The Suitability Ecotourism Beach Based Geopasial

in Padang City, Indonesia

(Case Study of Category Recreation Beach and Mangrove)

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Abstract

Padang city has a coastline 80.24 km with a water area 72,000 ha, and 19 small islands. Overall, coastal in Padang consists of beach sloping 41.52 km, cliff 22.08 km, muddy 8.19 km, and type of artificial beach in form of building coastal protection. Research aims for identify suitability for ecotourism beach (category of recreation beach and mangrove). Methodology used ie with matrix of suitability ecotourism beach using geospatial approach. Research results for suitability category recreation beach in 24 locations in beach Padang 18 locations are in category of very suitable with a value 82.28 % and only beach in Bung Hatta University are in category conditional with a value 27 %. Suitability category ecotourism mangrove in 19 locations in beach Padang 6 location is in a category is in accordance with a value 92.11 % and 4 location is in a category conditional/not suitable to value 50.88 %.

Keywords: Suitability, Ecotourism Beach, Geospatial, Padang City

Introduction

Natural resources and environmental services Indonesia has great potential both on land and sea, especially for tourism purposes. Tourism development should lead to the development planned thoroughly in order to obtain optimum benefit to society (Charlier *et al*. 1992). One of from tourism sector, recreation beach travel do around the beach like swimming, surfing, sunbathing, diving, snorkeling, take a walk or jog along the beach and enjoy beauty of coastal atmosphere (Dahuri, 2001). Development of marine tourism activities are not mass tourism, easy broken, and very limited space for visitors (Ketjulan 2010). Similarly, beach resort also has a visitor restrictions. As an archipelago, coastal tourism Indonesia plays an important role in the national economy, along with good management to maintain the quality of the environment and attract tourists (Silva *et al*. 2007). Uncontrolled tourism development will impact the resources and environmental damage. Marine ecotourism are tour utilizing the character of coastal and marine resources. Ecotourism resources consist of natural resources and human resources that can be integrated into an integrated component for tour utilization. Tourism activities that can be developed with the concept of marine ecotourism grouped into coastal tourism and mangrove. coastal tourism consist of two categories, the recreational beach and mangrove (Yulianda, 2007). Yulius (2009) define coastal tourism as recreational activities carried out around the coast. This kind of tourism ie often associated with 3S Sun, Sea, Sand means

that the type of tourism that provides a natural beauty and comfort of a combination of sun, sea and white sandy beaches.

Padang has a length 80.24 km coastline with the water authority area 72,000 ha, and 19 small islands. Waters of Padang included in continental shelf to a depth 200 m, waters heading out to sea off are continental slope to a depth 500 m (BPSPL, 2011). Information on coastal resources to support marine ecotourism in Padang requires identification and inventory conducted scientifically and continuous. Research aims for identify suitability for ecotourism beach (category of recreation beach and mangrove). This is necessary as one of the inputs in utilization of coastal resources sustainable.

