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SUITABILITY OF COASTAL ECOTOURISM IN PADANG CITY - WEST SUMATERA: CASE STUDY OF BEACH RECREATION AND MANGROVE

KESESUAIAN EKOWISATA PESISIR DI KOTA PADANG – SUMATERA BARAT: STUDI KASUS REKREASI PANTAI DAN MANGROVE

Aprizon Putra^{1,3)}, Try Al Tanto¹⁾, Widodo S Pranowo²⁾, Ilham¹⁾, Yurni Suasti³⁾, Triyatno³⁾ & Harfiandri Damanhuri⁴⁾

¹⁾Research Institute for Coastal Resources and Vulnerability, Padang 25245 - West Sumatra Province

²⁾Marine Research Center, Komplek Bina Samudera Jl. Pasir Putih II Lt 4, East Ancol, North Jakarta 14430 - DKI Jakarta

³⁾Geography Department of Padang State University, Padang 25171 - West Sumatra Province

⁴⁾Faculty of Fisheries and Marine Science, Bung Hatta University, Padang 25133 - West Sumatera Province

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ABSTRACT

The coastline length of Padang City is about 80 km with area 72,000 ha of coastal waters and 19 small islands. Overall, the beach of Padang City consists of the sloping beach (41.52 km), cliff (22.08 km), muddy beach (8.19 km), and also an artificial beach for coastal protection. The research aims to identify the beach that is suitable for coastal ecotourism, including those of beach recreation and mangrove areas. The methodology that was used was to estimate the Ecotourism Suitability Index (ESI) based on weighting and scoring of some physical parameters. The research results for suitability category of recreational beach in Padang City show 18 locations are suitable very (with average 82,28 %), 8 locations are suitable enough (with average 70 %), and only one beach location in front of Bung Hatta University is in conditional category (27 %). The beach suitable for mangrove ecotourism is identified in 6 locations are suitable very (with average 92 %), 9 locations are suitable enough (with average 73 %), 3 locations are suitable conditional (with average 49 %), while those which are not suitable in Carolina (Pasa Laban) beach (33 %).

Keywords: Suitability, Coastal Ecotourism, Mangrove, Padang City.

INTRODUCTION

Indonesian natural resources and environmental services have great potential both on land and sea, especially for tourism purposes. Tourism development should be linked to the development plan in order to obtain an optimum benefit to society (Kurniawan *et al.*, 2016). Tourism has provided significant benefits in terms of economy and has led to an increase of community awareness in protecting the ocean environment (Abecasis *et al.*, 2013). One of the well-known tourist destinations is beach recreations, including swimming, surfing, sunbathing, diving, snorkelling, walking or jogging along the beach and enjoying the beauty of coastal atmosphere (Halim, 2017).

As an archipelagic state, coastal ecotourism plays an important role in the national economy. However, uncontrolled tourism development will create damage to natural resources and environment. Coastal ecotourism makes use of coastal and marine resources which also include natural resources and human resources that can be integrated into an integrated component for tourism utilization (Hidayah *et al.*, 2016). Coastal ecotourism consists of two categories namely beach recreation and mangrove (Yulianda, 2007; Rachmawani *et al.*, 2016). Yulius (2009) defined that a coastal ecotourism is considered as a recreation activity carried out around the coast. This kind of tourism is often associated with 3Ss (Sun, Sea and Sand) meaning that this type of tourism is seeking natural beauty and comfort from the combined

condition of sun and sea on the white sandy beach.

Padang City consists of 11 sub-district administrations where 6 sub-districts are located directly adjacent to the coastal region, i.e: sub-districts of Bungus Teluk Kabung, Lubuk Begalung, South Padang, West Padang, North Padang, and Koto Tengah. The research aims to identify the suitability of Padang coastal region for coastal ecotourism-related to the category of beach recreation and mangrove.

METHODOLOGY

Research activity was carried out in the coastal region of Padang City. Geographically the Padang City is located in the area which is bounded by coordinates 0°44'00"-1°08'35"S and 100°05'05"-100°34'09"E covering an area of 1,414.96 km² and about 720 km² of marine waters. Padang City is bordered in east, west, north and south, respectively by Solok Regency, Indian Ocean, Padang Pariaman Regency and Pesisir Selatan Regency (Figure 1).

