

Mangrove Ecosystem Management Strategy in Maron Beach Semarang

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Abstract

Management of mangrove ecosystem is an important agenda in conserving tourism spots in coastal area. This research aimed at examining the recreation activities done in mangrove ecosystem area and mangrove forest strategy in Maron Beach, Tambakharjo, Semarang Municipality. This research employed a survey approach using direct interviews and field observations. The repondent included the entire population in the research area. Samples of this study were selected using cluster random sampling technique. Data were collected by observations, interviews and document study, followed by SWOT analysis. The results showed that the opening of Maron Beach recreation area has given some negative impacts to the post-rehabilitation of mangrove ecosystems, reducing the function mangrove in protecting the shore from coastal abrasion, reducing ability of wind abrasion protection, weakening the environmental conditions, decreasing the number of visitors and decreasing the production of fish. Mangrove forest management should be progressive, which means that research should be done in poor and unsteady conditions which result allow the market to continuously expand, enlarge the market growth and maximize the progress. Through the implementation of a non-overlapping effort, this condition can be improved.

Keywords: Community, society, activity, management, tourist area

Introduction

Coastal and marine development in Indonesia face bitter reality and challenges in the future. These are related to limited carrying capacity of natural resources, especially on land from time to time, while the population has increased. Coastal areas are an intermediate region between terrestrial and oceanic ecosystems that have high biological productivity. The presence of nutrient supply that goes from the mainland through river flow and surface water flow, as well as the growth and development of various natural ecosystems such as mangrove forests, coral reefs, seagrass beds and estuaries, causes fertile coastal areas. The coastal forests of the various regions of Indonesia, particularly in the northern coast of Java, Sumatra, South Sulawesi, Bali and East Kalimantan have been degraded by forest destruction as well as conversion to other uses as settlements, ponds, and farmland. Currently, most of the mangrove ecosystem is in damaged condition, even in some areas, they are in very poor condition (Saparinto, 2007). Muryani *et al.* (2012) reported that mangrove degradation rate has reached 160-200 thousand ha.y⁻¹ which suggests that the main activities that contribute the most to

the decline of mangroves in Indonesia is logging for commercial purposes as well as shifting to farms.

The benefits of mangrove ecosystems related to physical functioning are as disaster mitigation such as wave absorbers and storms for the area behind them, coastal protection from abrasion, tidal waves, tsunamis, mud retention and sediment traps transported by surface water currents, preventing intrusion of sea water into the mainland, as well as a neutralizer of water pollution to some extent (Lasibani and Kamal, 2009). Other benefits of this mangrove ecosystem are as the object of ecotourism attraction, (Heriyanto and Subiandono, 2012) and as a source of medicinal plants (Saparinto, 2007).

Mangrove ecosystem serves as a habitat for various types of animals and plays an important role in the development of coastal fisheries (Heriyanto and Subiandono, 2012) because it is a breeding ground, spawning for several species of fish, shellfish, crabs and shrimp (Djohan, 2007; Kariada and Andin, 2014). There are more types of plankton in mangrove waters than in open water (Supriyanto *et al.*, 2014). Mangrove forests provide protection and food in the form of organic ingredients into the feeding chain (Hogart, 2015). Part of the mangrove

canopy is also a habitat for various types of land animals, such as monkeys, insects, birds and bats (Saprudin and Halidah, 2012). Mangrove wood can be used as firewood, charcoal materials, building materials, and pulp raw materials. Profits of direct use of mangrove forests is around Rp. 11.61 million.ha⁻¹.y⁻¹ (Supriyanto et al., 2014)

Mangrove ecosystem has the ability to control seawater intrusion through the mechanism of preventing the precipitation of CaCO₃ by root exudate bodies, reducing the salt content by organic matter from decomposition of litter, the physical role of mangrove root structure that can reduce the tidal reach to the land, and the improvement of physical and chemical properties land through decomposition of litter (Kusmana, 2014). Mangrove density contributes to the extent of accretion, sediment distribution and high surface elevation (Kumara et al., 2010). There are three main factors causing mangrove damage, namely pollution, mangrove forest conversion and excessive logging (Kusmana et al., 2003).

Semarang as the capital of Central Java can be developed for the tourism sector. Tourism development planning is known for various theories and concepts. The concept of market driven is more focused on the desire of tourists and market behavior as the foundation of development. While the concept of product driven emphasis more on tourism product development. The conditions and advantages of the product or tourism object are the main foundation in the development of tourism (Fandeli, 2000).

