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Assessment of Marine Ecotourism Development Potential in Lapin Beach, North Rupat, Riau Province

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ABSTRACT

Lapin Beach in North Rupat, Riau Province, has excellent potential to be developed as a marine ecotourism area due to its natural beauty and local cultural richness. However, no scientific research has explored this potential in depth. This study aims to analyze the potential and formulate strategies for the sustainable development of marine ecotourism in Lapin Beach to improve the welfare of local communities. The research was conducted from December 2024 to February 2025. Data were collected through observation, interviews, questionnaires, and water quality measurements. The analysis used is the coastal tourism suitability index and the SWOT approach. The results showed that Lapin Beach has strong potential for ecotourism, supported by easy access, natural panoramas, and community participation. The tourism suitability index ranged from 83.97 to 86.53%, indicating a high suitability (S1). Water quality and coastal topography support tourism activities. SWOT analysis suggested strategies including promotion, facility improvements, and community engagement in maintaining sustainability. Recommended development strategies include optimizing natural attractions, empowering local businesses, improving infrastructure, and enhancing monitoring efforts. Further studies should consist of aspects of biota, vegetation, and economic impact to support sustainable ecotourism management and enhance community well-being.

Keywords: Marine Ecotourism, SWOT Analysis, Sustainable Development, Tourism Suitability Index

1. INTRODUCTION

Ecotourism is a form of travel that emphasizes environmental aspects, local culture, and community participation (Yoswaty & Samiaji, 2013). Its main goal is to preserve natural and socio-cultural sustainability while promoting economic growth for surrounding communities. In addition to generating economic benefits, ecotourism also serves as a means of education and promoting environmentally friendly behavior (Noverianto, 2018). The success of ecotourism networks greatly depends on the level of leadership, collaboration, and effective coordination among all involved stakeholders, including government institutions and community-based organizations (Ghimire, 2015). Institutions also encourage active community participation in tourism activities in a sustainable manner.

North Rupat, particularly Lapin Beach, is a developing marine tourism area with significant potential. This beach has been designated as one of the leading tourism destinations in Bengkalis Regency. It features a beautiful stretch of white sand, approximately 17 km long and 300–500 m wide during low tide. The sunset over the waters of the Malacca Strait, directly in front of Rupat Island, adds to its natural charm. This beach is frequently visited during specific periods by both domestic and international tourists (Fatkhurahman et al., 2024). Its gently sloping shoreline provides a sense of safety for parents, as children can swim farther out without concern due to the extended and shallow coastline. Rows of pine trees along the beach, community-built shaded huts, and views across the water toward Port Dickson, Malaysia, further enhance its visual appeal. Historically, Lapin Beach was known by several names according to the local villages, such as Tanjung Lapin and Tanjung Rhu.

Tourism activities at Lapin Beach include swimming, fishing, and walking across the coastal stretch during low tide, which can reach up to 300 meters. Supporting facilities such as parking areas, food stalls, accommodations, and photo spots are available and managed by the local community. The beach is also regularly used for annual cultural events like the Mandi Syafar Festival. The location can be reached by

sea from Dumai City (approximately 1.5 hours) or by land (approximately 3 hours). The availability of facilities and cultural activities strengthens Lapin Beach's position as a potential tourism destination in Riau Province.

The tourism potential of Lapin Beach has received little scholarly attention to date, leaving information on the area scarce. Limited promotion and exposure mean that many travellers, especially international visitors, remain unaware of this destination. However, Lapin Beach holds considerable promise as a marine ecotourism site that could benefit the local community socially and economically. Ecotourism activities on Rupat Island are still few and have not been optimally developed (Warningsih et al., 2024). A similar situation is evident on Jemur Island, where mangrove-based ecotourism remains under-managed due to inadequate facilities and infrastructure (Faradilla, 2022). Consequently, a thorough scientific study is needed to assess the site's potential and to formulate appropriate strategies for sustainable marine-ecotourism development at Lapin Beach.

