Potential And Carrying Capacity of Tourism Area in Onanbalu Beach, Bokonusan Village, Semau Island, Kupang District

Fandrianus Dhena Manu, Alexander Leonidas Kangkan, and Suprabadevi Ayumayasari Saraswati*

Study Program of Aquatic Resource Management, Faculty of Marine Science and Fisheries,
Nusa Cendana University, Indonesia
*Corresponding author: Suprabadevi@staf.undana.ac.id

Abstract This research was conducted to know the physical potential of Onanbalu Beach and what attractions could be developed as well as the carrying capacity of the area. The research method used is a scoring method based on the value of tourism suitability and analysis of the carrying capacity of the area. The research shows that: (1) The physical potential of Onanbalu beach consists of a beach width of 1.77-2 m; The type of beach is white sand, rocky and rocky; The width of the beach is 40.30-58 m; The basic material of the waters is rocky sand; Current speed is 0.19-0.27 m/s; The slope of the beach is 7-10°; The brightness of the waters is 3 m; Closure of coastal land in the form of trees, thickets, and settlements; Dangerous biota in the form of sea urchins; Availability of fresh water, namely 1-2.21 km, (2) Attractions that are suitable for development on Onanbalu beach, namely beach recreation, sunbathing, swimming, beach volleyball, and boating as well as the carrying capacity of the area carried out on Onanbalu beach, which can accommodate 14,833 people every day, with a total tourist area of 47.2 Ha. The area of Onanbalu Beach which is utilized for all activities is 27.78 Ha.

Keywords: Potential, Carrying capacity, Suitability of beach tourism, Onanbalu, Kupang district

I. INTRODUCTION

The beach is one of the coastal ecosystems where many human activities occur, such as tourism activities. Beach tourism is a tourism activity that prioritizes coastal resources and the culture of coastal communities such as recreation, sports, and enjoying the scenery and climate. A beach is a tourist object that has the potential to attract tourists because of its varied forms and atmosphere [3]. For beach tourism purposes, these objects have the potential to be used in ranging from passive activities (in the form of enjoying the scenery) to active ones (such as jogging) [19]. Of course, the physical elements of the beach will also be the basis for determining what tourist attractions can be developed. The development of beach tourism attractions is carried out by calculating the parameters of suitability and carrying capacity of beach tourism areas that are appropriate to be used as a guide in determining to zone for the development of beach tourism attractions so that sustainable beach tourism development is created and can increase the level of welfare of the community around the beach tourism area [15].

Carrying capacity is the ability of an area to accommodate human life from all existing activities. In tourism activities, the carrying capacity of the area provides an overview of the maximum number of visitors who can take advantage of the area or area to create comfort in carrying out activities and still pay attention to environmental sustainability [21].

Onanbalu Beach, which is located on Semau Island, Kupang Regency, East Nusa Tenggara Province, has a beautiful natural panorama with a wide expanse of white sand. This beach is one of the tourist destinations on Semau Island if it is supported by affordable access and is supported by information about beach tourism that has become widespread. Various tourism activities will affect the condition of the coastal environment. The ability of the beach to support tourist activities has a tolerance area. Utilization that exceeds the carrying capacity will cause environmental degradation [20].

The aspect of space and the carrying capacity of the area functions to organize and develop attractions into sustainable and sustainable tourist objects and attractions so

that they can attract both domestic and foreign tourist visits to the Onanbalu beach tourism area, therefore it is necessary to assess the physical potential beach tourism areas and what attractions can be developed as well as the carrying capacity of the area on Onanbalu beach, Bokunusan Village, Semau Island, Kupang Regency.

II. RESEARCH METHODS

The methods used in this study include scoring methods and carrying capacity methods. The scoring method is based on the tourism suitability value (TSV) [4] and the carrying capacity method uses the concept of regional carrying capacity [22].

The determination of research location was determined using a purposive sampling method [2] which is divided into three observation stations for the suitability and carrying capacity of beach tourism attractions including swimming, boating, beach volleyball, sunbathing, and beach recreation attractions as well as regional carrying capacity (RRC).

