

ANALYSIS OF MANGROVE FOREST ECOSYSTEM SUPPORT CAPACITY FOR DEVELOPMENT ECOTOURISM IN ANAK SETATAH VILLAGE, KEPULAUAN MERANTI REGENCY

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ABSTRACT

This research was conducted from April 2022 to June 2022 in Anak Setatah Village, Meranti Islands Regency, Riau Province. This study aimed to analyze the carrying capacity of mangrove forest ecosystems, the level of participation, and the perceptions of local communities towards developing mangrove ecotourism in Anak Setatah Village. The method used in this research is the survey method, which is data collection by interview. The data collected consists of primary and secondary data. Preliminary data includes water quality measurement data, carrying capacity (area measurement, length of visit time, physical data of the area), general condition of the research location, questionnaires, and documentation. Secondary data came from journals on mangrove ecotourism potential. Then, the sampling of respondents was determined/selected purposively (purposive sampling). The results showed that the Anak Setatah Village mangrove ecotourism area had several activities: tracking, sitting, photography, and education. The calculation results of the area's carrying capacity in the mangrove ecotourism of Anak Setatah Village are 168 people/day. This means that the maximum number of visitors allowed to do tourist activities in mangrove ecotourism is 168 visitors per day, with the time provided by the manager for traveling being 12 hours. The perception of the Anak Setatah Village community shows promising results, with the IPR category strongly agreeing, and the mean count category is classified into a high category.

Keywords: Area Carrying Capacity, Anak Setatah Village, Mangrove Ecotourism.

1. INTRODUCTION

Riau Province is a province in Indonesia with a mangrove forest ecosystem covering an area of 2345.17 ha¹. The extent of mangrove forests owned by Riau Province can be a center for research and development of mangrove forests on the island of Sumatra. Mangrove forests grow in river estuaries and coastal areas that can develop in tidal areas². Mangrove forests have various functions and benefits essential to human life, both ecologically, socially, and economically. Based on Warningsih et al.³, mangrove ecosystem

areas have economic benefits, especially for communities around coastal areas, so they need to be preserved. Ecotourism is a tourist activity carried out because of education, as a business / economic sector, by showing cultural heritage, welfare, participation of residents, and efforts to conserve natural resources and the environment⁴. Activities carried out in ecotourism exclusively allow all people to see, know, and enjoy the natural, intellectual, and cultural experiences of local communities⁵. Ecotourism is currently an essential economic activity that provides

opportunities for tourists to receive experiences about nature and culture to learn and know how important the protection of local biological and cultural diversity⁶. According to Wardhani⁷, mangrove forests have tourist value by attracting plants and fauna into the ecosystem. Mangrove forest ecotourism exists in various regions, including Anak Setatah Village.

The environmental carrying capacity of marine tourism activities is defined as the maximum number of people who can utilize an area without causing changes to the physical environment and maintaining the quality of the recreational experience⁸. Given that the development of marine tourism is not mass tourism, it is easily damaged, and space for visitors is minimal, it is necessary to determine the area's carrying capacity. The bearing capacity calculation must specify the number of tourists visiting mangrove tourism. This study aims to analyze the carrying capacity of mangrove forest ecosystems, the level of participation, and the perceptions of local communities towards developing mangrove ecotourism in Anak Setatah Village.

2. RESEARCH METHOD

Time and Place

This research was conducted from April 2022 to June 2022 and was located in Anak Setatah Village, Meranti Islands Regency, Riau Province.

Method

The method used in this research is the survey method, which is data collection by interview. The data collected consists of primary and secondary data. Primary data includes water quality measurement data, carrying capacity (area measurement, length of visit time, physical data of the area), general condition of the research location, and questionnaire data. Secondary data about the potential of mangrove ecotourism comes from journals.

Procedure

Water quality measurements were made three times so that the results obtained were close to the truth and reduced the occurrence of too much bias. The parameters measured are temperature, salinity, and pH. Then, the measurement of carrying capacity is carried out directly at the research site by measuring each spot or type of activity, as well as the kinds of activities that exist at tourist sites, namely tracking, sitting relaxed, photography, and education. In this study, samples of community participation and perceptions were taken directly at the research location through interviews with respondents and filling out questionnaires. The questionnaire data obtained is described, and the data collected includes: 1) Community participation in mangrove ecotourism development activities includes planning, implementation, supervision, evaluation, and utilization stages. 2) Community perceptions of mangrove ecotourism (positive impacts, advantages and attractiveness of the area, infrastructure support, stakeholder support, business opportunity development strategies, and social impacts of ecotourism).

