Analysis of Marine Tourism in Pandan Sub-district, Tapanuli Tengah Regency

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Abstract: *This study aims to 1) analyze the suitability of marine tourism in Pandan Sub-district, Tapanuli Tengah Regency, and 2) analyze policy directions for marine tourism development in Pandan Sub-district, Tapanuli Tengah Regency. This research uses a mixed method or mixed research. The sample in this study consisted of four stations. The suitability of marine tourism is obtained through the matrix of the suitability of marine tourism with ten parameters including water depth (m), beach type, beach width (m), water base material, current velocity (m/s), beach slope (0), water brightness (m/s), coastal land cover, hazardous biota and freshwater availability (distance/km). Policy direction is carried out using the Interpretive Structural Modeling (ISM) method with seven elements, namely E1 (tourism management), E2 (attractions), E3 (cleanliness), E4 (security and local community culture), E5 (infrastructure), E6 (quality of service), and E7 (lack of public awareness). The results showed that: 1) The suitability value for marine tourism in Pandan Sub-district includes Station I Pandan Beach very much by the value of 96%, Station II Pantai Indah Pandan is very appropriate with the suitability value of 94%, station III is quite by the value of 76%, and station IV is quite appropriate with the value of 66%. And the policy directions include the priority E1, the second priority E5, and E2, the third priority E4 and E6, and the weakest priority E3 and E7.*

Keywords: *Marine Tourism, Suitability, ISM, Tapanuli Tengah Regency.*

INTRODUCTION

Marine tourism is one type of tourism that has a major contribution to the Indonesian economy. Bakaruddin (2008) explains tourism is a temporary change of place and those who make the trip receive services from companies engaged in the tourism industry. In addition, Damanik & Weber*et al.,* (2006) add that "tourism is a recreational activity outside the domicile to escape from routine work or find another atmosphere". The contribution of marine tourism to national development is in the form of providing jobs and other economic activities (multiplier effect). Determining the right coastal area for marine tourism is not an easy thing. Several criteria and characteristics of coastal areas, both in terms of physical, chemical, biological, and socio-economic. One of the most visited marine tourism by tourists is along the coast of Tapanuli Tengah. In this district, there are marine tourism objects which are a major contribution to the economy of Tapanuli Tengah Regency. There is a lot of potential in the Pandan beach area which is very large to be developed and managed again professionally and has a natural beauty that is still awake. However, this marine tourism must also be studied for its suitability so as not to hurt tourists who come.

Analysis of land suitability of coastal areas for marine tourism is one of the bases for determining a suitable location which is essentially a process of estimating land resources and assessing land quality

for marine tourism activities at Pandan beach Tapanuli Tengah. According to Hidayatullah *et al.,* (2021), it is necessary to evaluate the suitability of marine tourism to reduce negative impacts on the environment, including pollution. In addition, Alfiaturrohmaniah *et al.,* (2020) said the results of the study on the analysis of the suitability of marine tourism were important so that they could be an indicator of whether the beach was suitable for sustainable marine tourism.

Nabila *et al.,* (2021) has conducted research that examines the suitability of marine tourism in the Pandan Sub-district with the title "Marine Ecotourism Potential of Pandan beach, Tapanuli Tengah Regency". This research uses a survey method. The results showed that Pandan beach was suitable for marine tourism. In addition, Aswita *et al.,* (2015) conducted a study entitled "Evaluation of the Suitability of Teupin Layeu Iboih Coastal Waters as Marine Ecotourism". This study uses survey methods and field observations. The parameters in this study were the type of coral reef, the type of reef fish, the depth of the waters, the brightness of the waters, the type of beach, the closure of the coastal land, the basic material of the waters, and the distance of the availability of fresh water. The research that the researcher did was different from previous research. This study analyzes the suitability of marine tourism with ten parameters including water depth (m), beach type, beach width (m), water base material, current speed (m/s), beach slope (0), water brightness (m), coastal land cover, hazardous biota, and freshwater availability (distance/km). Then look at the policy directions for the development of marine tourism using the ISM model.