At each station water samples are taken every two weeks. Sampling was carried out on April 26, May 10, May 24 and June 7, and June 21 2009. The water samples taken were then analyzed for heavy metal content. In addition, measurements of physical and chemical parameters of the waters including: temperature, salinity, water quality were carried out in situ when sampling at each research station. The heavy metal analysis procedure consists of analysis of crab meat and water. The method used is the method of testing for heavy metal content according to the Indonesian National Standard (Figure 1) [1].
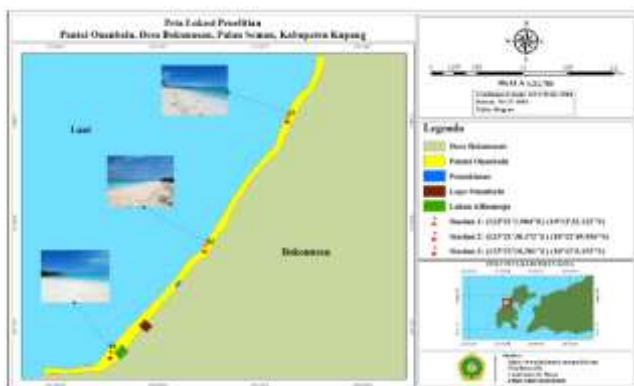

Figure 1. Research Locations

The collection was carried out by measuring the suitability variables for beach tourism at each observation station; (1). Water depth. (2). Beach type, (3). Beach width and water bottom material. (5). Current velocity using a Current meter. (6). The slope of the beach is measured using the Clinometer application, (7). Water brightness. (8). Coastal land cover observing the area around the coast. (9). Dangerous biota by using snorkeling around the research site. (10). Availability of fresh water is the distance between data collection points and fresh water points.

The data were analyzed using the coastal tourism suitability matrix referred to [20, 23, and 25] (tables 1, 2, 3, 4, 5, and 6), while the regional carrying capacity analysis (DDK) [22 and 16] (table 7).

Tourism suitability analysis with beach suitability for tourist areas [23]. With formulas:

$$NKW = \sum \left(\frac{Ni}{Nmaks}\right) X\ 100\ \%$$

Information:
  NKW   = Travel suitability value
  Ni   = Value of the i-parameter Weight (B) X Score (S)
  Nmax   = (Maximum value of the tourist category)

Calculation of regional carrying capacity (DDK) in the form of the formula [22]. Are as follows:

$$DDK = K \times \frac{Lp}{Lt} \times \frac{Wt}{Wp}$$

Where: DDK : The carrying capacity of the area
    K   : Ecological potential of visitors per unit area
    Lp   : Area or length of area that can be utilized
    Lt   : Area units that can be used for certain categories
    Wt   : Time provided by the area for tourism activities in one day
    Wp   : Time spent by visitors for each activity

The ecological potential of visitors is determined by the condition of the resources, the types of activities to be developed and the predicted time required for each activity (table 7) [16].

III. RESULTS AND DISCUSSION

Results

This study, in analyzing the physical potential of coastal tourism areas using ten parameters of the suitability of coastal tourism areas obtained by observing and measuring in the field focusing on three station points. (1). The depth of the waters is 1.77-2 m. (2). The type of Onanbalu beach at Station 1 and Station 2 has the same type of beach, namely slightly rocky white sand, while Station 3 has a type of white sand beach dominated by rocky and rocky. (3). The width of the beach at station 1 is 58 m, station 2 is 44.16 m, and station 3 is 40.30 m. (4). The basic material of Onanbalu beach waters at stations 1 and 2 is the same, namely slightly rocky sand, while at station 3, the sand is dominated by coral rock, (5). The current speed is 0.19-0.27 m/s. (6). The slope

of the beach is 7-10°. (7). Brightness water average value is 3 m, (8). The coastal land cover shows that at station 1 it is in the form of trees and low shrubs. Station 2 is in the form of trees, high thickets, and settlements while Station 3 is in the form of tall trees and shrubs, (9). The only dangerous biota is sea urchins found at stations 2 and 3 while station 1 does not have dangerous biota, (10). The availability of fresh water at Station 1 is 2.21 km, station 2 is 1.39 km, and Station 3 is 1 km.

Analysis of the suitability of coastal tourism areas describes the feasibility of a coastal tourism area. Based on the results of the analysis of the suitability value of the Onanbalu beach tourism area, from the date the three observation stations were categorized, namely where station 1 with the suitability category S1= Very suitable (80.12%), station 2 with the suitability category S1= Very suitable (76.28%) while for station 3 with the suitability category S2= quite appropriate (71.79%). Two factors are superior to station 1, namely having a beach width of 58 m and no dangerous biota, station 2 has a beach width value of 44.16 m and there is dangerous biota, and station 3 has a beach width value of 40.30 m and there are also dangerous Biota. The results of the analysis of the suitability value of the beach tourism area can be concluded that Onanbalu Beach is feasible to be used as a beach tourism area.

