

Analysis of ecotourism development as a mangrove conservation effort in Pasir Kadilangu and Jembatan Api-Api, Kulon Progo, Yogyakarta, Indonesia

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Manuscript received: 3 December 2022. Revision accepted: 12 January 2023.

Abstract. Astikasari L, Indriyani S, Muryanto BS, Al Madani AR, Muhammad F, Putri A, Hartanti AN, Afifah RN, Zuaini PAK, Rezapratama MS, Negari SIT, Sunarto, Kusumaningrum L, Kurniawati I, Budiharta S, Flores AB, Setyawan AD. 2023. Analysis of ecotourism development as a mangrove conservation effort in Pasir Kadilangu and Jembatan Api-Api, Kulon Progo, Yogyakarta, Indonesia. *Indo Pac J Ocean Life* 7: 125-132. Mangrove forests play an important role as a protector of coastal areas from abrasion and tsunamis while providing economic benefits for the surrounding communities. One management option for mangrove forests is through the development of mangrove-based ecotourism that combines the conservation and sustainable utilization of mangrove ecosystems. This study aimed to analyze the mangrove conservation efforts and ecotourism development at Pasir Kadilangu and Jembatan Api-Api, around Bogowonto River, located in Jangkaran Village, Temon Sub-district, Kulon Progo District, Yogyakarta, Indonesia. The study was conducted in November 2022. Primary data was collected through semi-structured observations and interviews using snowball sampling to 100 respondents consisting of 50 respondents at Pasir Kadilangu Beach and 50 respondents at the Jembatan Api-Api, while secondary data were collected through a literature review related to the research being carried out. The results show that efforts to protect and preserve mangrove forests include beach cleaning, greening, and improving the condition of the surrounding environment. The local community utilizes the mangrove forests by selling mangrove products and souvenirs, ticketing, parking, and tour guiding. Most of the community agrees to develop an ecotourism area at Pasir Kadilangu Beach and Jembatan Api-Api Mangrove to protect and preserve mangrove forests while utilizing ecotourism.

Keywords: Conservation, ecosystem, Jembatan Api-Api, mangrove, Pasir Kadilangu Beach

INTRODUCTION

Indonesia has a very large coastal area with a coastline reaching 81,000 km. The coastal areas of Indonesia consist of various supporting ecosystems such as mangrove forest ecosystems, coral reefs, seagrass beds, and wetlands with abundant biodiversity and natural resources such as fish and high-value mining materials (Mughtar et al. 2022). Mangroves are vegetation that lives in coastal areas and estuaries and are affected by tidal currents (Kordi 2012). Mangroves are tolerant to waterlogging conditions with high saline water and soils, with the presence of some prominent species from the genera of *Rhizophora*, *Bruguiera*, *Ceriops*, *Avicennia*, *Xylocarpus*, and *Acrostichum* (Soerianegara and Lemmens 1993). Mangrove

ecosystems are divided into three types, namely beach or delta mangrove, river mouth or lagoon mangrove, and island mangrove (Fitriah et al. 2013).

Mangrove forest ecosystems play an immense role in terms of physical, ecological, economic, and socio-cultural functions. Physically, mangrove forests protect coastal areas from abrasion, winds and storms, waves, and tsunamis. The ecological function of mangroves can be seen from their role as the habitat of biodiversity, carbon storage, and neutralizing pollution (Yuswinarto et al. 2019; Sutopo et al. 2022). From the economic aspect, the mangrove ecosystem provides various goods to fulfill human needs, including timber (e.g., firewood, charcoal), non-timber products, and food sources such as fish. Finally, the sociocultural function of mangroves can be seen from

their role in ecotourism, education and research area (Kusmana 2015; Harto et al. 2021).

Nowadays, there is an increasing trend in the development of mangrove-based ecotourism, which is promoted as a win-win solution in sustainable mangrove management that delivers benefits not only for conservation and ecological aspects but also for generating income for the surrounding communities. Ecotourism is a form of nature-based tourism that combines aspects of education and interpretation of the natural environment and community culture through environmental management. Ecotourism offers a unified tourism value that integrates the enjoyment of the beauty of nature and efforts to preserve it (Haryanto 2014). Therefore, ecotourism must be developed to minimize the negative impacts of tourism. Such tourism is ideal in Indonesia since the country possesses many natural beauties with aesthetic values (Prastika and Sunarta 2018).

Mangrove forest ecotourism is the development of mangrove tourism objects by paying attention to aspects of environmental suitability and carrying capacity and in its management must avoid risks and negative impacts on the environment (Kusaeri et al. 2015). According to Rianto et al. (2021), mangrove ecotourism can benefit local communities' economic empowerment. In addition, using mangroves as ecotourism areas can provide benefits for mangrove conservation and protection carried out by local communities so that the main functions of the mangrove ecosystem will be maintained. Ecotourism is now very popular in mangrove forests, parallel with the increasing concern for conserving tropical rainforests (Mahmud et al. 2015). Indonesia has the potential to develop mangrove-based ecotourism since the country has 2.5 million hectares of mangrove forest (Rahadian 2019) with unique flora and fauna characteristics (Fahrian et al. 2015). Tourism activities that can be developed in mangrove ecotourism include educational tours and mangrove monitoring, bird watching, fishing, mangrove tree planting, canoeing, and boating. In Sabah, Malaysia, there is potential to develop mangrove ecotourism destinations due to the diversity of forests that support diverse marine life, as well as the stunning landscapes and the unique cultures of local communities (Fazilah et al. 2013). One example of mangrove ecotourism in Indonesia is mangrove ecotourism in Mangunharjo, Tugu District, Semarang City. The management of mangrove ecotourism in the area is carried out by the surrounding community, which is being conducted sustainably. Various benefits are obtained from community-based mangrove ecotourism using their local ecological knowledge and management practices (Ulhaq et al. 2022).

