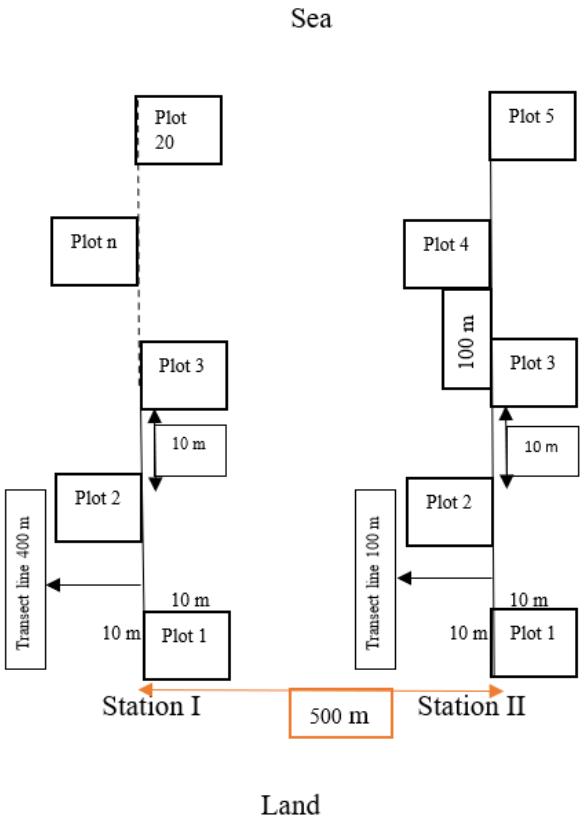
Figure 1. Research Location

Equipment and Materials

The equipment and materials used in this research include a camera as a documentation tool, writing tools such as notebooks and pen for recording research data, a 1000 m raffia string for creating transects, a 50 m rolling meter as a tool for measuring transect length, a mangrove identification book from Noor et al. (2006) as a guide for identifying mangroves, and two bags as containers for storing collected samples.

Data Retrieval Techniques

The research station selection using the purposive sampling method involved dividing the Reroroja Village Mangrove Area into two observation stations (Harahab & Setiawan, 2017). The division of study areas is based on the representation of research locations, where Station I represents the study area with a large and expansive mangrove area, while Station II represents the study area with a relatively small mangrove area and proximity to the estuary. The distance between Station I and Station II was 500 m. Subsequently, each station was divided into three transects. Station I consisted of three transects (transect I, II, III) and Station II consisted of three transects (transect I, II, III) which extended from the land boundary towards the sea with the size of the transect length at Station I was 400 m and Station II was 100 m with a distance of 50 m between transects. Plots were made measuring 10x10 m² in each transect and the distance between plots was 10 m (English et al., 1994). The total plots at Station I were 60 plots, and at Station II were 15 plots, resulting in a total of 75 research plots (Figure 2). The data observed in the plots were mangrove thickness, mangrove density, mangrove species, object biota, and waste. Other data measured included tides, distinctiveness, facilities, and accessibility while data related to laws/legalities, visitor/tourist information, and institutional data were obtained through observation and interviews.



Legend:

n = 1, 2, 3, ..., 20 (number of plots within one research transect)

Figure 2. Illustration of Research Transect

Data Analysis

Mangrove ecotourism suitability values can be seen in the following suitability matrix (Table 1).

The data obtained was then analyzed using the Tourism Suitability Index (TSI) with the following formula (Yulius et al., 2018):

$$TSI = \sum \left(\frac{Ni}{Nmax}\right) x100\%$$

Description:

TS I= Tourism Suitability Index

Nmax = Maximum value (150)
Ni = Parameter value to-i (weight x score)

The ecotourism suitability index values are then adjusted to the following categories:
S1 = Very Suitable, with TSI > 75-100%
S2 = Suitable, with TSI > 50-75%
S3 = Moderately suitable, with TSI > 25-50%
N = Not suitable, with TSI < 25%