Analysis of the suitability of beach tourism for the categories Beach Recreation, Sunbathing, Swimming, Beach Volleyball and Boating to assess the feasibility of the five attractions to be developed in the Onanbalu beach area. The suitability value of beach tourism for Station 1 with each category: 1) Beach recreation based on the calculation results obtained with a value of 75% included in the suitability class S1 (Very suitable); 2) Sunbathing based on the calculation results obtained with a value of 98.07% included in the suitability class S1 (Very suitable); 3) Swimming based on the calculation results obtained with a value of 85.89% included in the S1 suitability class (Very suitable); 4) Beach volleyball based on the calculation results obtained with a value of 87.23% entering the S1 suitability class (Very suitable); 5) Boating based on the calculation results obtained with a value of 45.83% included in the S2 suitability class (Quite suitable) (Figure 2).

The suitability value of beach tourism for station 2 with each category: 1) Beach recreation based on the calculation results obtained with a value of 78% included in the suitability class S1 (Very suitable); 2) Sunbathing based on the calculation results obtained with a value of 98.07% included in the suitability class S1 (Very suitable); 3) Swimming based on the calculation results obtained with a value of 85.89% included in the S1 suitability class (Very suitable); 4) Beach volleyball based on the calculation results obtained with a value of 85.10% entering the S1 suitability class (Very suitable); 5) Boating based on the

calculation results obtained with a value of 45.83% included in the S2 suitability class (Quite suitable) (Figure 3).
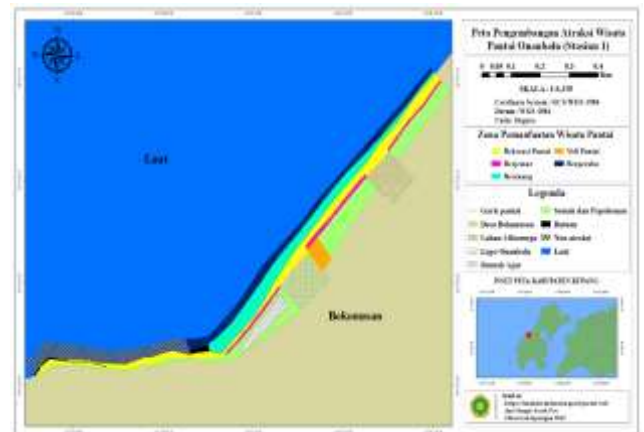

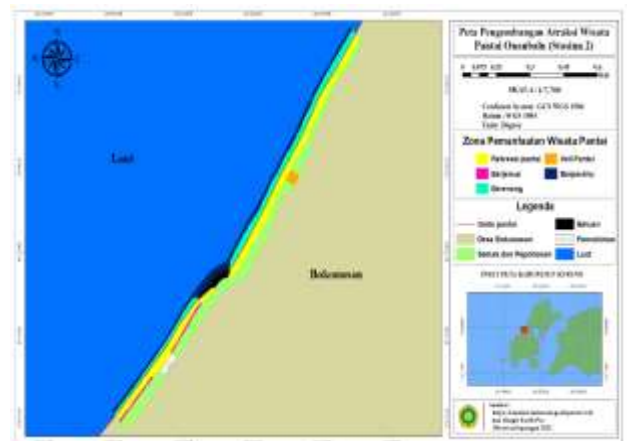Figure 2. Zoning for the development of Station 1 beach tourism attractions

Figure 3. Map of the amalgamation of zoning for the development of Station 2 beach tourism attractions

The suitability value of beach tourism for station 3 with each category: 1) Beach recreation based on the calculation results obtained with a value of 67% entering the suitability class S2 (Quite suitable); 2) Sunbathing based on the calculation results obtained with a value of 80.76% included in the suitability class S1 (Very suitable); 3) Swimming based on the calculation results obtained, namely station 3 with a value of 73.07% is included in the suitability class S2 (Quite suitable); 4) Beach volleyball based on the calculation results obtained with a value of 68.08% entered the suitability class S2 (Quite suitable); 5) Boating based on the calculation results obtained with a value of 45.83% included in the S2 suitability class (Quite suitable) (figure 4).

The carrying capacity of the tourist area on Onanbalu Beach is calculated based on the area and time provided by the beach tourism manager in one day to carry out activities. Based on the regional mapping carried out, it is known that the Onanbalu beach tourism area has an area of 47.2 hectares which can accommodate as many as 14,833 tourists per day

with various activities including beach recreation, sunbathing, swimming, beach volleyball, and boating. The area of tourism area used for various activities is 27.78 Ha.