2. RESEARCH METHOD

Time and Place

This research was conducted from December 2024 to February 2025 at Lapin Beach, North Rupat District, Bengkalis Regency, Riau Province. The research location is presented in Figure 1.

Figure 1. Research location

Method

This study used a survey method by collecting both primary and secondary data. Primary data were obtained through field observations, questionnaires, interviews, and environmental parameters such as temperature, salinity, pH, and brightness measurements. Interviews were conducted with local communities, tourists, business actors, and policymakers. Secondary data were collected through a literature review. The assessment of potential was carried out using a coastal tourism suitability matrix for recreational categories.

Procedures

Identification of Coastal Area Potential and Tourist Attractions

To identify the potential of the coastal area of Lapin Beach, it is necessary to determine the coastal region and tourist attractions at Lapin Beach. The identification was carried out in the field by exploring ecotourism objects and activities at Lapin Beach and by identifying the potential of the beach, including components of attractions, tourism activities, and supporting facilities and infrastructure. In addition, it is necessary to explore tourism objects and activities at Lapin Beach that have attraction components such as biota around the coastal area, recreational facilities or playgrounds for children, and activities carried out by local communities or tourists.

Determination of Respondents

The determination of respondents was carried out using the accidental sampling method, as stated by Sugiyono (2017), which involves selecting individuals who are encountered by chance and meet the specified criteria. The respondents comprised 20 local community members, 10% of tourists based on the total number of visits, 15–20 business actors, and 10 policymakers, such as village heads, neighborhood leaders (RT/RW), and relevant government officials. This selection refers to Arikunto (2016), who recommends taking a sample of at least 10–25% of the population.

Water Quality Measurement

Water quality measurements at Lapin Beach were conducted at several stations along the coast with three replications. The measured parameters included temperature using a thermometer, pH using universal indicator paper, salinity using a hand refractometer, brightness using a Secchi disk, and current velocity. The measurements aimed to assess the suitability of the waters for supporting marine ecotourism.

Data Analysis

Several parameters are required to determine the feasibility of Lapin Beach, Rupat Island, as a marine ecotourism area. These

include the beach slope based on the Coastal Resources Management Project (MCRMP, 2004) and the land suitability index for coastal tourism in the recreation category. Analysis of water quality at Lapin Beach for ecotourism activities, referring to the Decree of the Minister of Environment of the Republic of Indonesia No. 22 of 2021 concerning Marine Water Quality Standards for Marine Tourism, and SWOT analysis.

Ecotourism Suitability Index

The coastal ecotourism suitability was analyzed using a matrix based on ten parameters. The purpose is to ensure that Lapin Beach is suitable for designation as a coastal tourism area according to established standards (Yulianda, 2007).

$$IKW = \sum [Ni/Nmax] \times 100\%$$

Explanation:

IKW	:	Tourism Suitability Index (%)
Ni	:	Value of the i-th parameter (weight × score)
Nmax	:	Maximum value of a given tourism category

The parameters used as criteria for the coastal tourism suitability index in the recreation category in this study include: Water depth, Beach type, Beach width, Bottom material, Current velocity, Beach slope, Water clarity, Land cover, Dangerous biota, and Freshwater availability.

SWOT Analysis

The SWOT analysis used in this study is presented in Table 1.

Table 1. SWOT Matrix Format

Internal / External	Strengths	Weaknesses
Opportunities	SO Strategy Utilizing strengths to take advantage of opportunities	WO Strategy Minimizing weaknesses to capitalize on opportunities
Threats	ST Strategy Leveraging strengths to overcome or mitigate threats	WT Strategy Reducing weaknesses to avoid or lessen potential threats

SWOT analysis examines the overall potential of marine ecotourism at Lapin Beach. Through this analysis, the strengths and weaknesses of Lapin Beach's marine ecotourism are identified, along with the opportunities that can be leveraged and the potential threats.

The assessment of strengths, weaknesses, opportunities, and threats related to the development of Lapin Beach was based on the results of field observations, interviews, and questionnaires. Each SWOT element was linked to obtain alternative strategies.

