

Tourism Carrying Capacity Analysis as a Basis for The Determination of The Spatial Tourism in Tidung Besar Island South Thousand Islands Subdistrict The Province of Jakarta

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Abstract—With an area of 50.13 ha, Tidung Besar Island still could not accommodate the high number of tourist. This shows that the carrying capacity of tourism on the island is still inadequate. This research aims to analyze island spatial planning, tourism carrying capacity, and how the layout according to the carrying capacity of the land. The method used descriptive analysis and reviewing secondary data about the physical condition of the island for further verification in the field. After the secondary data is processed with digitized maps and calculated using the formula of ecological carrying capacity and the need for an accommodation. Results indicate that the carrying capacity of tourism on the island could not be sufficient on this island and accommodate activities like place to stay and tourism activities. Thus the development of the region should be offset Tidung Travel Agent corresponding spatial carrying capacity of land, so that the carrying capacity of the island has opportunity to recover from ecological conditions for tourist comfort. This is intended to ensure that the comfort is not reduced and no buildup at a specific location or area in order to provide an optimal travel experience.

Keywords—*marine tourism; tourism carrying capacity; tourism spatial.*

I. INTRODUCTION

With an area of 50.13 ha or 0.5013 km² of the Tidung Besar Island and inhabited by 4,391 people, according to the Arithmetic Population Density formula (KPA) ideally Tidung Besar Island could be inhabited by 4,142 inhabitants / km². This means that the condition of the island has exceeded the threshold value, it is excluded with the arrival of tourists that is increasing every year.

Tourism development of Tidung Besar Island must be balanced with the tourist spatial and tourism supportive ability that is qualified, so as not to affect the satisfaction of tourists with their space of motion during the trip, the comfort is not reduced and there is no buildup in a particular location or area and then it can provide comfort to the community around Tidung Besar Island.

This study has the following objectives: 1) Analyzing the spatial condition in Tidung Besar Island today. 2) Analyzing the carrying capacity of land for tourism in Tidung Besar Island. 3) Analysing and determining the spatial layout in accordance with the carrying capacity of land in Tidung Besar Island.

The benefit of this research is to provide input on the capacity of tourism area in Tidung Besar Island to accommodate tourists, so it is expected to be an input to manage the tourist spatial in accordance with the carrying capacity of the land for the ecosystem environment, the comfort of visitors and also the people around the island.

II. LITERATURE REVIEW

In the business of tourism activities, we should pay attention to environmental aesthetics and maintain the beauty of nature without ignoring the satisfaction to be achieved by visitors. [1] explains that Carrying Capacity is assessed according to the threshold of the ability of the land as an ecosystem to withstand the collapse due to the impact of land used, in this case is used for tourism. In addition to the analysis of land carrying capacity in the island, we also analysed spatial planning in accordance with land carrying capacity in order to maintain good environmental ecosystem, minimized the impact with the concept of [2].

This research refers to Douglass's theory (1975) in [3], which calculate the ecological carrying capacity approach that is intended to calculate the capacity of the region to accommodate the minimal number of tourists visiting. In line with that, according to [4] that someone who does tourism activities is to refresh the body and soul as well as recreation to have fun welfare. So tourists should get physical and spiritual satisfaction after the tour.

III. METHOD

The research that has been done is using descriptive qualitative approach. The authors used data collection methods

that are typical in qualitative research that are observation (participatory), interview (semi-structured), literature study, documentation of related references and triangulation / combination.

Participatory observations were made on the actual condition of spatial, land carrying capacity for tourism and spatial aspects. While semi-structured interview conducted to the parties that felt will be able to provide accurate information and explanations and ideas for the problems studied in this study, namely: Mr. Sanwari, Head of Sub-District Social and Economic Section of Tidung Island Sub-Regency; Mr. Erik, Chairman of the Supervisory Community Group (KMP) Tidung Island; Mr. Mahtum, Owner and manager of one of homestay and travel in Tidung Besar Island.

Literature studies were obtained from various sources of printed and electronic media on various conditions in Tidung Island. While the documentation study focused on photographs of the existing condition of land use in Tidung Besar Island.

The data obtained then analyzed and spatially by using Arc View. Furthermore, the design of data acquisition and analysis is largely determined by the situation and location where the data and information will be obtained / explored.