Bogowonto estuary is located on the border of Yogyakarta and Central Java Provinces, Indonesia. In the past, the estuary formed a lagoon with a thick mangrove forest and was protected by sand dunes from the waves of the South Java Sea (Setyawan et al. 2005). Nowadays, most of the mangroves have been converted into agricultural lands, ponds, and settlements. The remaining mangroves are currently left on the banks of the creeks and managed for ecotourism by two operators, namely "Pasir Kadilangu

Beach" in the east and "Jembatan Api-Api Mangrove" in the west. The mangrove forest and seaward panoramic of Pasir Kadilangu Beach is a natural tourist attraction at the eastern end of the Bogowonto River. This mangrove forest is managed for environmental protection, shrimp ponds, and nature tourism. On the other hand, the Jembatan Api-Api Mangrove has the attraction of a natural river and mangrove forest. The existence of mangrove-based ecotourism in the Bogowonto estuary has increased the area of mangrove forests by 1,442.55 m². However, the ecotourism activities and the development of facilities and utilities (e.g., photo spots) have also caused disturbances to the surrounding mangroves (e.g., wastes, the opening of mangrove canopy).

Despite the potential of the mangrove forest in Bogowonto estuary for ecotourism, current management is deemed insufficient to meet the good practices in sustainable ecotourism. In particular, there are still limited programs, facilities and utilities to support tourism activities. For example, the tourists are not involved in protecting the mangrove forest, there are no education and awareness programs regarding mangrove conservation, guides, and information centers are not available, and access roads to destinations are very limited. Therefore, it is necessary to identify aspects that support the development of the Bogowonto estuary for ecotourism so that tourism in this area can be marketed internationally (Nugraeni and Setiawan 2017). This research aimed to examine the efforts to conserve mangroves and develop ecotourism in Pasir Kadilangu Beach and Jembatan Api-Api, Kulon Progo, Yogyakarta. We expected the results of this study could be used as a reference for managing the mangrove in the studied area.

MATERIALS AND METHODS

Study area

This research was conducted in two adjacent mangrove forest areas in Pasir Kadilangu Hamlet (named as the Pasir Kadilangu Beach Mangrove Forest) and Pasir Mendit Hamlet (named as the Jembatan Api-Api Mangrove Forest (MJAA), Jangkaran Village, Temon Sub-district, Kulonprogo District, in the westernmost province of Yogyakarta, Indonesia, with coordinates 7° 54' 04" S 110° 02' 06" E (Figure 1). Jangkaran Village has territorial boundaries with Bogowonto River to the north, the Indian Ocean to the south, Sindutan Village to the east, and Purworejo District to the west and north.

Research procedure

Primary data were collected through observations and semi-structured interviews, while secondary data were collated through an in-depth study of literature related to the research being conducted. The observations aimed to directly see the reality in the research location to support data acquisition. The interviews used a semi-structured method with a questionnaire using a snowball sampling technique in which the head of the management at the research location was the first informant. Snowball

sampling uses the main research subject to obtain sample references that meet the research objective's criteria (Lenaini 2021). The other parties interviewed were the community and tourists above 17 years old, which consisted of 50 respondents in the Pasir Kadilangu Beach Mangrove Forest area and 50 in the Jembatan Api-Api Mangrove Forest area.

Data analysis

Data obtained through observation and interviews were analyzed using a qualitative research method with a descriptive approach (Andini et al. 2020). First, the results of community perceptions of ecotourism development were analyzed using the scoring method. The results formulated from data analysis were then described in narratives regarding the people's perceptions on the aspects of protecting mangrove forests, preserving mangrove forest resources, utilizing mangrove forests, and developing mangrove forest ecotourism.

RESULTS AND DISCUSSION

Mangrove forest protection and conservation efforts

Conservation is an effort to manage and maintain essential resources of nature in a balanced and wise manner. According to Syafei (2017), the concept of conservation can be viewed as sustainable management of natural resources considering both ecological and economic perspectives. From an ecological perspective, conservation is the maintenance of natural resources for the future, while from an economic perspective, conservation is the

maintenance of natural resources for the present. One form of conservation in sustainable natural management is by applying the concept of ecotourism. Ecotourism is a form of tourism that aims to preserve natural resources that are still natural and provide benefits both ecologically and economically for the local community (Mua and Indahsari 2021). In the context of mangrove forests, the concept of ecotourism can manifest as preserving a mangrove forest so that it can function ecologically, such as protecting coastal areas from wind and waves from abrasion while still generating economic benefits as a tourist spot, conservation and education area. Therefore, it is necessary to carry out conservation efforts to protect mangrove areas so that they function as they should.