Currently, despite being able to attract tourist arrivals, the number of tourists has not been maximized. In order to support the development of Maron Beach as part of the willingness of marine tourism, the study of seawater quality, density and diversity of mangrove as well as economic valuation for coastal recreation areas is needed.

The purpose of this study is to investigate community participation on the impact of recreational activities in the mangrove ecosystem and strategic plan in the management of the ideal mangrove ecosystem. The results of this research are expected to be considered in the mangrove ecosystem management in the tourist area of Maron Beach, Tambakharjo, Western Semarang,

Materials and Methods

This research was conducted from November 2017 to January 2018 located along the coast of Maron Beach, Tambakharjo, Semarang. It was

divided into 11 observation stations, namely station 1 to 3 (around Silandak river and coastal), station 4 to 6 (mangrove ecosystem), and stations 7 to 11 (ponds). Specifically sampling at the eleven stations considers existing areas of mangrove rehabilitation activities.

The respondents are all users of environmental services and that often have daily activities involving direct contact with the mangrove ecosystem in coastal areas of Tambakharjo which is around 75. The respondents are selected using Simple Random Sampling of 20% of the population, i.e. 15 respondents.

According to Creswell and Clark (2017), mixed methods is a procedure for collecting, analyzing, and mixing quantitative and qualitative methods in a study or series of studies. In the socio-economic observations of the community were done through direct interviews and questionnaires. Data collections were done by observations, interviews and document study.

Data analysis

The analysis of community participation in mangrove forest rehabilitation was done by using quantitative analysis with simple statistics by calculating frequency distribution. Community participation was known from the percentage of participation form conducted by the respondents. In order to have a better understanding to the evolving values of society in relation to community participation, interviews with questionnaires were conducted.

SWOT analysis were done to identify various factors systematically in formulating a strategy based on logic by maximizing the strengths and opportunities that exist simultaneously and minimize the weaknesses and threats that exist simultaneously. According to (Nurmalasari, 2001), each internal and external factors is weighted from 1.0 (very important) to 0.0 (not important).

Result and Discussion

Impact of recreational activities on mangrove ecosystem

The condition of the mangrove ecosystem in the tourist area of Maron Beach suffered from severe damage. Many mangrove trees were damaged and died because abrasion that often hit the area. In 2010, NGOs/private sectors assisted by the local government together with the community plants mangrove trees at the research site. Based

on the observations, the condition of mangrove forest post-rehabilitation is less than optimal conditions to grow. The condition of mangrove trees continue to decline since the area is used for recreation. Whereas, the objective of rehabilitation of mangrove ecosystem area is expected to prevent the abrasion. Based on the results of interviews using a questionnaire to the public, the impacts caused by the rehabilitation in mangrove ecosystem tourism areas (Table 1.).

Reducing coastal abrasion

Currently, the area of mangrove forest in the coastal area of Maron beach is damaged due to the abrasion of sea level rise. The utilization of land and trees from the mangrove ecosystem by the community causes the non-functioning of rehabilitated mangrove ecosystems in 2010. Abrasion often occur rapidly from year to year in Maron beach. The abrasion of the sea water overflows to the ground and floods the ponds of the community. Abrasion is the process of eroding land or soil, which is mostly due to sea wave factors. When land has frequent friction with sea water, it will cause abrasion, where the land will become increasingly eroded and narrowed. It causes a decrease in land area, and the sea water will easily rise to the surface.

Based on the results of observations in the field, the researchers found that the condition of mangrove post-rehabilitation is in a bad state and less optimal. So, after the rehabilitation of the research area in the coastal area of Maron beach becomes more severe due to abrasion. It is because the mangrove ecosystem that is not functioning optimally as a protector of the beach from abrasion. Mangrove ecosystems prevent this from happening even though it is not quite optimum. With the mangrove ecosystem area as a protector of a land from sea water, the possibility of abrasion can be minimized.

Resisting the breeze of the sea

Results of observation in the field after the rehabilitation of mangrove ecosystem is very important to protect the beach from bad weather. But, the results in table 1 show that the coastal community mangrove has no benefit. As the result, it is widely exploited by the community. The existence of mangrove ecosystems can be as a protector on the coast, which the strong sea breeze blowing to the ground will be retained and absorbed. Mangrove ecosystems should protect coastal areas from hurricanes. Because of the roots and limbs of mangroves, these ecosystems can withstand water

waves and are able to sip large amounts of water and there by prevent flooding.

Residents argue that the catch before the rehabilitation of mangrove forests is abundant. but However, after being made a tourist area and mangrove ecosystem, it turned out destroying environment and its habitat.