This study analyzes the suitability of marine tourism and analyzes policy directions in the development of marine tourism in Pandan Sub-district, Tapanuli Tengah Regency. The analysis used is a scoring of the parameters and weights obtained in the field and policy analysis of two experts in the field of tourism including the Head of the Tapanuli Tengah Tourism Office and the Head of the Tapanuli Tengah Marine Service. Arjana (2016); Putra *et al.,* (2020) explains tourism development cannot be separated from the existence of a tourist attraction until there is a type of development that is supported by the provision of facilities and accessibility. Based on the description above, the researcher conducted research on the suitability of marine tourism and then analyzed the direction of developing marine tourism in Pandan Sub-district, Tapanuli Tengah Regency with the output of the marine tourism suitability map in Pandan Sub-district, Tapanuli Tengah Regency.

METHODS

The type of research in this study is a combination of quantitative and qualitative methods (mixed method). According to Emzir (2017) research with a mixed methods approach is research that in data collection involves numerical or numerical information (through instruments) as well as text information. The samples taken in this study were four points, with two experts. The experts in this research are the Head of the Tourism Office of Tapanuli Tengah Regency and the Head of the Marine and Fisheries Service of Tapanuli Tengah Regency. The tools used in this research are Secchi disk, current meter, GPS, Arc GIS, Bathymetry Map, and ISM application. Data analysis using scoring.

Table 1. Marine Tourism Suitability Parameters

No	Parameter	Weight	Category S1	Score	Category S2	Score	Category S3	Score	Category TS	Score
1	Water depth (m)	5	0-3	3	>3-6	2	>6-10	1	>10	0
2	Beach type	5	White	3	White sand, little coral	2	Black sand, rocky, slightly steep	1	Rocky mud, steep	0
3	Beach width	5	>15	3	Oct-15	2	3-<10	1	<3	0
4	Waterbed material	3	Sand	3	Sandy coral	2	Muddy sand	1	Mud	0
5	Current velocity	3	0-0.17	3	0.17-0.34	2	0.34-0.51	1	>0.51	0

No		(m/s)								
6	Coastal slope (^{0})	3	<10	3	Oct-25	2	>25-45	1	>45	0
7	Water clarity (m)	1	>10	3	>5-10	2	03-May	1	<2	0
8	Coastal land cover	1	Coconut, open land	3	Fir, shrubs, low, savanna	2	High	1	Mangroves, settlements	0
9	Hazardous biota	1	None	3	Sea urchins	2	Sea urchins, stingrays	1	Sea urchins, stingrays, lepu fish, sharks	0
10	Fresh water availability (distance)/km	1	<0.5 km	3	>0.5-1 km	2	>1-2	1	>2	0

Source: Yulianda (2007)

Description:

Total   : (score x weight) d Imana maximum value = 84

S1   : Very suitable, with a score of 83-100%

S2   : Sufficiently appropriate, with a score of 50-<83%

S3   : Conditionally Conforming, with a value of 17-<50%

N   : Not suitable, with a value of <17%.

Furthermore, an analysis of the policy direction of marine tourism development was carried out using the ISM method. Marimin (2005); Umar (2022) describe several stages in the ISM method. In addition, Kholil *et al.,* (2008) ISM is very suitable to be used to determine development directions. The stages are as follows: 1) decomposition of elements into several sub-elements, 2) determining context between sub-elements; 3) determining the Structural Self Interaction Matrix (SSIM), 4) Creating the Reachability Matrix (RM), 5) performing transitivity, 6) determine the vertical hierarchical structure, 7) determine the relationship between Driver Power (DP) and Dependence (D). Making SSIM is done by pairwise comparison with the symbol VAXO. The meaning of the symbols:

V indicates that variable i affects variable j

A indicates that variable j affects variable i

X indicates that variable i affects variable j and vice versa

O indicates that variables i and j are not related.

RESULTS

3.1 Suitability of Marine Tourism

Suitability level at station I

Land suitability for marine tourism is based on a sample of land characteristic data. The level of suitability of marine tourism can be seen in the Table 2 below.

Table 2. The level of suitability of marine tourism (Station I)

No	Parameter	Weight	Field Data 2022	Score	Total
1	Beach Type	5	White Sand	3	15
2	Water Depth	5	3 m	3	15
3	Beach Width (m)	5	20 m	3	15

4	Waterbed Material	3	Sand	3	9
5	Coastal Slope (^{0})	3	30	3	9
6	Current Velocity (m/s)	3	0.02 m/s	3	9
7	Coastal Land Cover	1	Coconut and Land Open	3	3
8	Water clarity (m)	1	1.5 m	0	0
9	Hazardous biota	1	None	3	3
10	Fresh water availability (distance/km)	1	0.5 km	3	3
Total					81
% IKW Pandan Beach for Beach Tourism Activities (Ni/Nmax) x 100%					96%

Source: Processed Primary Data (2022).