Figure 4. Map of the amalgamation of zoning for the development of station 3 beach tourism attractions

The area used for beach recreation activities is 106,274.76 m² and has a carrying capacity of 5,667 people. The area used for sunbathing tourism activities is 14,076.46 m² with a carrying capacity of 1,126 people. The area used for swimming activities is 79,092.81 m² and has a carrying capacity of 6,327 people. The area used for beach volleyball activities is 7,212.46 m² and has a carrying capacity of 576 people the last activity is boating, which is 71,067.19 m² and has a carrying capacity of 1,137 people. The carrying capacity of the Onanbalu beach area (table 8) while the development zoning is displayed in the form of a beach with a map of each category (Figures 2, 3, and 4).

Discussion

The depth of the waters is an important parameter that is taken into account in determining an area to be used as a beach tourism area, especially swimming attractions because it greatly influences the safety aspect when swimming. Beach tourism recreational category Swimming with a good depth that is around 0-3 meters [24]. Visitors usually swim at a depth of no more than 1.5 meters because it is related to swimming safety [1]. Swimming activities cannot be carried out or have a high risk if the sea forms are steep with a depth of more than 5 meters [26], at that depth it is still classified as shallow sea [12]. Based on the suitability matrix of the coastal tourism area, stations 1, 2 and 3 are included in the S1 suitability category.

Beach type station 1 and station 2 have a slightly rocky white sandy beach type, included in the suitability category S2 (Quite suitable) while station 3 has a white sandy beach type dominated by rocky and rocky, included in the S3 suitability category (conditionally appropriate). Beach tourism will be very good if a beach is a sandy beach or in other words it is dominated by a sand substrate, compared

to a rocky beach or a beach which is dominated by a coral substrate which can disturb the comfort of tourists [23]. Generally, local and foreign tourists like the shape of fine sand or sandy beaches [10]. The type and color of sand in an ecotourism object gives its own value to the aesthetics of the beach, where beaches that have white sand are in great demand by tourists [9].

The width of the beach that is owned is included in the S1 category (Very suitable) because it has exceeded the limit determined by the suitability matrix of the coastal tourism area, namely> 15 m, while the beach width of less than 3 meters is not suitable for beach tourism. The wider the beach, the better it is for visitors, conversely the narrower the width of the beach, the narrower the space for visitors [18]. A high beach width value can also facilitate management so that it can make it easier for visitors to carry out various tourist activities.

The basic material at station 1 and station 2 is sandy coral so that it is included in the S2 category (Quite suitable), while at station 3, namely sandy coral, it is included in the S3 category (Conditionally appropriate). This can be seen clearly when making observations when the sea water is receding. Based on the results of this suitability, in general the basic materials of the waters are still proper and support beach tourism activities such as swimming and recreation. The results of the study [11] The basic material of the waters in the form of white sand is very suitable for beach recreation and swimming.

Current speed at Onanbalu beach is measured using the Current tool meters and get the results that stations 1, 2 and 3 fall into the S2 category (Quite suitable) with current speed figures of 0.19 m/s - 0.27 m/s. The current speed range is quite feasible for beach tourism attractions such as swimming and boating. Classification of current speed at stations 1 and 2 falls into the slow flow category with the number 0.19 m/s and for station 3 the medium flow category is 0.27 m/s. The current speed range is quite feasible for beach tourism attractions such as swimming and boating. Classification of current speed consists of 4 categories, namely the slow current category with speeds in the range of 0-0.25 m/s, the medium current category with speeds in the range of 0.25-0.50 m/s, the fast flow category with speeds in the range of 0. .5-1 m/s and very fast flow categories with speeds above 1 m/s [6].

The slope of the coast at station 1 and station 2 is category S1 (Very suitable), while station 3 is 10° category S2 (Quite appropriate). Tourists mostly like a sloping beach which is less than 10° considered most suitable for beach tourism [2]. The flat to gentle slope is very suitable for beach tourism [14]. This also makes Onanbalu beach suitable for beach tourism. Tourists can enjoy beach tourism in the categories of beach recreation, beach volleyball, sunbathing and so on.

The brightness of the waters is a parameter in tourism suitability, namely to be a parameter that characterizes the value of scenic beauty when carrying out beach tourism activities [2]. Onanbalu Beach, namely with an average of 3 meters so that it is included in the S2 category (conditionally appropriate).

The coastal land cover in the suitability matrix of the coastal tourism area is divided into coconut and open land, low scrub and savanna, high thicket, mangroves, settlements and ports. Land cover at station 1 is included in the suitability category S2 (Quite suitable). Station 2 is the category of conformity N (not appropriate) while station 3 is the category of suitability class S3 (conditionally appropriate).