Protection and conservation of mangrove forest in Pasir Kadilangu Beach

Based on the results of the observations, the characteristics of the mangrove ecosystem in the Pasir Kadilangu Beach Mangrove Forest are mangrove vegetation located on sloping coastal areas in muddy or inundated by seawater, thus being affected by tidal conditions. The entire local community protects the Pasir Kadilangu Beach Mangrove Forest. Initially, the mangrove forest was preserved only to prevent abrasion. Then, the community saw an opportunity of creating mangrove conservation that could be developed to attract tourists by conducting beach cleaning and reforestation. Cleaning the beach is carried out to remove trash on the beach to increase the attractiveness of tourists and create comfort for visitors (Wulandari et al. 2019).

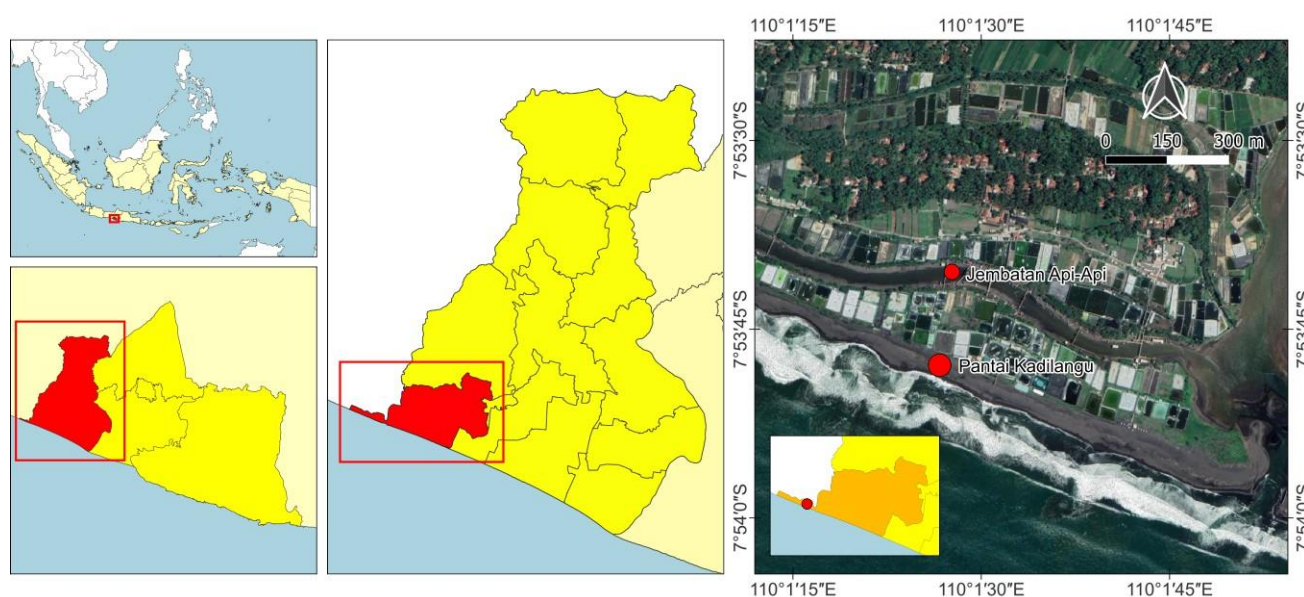


Figure 1. Map the study area of the Pasir Kadilangu Beach Mangrove Forest and the Jembatan Api-Api Mangrove Forest in Jangkaran Village, Temon Sub-district, Kulon Progo District, Yogyakarta Province, Indonesia

The conservation efforts carried out in the Pasir Kadilangu Beach Mangrove Forest are restoration/rehabilitation by planting mangroves within a particular time and carried out regularly with the help of the surrounding community when there are events. Routine planting is carried out by mangrove managers every six months. Mangrove nurseries were created by planting the seedlings in polybags, and after three months the seedlings are planted with a planting distance of one meter. Monitoring is carried out routinely from the mangrove area and the facilities therein including routinely replacing damaged mangroves. In planting mangroves, the community should pay attention to the health and quality of the mangrove seedlings planted in the mangrove ecotourism area in Kadilangu. The determination of the quality and health of mangrove seedlings can be seen from the condition of the stems, branches, leaves, and roots. In addition, healthy seedlings are not affected by pests (Wibawanti et al. 2018). The community also takes the initiative to maintain the mangrove seedlings with bamboo fences and safety nets to protect mangroves from garbage and household waste from the Bogowonto River hoping that the planted mangrove seedlings will not die and be able to grow well. In the Pasir Kadilangu Beach Mangrove Forest, there are nipa palms (*Nypa fruticans*) which occur on the land where it is not always affected by sea water. The habitat of nipa contains water with very low salinity compared to other zones and mainly grows on the river banks close to the sea.

The local community has a tradition held once a year, namely the Labuhan Samudra ritual or sea alms. This ritual is a form of gratitude to God grace for the surrounding environment. This ritual is began with the Gunungan procession and after the march, the village elders do a prayer, then the Gunungan is thrown into the sea, and the community fights over it. The mountain symbolizes the abundance of fortune that the people of Kadilangu receive.