Method

Study Area

Research activities carried out in coastal area of Padang. Geographically located at coodinates 0° $44'00''$ - $1^o08'35''$ LS and between $100^o05'05''$ - $100^o34'09''$ BT covers an area of 1.414,96 km² which one 720.00 km² consist of marine waters. Bordered on East with Solok Regency, west with Indian Ocean, North with Padang Pariaman Regency and South with Pesisir Selatan Regency (Figure 1).
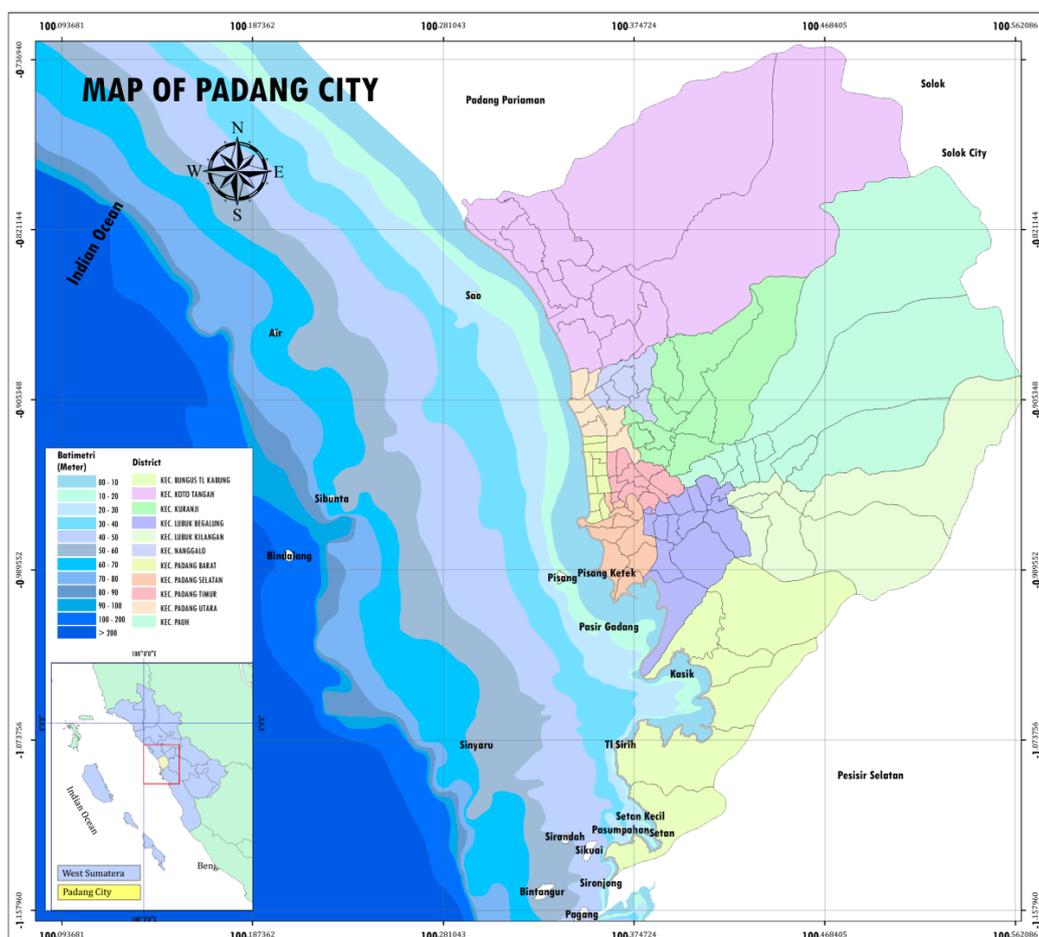

Figure 1. Map Padang City (Coastal Padang City as Study Area)

Of the 11 districts in of Padang, there are 6 district are coastal, ie: District Bungus Teluk Kabung, Lubuk Begalung, South Padang, West, North and Koto Tangah. Name of the capital district and the number of village in each district on coastal area of Padang can be seen in table 1 below.

Table 1. The Capital and Number of Village on Coastal Districts in Padang

District	Area (km²)	Number of villages	Capital of District
Bungus Teluk Kabung	100,78	6	Pasar Laban
Lubuk Begalung	30,91	14	Lubuk Begalung
South Padang	10,03	12	Mata Air
West Padang	7,00	10	Purus
North Padang	8,08	7	Lolong Belanti
Koto Tangah	232,25	13	Lubuk Buaya

Source : BPSPL, 2011.

Potential of waters in Padang from mangrove with a area ± 210.78 ha with long coastline 80.24 km. Mangrove in Padang predicted already decades old when viewed from the tree trunk diameter of 1.5-55 cm high with stands ranging from 5-20 m. Seagrass species are found in coastal Padang is kind *Thalassia* which generally of growing in waters of the Indian Ocean with value cover ranges from> 50-75%. Area of coral reefs has been reduced compared to 2000 year ie 583.65 ha (BPSPL, 2011).