Observations of dangerous biota need to be carried out to find out whether or not there are dangerous biota that will disturb tourist visitors [7]. Observation of dangerous biota is carried out by snorkeling around the research station. Biota such as sea urchins with their spines are quite dangerous when stepped on by visitors' feet, stingrays are dangerous with their stings, and also sharks which can attack visitors playing on the beach [4]. Sea urchins are classified as biota that are not too dangerous, because local people and tourists also use sea urchins for consumption [8].

The availability of fresh water at station 1 is included in category N (not suitable) while stations 2 and 3 are included in category S3 (conditionally appropriate). The availability of clean water in the form of fresh water is needed to support tourism management and service facilities [5]. Researchers concluded that Onanbalu beach is still feasible to be developed even though the availability of fresh water sources is quite far from the beach but can still be obtained by ordering from a clean water tanker service provider.

Based on the results of the analysis of the suitability value of the Onanbalu beach tourism area, from the data the three observation stations were categorized, namely where at station 1 with the suitability category S1= Very suitable (80.12%), station 2 with the suitability category S1= Very suitable (76.28%) while for station 3 with the suitability category S2 = quite appropriate (71.79%). There are two factors that are superior to station 1, namely having a wide beach and no dangerous biota, compared to station 2 and station 3.

Appropriateness of attractions that can be developed at Onanbalu beach. Based on the results of the analysis of the suitability of beach tourism for the categories Beach Recreation, Sunbathing, Swimming, Beach Volleyball, and Boating adjusted to the suitability value of beach tourism from each category of attractions, it can be concluded that these five attractions can be developed on Onanbalu beach.

The carrying capacity of the area (RRC) on Onanbalu beach for each activity is different. Activities undertaken include beach recreation, sunbathing, swimming, beach

volleyball and boating. From the results of the calculation of the area's carrying capacity carried out at stations 1, 2 and 3, it can accommodate 14,833 people every day, with a total tourist area of 47.2 Ha. The area of Onanbalu beach which is utilized for all activities is 27.78 Ha (table 8).

Beach Recreation Attractions carried out at station 1 with an area of 32,643.78 m², station 2 is 41,854.93 m² and station 3 is 31,776.05 m². The calculation obtained carrying capacity for station 1 is 1,741 people, station 2 is 2,232 people and station 3 is 1,694 people. The activities carried out include walking on the beach, sitting relaxed, playing in the sand, taking pictures, chatting and seeing the beauty of the *sunset*, in order to be able to do this activity comfortably it is estimated that 1 person requires an area of 50 m², with an area that is utilized as a whole is 106,274.76 m². The total time provided by the tourism manager for activities in one day is 8 hours, while the time usually used by tourists for beach recreation activities is 3 hours.

Sunbathing Attractions with an area at each station of 6,997.50 m², 2,692.87 m² and 4,386.09 m² with a total area of 14,076.46 m² as a whole. It is estimated that 1 person requires an area of 50 m² for sunbathing. The total time provided by the tour manager is around 8 hours per day with the usual length of time used by tourists for the swimming attraction is 2 hours. Calculations obtained carrying capacity values for Sunbathing activities for stations 1, 2 and 3 are as many as 1,126 people with an area of 14,076.46 m².

Swimming Attractions with an area of each station namely station 1 is 30,186.18 m², station 2 is 29,218.61 m² and station 3 is 19,688.02 m². The estimated area required for 1 person for a comfortable swimming attraction is 50 m². The total time provided by the tour manager is around 8 hours per day with the usual length of time used by tourists to swim is 2 hours. The calculation obtained the carrying capacity values for the three stations at the swimming attraction were 6,327 people with a total area of 79,092.81 m².

Beach volleyball attractions with an area at each station of 4,103.04 m², 2,005.86 m², and 1,103.56 m² with a total area of 7,212.46 m² as a whole. Beach volleyball is estimated that 1 person requires an area of 25 m². The total time provided by the tour manager is around 8 hours per day with the usual length of time used by tourists for the swimming attraction being 2 hours. Calculations obtained carrying capacity values for sunbathing activities for stations 1, 2, and 3 are as many as 576 people with an area of 14,076.46 m².

Boating attractions are carried out at Station 1 with an area of 22,216.67 m², station 2 is 22,811.37 m², and Station 3 is 26,039.15 m². The calculation obtained carrying capacity for station 1 is 355 people, station 2 is 365 people, and station 3 is 417 people. Boating comfortably is estimated to require an area of 500 m2. The total time

provided is around 8 hours per day with the usual length of time tourists use for boating being 1 hour.