The coastal region of Padang City consists of mangrove area ± 210.78 ha along the 80.24 km of coastal line. The Mangrove in the coastal area of Padang City is considered already decades old based on the tree trunk diameters of 15 - 55 cm (Putra *et al.*, 2015). Whereas of the seagrass species are found in the coastal area of Padang City, i.e *Thalassia hemprichii* with condition the area of coral reef is decreasing since 2000 i.e about 583.65 ha (BAPPEDA, 2007; Putra *et al.*, 2018).

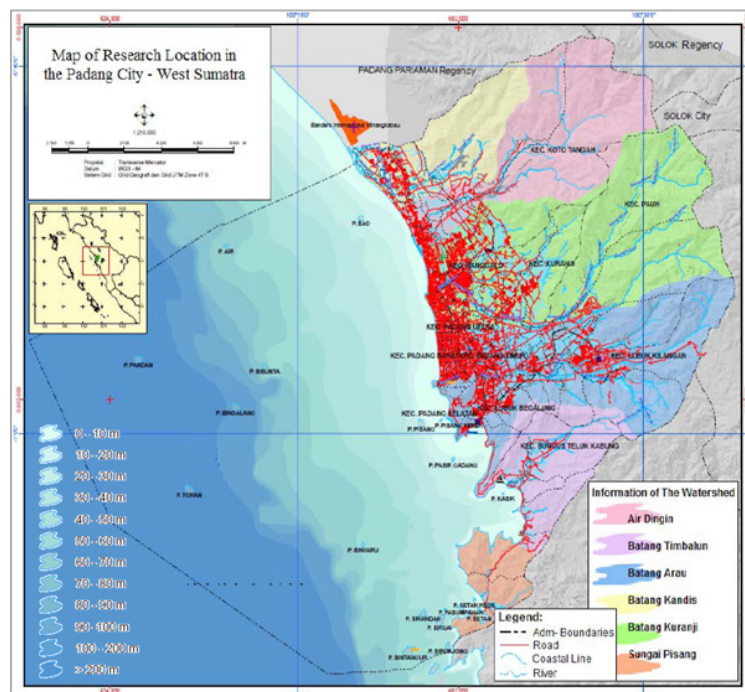


Figure 1. Map of research location (the coastal region of Padang City as study area).

Ecotourism is a nature-based tourism that considers various affecting aspects, such as education, management of natural environment and community culture with the management of ecological sustainability (Tuwo, 2011). Ecotourism activities to be conducted in an area should consider the suitability of the activities to potential resources in the area. Each tourism activity may be related to a number of supporting environmental parameters of the area which determine the Ecotourism Suitability Index (ESI). The determination of the suitability indeks is based on the multiplication of weights and scores of each parameter measured. The suitability of the area is reflected from the percentage of suitability calculated from all parameters. The formula for calculating the index of coastal ecotourism suitability, is shown in the following:

$$ESI = \sum \left(\frac{N_i}{N_{max}} \right) \times 100 \%$$

where:

- ESI = Ecotourism Suitability Index.
- N_i = Parameter value to-i (weights x Scores).
- N_{maks} = A maximum value of ecotourism category.

The matrix of suitability category of beach recreation

Suitability of ecotourism category of beach recreation is estimated by using 10 supporting parameters with 4 classifications. Parameters of category suitability of beach recreation include: 1) bathymetry, 2) beach type, 3) beach width, 4) sea bottom material, 5) current velocity, 6) beach slope, 7)

water brightness, 8) beach land use, 9) dangerous animal and 10) freshwater availability (Yulianda, 2007). The matrix of category suitability of beach recreation is shown in Table 1 following.

The matrix of suitability category of mangrove

Suitability of ecotourism category of mangrove is estimated by using 5 supporting parameters with 4 classifications. Parameters of category suitability of mangrove include: 1) thickness, 2) density, 3) types/variety, 4) tidal, and 5) object biota (Yulianda, 2007). The matrix of category suitability of mangrove is shown in Table 2 following.