Matrix Category Recreation Beach

Marine ecotourism of category beach tourism consist of two category, ie category recreation beach and mangrove. Suitability ecotourism category recreation beach use approach 10 parameter with 4 classification. Parameters of suitability beach recreation category, among others (1) depth waters (bathymetry), (2) beach type, (3) beach width, (4) materials basic waters, (5) current velocity, (6) slope beach, (7) water transparency, (8) closing of beach land, (9) dangerous biota and (10) freshwater availability (Yulianda, 2007). Matrix category recreation beach can be seen in table 2 below.

Table 2. Matrix of Category Ecotourism Recreation Beach

Parameter	weight	category S1	Score	category S2	Score	category S3	Score	category N	Score
depth waters (bathymetry) (m)	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	10-15	2	3-<10	1	<3	0
materials basic waters	3	sand	3	sandy coral	2	muddy sand	1	Mud	0
current velocity (m/dt)	3	0-0.17	3	0.17-0.34	2	0.34-0.51	1	>0.51	0
slope beach (°)	3	< 10	3	10-25	2	>25-45	1	>45	0
water transparency (%)	1	>80	3	50-80	2	20-<50	1	<20 (there trash - high turbidity)	0
beach land	1	coconut, open land	3	low shrubs, savanna	2	high shrubs	1	Mangrove, housing, port	0
dangerous biota	1	Nothing	3	sea urchins/ 1 species	2	sea urchins, stingrays / 2 species	1	sea urchins, lionfish, shark/ > 2 species	0
Freshwater availability (distance/km)	1	< 0,5	3	>0.5-1	2	>1-2	1	>2	0

Information:
Maximum value = 84
S1 = Very suitable, with a value 75-100%
S2 = Enough suitable, with a value 50 - <75%
S3 = Conditional suitable, with a value 25 - <50%
N = Not suitable, with a value <25%

Matrix Category Ecotourism Mangrove

Suitability ecotourism category mangrove use approach 5 parameter with 4 classification. Parameters of suitability ecotourism mangove category, among others (1) thickness, (2) density, (3) types, (4) tidal and (5) object biota (Yulianda 2007; Wahyudi, 2008). Matrix category ecotourism mangrove can be seen in table 3 below.

Table 3. Matrix of Category Ecotourism Mangrove

Parameter	weight	category S1	Score	category S2	Score	category S3	Score	category N	Score
thickness (m)	5	>500	4	>200-500	3	50-200	2	<50	1
density (100 m^2)	4	>15-25	4	>10-15	3	5-10	2	<5	1
Types	4	>5	4	3-5	3	1-2	2	0	1
Tidal	3	0-1	4	>1-2	3	>2-5	2	>5	1
object biota	3	Fish, shrimp, crab, mollusca, reptile, bird	4	Fish, shrimp, crabs, mollusca	3	Fish, mollusca,	2	One of aquatic biota	1

Information:

Maximum value = 76

S1 = Very suitable, with a value 80 – 100 %

S2 = Enough suitable, with a value 60 - < 80 %

S3 = Conditional suitable, with a value 35 - < 60 %

N = Not suitable, with a value < 35 %

Results and Discussion

Category of Recreation Beach

Depth of waters in Padang to activities swim and recreation beach about 0-3 m, depth this are one factor most noticed by tourists for recreation beach activities. Coastal area in Padang also there has been no security officer swim tour which will supervise activities of visitors in water column. Nugraha *et al* (2013) add depth most good for swimming in range of 0-5 m. Results of field measurements indicate that coastal areas in Padang city is based on depth waters is suitable to be used as tourism recreation beach, except in beach area Bung Hatta University Ulak Karang which has a depth > 5 m with type of beach muddy rocks which is result of reclamation for protection of campus and housing area surrounding.