IV. RESULTS AND DISCUSSION

According to [5], Tidung Island area of 50.13 Ha is already used by several zones, namely:

- A. Population housing zone (17.85 ha, with its 1.32 ha on Great Ayung Island): existing housing is also used as homestay for tourists.
- B. Tourism / recreation zones (18.51 ha): love bridge, water sports / water sport zone, snorkeling zone, Cemara kasih beach.
- C. Public facilities (3.16 ha): ATMs, restaurants, souvenir shops, stalls, mosques, public toilets, public health centre, police stations, schools, badminton and futsal fields, and children's playground.
- D. Place of Public Cemetery / TPU (1.02 ha):
- E. Green / RTH Open Space (5.59 ha): soccer field, residents' garden, rice field, and park. f. Road (4.0 ha)

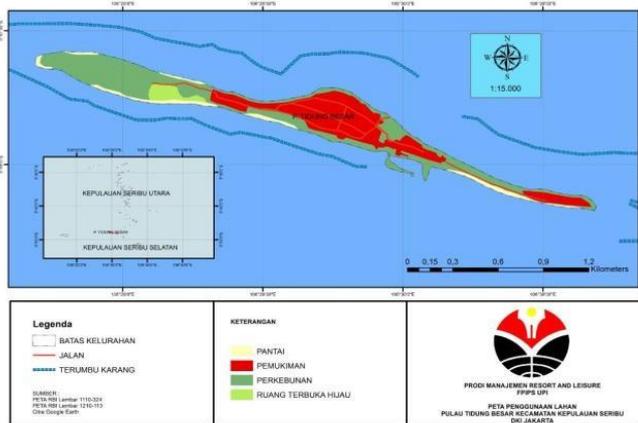


Figure 1. Tidung Besar Island Land Use Map

Figure 1 is showing the land use map in Tidung Besar Island based on RBI Map of Pulau Tidung in 1999, Jakarta Governor Decree No. 1989/2000 dated 27 July 2000. The increasing number of visitors who are curious for recreation on the island of Tidung, then make the development for accommodation facilities are increasing. Until 2014 the number of accommodation (homestay, lodging, rented) amounted to 314 [5].

Ecological Carrying Capacity

In this study, writer calculates the ecological carrying capacity of Tidung Besar Island and it has measured parameter which is the number of tourists, while other parameters have been set by Douglass (1975) in [3] with the following formula:

$$AR = \frac{D \times A}{Cd \times Tf \times 43.560}$$

Information:

- AR :The area required for tourism activities
- D :Tourist demand for one activity (number of tourists to Tidung Island 2014 is 113,211 tourists)
- A :The needs of every tourist area in feet², with a minimum area required for the camping area of 9070 feet².
- Cd :The number of days spent on a particular activity (the number of days spent on public holiday in 2014 is 19 days, weekends is 114 days and student holiday is 28 days, so Cd = 151 days.)
- Tf : Recovery factor: according to Douglass (1975) in [3] for camping activity the value of Tf = 1
- 43560:Constant (obtained from the conversion of acre to feet²).

Calculation of the ecological carrying capacity of Tidung Island with an area of 50.13 ha or 123,871 acres (1 ha = 2,471 acres, 1 acre = 0.4047 ha) are as follows:

For camping activities

$$AR = \frac{D \times A}{Cd \times Tf \times 43.560} = \frac{113.211 \times 9070}{151 \times 1 \times 43.560} = \frac{1.026.823.770}{6.577.560} = 156,11 \text{ acre} = 156,11(0,4047) = 63,17 \text{ ha}$$

This value means that with the number of tourists in 2014 to Tidung Island with a total of 113,211 people, requiring land for tourism activities of 63.17 ha with a fixed opportunity for tourists to recover in a comfortable ecological conditions. This means that there is a shortage of 13.04 hectares of land, so that in the actual conditions of the accumulation of tourists in one activity / activity.

The number of tourists who should be able to go to Tidung Island with a land area of 50.13 ha is 36,354 people, with the following calculations:

$$AR = \frac{D \times A}{Cd \times Tf \times 43.560}$$

$$50,13 = \frac{D \times 9070}{151 \times 1 \times 43.560}$$

$$50,13 = \frac{D \times 9070}{6.577.560}$$

$$D \times 9070 = 50,13 \times 6.577.560$$

$$D \times 9070 = 329.733.082, 8$$

$$D = 36.354 \text{ people}$$

The value obtained from the calculation of this capacity can be used as a reference to know the area on the threshold conditions that can still be utilized. Therefore, the ecological threshold values can be maintained or even can be improved if ecological conditions of tourist areas can be maintained and / or enhanced its quality.