Protection and conservation of mangrove forest in Jembatan Api-Api

The name of Jembatan Api-Api Mangrove Forest (MJAA) is originated from the dominant presence of *Avicennia* sp. (locally named Api-Api). This species grows near the sea in muddy soil conditions with a slightly sandy substrate. In the area, there is little organic matter and salinity is relatively high therefore the presence of *Avicennia* sp. can increase soil nutrients (Shalsabella et al. 2022). The Jembatan Api-Api Mangrove Forest has the function to provide access and mobility of local fishermen and the area was formerly known as Tambak Ikan, indicated by the distribution of dozens of shrimp ponds that stretch along the coast towards the mangrove tourism route. The area along the river is planted with mangroves which attract the attention of the wider community, especially young people. As more and more residents came to visit, the residents took the initiative to build bridges and go along the river in all directions. After the bridge was built in 2016 to facilitate public access to the pond area, it became famous because it passes through the mangrove area.

Mangrove planting at the Jembatan Api-Api has been carried out since 2005-2006. Then in 2016, a management was formed in which local people in the hamlet were the members. After the formation of the management body, the local community was given capital used to buy mangrove seeds and the mangrove seedlings were planted by each community member under the auspices of the local government. The Jembatan Api-Api mangrove area is managed by individuals of one large family. In the Jembatan Api-Api Mangrove Forest, there has been no production of mangrove seedlings. So to use windbreaks and protect coastal areas, managers and the community buy seeds in the Lamongan area at IDR 5,000 per seedling grown in polybags and then planted along the coastline by workers who have formed labor groups of 22 people per group. Procurement of seeds is carried out to reduce the estimated use of costs required to buy mangrove seeds and is very helpful in preserving mangrove areas (Alfandi et al. 2019).

In the Jembatan Api-Api Mangrove Forest, there are also garbage cleaning activities, especially during the rainy season, aimed to increase public awareness and participation in protecting the coastal and estuary environment to create a clean and sustainable environment (Nurzanah and Indrayani 2021). Currently, the local community in Jembatan Api-Api still really protects the mangroves, indicated by the minimal utilization of mangroves by the local communities.

The community perceived that the protection of the Jembatan Api-Api mangrove forest has an essential role in life, such as resisting sea wind abrasion and erosion. In addition, the mangrove forests can improve the surrounding community's economy. Nonetheless, the good initiatives from the local people that carry out planting and caring for mangroves need to be supported by agencies or institutions.

The mangrove protection and conservation efforts carried out in the Pasir Kadilangu Beach and the Jembatan Api-Api have almost the same approach. These efforts are supported by the adjacent hamlet areas so that the people of the two hamlets can interact and discuss the management and maintain the mangroves in each hamlet. Efforts to protect mangroves by local communities are included in the public environmentalist category, where local people seek to improve environmental conditions directly through their actions and behavior (Laila 2014).

Utilization of mangrove forests

Mangrove forest utilization in Pasir Kadilangu Beach

Most of the mangroves in Pasir Kadilangu Beach Hamlet have been utilized by the community, but not all of them. The use of mangroves was previously limited to environmental services, namely as the protection of coastal areas from the waves to prevent abrasion (Rinjani et al. 2022). However, the potential of well-developed mangrove forests has caused the community to understand the other role of mangrove forests to provide additional economic income. According to Turinso et al. (2018), mangrove forests have significant benefits for improving the economy of coastal communities through ecotourism while conserving biodiversity.

Mangrove forests provide an economic function as a source of livelihood for the people of Pasir Kadilangu Hamlet. Currently, the utilization of mangrove plants by the community includes processing them into pidada syrup which is carried out in groups. The part of the pidada plant (*Sonneratia* sp.) that is processed into syrup is the ripe fruit flesh. The flesh of the pidada fruit is round, green in color, and has a sour taste. The selling price of syrup made from the pidada fruit varies, starting from IDR 5,000 for a 50 mL size. The community also processes mangrove fruit as sweets but in limited quantities. In the mangrove forest, there are also nipa palms used by the community to make sweets and brown sugar. A few people have also used jeruju (*Acanthus ilicifolius*) as medicine in which the leaves is used as an internal medicine and the fruit is eaten to cure ulcers. According to Hakim et al. (2021), jeruju can be used as a medicine for boils, burns, and scabs and as an anti-cancer drug. Beside the flora, the fauna living in mangrove forest areas, such as mussels and crabs, are used by the community for personal consumption, and some are sold. The community uses the surrounding mangrove forest to become shrimp ponds with a selling price of shrimp per kilo from IDR 51,000 to IDR 60,000. Due to the topography of the Pasir Kadilangu Beach Mangrove Forest which is a transitional area between sea and land, most of the residents work as shrimp pond farmers and fishermen.