Data Analysis

Supportability

Processing carrying capacity data analysis using the Microsoft Excel 2016 for Windows computer program. The calculation of the carrying capacity of the mangrove ecotourism area is analyzed quantitatively using the calculation formula for the carrying power of the site (DDK)⁹, as follows:

$$DDK = K \times \left(\frac{lp}{lt}\right) \times \left(\frac{Wt}{wp}\right)$$

Description:

- DDK : Area carrying capacity (people)
- K : Ecological potential of visitors per unit area (people)
- Lp : Area or length of area that can be utilized (m or m²)
- Lt : Area unit for a specific category (m or m²)
- Wt : Time provided by the area manager for tourism activities in

one day (hours/day)
Wp : Time spent by visitors on each
specific activity (hours/day)

Community Participation and Perception

A Likert Scale questionnaire can calculate the level of community participation in mangrove ecotourism development. The categories of this scale can be seen in Table 1.

Table 1. Scoring categories of community participation and perception

Participation	Category	Perception
Very High (ST)	C	Strongly Agree (SS)
High (T)	C	Agree (S)
Moderately High (N)	N	Neutral (N)
Low (R)	A	Disagree (TS)
Very low (RS)	A	Strongly Disagree (STS)

Group A is the category (R, RS, STS, and TS), and Group C is the category (ST, T, SS, and S). Category N is not grouped because (N) is not a limiting factor but is in a neutral position¹⁰. After obtaining the assessment data from the questionnaire, the scoring is calculated with the following equation:

$$IPR = C - A/100$$

Table 2. Criteria for participation index score and respondent perception

Participation	Score value	Perception
Very High	(1.0)	Strongly Agree
Neutral	(0.0)	Neutral
Very Low	(-1.0)	Strongly Disagree

The next step is to measure the level of community participation and perception of all respondents using the Microsoft Office Excel 2016 application. The category measured is the average mean. The classification of the value is mean (>3.66) high, mean (2.33-3.65) medium, and mean (1-2.32) low.

3. RESULT AND DISCUSSION

General Situation of the Research Location

Anak Setatah Village is located in West Rangsang District, Meranti Islands Regency, Riau Province, geographically situated at 01°01'33" - 01°05'29" LU and 102°10'29" - 103°16'43" East. Anak Setatah Village has an area of 1062 Ha, with the following boundaries: The north borders the Malacca Strait, the south borders Sialang Pasung, the west walls Bantar Village, and the east walls Segomeng Village.

Mangrove Ecotourism Potential in Anak Setatah Village

Anak Setatah Village mangrove forest has excellent potential to be developed as a tourist attraction, and the interest in ecotourism is its potential. Tourism potential is everything found in tourist areas and attracts visitors to the tourist spot¹¹. The potential of the Anak Setatah Village mangrove forest is diverse and has attractions such as the richness of flora and fauna. The flora in the ecotourism area is mangroves with various types of mangroves, namely *Rhizophora apiculata*, *R.mucronata*, *Avicennia alba*, and *A.marina*. At the same time, the fauna found in the ecotourism area are fish, crustaceans, mammals, reptiles, birds, insects, and molluscs¹².

According to Yoswaty et al.¹², the level of mangrove density in the Anak Setatah Village ecotourism area is classified as very dense, with a thickness that reaches 1799 ind/ha. The mangrove forest ecotourism area in Anak Setatah Village has an excellent suitability index. The mangrove area is very supportive of ecotourism development in Anak Setatah Village.

Water Quality Parameters

The measurement results of water quality parameters can be seen in Table 3.

Based on Table 3, the measurement results of water quality parameters that have been carried out show that the temperature obtained is around 30°C, and the salinity of the waters in Anak Setatah Village is about 29 ppt.

Table 3. Water quality parameters in Anak Setatah Village

No.	Parameters	Results
1.	Temperature	30 C ⁰
2	Salinity	29 ppt
3	pH	7

Supportability Analysis

The calculation of the carrying capacity of the Anak Setatah Village mangrove tourism area can be seen in Table 4.