3. RESULT AND DISCUSSION

General Condition of the Study Area

Tanjung Punak, located in North Rupat District, Bengkalis Regency, Riau, is approximately 75 km from the Tanjung Kapal Roro Port. It is in the northern part of Rupat Island and directly borders the Malacca Strait and Malaysia. The beach has a coastline stretching about 17 km. Lapin Beach is also surrounded by natural vegetation such as pine trees (*Pinus* sp), coconut palms (*Cocos nucifera*), and Ketapang (*Terminalia catappa*). Its location facing directly toward the Malacca Strait makes the area vulnerable to abrasion caused by high waves.

Lapin Beach, Ketapang Beach, and Benut Lestari Beach are leading tourist destinations in North Rupat. Intensive tourism activities around the beach and river estuaries pose a risk of environmental degradation. Nevertheless, the calm atmosphere and beautiful natural scenery make it popular as a place to relax. Another attraction is the local culinary tourism of North Rupat, which includes melake cake, parang fish crackers, asam paye preserves, and snapper head curry, which are available along the beach.

Attractions and Facilities Available at Lapin Beach

Tourist attractions are the main potential of Lapin Beach to attract visitors. Its primary advantage lies in the beauty of its natural scenery, clear waters, stretches of white sand, and rows of pine trees that line the coastline. Its strategic location, in the northern part of Riau Province and directly facing the Malacca Strait, further strengthens Lapin Beach's image as an appealing tourism area. The clean sand area is highly suitable for relaxing activities, while the pine tree zone can be utilized for outbound

activities, nature play areas, and cool, comfortable family picnic spaces.

Food Stalls and Snack Vendors

Visitors along Lapin Beach can find various food stalls and traditional snacks typical of North Rupat, such as melaka cake, nagasari, sago noodles, and various seafood dishes. One unique feature that is an added attraction is selling fresh fish directly from local fishermen (Figure 2). In addition to enhancing the culinary experience, this activity also positively impacts the local community's economy.

Figure 2. Fresh Fish at Lapin Beach

In addition to selling fresh fish, the local community around Lapin Beach also provides supporting tourism facilities such as gazebos and food stalls. Comfortable gazebos and traditional snacks along the coastline enhance visitor comfort and the overall tourism experience. These facilities serve as resting spots where tourists can relax while enjoying the beach atmosphere and sampling local culinary offerings. Gazebo and snack stalls can be seen in Figure 3.

Figure 3. Gazebo and Snack Stalls

Photo Spot Structures

Since 2022, several photo spots have been constructed to enhance visual appeal and tourist experience, serving as a magnet for visitors. In addition to enjoying the scenery, tourists can capture moments with the stunning sunrise background and other iconic spots (Figure 4). These facilities beautify the beach and strengthen Lapin Beach's image as an Instagram-worthy destination.

Figure 4. Photo Spot Structure

Pine Tree Spot

The pine tree area was initially planted as a coastal protection measure against abrasion, but it has now developed into a favorite tourist spot (Figure 5). These trees grow in neat rows and create an incredible natural atmosphere, supporting leisurely walks and picnics. In addition to their aesthetic value, pine trees serve essential ecological functions, such as protecting the shoreline, providing habitats for flora and fauna, and supporting ecosystem balance.

Figure 5. Pine Tree Spot

Access to Lapin Beach is relatively easy, especially via the Tanjung Kapal Roro Port using motorcycles, cars, and buses. The land route has only one central access point, facilitating transportation and visitor data collection. Another alternative is the sea route via the Dumai–Selingsing speedboat, which is only accessible to passengers and motorcycles.

Tourism Stakeholders' Perceptions of Marine Ecotourism at Lapin Beach

The Lapin Beach area plays a significant role in improving the livelihoods of the surrounding community. Table 2 presents the questionnaire results distributed to tourism

stakeholders, including residents, tourists, business actors, and policymakers around Lapin Beach.