The community in Kadilangu has also developed the mangrove forest into a tourist area that adds economic income, named the Pasir Kadilangu Beach Mangrove Forest. This activity provides benefits for the community by creating new jobs as employees, selling entrance tickets to tourists, and selling food and drinks. The community is also starting to seriously develop mangrove forests into ecotourism which is also used for conservation and education. There are many stalls which sell knick-knacks and handicrafts made by the residents as souvenirs. There are also boat rentals for visitors to go along the Bogowonto River and see the beauty of the Pasir Kadilangu Beach Mangrove Forest from the boat. Some residents manage the parking, and the incomes are shared equally with the managers. According to Nurdin et al. (2021), the existence of a mangrove ecotourism area can provide benefits for the community by creating new jobs as employees, and selling food and drinks. In addition, the community utilizes the fruit from mangroves to increase economic income regularly but not excessively so that the mangroves are not damaged.

Utilization of mangrove forests in Jembatan Api-Api

The mangrove forest at the Jembatan Api-Api area in Pasir Mendit Hamlet is utilized as the protection of coastal areas from abrasions, tourist attractions, conservation and educational areas, and shrimp pond cultivation. The ecotourism is designated to combine conservation and tourism so that the people of Pasir Mendit Hamlet can increase their income through trading activities, ticketing and parking.

At the Jembatan Api-Api Mangrove Forest, a large and long bridge made of wood and bamboo can be used by visitors to walk around the mangrove tourism spots

separated by brackish waters. In addition, there is also a long footbridge used by visitors to enjoy mangrove tour and taking photos. The manager also provides a place to rest and shade for visitors in the form of a gazebo with bamboo seats and a tin roof. However, the effects of the pandemic have caused several facilities to appear poorly maintained, and much of the wood on the bridges is damaged (Figure 2).

The local resident has not optimized the potential uses of *Avicennia* sp. in this area, for example as formalin, firewood, and food ingredients. The fruit of *Avicennia* sp. has a high potential as a raw material for making cakes (Efriyeldi et al. 2019). Thus it becomes a challenge for the community regarding the utilization of *Avicennia* sp. in the mangrove area. The people of Pasir Mendit Hamlet have not yet utilized the mangroves to improve the economy. There needs to be innovation and community expertise to produce mangrove fruit into a processed product that can be sold. Basuki and Putri (2019) state that local community innovation is needed to develop and create added-value products. Previously, there had been training for managers and the community, especially women, in utilizing mangrove plants. However, the utilization of mangrove plants cannot be done haphazardly, and the community does not dare to cut down the mangroves. Mangrove plants are planted for conservation to rehabilitate coastal areas. The Presidential Regulation of the Republic of Indonesia Number 73 of 2012 concerning the National Strategy for Mangrove Ecosystem Management emphasizes that the management of mangrove ecosystems must be sustainable with all efforts to protect, preserve and use them sustainably so that the use of mangroves by the community must consider many factors in order to achieve the sustainability of the function of the mangrove ecosystem.

Community perceptions of ecotourism development

The community perceptions regarding the development of mangrove forest ecotourism in Pasir Kadilangu and Jembatan Api-Api can be viewed from several aspects as shown in Tables 1 and 2. The first aspect is community interest and participation in the development of ecotourism from a physical perspective, such as planning the development of tourist attractions and their objects, providing tour guides, building homestays, creating souvenir shops, and counseling regarding the application of the ecotourism concept itself. Second, the existence of groups or communities that manage ecotourism and the willingness of the community to involve in ecotourism. Third, public opinion regarding the government's role or intervention in developing ecotourism, either entirely or only partially. Fourth, the impact of ecotourism on the local population's economy is good for the whole community or only part of it. Fifth, from the perspective of residents on the impacts of ecotourism, including waste (in village locations and mangrove areas) and damage to mangrove vegetation due to the development of utilities, facilities and attractions. Finally, the community's willingness to realize sustainable ecotourism. The people from the two villages have good understanding regarding ecotourism where they balance economic and conservation aspects.



Figure 2. Tourism utilities and facilities in the Jembatan Api-Api Mangrove Forest, Kulonprogo, Yogyakarta, Indonesia

The result of analysis on community's interest and participation in the development of ecotourism and its facilities, both in the Pasir Kadilangu Beach Mangrove and the Jembatan Api-Api Mangrove showed that almost all of the people support the development of ecotourism. As much as 98% to 100% of the community participates in tourism development planning activities which can be seen from the construction of tourism facilities in the form of bridges in the two villages where the funds used are from non-governmental funding. In addition, community support can also be seen in the presence of traders in tourist areas where most traders agree to have a souvenir shop. For tour guide and homestay activities, some people agree. In contrast, some others follow village policies and decisions as managers of tourist attractions and can be implemented if the tourist conditions are already crowded with visitors.

The community that manages ecotourism in the Pasir Kadilangu Beach Mangrove and the Jembatan Api-Api Mangrove has been around for a long time. Since the beginning of the formation of mangroves in the area, a group of people have actively planted mangroves and started building tourist attractions and facilities until they finally became the managers of these tourist attractions. Other community members are also involved in ecotourism management in the efforts of conservation and protection of mangroves, and the economic sector. However, some members who were not willing to join the management community stated several reasons, including not knowing anything about mangroves, only living in the village because they were following their family members and they have a primary job outside the ecotourism field, so they do not have time and resources.