The results of the above calculations were analyzed based on the zoning of the land suitability level for marine tourism, namely the S1 (Highly Appropriate) zone with a value of 96%.

Suitability level at station II

The suitability of land for marine tourism was analyzed based on a sample of land characteristic data. The land suitability level can be seen in the Table 3 below.

Table 3. The level of suitability of marine tourism (Station II)

No	Parameter	Weight	Field Data 2022	Score	Total
1	Beach Type	5	White Sand	3	15
2	Water Depth	5	3 m	3	15
3	Beach Width (m)	5	17 m	3	15
4	Waterbed Material	3	Sand	3	9
5	Coastal Slope (^{0})	3	4^0	3	9
6	Current Velocity (m/s)	3	0.02 m/s	3	9
7	Coastal Land Cover	1	Cemara	3	2
8	Water clarity (m)	1	1.4 m	0	0
9	Hazardous biota	1	None	3	3
10	Fresh water availability (distance/km)	1	1 km	3	2
Total					84
% IKW Pandan Beach for Beach Tourism Activities (Ni/Nmax) x 100%					94%

Source: Processed Primary Data (2022).

The results of the above calculation are analyzed based on the zoning level of land suitability for marine tourism, namely the S1 (Highly Appropriate) zone with a value of 94%. According to Mulia (2019: 67) This very suitable class can be used sustainably.

Level of suitability at station III

The suitability of land for marine tourism was analyzed based on a sample of land characteristic data. The land suitability level can be seen in the Table 4 below.

Table 4. The level of suitability of marine tourism (Station III)

No	Parameter	Weight	Field Data 2022	Score	Total
1	Beach Type	5	Black Sand	3	5
2	Water Depth	5	4 m	3	10
3	Beach Width (m)	5	20 m	3	15
4	Waterbed Material	3	Sand	3	9

5	Coastal Slope (^{0})	3	4^0	3	9
6	Current Velocity (m/s)	3	0.01 m/s	3	9
7	Coastal Land Cover	1	Cemara	3	2
8	Water clarity (m)	1	1.1 m	0	0
9	Hazardous biota	1	None	3	3
10	Fresh water availability (distance/km)	1	0.5 km	3	2
Total					64
% IKW Pandan Beach for Beach Tourism Activities (Ni/Nmax) x 100%					76%

Source: Processed Primary Data (2022).

The results of the above calculations are analyzed based on the zoning of the land suitability level for marine tourism, namely S2, which means that it is quite in accordance with the value of 76%.

Level of suitability at station IV

The suitability of land for marine tourism was analyzed based on a sample of land characteristic data. The level of land suitability can be seen in the Table 5 below.

Table 5. The level of suitability of marine tourism (Station IV)

No	Parameter	Weight	Field Data 2022	Score	Total
1	Beach Type	5	Black Sand	3	5
2	Water Depth	5	5 m	3	10
3	Beach Width (m)	5	13 m	3	10
4	Waterbed Material	3	Sand	3	9
5	Coastal Slope (^{0})	3	13^0	3	6
6	Current Velocity (m/s)	3	0.01 m/s	3	9
7	Coastal Land Cover	1	Cemara	3	2
8	Water clarity (m)	1	1.1 m	0	0
9	Hazardous biota	1	None	3	3
10	Fresh water availability (distance/km)	1	0.5 km	3	2
Total					56
% IKW Pandan Beach for Beach Tourism Activities (Ni/Nmax) x 100%					66%

Source: Processed Primary Data (2022).

The results of the above calculations are analyzed based on the zoning level of land suitability for marine tourism, namely S2, which means that it is quite in accordance with the value of 66%.

The following (Table 6) is a recap of the assessment of the suitability of marine tourism in Pandan Sub-district, Tapanuli Tengah.