Table 2. Questionnaire Results on the Perceptions of Tourism Stakeholders at Lapin Beach

No.	Parameter	Respondent (%)			
		Local Community	Tourists	Business Actors	Policy Makers
1.	Strongly Disagree	-	-	-	-
2.	Disagree	2,7	5,8	1,3	1,3
3.	Neutral	8,47	8	6,7	10
4.	Agree	62,7	51,3	53	36
5.	Strongly Agree	26	35,07	38,7	52,7

Tourists

Lapin Beach is a popular tourism destination among both local and out-of-town visitors, particularly due to its well-maintained cleanliness and ease of access, approximately four hours from Pekanbaru and two hours from Dumai. Interviews with tourism stakeholders revealed that visitor numbers tend to increase during weekends, public holidays, and especially during Eid al-Fitr. Tourists have responded positively to the efforts of the local community in maintaining the beach's cleanliness, organizing vendor areas, and providing essential public facilities such as toilets, bathrooms, and prayer rooms. Improving infrastructure, collaboration between local communities and government, and effective tourism promotion are key strategies for sustainable coastal tourism development (Ali et al., 2024). Survey results indicate that 86.9% of tourists agree or strongly agree with developing Lapin Beach as a marine ecotourism area, demonstrating strong public support for the initiative.

Business Actors

Business actors at Lapin Beach play an essential role in supporting tourism development through culinary businesses, accommodations, souvenir shops, and seafood sales. They consist of residents and migrants seeking livelihoods in the marine ecotourism area. Based on Table 4, interview results show that 38.7% strongly agree, 53% agree, 6.7% are neutral, and 1.3% disagree with the development of ecotourism. No respondents stated strong disagreement. This indicates that most business actors support the development of Lapin Beach as a marine ecotourism area.

Local Community

The local community plays a vital role in preserving and developing marine ecotourism at Lapin Beach to ensure sustainability and generate positive economic impacts. Community involvement is key to maintaining the tourism area's sustainability while improving its welfare. Based on Table 2, 26% of respondents stated strong agreement, 62.7% agreed, 8.47% were neutral, 2.7% disagreed, and 0% strongly disagreed with ecotourism development. These results indicate that most of the local community supports the development of Lapin Beach's potential as a marine ecotourism area. This support is an essential form of social capital in managing sustainable tourism.

Policymakers

Policymakers play a vital role in developing marine tourism at Lapin Beach, particularly through the provision of infrastructure, regulation of access, and the formulation of management policies. They are also responsible for guiding local communities and tourism businesses in attracting visitors. In addition, policymakers have the authority to impose sanctions on tourists who violate established regulations. Based on interview results, 88.7% of policymakers strongly agreed or agreed with the development of Lapin Beach as a marine ecotourism area (Ali et al., 2024). Overall, the support from tourists, business actors, local communities, and policymakers reflects a collective commitment to promoting ecotourism development in Lapin Beach.

Supporting Factors for Marine Ecotourism Activities at Lapin Beach

Supporting factors for marine ecotourism include basic facilities such as mosques/prayer rooms and toilets, as well as amenities like local restaurants serving regional dishes. In addition, road accessibility to the beach and visual

attractions such as parks with attractive photo spots also play an essential role (Table 3).

Table 3. Supporting Factors for Marine Ecotourism Activities at Lapin Beach

No.	Supporting Factors	Description
1.	Beach Location	Relatively easy to reach and visit, as it is only about 2 hours from Dumai City
2.	Mosque/Prayer Room	There is one prayer room (mushalla)
3.	Public Toilets	There are two public toilets.
4.	Food Stalls	There are rows of food stalls that serve traditional foods of North Rupat
5.	Photo Spot	There is a structure that can be used as a photo spot location
6.	Transportation	Accessible using public transportation or private vehicles.
7.	Cleaness	The beach is relatively clean, and trash bins are available around the beach area.
8.	Parking Area	There is a spacious parking area
9.	Pine Tree Spott	Functions as a natural barrier to prevent coastal abrasion
10.	Community	There is a spacious parking area
	Friendliness	Functions as a natural barrier to prevent coastal abrasion

Water Quality Parameters of Lapin Beach

Water quality parameters are supporting data for marine ecotourism and are helpful for future marine ecotourism development. The results of water quality measurements (temperature, water transparency, depth, current velocity, pH, and salinity) from the three stations are presented in the water quality conditions obtained based on field or site observations (Table 4).