Table 1. Community perception of ecotourism development in Pasir Kadilangu Beach, Kulon Progo, Yogyakarta, Indonesia

Aspect	Agree	Less agree	Not agree
Willingness to participate in ecotourism development			
Planning activities	50	0	0
Tour guide activities	38	3	9
Souvenir activities	47	1	2
Providing homestay	38	9	3
Counseling about ecotourism	50	0	0
Community perception of ecotourism group			
Group formation	48	1	1
The willingness to join a group	33	7	9
Government intervention in Kadilangu ecotourism			
Partial intervention	41	3	6
Full intervention	8	18	24
Economic benefits of ecotourism			
Economic benefit for the whole community in Kadilangu	44	5	1
Economic benefit only for some participants	26	19	5
Environmental impacts of ecotourism			
Garbage in mangrove forest area	22	4	24
Garbage in village	18	8	24
Damaging the mangrove trees	2	5	43
Damaging the ecotourism facilities	3	5	32
Willingness to develop sustainable mangrove ecotourism	48	2	0

Table 2. Community perception of ecotourism development in Jembatan Api-Api, Kulon Progo, Yogyakarta, Indonesia

Aspect	Agree	Less agree	Not agree
Willingness to participate in ecotourism development			
Planning activities	49	0	1
Tour guide activities	41	7	2
Souvenir activities	47	0	3
Providing homestay	36	6	8
Counseling about ecotourism	50	0	0
Community perception of ecotourism group			
Group formation	50	0	0
The willingness to join a group	38	4	8
Government intervention in Api-Api ecotourism			
Partial intervention	39	2	9
Full intervention	13	8	29
Economic benefits of ecotourism			
Economic benefit for the whole community in Api-Api	47	0	3
Economic benefit only for some participants	30	9	11
Environmental impacts of ecotourism			
Garbage in mangrove forest area	15	6	29
Garbage in village	11	7	32
Damaging the mangrove trees	0	7	43
Damaging the ecotourism facilities	1	6	43
Willingness to develop sustainable mangrove ecotourism	50	0	0

Community's opinion regarding government intervention in the two villages has the same view. Government intervention in ecotourism areas is expected to develop ecotourism areas, especially in the promotion aspect. Most people agree with partial intervention from the government rather than full intervention because they feel this option still prioritizing the village's interests, especially from the economic benefits obtained. In addition, government intervention is also realized through the assistance of mangrove seeds and mangrove improvement and conservation projects. Government intervention can also be in the form of strict regulations enforcement to protect the mangrove areas with their ecological functions (Sabir 2020).

The impact of ecotourism on the community's economy is significant because ecotourism areas can improve the welfare of the local community. As much as 88% (Pasir Kadilangu Beach) and 94% (Jembatan Api-Api) of the community feel that ecotourism provides economic benefits for the residents. The benefits obtained by the community are in the form of profits from trading activities around the tourist sites. The rest of respondents believe that ecotourism can increase their primary income outside the ecotourism sector, namely the ponds. Respondents who earn income from the non-tourism sector believe that when tourism is open, they can open stalls to sell fresh fish along the road, thereby increasing buying and selling power. Ecotourism can provide perceived economic benefits through the existence of economic activities in the tourist areas, such as grocery stalls, food stalls, fish traders, and home industries (Rahim et al. 2022).

The development of ecotourism areas can impact the environment, such as pollution and wastes. In addition, the crowd of visitors can also cause other impacts, such as damage to existing facilities. In both villages, it was found that the presence of tourists did not cause damage to

mangroves as a tourist attraction or tourist facilities such as bridges built at these tourist sites. Damage to facilities such as bridges usually occurs when bamboo submerged in the water begins to brittle and break or damage bridges due to rotting wood and high waves reaching the bridge. However, the presence of tourists can produce wastes that contaminate the ecotourism areas. This waste problem has a range of around 20% -30% damage in the form of pollution and garbage in the mangrove areas, so it is still relatively low. Outreach to tourists and waste cleaning programs in ecotourism areas are needed to maintain the cleanliness of the ecotourism environment.

In conclusion, communities in the Pasir Kadilangu Beach Mangrove and Jembatan Api-Api Mangrove fully support sustainable ecotourism. The establishment of ecotourism in the form of mangrove tourism can help improve the population's economy and the ecological function of mangroves as protectors of their villages. The protection of ecotourism areas and the community's role in the surrounding environment is regulated to preserve the resources of the mangrove forest.

ACKNOWLEDGEMENTS

The authors thank the respondents and managers of the mangroves of Pasir Kadilangu Beach and Jembatan Api-Api, Kulon Progo, Yogyakarta, Indonesia as resource persons in this research.