Types of beach in Padang (figure 3) generally beach black sandy that caused effect of sedimentation, while type of beach white sandy are generally spread in South part Padang (beach of Teluk Sirih, Ujung saddah and Ujung Siboko). Type of sandy beach is more suitable its allocation for category recreation beach activities. Width of beach in Padang city is generally range > 15 m. Width of beach can be used for activities such as walking, relax, taking pictures, sunbathing and others.

Materials basic of waters on beach of north part Padang, generally black sandy, except beach of Bung Hatta University Ulak Karang with muddy material basic, Beach of Pasia Sabalah dan Pasia Putiah parupuk tabing which is downstream Watershed Muaro Panjalinan (Putra, 2012), beach of Aia Manih central part (tombolo in Pisang island) and beach in area Batu Malin Kundang with muddy material basic. While basic materials waters on beach of North part Padang city varies greatly influenced by morphology of coastal areas, generally type of beach sandy coral except at beach of cape Bungus, Carolina, Pasia Putih Pasa Laban with basic materials waters sandy, while at beach of Sako, Cindakir, Batung, kabung Gulf and Sungai Pisang has a basic materials waters muddy sand.

Current velocity on beach of Padang in this research ranged between 0 - 0.17 m/second and 0.17 - 0.34 m/second. Range of current velocity is very feasible for beach tourism activities. Classification of current velocity in beach of Padang belong to category of slow currents and being currents. Except on beach of Pasia Sabalah and Parupuk Tabing with current velocity > 12.51 m/second. Classification of current velocity in these locations belong to category fast currents. Sari and Usman (2012) explains that classification

current velocity consists of four categories, flow is slow with a speed in the range 0 – 12.25 m/second, category currents being with a speed in range 0.25 – 0.50 m/second, category rapid currents to speed on range 0.5 - 1 m/second and very fast with the current category at speeds above < 1 m/second.

Slope beach will affect the safety and comfort in tour, especially swimming. Yulianda (2007) propose that a type beach is generally divided into four types: beach of flat, sloping, steep and cliff. Beach of flat has a slope < 10°, sloping 10° - 25° and steep > 25°. Beach in Padang is a type of a gently sloping beach. A gently sloping beach can generally be utilized for a wide beach tourism activities. In matrix suitability beach tourism recreation category brightness values most suitable ie > 80% or > 10 m. Average brightness in research location ranged > 80%. Brightness values the classified both when viewed from tour suitability matrix. Land cover in matrix of tour suitability beach recreation category divided into open land, coconut, low shrub, high shrub, housing and ports. Land cover in beach of North part in Padang is generally dominated by mangroves, housing and ports, while coconut and open land there the tourist area of central beach of Padang on the beach of Padang, Purus, and Aia Manih.

Land cover types that opens very suitable for beach tourism category recreation beach. In tourist areas beach in Padang on average there is a place/building is already equipped with a rinse and MCK (supporting tourism). Where each unit is equipped with a special air-rinse and bathroom and access to these locations is quite easy. Only in coastal areas South part uneven in tour support facilities and difficulties in terms of access, such as at the beach Ujung Saadah (Pandan Gulf) and beach Ujung Siboko is because these areas are in protected areas that are more suitable to be developed for marine ecotourism. Location beach tourism recreation category in this research have access suitable with the availability of fresh water that distance < 0.5 km. Travel beach recreation category generally in 18 locations in coastal Padang is very suitable in a category (75 – 100 %) with an average of 82.28 % and 8 other locations have a value range of suitability 50 - < 75 % with enough suitable category average of 69.94 %. and beach Bung Hatta University that has a value of 27% suitability with the appropriate category for tour conditional beach recreation category. For more details can be seen in table 4 and figure 2 below.