3. Results and Discussion

Suitability Parameters in the Mangrove Area of Reroroja Village

1) Mangrove thickness

Station I has a mangrove thickness of 400 m based on the mangrove suitability matrix, and this 400 meters falls into a score of 3 and Station II has a thickness of 100 m falls into a score of 2 (Figure 3). This explains that the highest mangrove thickness is found at Station I. The results obtained from this study at Station I are similar to the findings of Yulianda et al. (2014), conducted at Indah Kapuak Beach, North Jakarta, with an average mangrove thickness value in region B of 400 meters and the research results obtained at Station II are not significantly different from the findings of Tuwongkesong et al. (2018), conducted in Tongkaina Village, Bunaken District, Manado City, with an average mangrove thickness value of 138.65 meters. Windusari et al. (2014); Sholiqin et al. (2022) explain that the substrate with the type of dust and clay is a supporting factor for the regeneration process because clay particles in the form of mud will catch mangrove fruit that falls when ripe. Conversely, on beaches with sandy or sandy mixed with coral debris substrates, the mangrove density will be low because this type of substrate is not able to capture/retain the fallen mangrove fruit so no regeneration occurs. The type of substrate at Station I is muddy while the type of substrate at Station II is sandy mud. The type of substrate that makes mangroves at Station I grow more optimally than in Station II. The low thickness of mangroves at Station II is also influenced by human activities such as cutting mangrove trees and making mangrove areas as a shortcut for various activities. Souisa & Tapotubun (2018) argues that mangrove degradation causes damage, especially in the exploitation and utilization of resources available in mangrove areas, activities such as illegal logging, and conversion of mangrove land into roads, causing changes in land use from initial conditions.