RESULTS AND DISCUSSION

The category of beach recreation

Bathymetry, Beach Type and Beach Width

The bathymetry condition of the coastal region in Padang City is obtained from the Indonesian Navy chart of 2011. Geographic Information System (GIS) analysis of the area shows that the depths of coastal waters in Padang City is in between 0 - 3 m depth. Moreno & Amelung (2009) considered that coastal waters of 0 - 5 m depths is most suitable for swimming. Therefore, the Padang City coastal waters are suitable for beach recreation except for the muddy rock beach in front of Bung Hatta University Ulak Karang, where the depth is larger than 5 m.

Based on field observation confirms that the colour of the coastal sands in Padang City is brown and black. The colour of the coastal sands of Padang

Table 1. The matrix of suitability category of beach recreation

Parameter	Weight	S1	Score	S2	Score	S3	Score	N	Score
bathymetry	5	0-3	3	3-6	2	6-10	1	>10	0
beach type	5	white sand	3	white sand, there trash	2	black sand	1	mud, rocky, steep	0
beach width (m)	5	>15	3	15 - 10	2	10 - 3	1	< 3	0
sea bottom material	3	sand	3	sandy coral	2	muddy sand	1	mud	0
current velocity(m/sec)	3	0 - 0.17	3	0.17 - 0.34	2	0.34-0.51	1	>0.51	0
beach slope (°)	3	0 - 10	3	10 - 25	2	25 - 45	1	>45	0
waters brightness (%)	1	>80	3	80 - 50	2	50 - 20	1	< 20	0
beach land use	1	coconut, open lands	3	low shrubs, savanna	2	high shrubs	1	mangrove, settlement, port	0
dangerous animal	1	none	3	1 species	2	2 species	1	>2 species	0
freshwater availability (km)	1	0.5	3	0.5 - 1	2	1 - 2	1	>2	0

Maximum value = 84
 S1 = very suitable, with value range 75 - 100%
 S2 = enough suitable, with value range 50 - 75%
 S3 = conditional suitable, with value range 25 - 50%
 N = not suitable, with value <25%.

Table 2. The matrix of suitability category of mangrove

Parameter	Weight	S1	Score	S2	Score	S3	Score	N	Score
thickness (m)	5	>500	3	500-200	2	200 - 50	1	< 50	0
density (100 m ²)	3	25 - 15	3	15-10	2	10 - 5	1	< 5	0
mangrove type/variety	3	>5	3	5 - 3	2	2 - 1	2	0	0
Tidal	1	0 – 1	3	1 - 2	2	2 - 5	2	>5	0
object biota	1	fish, shrimp, crab, mollusca, reptile, bird	3	fish, shrimp, crabs, mollusca	2	fish, mollusca	2	one of aquatic biota	0

Maximum value = 76

S1 = very suitable, with value range 80 - 100 %

S2 = enough suitable, with value range 60 - 80 %

S3 = conditional suitable, with value range 35 - 60 %

N = not suitable, with value < 35 %.

City indicates that the source material of the fluvial and marine sediments may come from the eastern volcanic hills (Putra *et al.*, 2013; Putra *et al.*, 2014; Putra *et al.*, 2015); (Putra, 2012) through the 6 watersheds i.e: Kandis, Air Dingin, Kuranji, Batang Arau, Timbalun, and Sungai Pisang. Those streams become the conduit for the most of Padang City coastal sands. There is, however, white sandy beach in the southern part of Padang City, i.e: Teluk Sirih, Ujung Saddah, and Ujung Siboko. The white sands come from volcanic sources. Nevertheless, from the BAPPEDA report (2007); Putra *et al.* (2015) indicates that the white sandy beaches are not in the priority of the development planning for the beach recreation because of disasters frequent, i.e: abrasion, accretion, and floods that happen in the area. In fact, the beach width range is more than 15 m, and this is suitable very for recreational activities such as walking, relaxing, photo-takings, bathing, and others.

Current Velocity, Beach Slope, and Waters Brightness

Sea surface current velocity in Padang City coastal waters are between 0.17 m/s and 0.34 m/s. The velocity range is in the category between slow

and medium currents, and it is very feasible for tourism activities (Dean & Dalrymple, 2004). The coupling between sea surface current velocity and beach slope will affect safety factors for beach recreational activities and comforts. The general slope of Padang City beaches in between 10° - 25° which is feasible for the recreational area (Yulianda, 2007).