Table 4. Matrix Results of Categories Suitability Ecotourism Recreation Beach in Padang

Location	long (km)	Coordinate		score	total	suitability
		lat	Long			
Beach Pasia Jambak (Muaro Anai)	± 3.75	0°49'12.99 0°50'19.01	100°17'32.79 100°18'52.53	70	83%	very suitable
Beach Pasia Kandang (Pasie Nan Tigo)	± 2.00	0°50'21.13 0°51'24.02	100°18'54.18 100°19'44.04	70	83%	very suitable
Beach Pasia Sabalah (Muaro Panjalinan)	± 1.45	0°51'24.02 0°51'54.05	100°19'44.04 100°19'55.03	58	69%	enough suitable
Beach Parupuk Tabing	± 3	°51'55.03 0°53'26.05	100°20'04.03 100°20'36.05	61	73%	enough suitable
Beach Patenggangan Air Tawar	± 0.55	0°53'44.02 0°53'53.00	100°20'38.07 100°20'39.01	67	80%	very suitable
Beach Parkit (Air Tawar)	± 0.92	0°53'44.10 0°54'13.58	100°20'38.04 100°20'38.77	64	76%	very suitable
Beach Bung Hatta (University)	± 0.85	0°54'18.03 0°55'23.52	100°20'41.51 100°20'57.84	23	27%	conditional suitable
Beach Mauro Lasak	± 0.85	0°55'29.02 0°55'48.06	100°20'59.04 100°21'00.00	71	85%	very suitable
Beach Purus	± 2.35	0°55'53.14 0°57'8.02	100°20'58.19 100°21'07.76	71	85%	very suitable
Beach Padang (Muaro)	± 1.45	0°57'08.19 0°57'51.31	100°21'7.82 100°21'4.81	63	75%	very suitable
Beach Aia Manih	± 1.25	0°58'43.75 0°59'21.97	100°21'35.94 100°21'26.97	68	81%	very suitable
Beach Aia Manih II	± 0.50	0°59'21.97 0°59'30.93	100°21'26.97 100°21'39.17	63	75%	very suitable
Beach Aia Manih III (Malin Kundang)	± 0.75	0°59'31.08 0°59'47.81	100°21'39.28 100°21'54.99	64	76%	very suitable
Beach Sungai Beremas	± 0.35	1° 0'5.73	100°23'14.00	60	71%	enough suitable

		1° 0'16.45	100°23'14.49			
Beach Nirwana	± 3.15	1° 0'26.72 1° 1'55.05	100°23'20.67 100°22'53.97	66	79%	very suitable
Beach Ujung Tanjung	± 1	1° 2'21.35 1° 1'58.78	100°23'15.58 100°23'35.77	67	80%	very suitable
Beach Sako	± 0.45	1° 1'50.94 1° 2'3.66	100°24'1.74 100°24'6.57	61	73%	enough suitable (affected from land clearingconstruction)
Beach Carolina	± 0.33	1° 1'50.94 1° 2'15.72	100°24'23.38 100°24'32.52	66	79%	very suitable
Beach Pasa Laban	± 2.15	1° 2'15.12 1° 3'9.77	100°24'34.18 100°24'24.28	66	79%	very suitable
Beach Cindakir	± 0,75	1° 3'8.87 1° 3'24.81	100°24'36.89 100°24'49.04	59	70%	enough suitable
Beach Batung	± 1,1	1° 3'25.41 1° 3'55.41	100°24'50.28 100°24'45.12	55	65%	enough suitable
Beach Kabung Gulf	± 1	1° 4'7.83 1° 4'31.20	100°24'47.21 100°24'27.58	61	73%	enough suitable
Beach Ujung Saddah (Pandan Gulf)	± 1.10	1° 4'1.54 1° 4'29.21	100°23'48.27 100°23'28.91	77	92%	very suitable (no access)
Beach Teluk Buo	± 0.85	1° 4'3.13 1° 3'55.59	100°23'15.52 100°22'51.09	77	92%	very suitable
Beach Ujung Lalang	± 1.25	1° 3'49.70 1° 4'14.49	100°22'54.25 100°22'31.96	77	92%	very suitable
Beach Sungai Pisang	± 1.5	1° 6'38.10 1° 7'23.79	100°22'58.64 100°23'8.90	55	65%	enough suitable
Beach Ujung Siboko	± 0,45	1° 7'30.39 1° 7'32.91	100°22'17.90 100°22'3.82	77	92%	very suitable

