

Mangrove Suitability for Ecotourism Location in Tuada Village, Jailolo, West Halmahera

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Keywords: Ecotourism, Land suitability, Mangrove.

Abstract: Tuada Beach in West Halmahera is one of the local tourist destinations in North Maluku which still has mangrove in the side part. Instead of its beautiful view of the beach, the mangrove's itself have potential to be developed as ecotourism spot for those who are interesting in a special adventure. The objective of the research was to identify mangrove ecotourism potential and assessment its suitability as ecotourism in Tuada Beach, Jailolo, West Halmahera. The research method was by mapping, weighting and scoring variables, continued with overlay analysis. Variables of the assessment were mangrove density, thickness and variety, accessibility, slope, and freshwater supply. Slope data were generated from map contour, while freshwater supply, accessibility, and mangrove variables collected with field surveys. Results showed that mangrove thickness was suitable. It has a flat slope, which very suitable for ecotourism. Tidal range varies between 3-1.7 meters which suitable for ecotourism, while water supply located for 0.1 – 0.67 km from the area and it's considered suitable for ecotourism. This area has good accessibility. For the density of mangrove varies between rare until very dense, while its variety consists of 8 species. Tuada Beach has the potential to be developed for mangrove ecotourism, as its suitability varies from moderate suitable (S2) to highly suitable (S1). For its potential and suitability, the facilities need to improve as this beach recommended for ecotourism spot. Yet, in some part of the area need cultivation, so that the conservation of the mangrove could've sustainable.

1 INTRODUCTION

Mangrove is a woody plant that grows on the surface between the sea and land, both in tropical and subtropical regions. Generally, these plants are found in areas with high salinity, calm waves, strong winds, high temperatures, and muddy anaerobic soils. Mangrove forests have many functions, both ecologically and economically. This forest provides shelter, food, spawning for various kinds of marine and terrestrial organisms, niche providers for organisms that depend on coastal ecosystems, carbon sinks, and as a nursery ground for organisms living on the sea. Mangrove could also useful for fisheries, agriculture, forestry, regional protection coastal areas from erosion, sources of wood raw materials for firewood and building materials, tourism and other benefits (Kathiresan and Bingham, 2001; Doydee, Doungnamol and Jaitrong, 2010; Pinto, 1986 in Dissanayake and Chandrasekara, 2014; Lee *et. al.*, 2014; Sirajudin, 2018).

North Maluku has potential in coastal ecotourism development, especially mangrove ecotourism. Mangrove ecotourism plays an important role in maintaining the authenticity of nature and the coastal environment, as well as maintain the preservation of flora and fauna in the area. Tuada Beach in West Halmahera was one of the local tourist destinations in North Maluku which still has mangrove in the side part. Instead of its beautiful view of the beach, the mangrove's itself have potential to be developed as ecotourism spot for those who are interesting in a special adventure. The objective of the research was to identify mangrove ecotourism potential and assessment its suitability as ecotourism in Tuada Beach, Jailolo, West Halmahera.

2 METHOD

The research method was by mapping, weighting and scoring all the variables, continued with overlay

analysis and reclassification with Geographical Information System, using ArcGis 10.

2.1 Data Collection

Variables of the assessment were mangrove density, thickness and variety, accessibility, slope, and

freshwater supply, as can be seen on table 1. Slope data were generated from map contour, while freshwater supply, accessibility, and mangrove variables collected with field survey. Range tide data was collected by secondary data, gathered from Dishidros Indonesian Navy.

Table 1: Matrix Mangrove Suitability for Ecotourism.

Variables	Weight	Highly Suitable (S1) (score 3)	Moderate Suitable(S2) (score 2)	Marginally Suitable (S3) (score 1)
Mangrove diversity	3	> 5	3-5	1-2
Mangrove thickness (m)	3	> 500	> 200 – 500	50-200
Mangrove density	3	>15-25 (100m ²)	>10-15	5-10
Range tide (m)	1	0-1	>1-2	> 2- 5
Freshwater supply (Km)	1	< 1	1-2	> 2 Km
Accessibility	1	Good	average	bad
Slope	1	Nearly level/Very gently sloping	Steep	Very steep

Source: Yulianda, 2007, with modification.