The area of mangrove ecosystem in Maron Beach resort area experienced severe damage. The destruction of mangrove forest is caused by the human and natural factor which is abrasion. Damage to mangrove ecosystems is due to changes in the function of forest into ponds and excessive logging which continues to occur and get worse from year to year due to the beach recreation area. So, the visitor drastically decreases. To increase the number of tourist visits, the government assisted NGO and the community plant the mangrove seeds as a sustainable management of mangrove ecosystems. So, with the benefits of mangrove ecosystems, it can provide different attractions, one of them is forest that lives in the two realms of land and water (sea).

Increasing the production of salt / fish ponds

The condition of mangrove before rehabilitation is damaged and died due to abrasion. Salt farmers get more loss because they will frequently harvest the salt, but when heavy rain occurs, the salt will be lost to the ocean currents. After rehabilitation mangrove trees can absorb and refract the sea water waves so that salt remains stable and does not drift. In addition, mangrove forest serves as a breeding ground for animal, especially fish. Good water condition is one of the reasons why mangrove forest area is very good to produce fish seeds.

Table 2 shows that the rehabilitation of mangrove forests in Maron Beach has a negative impact and falls into a low category. It shows that the level of public awareness in the area of Maron Beach tourism is low. Communities already know and understand that rehabilitation of mangrove forests can work physically, chemically, biologically and economically and serve as a priority area for tourism, research, education and conservation. However, public awareness of the mangrove ecosystem is still very low. In addition, if the rehabilitation of mangrove forests is successful, the economic could function the mangrove ecosystems of wood as building materials, fuel, fish and shrimp. The husk can be used as a tanner, medicine and food. Therefore, rehabilitation of mangrove provides a positive impact that is beneficial to the community in

the area. However, due to not functioning optimally, the community is less responsive to the rehabilitation of mangrove ecosystems in coastal areas.

Strategy of mangrove ecosystem management

Result of calculation of IFE matrix, based on rating value obtained, internal factor becomes major strength from society which is the government institution in mangrove management. Also, the influences of mangrove existence to economy score was 0.88 and community organization in mangrove management scores was 0, 48. The minor strength of the community does not exist. For internal factors that become the most important weaknesses for the community in mangrove forest management is mangrove logging with a score of 0.12. For EFE

matrix calculation result, external factor becoming the most important opportunity for the community in mangrove forest management is mangrove planting does not violate customs with score 0,22, and the potential is moved by non-governmental organization with score 0,20. For external factors, it can be a threat to the community and can affect the management of mangrove forests in the form of overlapping authority a score of 0.66. It can be seen that the community should be given the opportunity to participate or to be involved in the management, especially for the concept of sustainable management of mangrove forests into alternative management strategies. By maximizing the fighting power and spirit of improvement in the management, as well as ensuring the sustainability of marine resources, it can also ensure the survival and welfare of the surrounding community.

Table 1. Impact of mangrove ecosystem rehabilitation

Impact	Strongly Agree	Agree	Less Agree	Disagree
Reducing Abrasion	2 respondent (13%)	12 respondent (80%)	0 respondent (0%)	1 respondent (7%)
Blocking the breeze of the sea air	0 respondent (0%)	0 respondent (0%)	14 respondent (93%)	1 respondent (7%)
Making the environment comfort	0 respondent (0%)	0 respondent (0%)	14 respondent (93%)	1 respondent (7%)
Making the tourist area	0 respondent (0%)	0 respondent (0%)	3 respondent (20%)	12 respondent (80%)
Increasing the production of salt or fish pond	0 respondent (0%)	13 respondent (86%)	1 respondent (7%)	1 respondent (7%)

Table 2. Impact of mangrove ecosystem rehabilitation

Score	Category	Number of Respondents	(%)
5-10	Low	11	72 %
11-15	Medium	4	28 %
16-20	High	0	0 %
Total Score		15	100 %

Table 3. Result of Matrix Processing IFE

Internal Factors Strategy	Weight	Rate	Score
Strengths			
1. Government agencies in mangrove management	0,22	4	0,88
2. Community organization in mangrove management	0,12	4	0,48
3. Effect of mangrove existence on community income	0,22	3	0,66
Weakness			
1. Mangrove community mangrove logging	0,12	1	0,12
2. The level of education is still low	0,22	2	0,44
3. Untouched by technology	0,10	2	0,20
Total Score	1,00	-	2,78

Rating Value : 1 = major weakness, 2: minor weakness, 3: minor strength, 4: major power.