The results of the carrying capacity analysis above are expected to be input as future considerations in the development of the Onanbalu beach area so that in the future the utilization of this area does not exceed the carrying capacity so that tourism activities remain sustainable and nature can be maintained. Study the carrying capacity of coastal areas so that ecotourism activities carried out can sustainably take place and formulate appropriate and effective management to increase the potential of the beach itself for the surrounding community [17]. Assessment of an area's carrying capacity is considered important because it is to find out the maximum number of visitors that can be accommodated in 1 day of tourism activities so that they cannot cause disturbance to both humans and the environment so that the use of beach tourism is sustainable and in a sustainable state [21]. Optimum utilization of coastal areas can only be carried out if utilization does not exceed its carrying capacity [13].

IV. CONCLUSION

Coastal tourism potential, station 1 conformity category 80.12% is included in the suitability class S1 (Very suitable), station 2 is suitable category 76.28% is included in the suitability class S1 (Very suitable) while station 3 is suitable category 71.29% is included in the S2 conformity class (conditionally appropriate) . Attractions that can be developed on Onanbalu beach are beach recreation, sunbathing, swimming, beach volleyball and boating, with a total area of 47.2 hectares and can accommodate as many as 14,833 tourists per day.

REFERENCES

[1] Agam, B., Maryono, M., & Sigiro, ON 2021. Development Strategies of the Bahari Jawai Marine Tourism Coast Area Based on Community Empowerment in Sambas Regency. *IOP Conference Series: Earth and Environmental Science*, *934* (1).

[2] Chasanah, I., Purnomo, PW, & Haeruddin, H. 2017. Analysis of the Suitability of Jodo Beach Tourism, Sidorejo Village, Gringsing District, Batang Regency. *Journal of Natural Resources and Environmental Management*, *7* (3), 235–243.

[3] Fandeli, C. 2000. Tourism business. Yogyakarta: Publishing Faculty of Forestry, University of Gajah Mada

[4] Fauzi, A., Suroso, & Arifien, M. 2015. Geo Image (Spatial-Ecological-Regional). *Geo Image Journal*, *9* (2), 76–81.

[5] Handaawati, H. 2010. Coastal-Marine Nature Tourism Potential. PM PSLP PPSUB.

[6] Ihsan, N. 2009. Composition of Sondong Catches in Batu Teritip Village, Sungai Sembilan District, Dumai City, Riau Province. Thesis. Faculty of Fisheries and Marine Sciences, University of Riau. Pekanbaru. 102 pages.

[7] Kamah, M. 2013. Suitability of Saronde Island Sandy Beach Tourism, Ponelo Islands District, North Gorontalo Regency. in *Thesis*.

[8] Koroy, K., Nurafni, N., & Pina, F. 2019. Analysis of Coastal Ecosystem A Marine Ecotourism at Kokoya Island, Morotai Island District. *Musamus Fisheries and Marine Journal*, *2* (1), 63–76.

[9] MH T Pangesti. 2007). Tourism Object Practice Module. Bogor Forestry Training Center.

[10] Mizan, A., Lestari, F., & Susiana. (2018). Level of Suitability and Carrying Capacity of Beach Tourism on Penjalin Island, Anambas Islands Regency. *Journal of Sustainable Aquatics*, *2* (1), 1–8.

[11] Muflih, A., Fahrudin, A., & Wardiatno, Y. 2015. Suitability and Carrying Capacity of Tourism in Tanjung Pasir Coast and Untung Jawa Island. *Indonesian Journal of Agricultural Sciences*, *20* (2), 141–149.

[12] Nugraha, HP, Indarjo, A., & Helmi, M. 2013. Study of the Suitability and Carrying Capacity of the Area for Beach Recreation at Panjang Beach, Bengkulu City. *Diponegoro Journal of Marine Research*, *2* (2), 130–139.

[13] Prasita, V. 2007. Analysis of Environmental Carrying Capacity and Optimization of Utilization of Coastal Areas for Aquaculture in Gresik Regency.

[14] Purbani, D. 1997. The Role of GIS/Inderaja Applications for Coastal Tourism Development Around Banten Bay. *ESDAL Conference Proceedings*.

[15] Rahman, MK, Ahyuni, & Purwaningsih, E. 2018. Mapping the Potential of Pulau Dua Beach Tourism Area, Bakongan Timur District, South Aceh Regency. *Buana*, *3* (3), 451–465.

[16] Safina, E., Patana, P., & Muhtadi, A. 2015. Analysis of the Potential and Carrying Capacity of the Mutiara Beach Tourism Area 88, Pantai Cermin District, Serdang Bedagai Regency. *Aqua Coast Marine*, *6* (1), 1–13.