Table 6. the assessment of the suitability of marine tourism in Pandan Sub-district, Tapanuli Tengah

Sample	Name of Beach	Results
Station I	Pandan Beach	Very Appropriate
Station II	Pantai Indah Pandan	Very Appropriate
Station III	Tolkit Beach	Fairly Appropriate
Station IV	Pantai Kalangan	Fairly Appropriate

Source: Processed Primary Data 2022

3.2 Analysis of marine tourism development directions

This analysis was carried out using the ISM method. There are two experts who are carried out in determining the hierarchy of policy directions, namely the Head of the Tourism Office and the Head of the Marine and Fisheries Service. There are 7 elements included in the analysis, including:

E1   : Lack of tourism management

E2   : Lack of tourist attractions

E3   : Cleanliness

E4   : Security conflicts and local community culture

E5   : Inadequate infrastructure

E6   : Low quality of service

E7   : Lack of public awareness

Based on these elements, a graph of the relationship between driving power and dependence is generated based on the following ISM results.
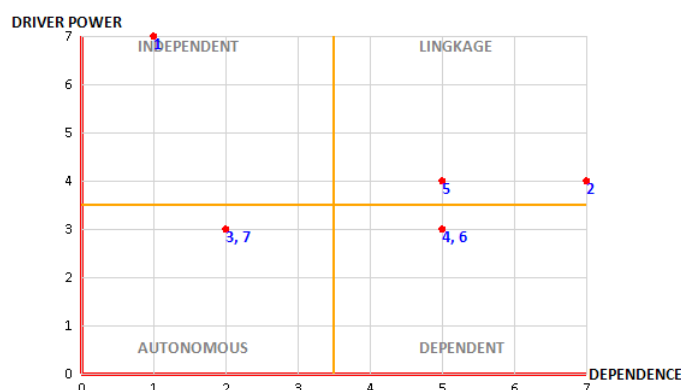
Figure 1. Graph of the relationship between Driver Power (DP) and Dependence constraints in developing marine tourism in Tapanuli Tengah

Based on the graph, it can be seen that the elements that are a priority in the development of marine tourism in Pandan Sub-district, namely E1 include tourism management. Furthermore, the second priority E5 and E2 covers infrastructure and tourist attractions.

Then the hierarchical structure of the policy for marine tourism can be seen as follows:
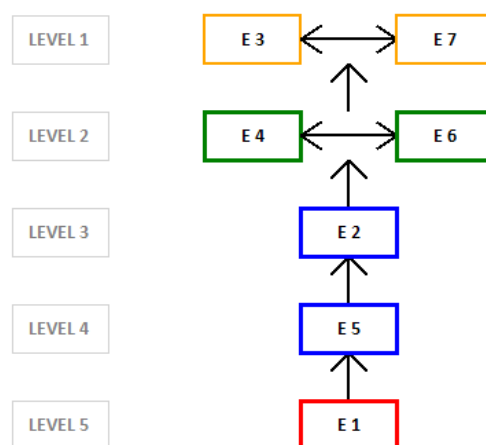

Figure 2. Hierarchical Structure of Policy Directions

Discussions

Marine tourism suitability

The types of beaches in this area are stations I and II, namely Pasir Putih, and stations III and IV are black sand. Tanto *et al.,* (2017); Putra *et al.,* (2018); Rahima *et al.,* (2020) stated that it is very suitable to be used as a marine tourism location. Unlike stations III and IV, they are quite suitable for marine tourism. In addition, Wabang *et al.,* (2017) states that beach tourism will be very good if a beach is a white sandy beach in other words dominated by a sand substrate, compared to a rocky beach or a beach dominated by the coral substrate which can interfere with the comfort of tourists.

The water depth based on the bathymetric map obtained at stations I and II is 3 meters, station III is 4 meters and station IV is 5 meters. This shows that stations I and II are very suitable for marine tourism, but they are different from stations III and IV. This is supported by HIA (2014) who provides a depth value limit for the suitability of marine tourism that is quite suitable, namely 0-3 meters. The width of the coast of stations I-III shows a suitable width for marine tourism, in contrast to station IV which has a width of 13 m. according to Rahmawati (2009), the width of the beach is related to the extent of coastal land used for various marine tourism activities. The width of the beach that is very suitable for marine tourism is more than 15 meters, the wider the beach, the better for tourists to carry out their activities, and vice versa. The basic water material at the four stations is the same, namely sand. This shows that the material is very suitable for marine tourism. Furthermore, the slope of the coast at station I is 30, and II and III are 40. However, it is different from station IV the slope of the slope is 130. Juliana *et al.,* (2013) basic materials are one of the supporting factors for the feasibility of marine tourism.

Furthermore, the speed of coastal currents in Pandanini District is on average 0.02 m/s. This shows that the speed is very suitable for marine tourism activities. The speed of the flow is closely related to the comfort of tourists who come to the tourist attraction. According to Wabang (2017), if the current is at high speed, visitors should not carry out marine tourism activities because it will be dangerous for the safety of visitors who come.