REFERENCES

- Alfandi DR, Qurniati, Febryano IG. 2019. Partisipasi masyarakat dalam pengelolaan mangrove (community participation in mangrove management). *Jurnal Sylva Lestari* 7 (1): 30-41. DOI: 10.23960/jsl1730-41. [Indonesian]

- Andini AN, Barokah S, Wulandari OAD, Girsang AA, Afifah RAN. 2020. Strategi pengembangan ekowisata hutan mangrove pandansari kabupaten brebes untuk mengurangi kemiskinan. *Syntax Literate: Jurnal Ilmiah Indonesia* 5 (7): 251-261. DOI: 10.36418/syntax-literate.v5i7.1457. [Indonesian]
- Basuki HI, Putri MK. 2019. Inovasi masyarakat lokal terhadap pemanfaatan hutan mangrove tanjung Api-Api Kecamatan Banyuasih II Kabupaten Banyuwangi. *Jurnal Geografi* 8 (1): 70-77. [Indonesian]
- Efriyeldi, Mulyadi A, Samiaji J, Nursyirwani, Eliza, Suanto E. 2019. Peningkatan nilai ekonomi ekosistem mangrove melalui pengolahan buah Api-Api (*Avicennia* sp.) sebagai bahan makanan di Desa Sungai Kayu Ara Kabupaten Siak. *J Rural Urban Commun Empowerment* 1 (1): 1-8. [Indonesian]
- Fahrian HH, Putro SP, Muhammad F. 2015. Potensi ekowisata di kawasan mangrove, Desa Mororejo, Kabupaten Kendal. *Biosaintifika: J Biol Biol Educ* 7 (2): 104-111. [Indonesian]
- Fazilah M, Noor AGA, Abdullah M. 2013. Enhancing the quality of life of coastal community through ecotourism development in Kota Marudu, Sabah. *Prosiding Persidangan Kebangsaan Pertama Program Pemindahan Ilmu (KTP 01) 21-23 Ogos 2013 Bangi, Selangor (Program Pemindahan Ilmu – Kementerian Pendidikan Malaysia)*.
- Fitriah E, Yuyun M, Edy C, Asep M. 2013. Studi analisis pengelolaan hutan mangrove Kabupaten Cirebon. *J Sci Educ* 2 (2): 1-18. [Indonesian]
- Hakim MR, Rahman A, Alhabsi F. 2021. Pelestarian ekosistem mangrove melalui pemanfaatan jeruju (*Acanthus Illicifolius*) sebagai makanan ringan alternatif. *Buletin SWIMP* 1 (2): 84-89. DOI: 10.15578/bs.v1i02.15. [Indonesian]
- Harto S, Rd Siti SS, Okta K. 2021. Development strategy mangrove ecotourism based on local wisdom. *Sosiohumaniora: Jurnal Ilmu-ilmu Sosial dan Humaniora* 23 (1): 115-123. DOI: 10.24198/sosiohumaniora.v23i1.31315. [Indonesian]
- Haryanto JT. 2014. Model pengembangan ekowisata dalam mendukung kemandirian ekonomi daerah studi kasus Provinsi DIY. *Kawistara* 4 (3): 271-286. DOI: 10.22146/kawistara.6383. [Indonesian]
- Kordi K, Ghufuran H. 2012. Ekosistem Mangrove: Potensi, Fungsi dan Pengelolaan. *Rineka Cipta, Jakarta*. [Indonesian]
- Kusaeri, Putro SP, Wasiq J. 2015. Potensi sumberdaya alam hayati kawasan mangrove Pasar Banggi Kabupaten Rembang sebagai objek ekowisata. *Biosaintifika* 2 (5): 120-127. [Indonesian]
- Kusmana C. 2015. Integrated sustainable mangrove forest management. *Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan* 5 (1): 1-6. DOI: 10.19081/jpsl.2015.5.1.1. [Indonesian]
- Laila NA. 2014. Gerakan masyarakat dalam pelestarian lingkungan hidup. *Jurnal Politik Muda* 3 (3): 283-302. [Indonesian]
- Lenaini I. 2021. Teknik pengambilan sampel purposive dan snowball sampling. *HISTORIS: Jurnal Kajian, Penelitian dan Pengembangan Pendidikan Sejarah* 6 (1): 33-39. [Indonesian]
- Mahmud AI, Kassu TE, Eleonore RAV. 2015. Ecotourism in mangrove in Peninsular Malaysia. *World Appl Sci J* 33 (5): 699-703.
- Mua MR, Indahsari K. 2021. Pengembangan ekowisata di Indonesia. *SENRIABDI* 1 (1): 295-308. [Indonesian]
- Muchtar A, Herawaty, Indra W. 2022. Potensi hutan mangrove dan karbon tersimpan pada hutan mangrove Lampung di Kota Makassar. *Jurnal Inovasi dan Pelayanan Publik Makassar* 1 (1): 57-65. [Indonesian]
- Nugraeni, Setiawan AH. 2017. Wisata mangrove Jembatan Api-Api dan Pasir Kadilangu Beach, Mandiri dan Sejahtera; *Prosiding SNaPP2017 Sosial, Ekonomi, dan Humaniora*. Yogyakarta, 2017. [Indonesian]
- Nuridin N, Khumaera NI, Mantu YH. 2021. Analisis manfaat langsung sumberdaya mangrove pada kawasan ekowisata mangrove lantebug Kota Makassar. *PAPALELE: Jurnal Penelitian Sosial Ekonomi Perikanan dan Kelautan* 5 (2): 94-99. DOI: 10.30598/papalele.2021.5.2.94. [Indonesian]