Table 4. Supportability of the Anak Setatah Village mangrove tourism area

No.	Activity Type	K (person)	Lp (m ²)	Lt (m ²)	Wt (hour)	Wp (hour)	DDK (person/day)
1	Tracking	1	720	50	12	2	86
2	Sit back and relax	1	7	5	12	1	17
3	Photography	1	50	50	12	0.25	48
4	Education	1	66	25	12	2	16
Total							168

Based on the calculations that have been carried out in Table 4, the carrying capacity in the mangrove ecotourism area of Anak Setatah Village has several activities, namely tracking, sitting relaxed, photography, and education. The number of people who can be accommodated in tracking activities is 86 people/day; in leisure activities, the number of people who can be accommodated is 17 people/day; in photography activities, the number of people who can be accommodated is 48 people/day, and in educational activities, the number of people who can be accommodated is 16 people/day.

The maximum carrying capacity of the area in the mangrove ecotourism of Anak Setatah Village is 168 people/day, meaning that the maximum number of people who can be allowed to do tourism activities in mangrove ecotourism is 168 visitors per day, with the time provided by the Anak Setatah Village mangrove tourism manager for traveling is 12 hours. The time visitors spend carrying out activities in the tourist area depends on the length of time visitors carry out training. This is to

research Lalika¹³, which states that ecotourism development can be studied based on the size of time visitors spend traveling.

According to Rodiana et al.¹⁴, the area's carrying capacity is the number of people or visitors who can be accommodated in the space provided at a particular time without causing disturbance to both nature and humans. According to Nofiansyah et al.¹⁵, if the number of people doing tourism activities is within the carrying capacity, it will impact the inconvenience of visiting mangrove tourism. Based on the results of interviews with managers, the number of visitors on peak days and quiet days is known to average 70 visitors per day. This value is still smaller than the carrying capacity value of the Anak Setatah Village mangrove forest ecotourism area, which is 168 people/day.





However, it is different when, on certain days, such as Earth Day activities, the environment, and commemorating other major holidays, the average visitor can reach 200-300 people in one to two days. These conditions can pose a significant

threat to damage to the mangrove ecosystem. Therefore, the carrying capacity of the area can be used to minimize the impact caused by the number of visitors who exceed its capacity, with the hope that tourism objects and attractions can be preserved so that ecotourism management becomes an important aspect that must be appropriately managed to ensure the life of ecosystems in the ecotourism environment and will determine the level of sustainability of an ecotourism activity.

Types of Activities of Mangrove Forest Ecotourism Areas in Anak Setatah Village

The types of activities in the mangrove forest ecotourism area in Anak Setatah Village were identified by direct observation at the research location. Identification is done to obtain information about the type and length of time tourists enjoy each object in the mangrove ecotourism area.

Table 5. Types of activities in the mangrove forest Ecotourism Area in Anak Setatah Village

No.	Type of Activity	Description	Documentation
1	Education	Visitors can conduct teaching and learning activities that are study tours because there are facilities for discussion, and they can also be done while traveling around with the guidance of mangrove tourism area managers.	
2	Tracking	Tracking serves as a connecting path for every other facility in the mangrove tourism area. The width of the tracking path is 1.5 m. It is made of wood, painted in colorful colors, and surrounded by mangrove forests. The course is made of branched winding and has a height of about 3 m from the ground.	
3	Sit back and relax.	Visitors can sit back and relax while observing and enjoying nature. This place can also be used to take a short break after touring the area. This relaxing seat is made of wood, painted blue, and open. Each chair is provided with a trash can nearby.	
4	Photography	This facility is provided for visitors who want to capture moments by taking pictures with relatives and friends. The manager offers various models of photo spots so visitors stay energized.	

The activities at the research location include tracking, sitting, photography, and education. This mangrove forest tourist attraction can become an icon of the coastal area in Anak Setatah Village (Table 5).