[17] Saraswati, SA, Negara, IKW, & Pebriani, DAA 2020. Characteristics of Beach Typology for the Development of Marine Tourism in the Blue Lagoon Beach of Karangasem Bali. *Advances in Tropical Biodiversity and Environmental Sciences*, *4* (2), 49.

[18] Selly, V., Adi, W., & Salim, K. 2021. Beach Tourism Development Strategy for Land Suitability and Carrying Capacity of the Yellow Sand Beach Tourism Area, Air Lintang Village, Tempilang.

Aquatic: Journal of Aquatic Resources, *15*.

[19] Senoaji, G. 2009. Environmental Carrying Capacity and Land Suitability in the Development of Bengkulu's Enggano Island. *Journal of Sustainable Earth*, *9* (2), 159–166.

[20] Tambunan, JM, Anggoro, S., & Purnaweni, H. 2013. Study of Environmental Quality and Suitability of Tanjung Pesona Beach Tourism, Bangka Regency. *Proceedings of the National Seminar on Natural Resources and Environment Management*, 356–362.

[21] Wunani, D., Nursinar, S., & Kasim, F. 2013. Land Suitability and Carrying Capacity of Coastal Tourism Areas Botutonuo, Kabila Bone District, Bone Bolango Regency. 1 (Sep.), 89–94.

[22] Yulianda F, Fahrudin A, Hutabarat, Armin A, Sri H, Kusharjani, SK 2010. Integrated coastal and marine management. Bogor (ID): Forestry Education and Training Center, Indonesian Ministry of Forestry,

Secem– Korea International Cooperation Agency.

[23] Yulianda, F. 2007. Marine Ecotourism as an Alternative Utilization. Bogor: Science Seminar Department of Aquatic Resources Management FPIK-IPB.

[24] Yulisa, EN, Johan, Y., & Hartono, D. 2016. Analysis of the Suitability and Carrying Capacity of Beach Ecotourism for the Lagoon Beach Recreation Category, Merpas Village, Kaur Regency. *Enggano Journal*, *1* (1), 97–111.

[25] Yulius, Rahmania, R., Kadarwati, UR, Ramdhan, M., Khairunnisa, T., Saepuloh, D., Subandriyo, J., & Tussadiah, A. 2018. *Criteria for Establishing Marine Ecotourism Zones* (Issue 3).

[26] Yustishar, M., & Pratikto, I. 2012. Review of the Physical Parameters of Mangkang Kulon Beach for the Suitability of Beach Tourism in Semarang City. *Journal Of Marine Research*, *1* (2), 8–16.

TABLE I
COASTAL TOURISM AREA SUITABILITY MATRIKS

No	Parameter	Category S1	Category S2	Category S3	N category
1	Water depth (m)	0-3	>3-6	>6-10	>10
2	Beach type	White sand	White sand slightly rocky	The black sand is slightly steep	Mud, rocky, steep
3	Beach width (m)	.> 15	10-15	3-<10	<3
4	Water base materials	Sand	Paired corals	Muddy sand	Mud
5	Current speed (m/s)	0-0.17	0.17-0.34	0.34-0.51	>0.51
6	Beach slope (°)	<10	10-25	>25-45	>45
7	Water brightness (m)	>10	>5-10	3-5	<2
8	Beach cover	Coconut, open land	Low scrub, Savanna	High thicket	Mangroves, Settlements, Ports
9	Dangerous biota	There isn't any	Sea urchins	Sea urchins, stingrays	Sea urchins, stingrays
10	Availability of fresh water (km)	<0.5	0.5-1	>1-2	>2

Description: S1 = Very suitable (75%-100%); S2 = Fairly Suitable (50- <75%); S3 = Conditionally Compliant (25-<50%) and N = Not suitable

TABLE II
BEACH TOURISM SUITABILITY MATRIX FOR BEACH REACREATION CATEGORIES

No	Parameter	Category S1	Category S2	Category S3	N category
1	Beach type	White sand	White sand, coral	Black sand, steep coral	Mud, rocky, steep rock
2	Beach width	>5	10-15	3-<10	<3
3	Water base materials	Sand	Sandy coral	Muddy sand	Mud
4	Beach slope (°)	<10	10-25	>25-45	>45
5	Beach closure	Coconut, open land	Shrubland, lowly Savannah	High thicket	Mangroves, Settlements, Ports
6	Availability of fresh water (km)	<0.5	>0.5-1	>1-2	>2

Description: S1 = Very suitable (75%-100%); S2 = Fairly Suitable (50- <75%); S3 = Conditionally Compliant (25-<50%) and N = Not suitable