Table 4. Water Quality Measurements at Lapin Beach

Station	Coordinates	Temperature (°C)	Water transparency (cm)	Depth (m)	Current velocity (m/s)	pH	Salinity (ppt)
I	2°09'13,7" U 101°70'94,0" T	30,4	42	0,58	0,4	7	28
II	2°09'15,2" U 101°70'90,3" T	30,4	38	0,54	0,45	7,2	29
III	2°09'23,7" U 101°70'81,1" T	33,2	40	0,56	0,5	7,5	29

Based on Table 4, the water temperature at Lapin Beach ranges from 30–33°C, with the lowest temperature recorded at Station I (30.4°C) and the highest at Station III (33.3°C). The highest water transparency was recorded at Station I at 40 cm, and the lowest at Station II at 38 cm, influenced by location and depth. Water depth varies between 0.54 and 0.58 m, with an average of 0.56 m, with Station I having the deepest depth.

Water current velocity ranges from 0.4 to 0.5 m/s, with an average of 0.45 m/s; the highest current was recorded at Station III. The water's acidity (pH) ranges from 7 to 7.5, averaging 7.25. Salinity varies between 28 and 29 ppt, with the lowest salinity found at Station I due to its proximity to the estuary, where the mixture of brackish water reduces salt concentration.

Slope of Lapin Beach

The slope of Lapin Beach was measured by dividing the depth by the distance from the shoreline (18 m) and multiplying by 100%. The slope measurement results of Lapin Beach are presented in Table 5.

Table 5 shows a slight variation between stations in the beach slope measurements at Lapin Beach. The average slope ranges from 3% to 3.22%. Lapin Beach's slope falls into the gently sloping category, with an average of

3.11%. The highest slope value was recorded at Station I, while the lowest was at Station II.

Table 5. Beach Slope

No	Parameter	Score (N)			Weight (B)	Total Score (NxB)		
		I	II	III		I	II	III
1.	Water Depth (m)	4	4	4	5	20	20	20
2.	Beach Type	3	3	3	5	15	15	15
3.	Beach Width (m)	4	4	4	5	20	20	20
4.	Water Substrate Material	3	3	3	4	12	12	12
5.	Current Speed (m/s)	1	1	1	4	4	4	4
6.	Beach Slope (°)	4	4	4	4	16	16	16
7.	Water Clarity	1	1	1	4	4	4	4
8.	Coastal Land Cover	3	3	2	4	12	12	8
9.	Dangerous Biota	4	4	4	4	16	16	16
10.	Availability of Freshwater	3	4	4	4	12	16	16
Tourism Suitability Index Value (Ni)						131	135	131
Maximum Suitability Score (N max)							156	
Tourism Suitability Index (Ni / N max x 100%)						83,97	86,53	83,97

Marine Tourism Suitability Index

The Lapin Beach area was assessed for suitability for tourism activities such as sand play, swimming, and beach sports based on 10 parameters. Tourism suitability was determined through a land suitability analysis derived from the multiplication of scores and weights for each parameter in each type of tourism activity. The suitability percentage was obtained from the total value of all analyzed parameters, allowing for identifying the area's appropriateness as a marine ecotourism site.

The analysis results show that all three observation stations have a high suitability index, with Station I and III scoring 83.97% and Station II scoring 86.53%. All values fall into the S1 category or are highly suitable for marine ecotourism recreational activities. Stations I, II, and III locations have land suitability percentages indicating that the area is feasible to develop as an ecotourism zone by considering the potential of natural resources and the existing environmental carrying capacity. Each tourism activity has specific resources and ecological requirements for developing the tourist attraction. The tourism suitability index parameters used in this study include: water depth, beach type, beach width, seabed material, current Speed, beach slope, water clarity, land cover, presence of dangerous biota, and freshwater availability. Marine Tourism Suitability Index: The analysis is seen in Table 6.