Local Community Participation

In developing ecotourism in Anak Setatah Village, local community participation is needed to discover the potential contained in the area. The results

of interviews that have been conducted about the involvement of local communities in the development of mangrove forest ecotourism in Anak Setatah Village show that 30 respondents have been interviewed. Interviews can be seen in Figure 1. In developing ecotourism in Anak Setatah Village, local community participation is needed to discover the potential contained in the area. The results of interviews that have been conducted about the involvement of local communities in the development of mangrove forest ecotourism in Anak Setatah Village

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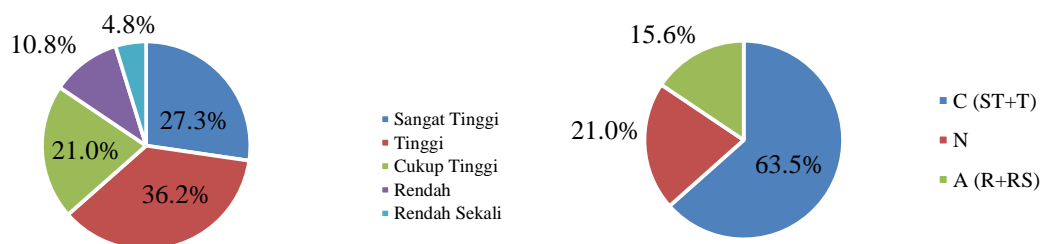


Figure 1. Frequency of local community participation in Anak Setatah Village

The results showed that the percentage of community participation from 35 people who belonged to Group C was 22 people (63.5%), 7 people (21.0%) belonged to Group N and Group A 6 people (15.6%). Based on the participation level category calculation, the development of mangrove ecotourism in Anak Setatah Village is classified as high. From the interview results, it can be concluded that the local community strongly supports the development of mangrove forest ecotourism areas in Anak Setatah Village.

Based on community participation, which includes 5 stages of activities, namely planning, implementation, supervision, evaluation, and utilization for ecotourism development, it can be concluded that without community involvement, ecotourism development will not be adequately achieved because the community is an integral part of the formation and management of an ecotourism area. The participation referred to in control is the participation of people involved in the decision-making process at

every stage of development, starting from planning, implementation, supervision, and preservation¹⁶.

Local Community Perception

In people's perceptions, five main questions will be used as parameters in the research that has been carried out. The parameters of people's perceptions can be seen in Figure 2.

Based on the calculation of the parameters of the five main questions, the total value of the community perception IPR score is 3.29, indicating the IPR value > 1, so the IPR value is very agreeable. The mean calculation value obtained is 5.87, meaning the community perception of mangrove ecotourism development in Anak Setatah Village is classified as a high category.

Local people's perceptions are needed in the development of ecotourism because community perception is a process where the community conveys their views, images or responses to the development carried out in Anak Setatah Village. Tourism attraction

whether realized or not can be assessed from perceptions which are self-

understanding¹⁷.

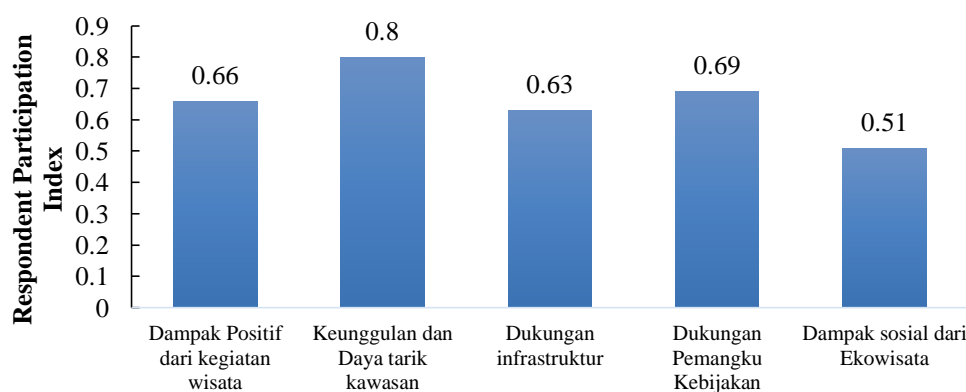


Figure 2. Local community perceptions of Anak Setatah Village

Stakeholder Perception

Each policy maker has their own role in developing an ecotourism to achieve the goal. Based on interviews conducted about policymakers' perceptions regarding the

development of mangrove ecotourism in Anak Setatah Village, 30 respondents have been successfully interviewed, which can be seen in Figure 3.