Needs of Accommodation / Homestay in Tidung Besar Island

The need for accommodation in Tidung Besar Island is viewed based on the number of visitors in 2014 which amounted to 113,211 tourists. With this number the researcher will then calculate the number of accommodations or number of rooms needed to meet the needs of travelers using the Inskip formula (1991, p.135) in Fandeli (2009, pp. 78).

$$A = \frac{B \times C}{D \times E}$$

Information:

- A: Needs a bed
- B: The number of tourists at a certain period (the number of tourists in 2014, ie 113,211 tourists)
- C: The average length of stay is calculated for how many nights (according to the survey the packet is sold is 2 days 1 night package, then C = 1)
- D: The number of nights in a certain period (the number of nights is calculated from the total public holiday of 2014, which is 115 days)
- E: Accommodation use factor (at peak season E = 95% usage)

To calculate the number of rooms using the formula as below:

$$E = A / F$$

Information:

- E: Room Needs
- A: Number of bed needs
- F: Average use of rooms (number of rooms of each homestay is 2 persons / room)

The following is the calculation of the number of accommodation / homestay required in Pulau Tidung Besar.

Average stay 1 night (2D1N package):

a. Low Season Period

$$A = \frac{B \times C}{D \times E}$$

$$= \frac{113.211 \times 1}{151 \text{ days}} = 749, 74$$

$$= 750 \text{ beds (rounding)}$$

$$\text{Total beds needs } E = A/F = 750/2 = 375 \text{ rooms}$$

b. Peak Season Period

$$A = \frac{B \times C}{D \times E}$$

$$= \frac{113.211 \times 1}{151 \text{ days} \times 95\%} = 789 \text{ beds}$$

$$\text{Total beds needs } E = A/F = 789/2 = 394 \text{ room}$$

These values means that during the period of Low Season (2D1N package) the required accommodation / homestay is 375 rooms, and when the Peak Season period (2D1N package) the required accommodation / homestay is 394 rooms with average use of two persons / room.

From these results we obtained that the number of accommodation / homestay on the island of Tidung Besar is currently not sufficient for tourists. The number of accommodations up to 2014 is 314 rooms, whereas according to the calculation result 375 rooms (low season) and 394 rooms (peak season), so there is still a shortage of accommodations/homestays.

Tourism Spatial Appropriate with Land Supporting Capacity

Based on the problem of carrying capacity found in marine tourism area of Tidung Besar Island, the following strategies and tactics were chosen to overcome and minimize visitor density at one point of tourist area in Tidung Besar Island based on Manning 1979 strategy in [2] .

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TABLE I. STRATEGIES AND TACTICS SELECTED FOR OVER CAPACITY ON TIDUNG BESAR ISLAND

Strategy	Information
Encouraging the Use of Other Areas	<ol style="list-style-type: none"> 1. Break the flow of circulation by creating a new zoning, creating a thematic zone. This zone has a theme to minimize high visitor density in crowded areas and the flow of visits will spread. 2. Managers can offer homestays located in the exclusive homestay zone, which is east of Tidung Besar Island. Excess area is close to the dock, infrastructure (water source and telephone signals) and Cemara Kasih Beach.
Limiting the Number of Tourists in the Troubled Area	<ol style="list-style-type: none"> 1. Schedule of activities / rundown is made by dividing it into other areas / zones with different time, so that between one group of tourists with other tourists can take turns enjoying tourist attraction in Pulau Tidung Besar and will not accumulate in one area. 2. Make interesting programs in low season, for example, made the ticket cheaper than in peak season; making outbound programs around the beach for families or groups, so that visitors during peak season are not that soaring.
Setting the Limit to Live in the Area with Problems	<p>Currently there are only two best-selling tour packages on Tidung Besar Island, the 2D1N package and 3D2N package. To minimize the high need for accommodation / homestay, managers should set the regulation of the limits of stay only 2D1N tourists only. Seeing the condition of the island is getting denser with the building, the regulation can be done for the sake of preserving the physical and environmental conditions.</p>
Placing the facility in a location that is not problematic	<p>Provide facilities (bicycles parking area, restaurants / cafes / public toilets, souvenir shops and casual seating / gazebo) are the same in other zones / tourist areas, such as Cemara Kasih Beach, and in other beaches. So while the manager divided the time event / rundown to tourists, they also can explain about how interesting the location / other tourist areas are.</p>
Splitting Tourists According to Its Characteristic	<p>Tourists who come have a variety of characteristics. To suppress the density of one location, the manager / tour agent can register the group they serve in advance.. The data is intended to determine the characteristics of tourists they serve. So at the time division of rundown, it will be in accordance with the character of tourists</p>
Suggesting Group Size Restrictions	<p>It is necessary to enact a regulation stipulating that every travel agent must have a limit on the number of tourist groups visiting Tidung Besar Island. For example in one year 2014 the number of visits 113,211, the average number of tourists per month is 9.434 tourists divided by 44 agents, so that one agent can only bring a group per month of 214 people, but that number exceeds the area capacity for tourism area, so each agent must decreasing the number of groups who can visit each month to 100 groups per agency. The amount is according to the carrying capacity count that will not exceed the threshold value.</p>
Protecting the Venue from Impact	<p>Buffer Zone is expected to be a balancer for the activities and facilities in the area and must be maintained existence.</p>