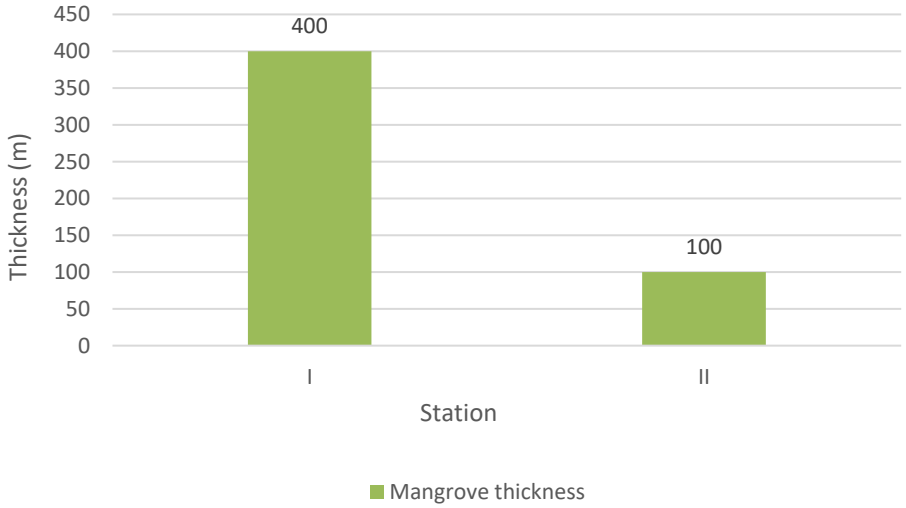


Figure 3. Mangrove Thickness of Reroroja Village

Table 1. Tourism Suitability Matrix

No	Parameters	Weight	Category	Score	Source
1.	Mangrove thickness (m)	5	> 500	4	(Yulius et al., 2018)
			> 200 – 500	3	
			50 – 200	2	
			< 50	1	
2.	Mangrove species	3	> 5	4	
			3 - 5	3	
			1 - 3	2	
			0	1	
3.	Mangrove density (trees/m²)	3	> 15-20	4	
			> 10 - 15; >20	3	
			5 – 10	2	
			< 5	1	
4.	Tides (m)	1	0 – 1	4	
			> 1 – 2	3	
			> 2 – 5	2	
			> 5	1	
5.	Object biota	1	Fish, shrimp, crabs, molluscs, reptiles, birds (6)	4	
			Fish, shrimp, crabs, molluscs, reptiles (5)	3	
			Fish, molluscs, shrimp (3)	2	
			One of the biota (1)	1	
6.	Distinctiveness	1	International	4	Modification of Dwijayati et al. (2016)
			Nasional	3	
			Province	2	
			Lokal	1	
7.	Law/ legality	8	Constitution, presidential decree/ presidential decree, mangrove forest management regulations, and customary norms (4)	4	
			Constitution, presidential decree/ presidential decree, and customary norms (3)	3	
			Constitution, presidential decree/ presidential decree (2)	2	
			One of the criteria (1)	1	
8	Accessibility	10	Good roads to reach tourist attractions, many alternative roads to tourist attractions, plenty of transportation to tourist attractions, and many means of transportation support to tourist attractions (4)	4	Modification of Harahab et al. (2017)
			Good roads to reach tourist attractions, many alternative roads to tourist attractions, plenty of transportation to tourist attractions (3)	3	
			Good roads to reach tourist attractions, many alternative roads to tourist attractions (2)	2	
			One of the criteria (1)	1	
9	Visits/tourists	10	There are visitors, a high frequency of visits, a high amount of visitors, visitors from domestically and abroad (4)	4	
			There are visitors, a high frequency of visits, a high amount of visitors (3)	3	
			There are visitors, a high frequency of visits (2)	2	
			One of the criteria (1)	1	

Table 1. Tourism Suitability Matrix (continued)

No	Parameters	Weight	Category	Score	Source
10	Waste (pcs/m²)	4	0-5 (Very clean)	4	Modification of Marin et al. (2019)
			5-10 (moderate, some pieces of trash can be seen)	3	
			10-20 (Dirty or a lot of trash)	2	
			20 and higher (Very Dirty)	1	
11	Facilities	3	Toilets, trash cans, restaurants, stalls, bridges, parking areas, electricity networks, telephone networks and sewage systems (9)	4	Modification of Fajriah et al. (2014) & forestry Departemen (2003)
			Toilets, trash cans, restaurants, stalls, bridges, and parking areas (6)	3	
			Toilets, trash cans, andrestaurants (3)	2	
			One of the criteria (1)	1	
12	Institutional	3	Environment and Forestry department, Fisheries department, Tourism department, Transportation department, Regional Owned Enterprises (BUMD), Village Government, private institutions and individuals (8)	4	Modification of Wijaya & Puspitasari (2020)
			Environment and Forestry department, Fisheries department, Tourism department, Transportation department, Regional Owned Enterprises (BUMD) (5).	3	
			Environment and Forestry department, Fisheries department, Tourism department	2	
			One of the criteria (1)	1	

2) Species of mangroves

There are 576 trees in Station I, consisting of four species namely *Avicennia lanata*, *Rhizopora apiculata*, *Sonneratia alba*, and *Lumnitzera racemosa*. At Station II there are 72 trees consisting of five species namely *Avicennia lanata*, *Rhizopora apiculata*, *Sonneratia alba*, *Lumnitzera racemose*, and *Acanthus ilicifolius,* which means Station I and Station II both fall within a score of 3. Mangrove ecosystems are generally dominated by *Avicennia lanata*, *Rhizopora apiculata*, and *Sonneratia alba* (Table 2). A tree species is dominant if the species are lots in the same area spread evenly in all areas, and the trees have a large diameter. *Avicennia lanata*, *Rhizopora apiculata*, and *Sonneratia alba* have unique adaptation resistance to be able to live and develop on muddy, acidic, anoxic substrates, always submerged in water, high-salinity environments, unstable land surface, and tides conditions (Ayu et al., 2023; Muli et al., 2021). *Lumnitzera racemosa* is the least commonly found in Stations I and II. According to Brown et al. (2016), *Lumnitzera racemosa* is a true mangrove tree that predominantly grows on the edges of the mangrove zone, especially in areas adjacent to the mainland. This tree also