Beach Land Use, Dangerous Animal and Freshwater Availability

The land use for evergreen park and open land in Padang City are located in the central and south parts i.e in Pasia Jambak, Pasia Kandang, Pasia Sabalah, Parupuk Tabing, Mauro Lasak, Purus beach, Padang beach and Aia Manih beach (Putra, 2010). The beach in the northern part of Padang City is generally occupied by mangrove park (Figure 2), cliff beach park, settlement, and ports. Yulianda (2007) suggested that the beach in the northern part of Padang City is appropriate for the recreation area. In fact, the local government has provided public facilities such as children’s playground, bathrooms, cottages, souvenir shops, and public toilets.

Dangerous animals are commonly found along



Figure 2. Evergreen park in Pasiie Jambak beach (1); and Mangrove and the rock in Cindakir beach, Bungus (2).

Table 3. Analysis Results of beach recreation category in Padang City

Location	Km	Coordinate		Score	Suitability
		Lat	Long		
Pasia Jambak beach (Muaro Anai)	± 3.75	0°49'12.99	100°17'32.79	70	83% very suitable
Pasia Kandang beach (Pasio Nan Tigo)	± 2.00	0°50'21.13	100°18'54.18	70	83% very suitable
Beach Pasia Sabalah (Muaro Panjalinan)	± 1.45	0°51'24.02	100°19'44.04	58	69% suitable enough
Parupuk Tabing beach	± 3	0°51'55.03	100°20'04.03	61	73% suitable enough
Patenggangan Air Tawar beach	± 0.55	0°53'44.02	100°20'38.07	67	80% very suitable
Parkit (Air Tawar) beach	± 0.92	0°53'44.10	100°20'38.04	64	76% very suitable
Beach Bung Hatta (University) beach	± 0.85	0°54'18.03	100°20'41.51	23	27% suitable conditional
Mauro Lasak beach	± 0.85	0°55'29.02	100°20'59.04	71	85% very suitable
Purus beach	± 2.35	0°55'53.14	100°20'58.19	71	85% very suitable
Padang (Muaro) beach	± 1.45	0°57'08.19	100°21'7.82	63	75% very suitable
Aia Manih beach	± 1.25	0°58'43.75	100°21'35.94	68	81% very suitable
Aia Manih II beach	± 0.50	0°59'21.97	100°21'26.97	63	75% very suitable
Aia Manih III (Malin Kundang) beach	± 0.75	0°59'31.08	100°21'39.28	64	76% very suitable
Sungai Beremas beach	± 0.35	1°0'5.73	100°23'14.00	60	71% suitable enough
Nirwana beach	± 3.15	1°0'26.72	100°23'20.67	66	79% very suitable
Ujung Tanjung beach	± 1	1°2'21.35	100°23'15.58	67	80% very suitable
Sako beach	± 0.45	1°1'50.94	100°24'1.74	61	73% suitable enough
Carolina beach	± 0.33	1°1'50.94	100°24'23.38	66	79% very suitable
Pasa Laban beach	± 2.15	1°2'15.12	100°24'34.18	66	79% very suitable
Cindakir beach	± 0.75	1°3'8.87	100°24'36.89	59	70% suitable enough
Batung beach	± 1.1	1°3'25.41	100°24'50.28	55	65% suitable enough
Teluk Kabung beach	± 1	1°4'7.83	100°24'47.21	61	73% suitable enough
Ujung Saddah (Teluk Pandan) beach	± 1.10	1°4'1.54	100°23'48.27	77	92% very suitable
Teluk Buo beach	± 0.85	1°4'3.13	100°23'15.52	77	92% very suitable
Ujung Lalang beach	± 1.25	1°3'49.70	100°22'54.25	77	92% very suitable
Sungai Pisang beach	± 1.5	1°6'38.10	100°22'58.64	55	65% suitable enough
Ujung Siboko beach	± 0,45	1°7'30.39	100°22'17.90	77	92% very suitable

Source: Field observation and data analysis, 2017.

the Padang City Beach, as reptiles Varanidae (lizard), Colubridae (Snake), Gekkonidae (Gecko), Viverridae mammal species (Civets), and Scorpiones. Estuarine crocodiles (*Crocodylus porosus*) are found in Muaro Panjalinan, Pasie Kandang Beach. A large crocodile of about 2 meters long has been seen around the tourist and local residents areas (metrotvnews.com, 2016). Freshwater availability in the recreational locations along the Padang City Beach is generally close by; it is only less than 0.5 km away from the beach area. Table 3 shows that 18 coastal locations in Padang City are in very suitable category for recreational areas, 8 locations are in suitable enough category and only in Bung Hatta University beach is in conditional suitability due to the scarcity of freshwater. Figure 3 illustrates the distribution of beach types in Padang City.