Table 4. Result of Matrix Processing EFE

External Factors Strategy	Weight	Rate	Score
Opportunities			
1. Potential development of mangrove ecosystem area	0,12	1	0,12
2. The role of non-governmental organizations	0,10	2	0,20
3. Mangrove planting does not violate customs and customs	0,22	1	0,22
Threats			
1. Damage to natural resources and environment	0,22	1	0,22
2. Overlapping authority	0,22	3	0,66
3. Environmental pollution	0,12	1	0,12
Total Score	1,00	-	1,54

Rating Value : 1= less public response, 2= average response, 3= good response, 4= very good public response

Table 5. Community-based management model plan

No	Activities
1.	Maximizing the existing potential by improving the mangrove ecosystem by involving the community and Semarang government
2.	Establishing a limited zone of mangrove ecosystem so that the mangrove ecosystem area is maintained well and sustainably
3.	Providing socialization or understanding to the public about the importance of maintaining the mangrove ecosystem
4.	Post-rehabilitation of mangrove ecosystems, it needs technological progress in the improvement effort in order to provide quality and quantity of good mangrove seedlings for the management of sustainable mangrove ecosystems.

The involvement of local communities in management provides positive benefits of the ability to encourage equity in the management of fishery resources. It also reflects the specific needs of local communities, become responsive and adaptive to the variation of local social and environmental conditions and local communities are motivated to manage resources sustainably (Nijikuluw, 2002). Formulate ecotourism-based tourism strategies, evaluations of external factors (opportunities and threats) and internal factors (strengths and weaknesses) in each region are conducted using EFEM and IFEM as a consideration for sustainable coastal management because that is what it takes for the momentum of change (Susanty *et al.*, 2017).

Tourism sector plays an important role in the Indonesian economy, either as wrong one source of foreign exchange earnings and job creation and opportunity attempted. Tourism is also one sector that contributes the most in the acquisition of foreign exchange from foreign tourists (Wijayanto, 2013). To develop the tourism activities of mangrove in Indonesia, Maron beach has good prospects as a supporter of non-oil and gas foreign exchange.

Development of the main Maron beach attractions have a number of strengths, weaknesses, opportunities and the following threats. Furthermore, on the basis those aspects, it can be

matrix of Internal Factors Evaluation Matrix (IFE) and Matrix External Factors Evaluation Matrix (EFE) (Table 3 and 4). Based on the analysis of the internal environment and external using IFE matrix and matrix EFE as well as the two values above, the position of a tourist attraction of Maron beach is located in the 2nd quadrant with a suitable general strategy which is intensive (market penetration, market development, and product development) or integration (backward integration, forward integration, and horizontal integration) (Susanty *et al.*, 2015)

Based on the result of SWOT analysis, there are also negative sides with 4 scale priority management strategies that need to be set within implement mangrove ecotourism development as what had happened in the area of Pramuka Island which is grouped into 2 the priority of the strategies that must be done when facing the problem as follows: (a) Coordination between local communities and stakeholders which starts with planning, socialization, implementation and monitoring the concept of ecotourism development mangroves; (b) Reorganization of space for ecotourism activities, improvement of infrastructure, water supply network, development public toilets, sewage treatment and disposal systems, as well as business unit supports for the needs of tourisms (Putra *et al.*, 2015). The disadvantage of this system is that the

SWOT analysis framework used in the study has no definite framework in determining the criteria for each SWOT indicator (Kusumawardani and Sediyo, 2016).

In the service/accommodation development strategy that is the empowerment of the community by fostering creativity in the form of skills and abilities. Thus, it can provide what is needed by the visitors such as homestay, restaurant, kiosk, craft and others, and promotion and publication development that can be done by the community by selling brochures, T-shirts, stickers that is created in accordance with interesting sights, in order to increase the income for the community. In promotional development, the government can create a special website, brochures, booklets and pamphlets, as well as via radio and television promoting Maroon beaches and surrounding areas (Dhiniati and Mardiansjah, 2016).

Conclusion

Mangrove ecosystem management at Maron Beach should be progressive meaning that the research location should be in a less potential and less stable condition so it is likely to continue to expand the market, increase growth and achieve maximum progress. In addition, with a non-overlapping efforts, the authority can be maximized. Impacts caused by the rehabilitation of mangrove forests include increased salt/fish production, reduced coastal abrasion, blocking sea breeze to the shore, increasing the capture of biota (shrimp, crabs, shells) on the coast, and developing the area a tourist attraction. However, the opening of Maron Beach recreation area has given some negative impacts to the post-rehabilitation of mangrove ecosystems.

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