Based on statement (Wantasen, 2002) that the a sloping beach has a level diversity of ecosystems mangrove which is high compared to cliff beach. This happens because of sloping areas have a broad space for overgrown with mangrove so that the distribution of mangrove species extends and widens. Study area in Patenggangan, Sungai Beremas, Carolina Pasa Laban, and Batung an area that is protected from waves and wind. Based on calculations performed indicate these locations have suitability 35-60 %, which means as many categories as conditional and is not suitable for mangrove ecotourism, with an average of 50.88 %. Election observation location ecosystems mangrove determined based representation and thickness of mangrove, in general study area have land muddy sand. By decree of Director General of Forestry No. 60/KPTS/DJ/I/1978 concerning silvicultural guidelines in the area of brackish water, that green line set width of 10 m along river (from edge of forest overlooking river) and 50 m along beach at lowest tide (on edge of forest overlooking to sea) (Wahyudi, 2008).
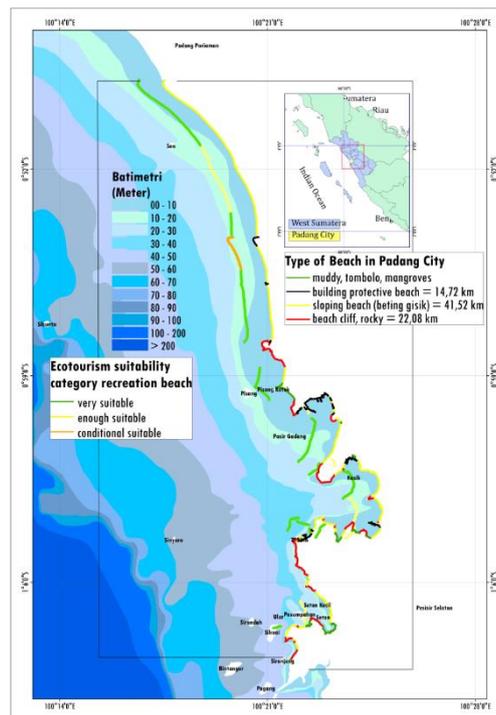
Figure 2. Map of Type and Ecotourism Suitability Category Recreation Beach in Padang

Category of Ecotourism Mangrove

For suitability ecotourism mangrove with very suitable categories found in 6 location dari 19 location observed, as in Pasia Jambak, Parupuk Tabing, Gulf of Kaluang and Pandan, Sungai Pisang, and Batu Tajarang with an average suitability value 92.11% . While suitability with enough suitability category, out of 19 locations there are 9 locations with enough suitable. In this category have an average suitability value 71.78%, locations in Padang Sarai, Pasia Putih, beach of Bung Hatta University, Nirwana, Labuhan Tarok, Cindakir, Gulf of Kabung, Setan and Pasumpahan Island. For more details can be seen in table 5 and figure 3 below.

Table 5. Matrix Results of Categories Suitability Ecotourism Mangrove in Padang.

Location	area (ha)	coordinate		score	total	suitability
		lat	long			
Padang Sarai	31.0	0°48'49.50	100°17'38.80	52	68%	enough suitable
Pasia Jambak	43.61	0°50'2.21	100°18'57.38	61	80%	enough suitable
Pasia Putih	5.11	0°52'19.77	100°20'17.19	60	79%	enough suitable
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%	conditional suitable
Univ. Bung Hatta	0.53	0°54'21.58	100°20'32.59	51	67%	enough suitable
Sungai Beremas	0.93	1° 0'32.72	100°23'29.11	38	50%	conditional suitable
Nirwana	2.58	1° 1'33.00	100°23'11.71	49	64%	enough suitable
Labuhan Tarok	10.09	1° 1'44.60	100°24'0.89	57	75%	enough suitable
Carolina (Pasa Laban)	1.75	1° 2'8.27	100°24'34.99	25	33%	No suitable
Cindakir	2.97	1° 3'8.59	100°24'24.83	56	74%	enough suitable
Batung	0.23	1° 4'2.70	100°24'45.56	39	51%	conditional suitable