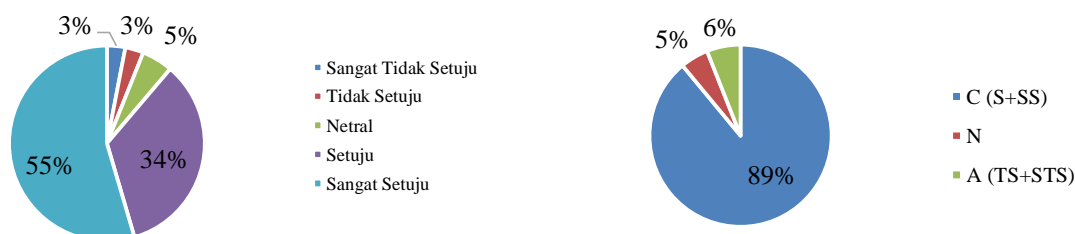


Figure 3. Frequency of policymaker perceptions

The research results in Figure 3 show that the percentage of perceptions of policymakers from 30 people who belong to group C is 26 people (89%), 2 people belong to group N (5%), and group A is 2 people (6%). Based on the calculation of the category of the level of perception of policymakers included in the category of strongly agreeing with the development of ecotourism in Anak Setatah Village, each policy maker has their respective roles in achieving the ecotourism development goals of Anak Setatah Village.

The Anak Setatah Village mangrove forest area has an excellent opportunity to become an ecotourism area, given the ecological conditions that support it. According to Winarno et al.¹⁸, the concept of ecotourism can become a reference in shaping a sustainable environment (both in

terms of economic, ecological, and socio-cultural), fostering conservation education and providing satisfaction and exciting experiences for tourists and the community also has hopes for environmental development that can increase economic value in the local community, to realize the Anak Setatah Village mangrove forest area as an ecotourism area, coordination and cooperation are needed as well as support between the village government and the community so that mangrove ecotourism development activities can be carried out.

Traveller Perception

One of the potential factors of the conditions of an ecotourism area to be developed into an ecotourism area is the potential of visitors, where with the visitors, the ecotourism can be carried out correctly.

Based on the results of interviews conducted with visitors about their perceptions of the development of Setatah

mangrove ecotourism, there are 30 respondents who have been successfully interviewed, which can be seen in Figure 4.

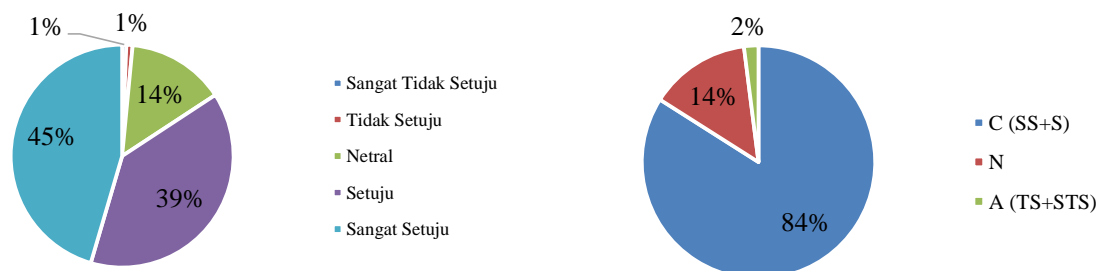


Figure 4. Frequency of tourist perception

The research results in Figure 4 show that the percentage of tourist perceptions of 30 people who belong to Group C is 26 people (84%), 4 people belong to Group N (14%), and group A is 0 people (2%). Based on the calculation of the category of visitor perception levels, it is included in the category of strongly agreeing with the development of ecotourism in Anak Setatah Village. Understanding this perception can be used to manage the mangrove ecotourism currently being developed in Anak Setatah Village. Visitor perception is an essential factor determining visitor satisfaction in traveling in an ecotourism area¹³.

4. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded as follows: Anak Setatah Village mangrove ecotourism area has several activities: tracking, sitting, photography,

and education. The total carrying capacity of the area in the mangrove ecotourism of Anak Setatah Village is 168 people/day. This means that the maximum number of visitors allowed to do tourism activities in mangrove ecotourism is 168 visitors per day, with the time provided by the Anak Setatah Village mangrove tourism manager for traveling is 12 hours. The perception of the Anak Setatah Village community shows promising results, with the IPR category strongly agreeing, and the mean count category is classified into a high category. This indicates that the community, policymakers, and tourists of Anak Setatah Village strongly agree that the area should be used as a mangrove ecotourism area.

ACKNOWLEDGMENTS

Thanks to the Education Fund Management Institution (LPDP) in the Village Research activity titled Tourism Village Development Strategy.

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