The category of Mangroves

The beach slope of Padang City is commonly covered by mangrove forest which is a habitat for marine organisms. Depending on the degree of the slope, gentle sloping beach contains more marine organisms than the cliff beach (Wantasen, 2002), because the gentle sloping beach provides more space for mangrove to grow and to extend so that the

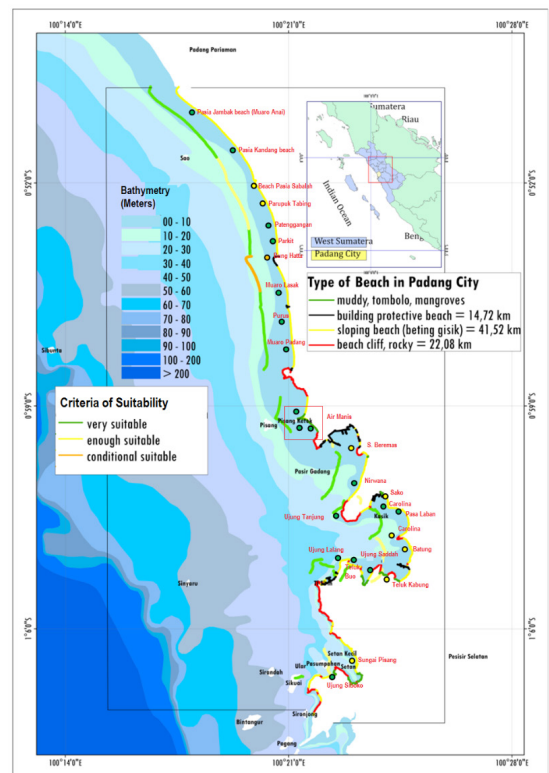


Figure 3. Beach type and ecotourism suitability for recreational beach in Padang City.

Table 4. Analysis Results of Mangroves in Padang City

Location	Ha	Coordinate		Score		Suitability
		Lat	Long			
Padang Sarai	31.0	0°48'49.50	100°17'38.80	52	68%	suitable enough
Pasia Jambak	43.61	0°50'2.21	100°18'57.38	61	80%	suitable enough
Pasia Putih	5.11	0°52'19.77	100°20'17.19	60	79%	suitable enough
Parupuk Tabing	17.44	0°52'25.16	100°20'20.21	64	84%	very suitable
Patenggangan	4.58	0°53'24.98	100°20'47.29	36	47%	suitable conditional
Bung Hatta University	0.53	0°54'21.58	100°20'32.59	51	67%	suitable enough
Sungai Beremas	0.93	1° 0'32.72	100°23'29.11	38	50%	suitable conditional
Nirwana	2.58	1° 1'33.00	100°23'11.71	49	64%	suitable enough
Labuhan Tarok	10.09	1° 1'44.60	100°24'0.89	57	75%	suitable enough
Carolina (Pasa Laban)	1.75	1° 2'8.27	100°24'34.99	25	33%	not suitable
Cindakir	2.97	1° 3'8.59	100°24'24.83	56	74%	suitable enough
Batung	0.23	1° 4'2.70	100°24'45.56	39	51%	suitable conditional
Taluak Kabung	4.11	1° 4'29.63	100°24'20.21	62	82%	very suitable
Taluak Kaluang	12.79	1° 4'21.18	100°23'54.18	76	100%	very suitable
Taluak Pandan	29.76	1° 4'41.15	100°23'20.55	76	100%	very suitable
Sungai Pisang	39.01	1° 7'31.50	100°23'19.11	76	100%	very suitable
Setan Island	0.39	1° 7'15.04	100°22'58.24	58	76%	suitable enough
Pasumpahan Island	0.43	1° 7'3.16	100°22'5.23	58	76%	suitable enough
Batu Tajarang	3.67	1° 7'26.13	100°22'23.77	76	100%	very suitable

Source: Field observation and data analysis, 2017.

distribution of mangroves widens. Some mangrove forests in Padang City are large and outspread into upstream areas, for example the mangrove forests at Patenggangan Estuary, Sungai Beremas Estuary, Carolina Pasa Laban Estuary, and Batung Estuary.