Sources: Processed Data of Researchers, (2017)

The following is a map of spatial planning in Tidung Besar Island based on RBI map in 1999, Jakarta Governor Decree Number 1989/2000 dated July 27, 2000 which describes the location of Tidung Island land use and research results.

Based on the analysis, it is concluded that there are six zones that will be planned in the spatial planning of Pulau Tidung Besar based on zoning regulations for Small Island [3], namely Thematic Tourism Zone, Accomodation Zone/Homestay Exclusive, Buffer Zone, Residential Zone/Simple Homestay, Facility Zone and Industrial Zone and also Coral Reef Zone.

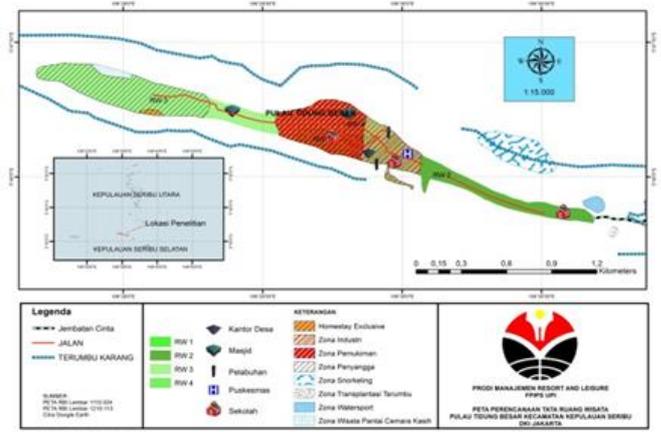


Fig. II. Spatial Planning Tour Map of Tidung Besar Island

V. CONCLUSION

The land area of Tidung Besar Island 50.13 ha is not enough to accommodate the number of tourists in 2014, ie 113.211, requiring the area of land for tourism activities covering 63.17 ha with a fixed chance of land to recover from a comfortable ecological conditions. The difference of land for the required tourism activities is 13.04 ha. So that there is accumulation in one area. The number of tourists who should be able to go to Tidung Besar Island is 36,354 people.

The number of accommodation / homestay is currently not sufficient for tourists. The number of accommodation/homestay up to the month of 2014 is 314 units while the number of required accommodation is 375 rooms (low season) and 394 rooms (peak season).

There are several strategies from the eight strategies and tactics of the concept of visitor management according to Manning (1979) in [2] that can be selected to overcome the density / buildup of visitors at one point of the tourist area; encourage the use of other areas by applying a zoning system for small islands by creating a thematic tourism zone (Cemara Kasih coastal zone, snorkeling zone, water sport tourism zone, exclusive home stay zone, buffer zone, simple homestay zone, facility and industrial zone, Coral reefs); limiting the number of tourists in troubled areas such as the rundown schedule is made by dividing it into different regions / zones at different times and making the program attractive during low season; set a fixed limit on the problem areas for example to set the

regulation of tourist stay limit of only 2 days 1 night only; putting facilities in non-problematic locations for example to create comfortable facilities in locations that lack of visitors; separating tourists according to their characteristics, for example, to make a rundown in accordance with the characteristics of tourists, suggesting limiting the size of the group, for example, travel agencies must have a limit on the number of tourists visiting this island, and protect the place from the impact such as creating a buffer zone around the coast.

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