Table 2. Types of Mangroves in the Reroroja Village Mangrove Area

Station	Transect	Species
I	I	*Avicennia lanata*
		Lumnitzera racemosa
		Rhizopora apiculata
		Sonneratia alba
	II	*Avicennia lanata*
		Rhizopora apiculata
		Sonneratia alba
	III	*Avicennia lanata*
		Rhizopora apiculata
		Sonneratia alba
		Acanthus ilicifolius
II	I	*Avicennia lanata*
		Lumnitzera racemosa
		Rhizopora apiculata
	II	*Avicennia lanata*
		Lumnitzera racemosa
		Rhizopora apiculata
		Sonneratia alba
	III	*Avicennia lanata*
		Lumnitzera racemosa
		Rhizopora apiculata
		Sonneratia alba

characterizes the transitional zone between mangrove forests and mainland forests.

3) Density

The mangrove tree categories in each transect (Table 3) show that *Avicennia lanata* has the highest density value compared to other species such as *Rhizopora apiculata, Sonneratia alba,* and *Lumnitzera racemosa*. This is due to the muddy substrate sediment texture which is very closely related to mangrove species that live and dominate in the mangrove area of Reroroja Village, including *Avicennia* which is a common characteristic for muddy sediment types (Soeprobowati et al., 2022; Utina et al., 2019).

Station I has a density value of 10.55 trees/m² which means Station I falls within a score of 3. Station II has a density value of 9.133 trees/m² which means Station II falls within a score of 2. The highest density is obtained at Station I because Station I is dominated by muddy substrate and is consistently inundated during normal high tides, while Station II is dominated by sandy mud substrate and has a limited supply of seawater. Cahyaningsih et al. (2022) explained that mangroves thrive better in areas where the flow contains a significant amount of mud.

4) Tides

Tidal data obtained from BMKG (Meteorology, Climatology, and Geophysics Agency) for one year or 12 months from January 1, 2022, to December 31, 2022, indicates that the highest tide of 2.8 m occurs 19 times a year in January, April, May, June, October, November, and December (Figure 4). The lowest tide at 0.0 m occurs four times a year in February, July, and August. The tidal range obtained for the mangrove area of Reroroja Village is 2.8 m, which means Station I and Station II both fall within a score of 2. Quoting from BMKG explains that the type of tides in Reroroja Village is a mixed tide, prevailing semi-diurnal. This means that the tides occur twice high and twice low, but sometimes there is one tide with different heights and periods. Tides can cause the shifting and movement of bottom sediments, which in turn affects the thickness of the sediment that serves as the habitat for mangroves to grow. Tides also have an impact on groundwater dynamics, which are believed to influence the distribution of

Table 3. Mangrove Density in Reroroja Village Mangrove Area

Station	Transect	Species	Density (Di)
I	I	*Avicennia lanata*	0.046
		Lumnitzera racemosa	0.004
		Rhizopora apiculata	0.049
		Sonneratia alba	0.010
	II	*Avicennia lanata*	0.049
		Rhizopora apiculata	0.044
		Sonneratia alba	0.010
	III	*Avicennia lanata*	0.053
		Rhizopora apiculata	0.045
		Sonneratia alba	0.009
Total			0.317
Average			0.106
Density (trees/m²)			10.55
II	I	*Acanthus ilicifolius*	0.006
		Avicennia lanata	0.040
		Lumnitzera racemosa	0.014
		Rhizopora apiculata	0.028
	II	*Avicennia lanata*	0.048
		Lumnitzera racemosa	0.012
		Rhizopora apiculata	0.022
		Sonneratia alba	0.020
	III	*Avicennia lanata*	0.052
		Lumnitzera racemosa	0.006
		Rhizopora apiculata	0.018
		Sonneratia alba	0.008
Total			0.274
Average			0.091
Density (trees/m²)			9.133