TABLE III
BEACH TOURISM FITNES MATRIX FOR SUN CATEGORY

No	Parameter	B	CategoryS1	Category S2	S	Category S3	S	N category	S
1	Beach type	5	White sand	White sand slightly rocky	3	The black sand is rocky and steep	2	Mud, rocky, steep reef	1
2	Beach width	5	>5	10-15	3	3-<10	2	<3	1
3	Beach slope	3	<10	10-25	3	>25-45	2	>45	1

Description: S1 = Very suitable (75%-100%); S2 = Fairly Suitable (50- <75%); S3 = Conditionally Compliant (25-<50%) and N = Not suitable

TABLE IV
BEACH TOURISM SUITABILITY MATRIX SWIMING CATEGORY

No	Parameter	Category S1	Category S2	Category S3	S	N category	S
1	Beach type	White sand	White sand, coral	Coral black sand and steep	1	rocky mud, rock and steep	0
2	Beach width (m)	>5	10-15	3-<10	1	<3	0
3	Water depth (m)	0-3	>3-6	>6-10	1	>10	0
4	Water base materials	Sand	Sandy coral	Muddy sand	1	Mud	0
5	Current speed (m/s)	0-0.17	>0.17-0.34	>0.34-0.51	1	>0.51	0
6	Beach slope (°)	<10	10-25	>25-45	1	>45	0
7	Dangerous biota	There isn't any	Sea urchins	Sea urchins and stingrays	1	Sea urchins, stingrays, lionfish, sharks	0
8	Availability of fresh water (km)	<0.5	>0.5-1	>1-2	1	>2	0

Description: S1 = Very suitable (75%-100%); S2 = Fairly Suitable (50- <75%); S3 = Conditionally Compliant (25-<50%) and N = Not suitable

TABLE V
BEACH TOURISM SUITABILITY MATRIX SWIMMING CATEGORY

No	Parameter	Category S1	S	Category S2	S	Category S3	S
1	Beach type	White sand	4	White sand slightly rocky	3	The black sand is rocky and steep	2
2	Beach width	>5	3	10-15	2	3-<10	1
3	Beach slope (°)	<10	3	10-25	2	>25-45	1
4	Beach closure	Coconut, open land	3	Bush, Savanna	2	High thicket	1

Description: S1 = Very suitable (75%-100%) ; S2 = Fairly Suitable (50- <75%); S3 = Conditionally Compliant (25-<50%) and N = Not suitable

TABLE VI
BEACH TOURISM FITNES MATRIX FOR BEACH VOLLEY CATEGORY

No	Parameter	B	Category S1	S	Category S2	S	Category S3	S
1	Water depth	5	>8	3	>4-8	2	<4	1
2	Current speed	3	0-0.15	3	>0.15-0.40	2	>0.40	1

Description: S1 = Very suitable (75%-100%) ; S2 = Fairly Suitable (50- <75%); S3 = Conditionally Compliant (25-<50%) and N = Not suitable

TABLE VII
ECOLOGICAL POTENTIAL OF VISITORS (K), AREA OF ACTIVITIES AND PREDICTION OF TIME REQUIRED FOR EACH TOURISM ACTIVITY

Type of activity	K (Σ Traveler)	Area Units (Lt)	Time taken Wp-(hours)	Total time 1 day Wt (hours)	Information
Beach recreation	1	50 m²	3	8	1 person every 10 m × 5 m long beach
Swim	1	50 m²	2	8	1 person every 10 m × 5 m long beach
Beach volleyball	1	50 m²	2	8	1 person every 10 m × 5 m long beach
Sunbathe	1	50 m²	2	8	1 person every 10 m × 5 m long beach
boating	1	500 m²	1	8	1 person every 100 m × 5 m Beach Length

TABLE VIII
CALCULATION OF ONANBALU BEACH TOURISIM AREA AT EACH ATTRACTION STATIONS 1, 2 AND 3

No	Type of activity	Station 1		Station 2		Station 3	
		Area or length of area (LP) (M²)	DDK (Person)	Area or length of area (LP) (M²)	DDK (Person)	Area or length of area (LP) (M²)	DDK (Person)
1	Beach Recreation	32,643.78	1,741	41,854.93	2,232	31,776.05	1694
2	Sunbathe	6997.50	560	2,692.87	215	4,386.09	351
3	Swim	30186,18	2,415	29,218.61	2,337	19,688.02	1,575
4	Beach volleyball	4.103,04	328	2005.86	160	1103.56	88
5	Boating	22,216.67	355	22,811.37	365	26039.15	417
	Total	96147,17	5,399	98,583.65	5.309	82,992.88	4.125
	Total Beach Area	277,723.70 M²					
	DDK Total	14,833 People					