2.2. Suitability Analysis of Ecotourism for Mangrove Forests on Tuada Beach

Determination of the suitability of the mangrove ecotourism class index can be determined based on the assessment of the mangrove ecotourism suitability matrix. Based on primary data and secondary data, the land suitability class is obtained. This suitability class was established based on overlay variables that has been weighted and scored, thus defined by its class interval as can be seen in table 2.

Table 2: Suitability Interval Based Category.

Class	Category	Suitability Interval
S1	highly suitable	> 31
S2	Moderate suitable	22-30
S3	not suitable	13-21

3 RESULT AND DISCUSSION

The results obtained from this research study were presented in form of maps.

3.1 Mangrove Diversity

Mangrove diversity represents the variability of its species of the area. Higher variability reflects its potential for ecotourism.

Table 3: Mangrove composition on Tuada Beach, 2018.

No .	Mangrove	Station				
		1	2	3	4	5
1.	<i>Rhizophora mucronata</i> L	+	+	+	+	+
2.	<i>Bruguiera gymnorrhiza</i>	+	+			
3.	<i>Ceriops tagal</i> (perr)	+				

4.	<i>Avicennia marina</i>		+			
5.	<i>Rhizophora apiculata</i> BI		+	+		
6	<i>Avicennia officinalis</i>				+	+
7	<i>Xylocarpus granatum</i>	+		+		
8	<i>Xylocarpus moluccensis</i>	+	+		+	
9	<i>Nypa fruticans</i>	+	+	-	-	-
Total		6	6	3	3	3
Average		4,2 ~ 4 (S2)				

(+) found

(-) not found

Based on table 3, it can be concluded that mangrove of Tuada Beach consisted of 9 different species which are *Rhizophora mucronata* L, *Bruguiera gymnorrhiza*, *Ceriops tagal* (perr), *Avicennia marina*, *Rhizophora apiculata* BI, *Avicennia officinalis*, *Xylocarpus granatum*, *Xylocarpus moluccensis* and *Nypa fruticans*. Mangrove in each station could be different, *Rhizophora mucronata* L, *Bruguiera gymnorrhiza*, *Ceriops tagal* (perr), *Xylocarpus granatum* and *Xylocarpus moluccensis* and *Nypa fruticans* (1st station). *Rhizophora mucronata* L, *Bruguiera gymnorrhiza*, *Avicennia marina*, *Rhizophora apiculata* BI, *Xylocarpus moluccensis*, and *Nypa fruticans* (2nd station), *Rhizophora mucronata* L, *Rhizophora apiculata* BI and *Xylocarpus granatum* (3rd station). *Rhizophora mucronata*, *Avicennia officinalis* and *Xylocarpus moluccensis* could be found in 4th station, while *Rhizophora mucronata* L, and *Avicennia officinalis* for the 5th station. In average there are 4,2 ~4 different species within the area so that concluded as moderately suitable (S2) for ecotourism.

3.2 Density and Mangrove Thickness

The distribution of mangrove density in the study area has a very rare, rare, medium and very dense in density. Its density is considered not suitable (S3). Mangrove thickness at I-V station has an average mangrove thickness 550-600 m. The thickness at the 1st station to station 5 can be categorized moderately suitable (S2) because it is in the value of more than 500 m.

3.3 Slope

The slope of the beach in Tuada village is categorized as flat to almost flat with a value of <

3% so that was highly suitable for ecotourism (S1). Flat slope and sloping is very suitable for bathing and swimming activities (Purbani, 1999). A slope can affect the safety of visitors when bathing and swimming on the beach. Slope could also effect on abrasion and a land subsidence, which makes the soil unstable and change its location, thus affects the saplings of mangroves that grow and expand along the coast

3.4 Tidal Range

Based on tidal data from the results of the previous research and tidal data from Dishidros AL (2009), it is known that in Jailolo has the same type as other area in the Halmahera island group, which has two episodes of equal high water and two episodes of low water each day (Semi-Diurnal Tide Type).

Data showed that tidal ranges generally range from 3 to 1,7 meters that could cause more shallow parts of the water to appear on the surface. The tidal range concluded moderately suitable (S2) because of its safety reason and its effects on the vertical distribution of mangroves.