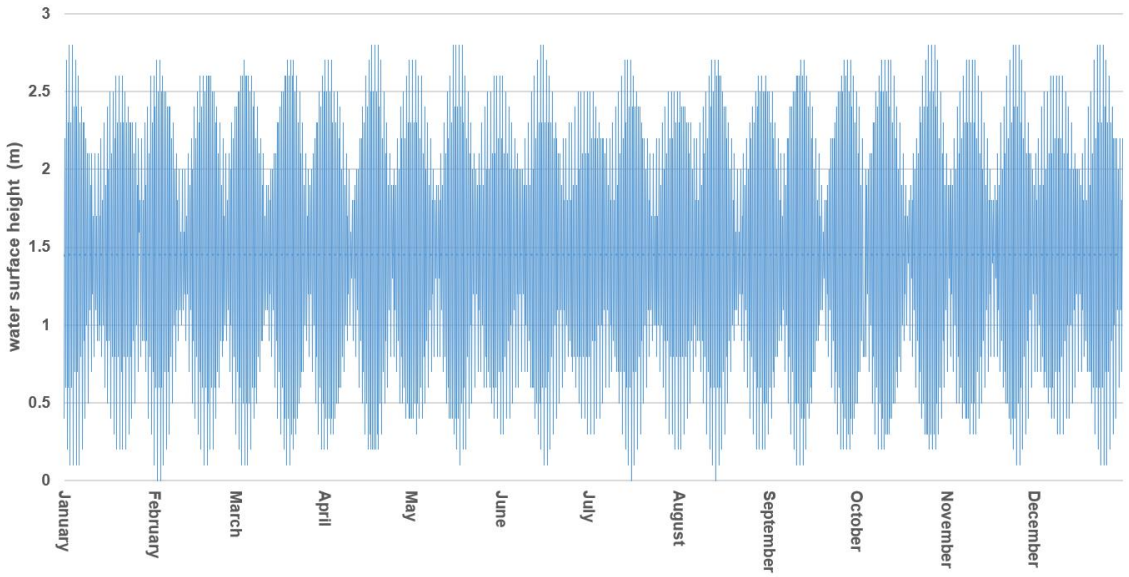


Figure 4. Tidal Graph for the Mangrove Area of Reroroja Village, Magepanda District in 2022

freshwater from within the ground (Purnomo et al., 2021). Factors inhibiting mangrove ecotourism include tides and seasons. Tides have an impact on the timing of tourist activities, especially boating activities, while the season determines the comfort and safety of tourists from waves and currents (Rahmila & Halim, 2018).

5) Object Biota

The types of biota found in the mangrove area of Reroroja Village include fish, crabs, molluscs, reptiles, and birds, which means Station I and Station II both fall within a score of 3 (Table 4). These biota species make the mangrove area a source of food and a habitat for survival. Organic matter in mangroves serves as a food source and shelter for a variety of organisms. Many populations of molluscs and birds are also found in association with mangrove constituent plants (Sukardjo, 2004; Basyuni et al., 2018). Kusmana et al. (2016) added that mangrove areas provide habitat and can fulfill all the basic needs of the population such as shelter, reproduction, food, and water. The mangrove forest has tourism value through the attraction of its flora and fauna associated within its ecosystem. The wealth of natural resources in mangroves, such as unique vegetation formations, wildlife, and associations with the mangrove ecosystem, has the potential to be marketed as tourist attractions, especially ecotourism that offers educational and conservation concepts (Hakim et al., 2017).

6) Distinctiveness

Types of fauna in the mangrove area of Reroroja Village include fish: Gelodok (*Periopthalmus sp*.) and Milkfish (*Chanos chanos*), Crab: Uca (*Uca sp*.) and Semapor (*Ilyoplax sp*.), Molluscs: *Telescopium telescopium, Cerithium, Pirenella,* and *Tenguella*,

Table 4. Biota Objects in the Mangrove Area of Reroroja Village

No.		Types of Biota
1.	Fish	Gelodok (*Periopthalmus sp.*) and milkfish (*Chanos chanos*).
2.	Crab	Uca (*Uca sp.)* and Semapor (*Ilyoplax sp.*).
3.	Molluscs	*Telescopium telescopium, Cerithium, Pirenella,* and *Tenguella*.
4.	Reptiles	Lizards (*Varanus*).
5.	Birds	Spotted Dove (*Spilopelia chinensis*), Actitis Hypoleucos (*Tringa hypoleucos*), Eurasian Tree Sparrow (*Passer montanus),* and Sea Crawfish (Gerygone sulphurea).