| Kabung Gulf | 4.11 | 1° 4'29.63 | 100°24'20.21 | 62 | 82% | very suitable |
Kaluang Gulf	12.79	1° 4'21.18	100°23'54.18	76	100%	very suitable
Pandan Gulf	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%	Cukup Sesuai
Pasumpahan Island	0.43	1° 7'3.16	100°22'5.23	58	76%	Cukup Sesuai
Batu Tajarang	3.67	1° 7'26.13	100°22'23.77	76	100%	very suitable
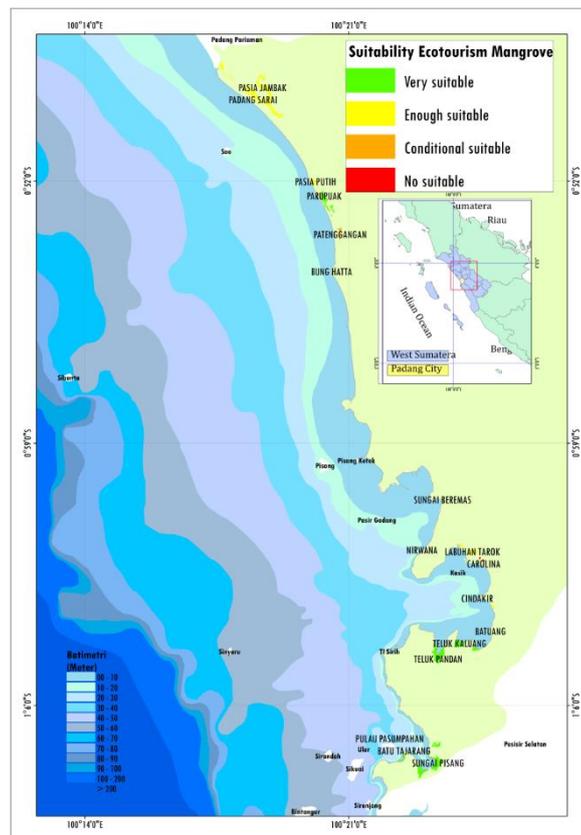
Figure 3. Map of Suitability Ecotourism Mangrove in Padang

Most people assume mangrove areas as a place muddy and swamp full of mosquitoes, snakes, spiders, and give a sense of an uncomfortable, mangrove areas is one of the best locations for education and research. In shade of forest there are various types of arthropods, mollusca, birds, fish, reptiles, mammals and others, so it is interesting to traced. Area of mangrove in Padang have several of biota that associated in mangrove even there including in the form of species that are endemic, constitute a huge capital to attract tourists to visit the area, especially to a location mangrove. Types of species or organisms that are found in the coastal Padang, namely bird reptile, sponge, jellyfish, mollusca and crustaceans.

Conclusion

Only a small proportion in beach of Padang is not suitable for marine ecotourism, it is because type of beach with type beach cliff, rocky and muddy. As for direction of management for type of muddy beach such as mangrove, be directed to development of mangrove ecotourism to research and education. Length of coastline for marine ecotourism category of recreation beach in of Padang, namely along ± 35.1

km of a total 80.24 km.Suitability category of recreation beach in 24 locations in beach Padang 18 locations are in category of very suitable with a value 82.28 % and only beach in Bung Hatta University are in category conditional with a value 27 %. Suitability category ecotourism mangrove in 19 locations in beach Padang 6 location is in a category is in accordance with a value 92.11 % and 4 location is in a category conditional/not suitable to value 50.88 %. Gratitude to the head of Research Institute for Coastal Resources and Vulnerability, which has given full encouragement for us in Implementing of research suitability ecotourism beach in Padang using DIPA APBN 2015. We also thanking to all those who have helped the administration process, providing data research and also those who helped us in the field.

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