Table 6. Marine Tourism Suitability Index

Station	Depth (m)	Distance Seaward	Slope (%)
I	0,58	18 m	3,22
II	0,54		3
III	0,56		3,11
Total	1,68		9,33
Average	0,56		3,11

Based on the calculation results, the suitability index values for beach recreation activities at Lapin Beach are 83.97% at Station I, 86.53% at Station II, and 83.97% at Station III, all of which fall into the S1 category or are highly suitable for marine ecotourism activities. The highest marine tourism suitability index value was recorded at Station II. Based on observations and data analysis, the parameters classified as highly suitable in supporting marine ecotourism at Lapin Beach include:

Water Depth. All stations have a depth of less than 1 meter, which is classified as highly suitable (score 4) for water activities such as swimming and playing in the water. Beach Width. The beach width at all stations exceeds 15 meters, making it highly suitable (score 4) for various recreational activities.

Beach Slope. The average slope is 3.11%, which falls into the gentle category and is considered highly suitable (score 4). Hazardous Biota. No hazardous biota were found, making it highly suitable (score 4) for tourist safety. Availability of Freshwater. Freshwater is available within 0.5 km from the site, classified as highly suitable (score 4).

Meanwhile, the parameters classified as suitable include: Beach Type: Sandy beaches with pine and coconut vegetation are classified as suitable (score 3). Seabed Material: The

substrate is predominantly sand, moderately suitable (score 3). Beach Land Cover: Stations I and II are moderately suitable (score 3), while Station III is less suitable (score 2) due to the presence of residential areas.

The parameter categorized as not suitable is: Current velocity: The current Speed is < 0.17 m/s at all stations, which is categorized as not suitable (score 1) for swimming activities due to being too slow. Water clarity: The visibility ranges from 38–42 cm, which is considered not suitable (score 1) for underwater visual tourism. Several physical parameters are linked to biological and geomorphological conditions to assess coastal tourism land suitability. Yulianda's (2007) tourism suitability index applies to beaches with specific characteristics, such as gently sloping sandy shores and clear waters. However, this method is not relevant for rocky beaches or high cliff-type coasts, such as those in Sweden and Norway, which are popular for hiking and enjoying ocean views.

Overall, the analysis confirms that Lapin Beach is highly suitable for development as a sustainable marine tourism area, provided that any tourism activities developed continue to consider the environmental carrying capacity and the potential of existing local resources.

Lapin Beach Management Strategy for Development Based on SWOT Analysis

A management strategy plan for developing the area as a marine ecotourism site is determined based on a SWOT analysis, which identifies strengths, weaknesses, opportunities, and threats. SWOT analysis is used to identify the interrelations between ecotourism resources and other types of resources. Therefore, all stakeholders, particularly the local community, need to understand the strengths and weaknesses possessed by the area and its ecotourism objects (Sawindri, 2016).

Identification of Internal Strategic Factors
Strength

Natural Attractions and Scenic Beauty. Lapin Beach possesses natural resources that remain pristine and support the development of ecotourism, such as white sand, coastal vegetation, and traditional culinary offerings. Its unspoiled condition and cleanliness make it a favorite destination for both local and non-local tourists.

Local Community Hospitality. The local community is known for being friendly and polite, which enhances the comfort of tourists. This serves as an added value and aligns with the government's Sapta Pesona program.

Creativity of Local Entrepreneurs. Local entrepreneurs offer various attractions such as culinary delights, ATV rentals, and sales of local souvenirs. This creativity serves as a unique attraction while also supporting the improvement of the local community's economy.

Weakness

Poorly Maintained Facilities**.** Facilities at Lapin Beach, such as accommodations, are not yet operational, and there are no multipurpose buildings or tourist information centers available, which reduces visitor comfort. Lack of Beach Security**.** The beach does not have permanent security personnel for visitor safety. Lifeguards are only present during major holidays, while on regular days, there is insufficient supervision.