Reptiles: Lizards (*Varanus*), Birds: Spotted dove (*Spilopelia chinensis*), Actitis Hypoleucos (*Tringa hypoleucos*), Eurasian Tree Sparrow (*Passer montanus*), and Sea Crawfish (*Gerygone sulphurea*). Types of flora at the ecosystem such as *Avicennia lanata*, *Rhizopora apiculata, Sonneratia alba, Acanthus ilicifolius,* and *Lumnitzera racemose*. There is not unique species at the mangrove ecosystem, which means Station I and Station II both fall within a score of 1. According to Arbi (2022), endemic species are those species that are found in one particular place on the planet. They are not found anywhere else. Endemic species run a higher risk of extinction because of their geographic isolation.

7) Law/Legality

The law/legality that applies to the Reroroja Village Mangrove area is governed by Law No. 5 of 1990 Conservation of Natural Resources and Ecosystems Article 21 Paragraph 2 point a and Article 40 Paragraph 2, which means Station I and Station II both fall within a score of 1. Sanctions are given by the Ministry of Environment and Forestry by the forestry department which provides forest police who routinely conduct surveillance. Amalina (2022) argues that, in special regulations relating to conservation, especially Law No. 5 of 1990 concerning the conservation of natural resources and their ecosystems, tourism activities are legally allowed in protected areas. The existence of various national regulations governing ecotourism aims to prevent tourism from deviating from the direction of national and international policies.

8) Accessibility

The accessibility to the mangrove area in Reroroja Village is characterized by multiple alternative routes and various transportation options, including land, sea, and air transport, which means Station I and Station II both fall within a score of 2. The distance from Ende Regency to the mangrove location is approximately 35 km, with a travel time of roughly 40 minutes. The distance from Ende City to the Reroroja Village mangrove area is 130 km, taking approximately four hours to reach. Therefore, a convenient alternative route for tourists from outside the island using sea and air transport can be through Maumere City. The distance from Maumere City in Sikka Regency to the mangrove area is approximately 30 km, with a travel time of about 45 minutes. According to Ismail & Rohman (2019), accessibility is considered one of the crucial factors supporting tourism development as it relates to cross-sectoral development. Jocom et al. (2021); Aso et al. (2021) add that accessibility is a crucial factor that significantly influences tourist visits. Tourists can also influence the development of accessibility in an area. If an area has tourism potential, it is essential to provide adequate accessibility, so that the area can be visited by tourists.

9) Visits/tourists

Tourists come from the local community, domestic tourists, and foreign tourists, which means Station I and Station II both fall within a score of 2. Visitors usually increase on weekends and holidays, because tourists are dominated by students. Holik (2016); Liu et al. (2020) argues that the visit/tourist factor is very important because tourists are the perpetrators of tourism activities. The tourists will bring money from their place of origin to be used in destination tourist areas. Without tourists, there is no tourism and the tourism industry cannot contribute to the region or even the country.

10) Waste

The amount of waste found in the mangrove area of Reroroja Village at Stations I and II is included in the very clean category with a value at Station I is 0.23 pcs/m² and Station II is 1.24 pcs/m², which means Station I and Station II both fall within a score of 4 (Table 5). This is because mangrove managers clean mangrove areas regularly. According to Cahyaningsih et al. (2022); Mboro et al. (2022); Turker (2022), the amount of litter in the mangrove area can cover the root layer of mangrove trees, so it can affect the process of mangrove respiration and cause the death of mangrove trees. The debris in the mangrove ecotourism areas can also damage the aesthetic appearance of the natural surroundings, which is typically a major attraction for visitors. This can reduce the appeal of ecotourism and decrease the number of tourists (Kiswantoro et al., 2022).