Table 4 indicates a suitability of mangrove area for marine ecotourism. The category of the suitability is estimated based on survey data such as 1) thickness, 2) density, 3) mangrove types; 4) tidal characteristic, and 5) living biota associated with mangroves along the coastal area and small islands in Padang City. The thickness and density of mangrove forest is influenced by the substratum on which the mangroves grows. Mangroves in the study sites grow on muddy sand bottom substrates. Figure 4 shows that mangrove forests in Taluak Kaluang, Taluak Pandan, Sungai Pisang and Batua Tajarang are very suitable for ecotourism. Mangrove forests in other locations are suitable enough for ecotourim; these include the mangroves in Padang Sarai, Pasia Jambak, Pasia Putih, the region of Bung Hatta University, Nirwana Beach, Labuhan Tarok, Cindakir Beach, Setan Island and Pasumpahan Island. In lower category, mangroves in Patenggangan, Sungai Beremas and Batung are conditional suitable for ecotourism. On the lowest category, small area of mangroves is not suitable for ecotourism such as those in Carolina estuarine coastal area. For more details can be seen in Table 4 and Figure 4 following.

Most people are in the perception that mangrove areas are muddy and swampy and full of mosquitoes, snakes, spiders, which create uncomfortable sense.

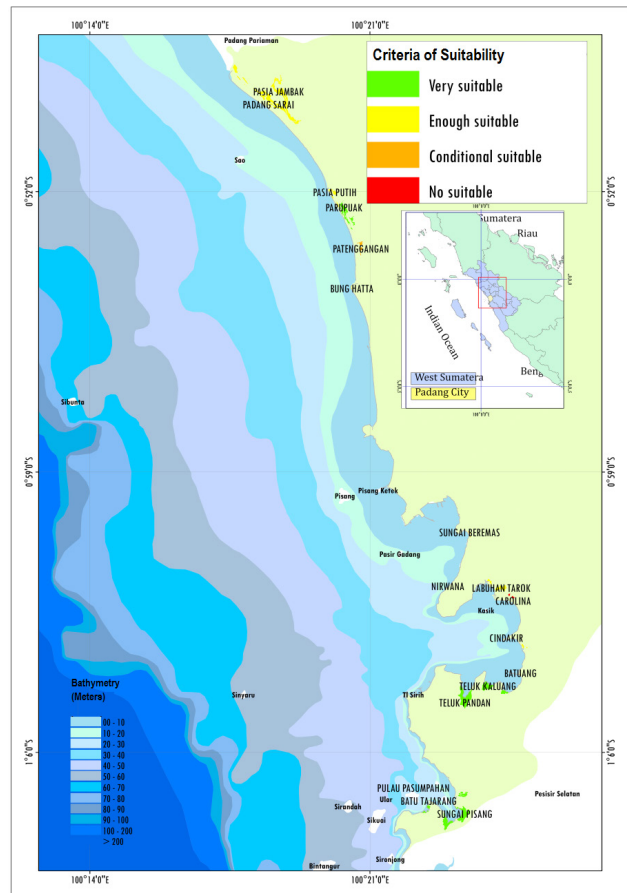


Figure 4. Map of suitability of mangroves ecotourism in Padang City.

Actually, mangrove areas are one of the best locations for education and research because mangrove forests are habitat for various types of arthropods, Mollusca, birds, fish, reptiles, mammals, and others. Mangroves in Padang City are rich with biodiversity that associated with mangrove ecosystem. For this reason, mangrove ecosystems in Padang City may be promoted to become the tourist destination, at least for local tourists who are interested in knowing and learning more about coastal environment.

CONCLUSION

Most of the coastal area of Padang City is very suitable for beach recreation area and mangrove ecotourism. The very suitable recreational areas are identified at 18 locations and the suitable enough category are found at 8 locations. Mangroves in Padang City are mostly suitable for mangrove ecotourism which 6 locations are graded as very suitable.

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