Inefficient Road Access. The road leading to Lapin Beach is still under construction in several sections. Although it can be reached by various vehicles, the incomplete road conditions may hinder tourist visits.

Identification of External Strategic Factors
Opportunities

Improving the Welfare of Local Communities**.** The development of marine ecotourism at Lapin Beach has the potential to create job opportunities and boost the local economy through businesses such as culinary services, accommodations, tour guides, and souvenir sales.

Commitment of the Local Government**.** The local government demonstrates a strong commitment to developing infrastructure and tourism facilities that meet national standards, while still preserving local culture and wisdom. Increasing Tourist Interest**.** With its natural potential, culinary uniqueness, and high tourism suitability value, Lapin Beach is capable of attracting both local and non-local tourists, provided it is supported by good road access.

Threats

Environmental changes caused by poor waste management or the influx of external cultures can reduce the physical and socio-cultural quality of Lapin Beach, thereby requiring strict supervision. Tsunamis, earthquakes, and storms are unpredictable

threats that can damage tourism infrastructure. Mitigation efforts and environmental conservation norms need to be enforced.

The arrival of outside tourists has the potential to erode local cultural and religious values. The government and local communities need to strengthen regulations to preserve local culture. A lack of awareness about cleanliness and environmentally harmful activities contributes to environmental degradation, which must be prevented through education and appropriate policy support.

SWOT Matrix

Strength – Opportunity (S-O) Strategy

The Strengths–Opportunities strategy is a power-opportunity approach, which means leveraging strengths to capitalize on opportunities. There are two Strength–Opportunity strategies that can be implemented in the development of marine ecotourism in the Lapin Beach area, as follows: Utilize the natural environmental attractions and effective road connections to attract visitors through the development and promotion of marine tourism based on the ecotourism concept. Create employment opportunities and reduce the poverty rate while preserving environmental sustainability.

A region to be developed into a tourism area certainly requires a well-planned, comprehensive, and integrated strategy to achieve the desired targets and minimize the emergence of negative impacts, whether from an ecological, economic, socio-cultural, or legal perspective (Susilawati, 2016).

Weakness–Opportunity (W–O) Strategy

The Weakness–Opportunity strategy is a strategy in which existing weaknesses are minimized to take advantage of available opportunities. There are three Weakness–Opportunity strategies that can be implemented for the development of marine ecotourism in the Lapin Beach area, as follows: Enhancing the creativity of local tourism entrepreneurs to improve the community's economy and attract visitors through this creativity. Improving facilities and infrastructure at Lapin Beach to increase comfort for visiting tourists. Reorganizing and strengthening security supervision to monitor visitors around the beach area.

To develop the Lapin Beach area and attract tourists, it is essential to enhance creativity in producing unique souvenirs representative of the region. This effort aims to promote the ecotourism sector and improve the local community's economy. Tourist satisfaction depends on the quality and quantity of existing facilities and infrastructure. In addition, proper regulation and strict supervision of safety around the coastal waters are necessary to enhance the tourist experience and comfort for tourists (Yulianda et al., 2019).

Strength – Threat Strategy (S-T)

Strength–Threat Strategy refers to an approach that uses strengths to overcome threats. There are three Strengths–Threat strategies that can be implemented in the development of marine ecotourism in Lapin Beach, as follows:

Forming a special team consisting of local community members and volunteers to monitor activities at Pantai Lapin. Utilizing natural resources without exceeding the environmental carrying capacity would have a negative impact on the beach. Providing education to all parties regarding the sustainable use of natural resources.

Negative environmental impacts often arise when tourism areas such as Pantai Lapin are utilized due to the lack of awareness among the local community, tourists, and related stakeholders. Therefore, it is necessary to form a monitoring team consisting of residents and volunteers and improve environmental education for all parties so that the area's use does not exceed its carrying capacity. According to Erniyati (2023), ecological pollution will continue without commitment to written regulations and education-based awareness.