The brightness of the waters at the four stations shows an average of 1.2 m. This shows that it is very suitable for marine tourism. Effendi (2013) states that brightness is strongly influenced by weather conditions and the time of measurement and the accuracy of the person taking the measurement. In addition, the brightness of the waters is also very closely related to marine tourism in terms of swimming comfort. Furthermore, there was no harmful biota in the four stations that were sampled for the study. Observation of dangerous biota also needs to be done to find out whether or not there is dangerous biota that will disturb tourist visitors. In addition, the availability of fresh water at these four stations is said to be very suitable because they are located within a radius of 1 km. Opinion according to Dahuri (2003) freshwater sources are necessary, especially for the survival of the population and to support marine tourism activities. Furthermore, according to Handayani (2010) when carrying out tourism activities, the availability of clean water in the form of fresh water is needed to support marine tourism facilities. In addition, it can also be seen based on the marine tourism suitability map in Fig 3 below.
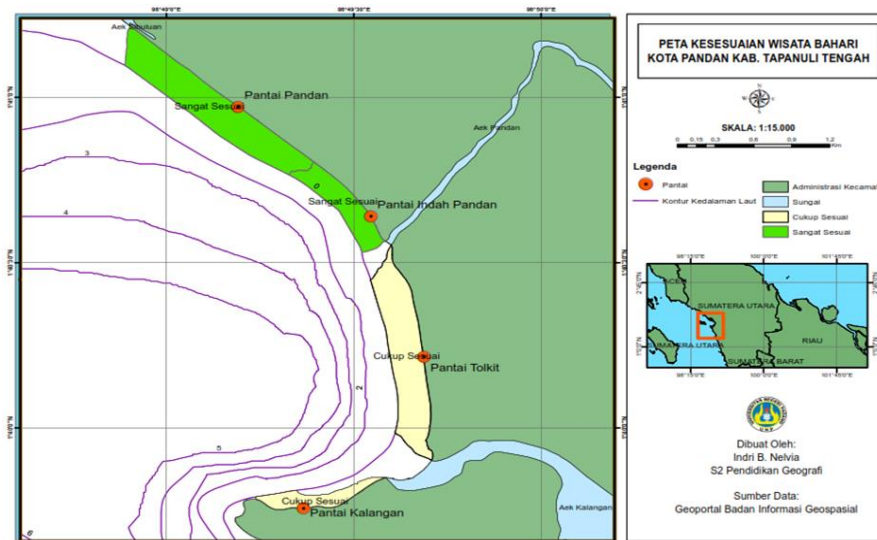
Figure 3. Map of Marine Tourism Suitability in Pandan Sub-district, Tapanuli Tengah Regency

Policy Direction Analysis

Based on the analysis of policy directions using the ISM method, the strongest priority in developing marine tourism is to improve its management first. Based on an interview with the Head of Tourism of Tapanuli Tengah Regency said: "… in developing marine tourism there are obstacles in its management because many people still think that the land around the coast is their land, and if there is an area that wants to be developed, the land must be granted. Besides that, so far, tourism in Tapanuli Tengah is still being processed by individuals…".

This is by the results of the graph obtained through the ISM. Furthermore, the second priority is tourist attractions and infrastructure. There are not many attractions in the four marine tourism types of research, such as snorkeling, banana boat, jetski, etc. In addition, the infrastructure is also inadequate, such as there is only one toilet on each tour. Furthermore, the third priority is to improve the quality of service and security in the marine tourism area. Based on observations, the service is still lacking such as there is no entrance ticket and there are still many beggars when we travel there. And the weakest priority is cleanliness and public awareness. Based on tourist observations the four points are quite clean, this can be seen by the presence of trash bins and garbage selection and public awareness also need to be improved again to support the local community's economy.

CONCLUSIONS

Based on the results of the research described in the discussion chapter, the following conclusions, namely: 1) The suitability value for marine tourism in Pandanini District includes Station I Pandan Beach which is very suitable with a value of 96%, Station II Pantai Indah Pandan is very suitable with the suitability value of 94%, station III is quite by the value of 76%, and station IV is quite by the value of 66 %; and 2) The development direction based on the ISM results obtained is that the priority is in E1 covering tourism management, the second priority E5 and E2 covering attractions and infrastructure. Furthermore, the third priority includes security and service quality. And the weakest priorities, namely E3 and E7, include cleanliness and public awareness.

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