11) Facilities

The facilities available in the mangrove area of Reroroja Village include toilets, trash bins, bridges, parking areas, telephone networks, and wastewater disposal systems, which means Station I and Station II both fall within a score of 3. According to Butarbutar & Soemarno (2013); Arismayanti (2019), infrastructure in the form of facilities to meet the needs of tourists in ecotourism areas is very important in developing the potential of future ecotourism, so it is

Table 5. Waste in the Mangrove Area of Reroroja Village

Station	Transect	Waste Amount (pcs)	General Indeks (pcs/m²)	Criteria
	I	32	0,32	Very Clean
I	II	18	0,18	Very Clean
	III	20	0,20	Very Clean
Average			0,23	Very Clean
	I	58	2,32	Very Clean
II	II	24	0,96	Very Clean
	III	11	0,44	Very Clean
Average			1,24	Very Clean

necessary to complete infrastructure for ecotourism to support natural tourism which has own natural charm for tourists.

12) Institutional

The institutional status of the Reroroja Village mangrove area is privately owned by Babah Akong, which means Station I and Station II both fall within a score of 1. However, the government remains a supervisor and facilitator in the management of mangrove forests in Reroroja Village. Supervisors are carried out by the forestry department which provides forest police who routinely conduct surveillance in mangrove forest areas. Inaddition, the forestry department and the environmental department play a role in planning the development of the mangrove forest area of Reroroja Village. The Tourism Department is currently involved in planning the development of ecotourism in the mangrove forest. Kerdpitak & Heuer (2016) argues that effective tourism management institutions are a key factor in the success of a tourist attraction. Harahap (2009) adds that the presence of management institutions involving all stakeholders generally helps prevent mangrove damage.

The results of the Tourism Suitability Index (TSI) Calculation at Station I and Station II

The results of the Tourism Suitability Index (TSI) calculation in the mangrove ecotourism in Reroroja Village (Table 6) Station I is 74% included in the category S2 (Suitable) and Station II 69% included in the category S2 (Suitable). Based on these results, the mangrove area of Reroroja Village is suitable to be developed as an ecotourism destination area with an average Tourism Suitability Index (TSI) value of 71.5. The obtained category is influenced by low scores in several parameters such as tidal range, uniqueness, legal aspects, visitor numbers, accessibility, and institutional factors. However, parameters like tidal range, uniqueness, and

Table 6. Results of TSI Calculation in Reroroja Village Mangrove Area as an Ecotourism Area

No	Parameters	Weight	Station I		Station II	
			Score	Value	Score	Value
1.	Mangrove thickness (m)	5	3	15	2	10
2.	Types of mangroves	3	3	9	3	9
3.	Mangrove density (trees/m²)	3	3	9	2	6
4.	Tides (m)	1	2	2	2	2
5.	Object biota	1	3	3	3	3
6.	Distinctiveness	1	1	1	1	1
7.	Law/legality	8	1	8	1	8
8.	Accessibility	10	2	20	2	20
9.	Visits/tourists	8	2	16	2	16
10.	Waste (pcs/m²)	4	4	16	4	16
11.	Facilities	3	3	9	3	9
12.	Institutional	3	1	3	1	3
Total				111		103
Suitability score				74%		69%
Suitability category				S2		S2

visitor numbers are aspects that cannot be changed because tidal range and uniqueness are natural factors, while visitor numbers depend on people's interest in visiting a tourist area. On the other hand, legal aspects, accessibility, and institutional factors can be modified to achieve higher scores, thereby allowing the Reroroja Village mangrove area to reach a highly suitable category.

4. Conclusions

The research that has been conducted in the mangrove area of Reroroja Village, can be concluded that the suitability value of Station I is 74% and Station II is 69%.The average suitability index value for both Station I and Station II is 71.5%. According to the standard category of the Tourism Suitability Index (TSI), the value of 71.5% is included in the S2 (Suitable) category. From the results obtained, the mangrove area in Reroroja Village is suitable to be developed as an ecotourism destination. There is a need for government regulations regarding business area permits, supervision, and law enforcement, with various legal provisions in the management of mangrove resources that impose sanctions on business owners or individuals who do not comply, as well as on the community.

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