Weakness – Threat (W-T) Strategy

Threat Strategy is a strategy in which weaknesses can be minimized to avoid threats. Three strategies can be implemented in developing marine ecotourism in the Lapin Beach area as follows.:

Increasing awareness among all relevant authorities and providing education to the community and tourists regarding the importance of protecting the environment, preserving ecosystem integrity, and respecting local customs and traditions. Conducting outreach on the importance of environmental conservation, disaster mitigation, and pollution hazards. Involving the community, tourists, and government in preserving the environment surrounding the marine ecotourism area.

Lapin Beach in North Rupat, Riau, holds great potential as a marine ecotourism area due to its beautiful white sand and strategic location, which faces directly towards the Strait of Malacca and is near Malaysia. However, challenges such as inadequate infrastructure, lack of promotion, and limited community participation remain major obstacles in its development.

To support sustainable ecotourism management, communities and visitors must understand the importance of marine and coastal ecosystems and local customs and cultural norms, fostering a sense of care for both the environment and local culture. The involvement of local communities is essential as the center of transformation in the tourism industry (Laksmi et al., 2021), while government and policy stakeholders also hold a strategic role (Mandic & Kennell, 2021). Marine ecotourism development requires a conservation-based approach to coastal areas, including the protection and sustainable use of resources. According to Angessa et al. (2022), ecotourism is a professional tourism activity containing educational elements, respecting cultural heritage, supporting local community participation and well-being, and environmental conservation.

The following are several strategies for developing marine ecotourism in Lapin Beach, North Rupat: Road Construction and Improvement: Ensuring that road access to Lapin Beach is easily reachable and in good condition, especially from the port or nearest transportation hub. Provision of Transportation Facilities: Developing convenient and environmentally friendly local transportation options, such as public transport or vehicle rentals. Enhancement of Basic Facilities: Constructing and maintaining essential facilities such as toilets, prayer rooms, tourist information centers, and adequate parking areas.

Diversification of Ecotourism Activities: In addition to enjoying the beach, develop other activities such as snorkeling or diving (if there is potential for coral reefs), kayaking, birdwatching (if supported by coastal ecosystems), or trekking in the surrounding area. Education and Conservation: Implement educational programs to maintain marine environmental cleanliness and sustainability for tourists and local communities. These efforts involve tourists in conservation activities such as mangrove planting or beach clean-ups.

Development of Local Culinary Centers: Encourage the establishment of eateries that serve traditional local dishes made from locally sourced ingredients. This will provide tourists with an authentic culinary experience while empowering the local economy. Creation of Attractive Photo Spots: Build art installations or parks with unique and Instagrammable designs that remain in harmony with nature and do not harm the environment.

Utilization of Digital Media: Optimize promotion through social media, official tourism websites, and collaborations with influencers or travel bloggers. Building a Unique Narrative: Attract attention by highlighting Pantai Lapin's uniqueness, such as the "Mandi Safar" tradition or other interesting natural phenomena, as well as the local culture of North Rupat.

Participation in Tourism Events: Participate in national and international tourism exhibitions to introduce Pantai Lapin to a broader audience. Community-Based Tour Packages: Develop tour packages that involve direct experiences with local communities, such as learning traditional handicrafts or participating in fishing activities.

4. CONCLUSION

Based on the results of land suitability analysis and existing potential, the Pantai Lapin area in North Rupat, Riau, falls into the S1 category (highly suitable) for development as a marine ecotourism destination. The tourism suitability index values at the three observation stations (Station I: 83.97%, Station II: 86.53%, Station III: 83.97%) indicate that the area meets biophysical requirements to support various tourism activities such as sand play, swimming, and other beach recreation. Natural potential, such as white sand, coastal vegetation, and local culinary specialties, is the main attraction supporting tourism development.

To realize sustainable development, the ecotourism management strategy for Pantai Lapin should focus on improving infrastructure, empowering local business actors, creating job opportunities, and protecting the environment and local culture. Active community participation and government policy support balance economic, social, and ecological aspects. With proper planning and wise management, Pantai Lapin has the potential to become one of the leading marine ecotourism destinations in Riau Province, while also making

a tangible contribution to improving local community welfare and preserving the coastal environment.

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