- Nurzanah W, Indrayani I. 2021. Sosialisasi pelestarian mangrove kelompok tani dan masyarakat Desa Alur Dua Kec. Sei Lapan Kabupaten Langkat. *Jurnal Al Ulum LPPM Universitas Al Washliyah Medan* 9 (2): 46-49. DOI: 10.47662/alulum.v9i2.175. [Indonesian]
- Prastika Y, Sunarta IY. 2018. Studi perkembangan pariwisata dan pengaruhnya pada lingkungan fisik di pantai balangan, Desa Ungasan, Jimbaran. *Jurnal Destinasi Pariwisata* 6 (1): 110-116. DOI: 10.24843/JDEPAR.2018.v06i01.p16. [Indonesian]
- Rahadian ASWIN. 2019. Model Spasial Pendugaan Biomassa dan Karbon Mangrove di Indonesia. [Doctoral Dissertation, Thesis]. Sekolah Pasca Sarjana IPB, Bogor. [Indonesian]
- Rahim, Situmorang FMR, Ramadhani A. 2022. Peningkatan ekonomi warga desa pantai mekar sebagai pengaruh ekowisata hutan mangrove di Kecamatan Muara Gembong, Bekasi. *Jurnal Penelitian dan Karya Ilmiah Lembaga Penelitian Universitas Trisakti* 7 (1): 37-44. DOI: 10.25105/pdk.v7i1.10393. [Indonesian]
- Rianto F, Jenawi B, Sujawani R. 2021. Pemberdayaan masyarakat melalui ekowisata pada Desa Pesisir di Kabupaten Bintan. *Jurnal Pemberdayaan Masyarakat* 6 (1): 623-631. DOI: 10.21067/jpm.v6i1.4049. [Indonesian]
- Rinjani EK, Nurhidayah, Panbriani S, Amalina UA, Artayasa IP. 2022. Mitigasi bencana abrasi pantai melalui penanaman mangrove di Desa Seriwe, Jerowaru, Lombok Timur. *Jurnal Pengabdian Magister Pendidikan IPA* 5 (1): 226-230. DOI: 10.29303/jpmipi.v5i1.1419. [Indonesian]
- Sabir M. 2020. Strategi pengembangan ekowisata mangrove Tongke-Tongke di Kabupaten Sinjai. *Jurnal Industri Pariwisata* 3 (1): 53-60. DOI: 10.36441/pariwisata.v3i1.45. [Indonesian]
- Setyawan AD, Indrowuryatno, Wiryanto, Winarno K, Susilowati A. 2005. Tumbuhan mangrove di pesisir Jawa Tengah: 2. komposisi dan struktur vegetasi. *Biodiversitas* 6 (3): 194-198.
- Shalsabella RT, Indriyawan MW, Sartimbul A. 2022. Pemanfaatan penginderaan jauh sebagai upaya untuk rehabilitasi hutan mangrove di Kecamatan Brondong, Lamongan, Jawa Timur. *Buletin Oseanografi Marina* 11 (1): 30-40. DOI: 10.14710/buloma.v11i1.38450. [Indonesian]
- Soerianegara I, Lemmens RHMJ. 1993. *Plant Resources of Soutl-East 5 (1): Timber Trees: Major Commercial Timbers*. Poduc Scientific Publishers, Wageningen, Belanda.
- Sutopo AZ, Kusai, Trisla. 2022. Mangrove ecotourism development strategy in Kayu Ara Permai Village, Sungai Apit District, Siak Regency. *Asian J Aquat Sci* 5 (2): 234-241. DOI: 10.31258/ajoa.5.2.234-241.
- Syafei LS. 2017. Keanekaragaman hayati dan konservasi ikan air tawar. *Jurnal Penyuluhan Perikanan dan Kelautan* 11 (1): 48-62. DOI: 10.33378/jppik.v11i1.85. [Indonesian]
- Turinso BE, Suharto R, Priyono EA. 2018. Peran serta masyarakat dan kewenangan pemerintah dalam konservasi mangrove sebagai upaya mencegah rob dan banjir serta sebagai tempat wisata. *Masalah-Masalah Hukum* 47 (4): 479-497. DOI: 10.14710/mmh.47.4.2018.479-497. [Indonesian]
- Ulhaq AZD, Rudhi P, Ria ATR. 2022. Pemberdayaan masyarakat terhadap ekowisata mangrove di Mangunharjo, Kecamatan Tugu, Kota Semarang. *J Mar Res* 11 (2): 295-302. DOI: 10.14710/jmr.v11i2.33852. [Indonesian]
- Wibawanti JMW, Fadhiliya L, Pamungkas S, Mudawaroch RE. 2018. Produksi pangan fungsional alternatif olahan mangrove di Kabupaten Purworejo. *Commun Empowerment* 3 (1): 27-33. DOI: 10.31603/ce.v3i1.2450. [Indonesian]
- Wulandari YP, Raysina N, Muningsih D. 2019. Kajian dampak inovasi mangrove protector pada ekowisata mangrove Desa Pantai Mekar. *Jurnal Resolusi Konflik, CSR dan Pemberdayaan (CARE)* 4 (1): 43-50. [Indonesian]
- Yuswinarto RH, Jaka A, Indah S. 2019. Eco tourism development strategy in Semarang City (Case of Mangrove Tugurejo Ecotourism). *Jurnal Ilmiah dan Bisnis Ekonomi Asia* 16 (1): 36-51. DOI: 10.32815/jibeka.v16i1.436. [Indonesian]