3.5 Freshwater Supply

The existing water resources in an area greatly influences the economic activities of the population in the region. The existence of clean water is very influential in the development of tourism objects and the surrounding area. In coastal tourism areas, the availability of fresh water is the main object besides sea water. Freshwater sources come from underground springs and rivers that are adjacent to tourist sites. The result showed that water resources in Tuada beach for tourism activities came from Todowongi River and resident wells within 0.1-0.67 Km perimeter. Based on the criteria in the land suitability matrix, the availability of fresh water is categorized as highly suitable (S1) because the freshwater resource located was only < 0.5 km from the area. With the presence of fresh water sources that are close to the beach, this can support the activities of visitors or tourists. The source of fresh water is absolutely necessary, especially for the survival of the population and supporting the development of the potential for tourism in the area of small islands (Dahuri, 2003). And when conducting tourism activities, the availability of clean water is very necessary to support management facilities and tourism services (Handayani, 2010).

3.6 Accessibility

Accessibility is the the link between zones whose forms are in the form of transport facilities in the broadest sense, covering transportation networks, such as: terminal capacity (airports, ports, and stations), road networks, and service networks, including: vehicle availability / transportation (transportation modes), costs reasonable, and

reliable service. In addition, the frequency and speed of service can result in long distances as if being closer. Increased accessibility means shortening the time and will certainly reduce costs.

The land suitability class was obtained based on the suitability interval. As could be seen that the Tuada Beach categorized as highly suitable (S1) and moderately suitable (S2).

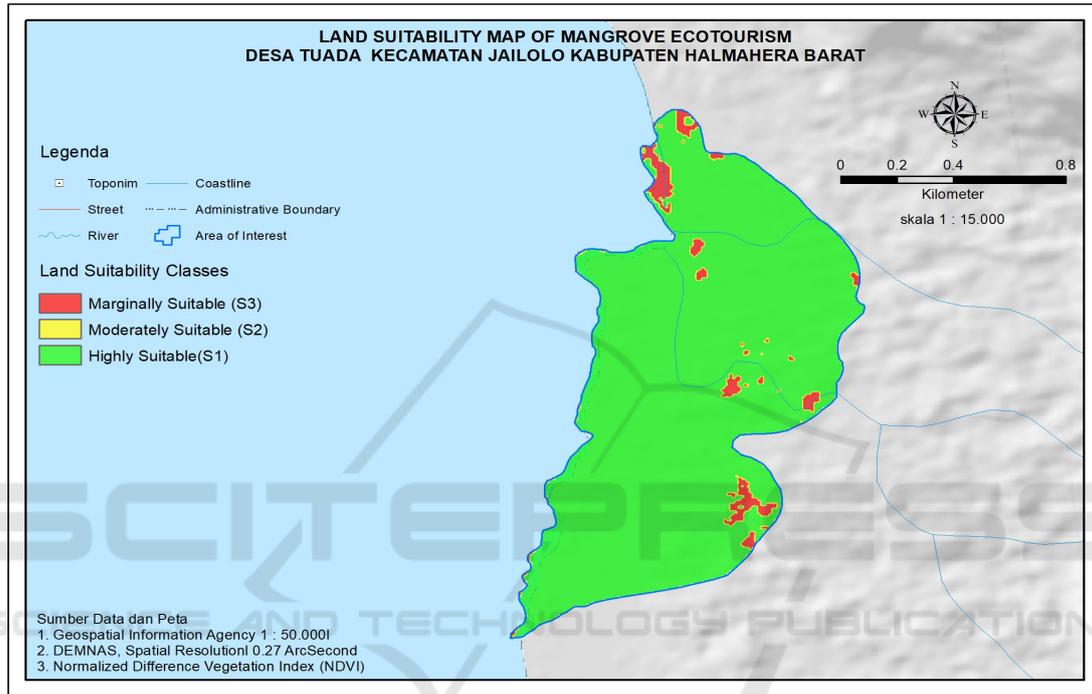


Figure 1: Mangrove suitability map for ecotourism in Tuada Village, Jailolo, West Halmahera.

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4 CONCLUSION

Tuada Beach has the potential to be developed for mangrove ecotourism, as its suitability varies from suitable to highly suitable (S1). For its potential and suitability, the facilities need to improve as this

beach recommended for ecotourism spot. Yet, in some part of the area need cultivation, so that the conservation of the mangrove could've sustainable.

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