

Degree of community participation in mangrove resources management as livelihood support in West Java, Indonesia

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Abstract. Mangrove forests in the northern coastal region of Pantai Bahagia Village, Muara Gembong, Bekasi Regency, West Java, form a crucial component of the livelihoods of coastal communities. However, mangrove systems are being degraded and lost at an alarming rate due to their conversion to aquaculture and abrasion since 1992. To overcome this problem, community of fishermen, naming themselves as Kelompok Sadar Wisata and Kelompok Bahagia Berkarya voluntarily started mangrove cultivation and began to implement Community-Based Mangrove Management (CBMM) with various approaches and outcomes. This study will examine and the participatory level of the CBMM practice within the community, analyze the achieved rehabilitation and its strategies to accomplish sustainable management of mangrove resources in the village through qualitative and descriptive statistic methods. The local data on institutions, socio-economic conditions, and mangrove resources utilization will be collected through in depth interviews with 40 key actors from 15 households. The study resulted that the degree of participatory in Pantai Bahagia Village is in the Delegated Power level, which means that citizen is given the permit to utilize the area to independently cultivate the mangrove area as long as it complies with government's regulation.

1 Introduction

In line with SDG's Goal No. 14, preserving mangrove systems is essential to sustain life below water. It is one of the most productive and biologically important ecosystems in the world, as it acts as a natural 'sponge' to absorb pollutants in freshwater [1]. They form a crucial component of the livelihoods of coastal communities in developing countries, providing: fish, crustaceans and other sea life for food and income; wood for fuel and energy; protection of shorelines from erosion, flooding and storm damage; and a filter for pollutants to help maintain water quality [2]. Previous researchers had stated that mangrove systems in Indonesia have experienced rapid change in the form of degradation and loss due to increased human activity, especially from intensive and extensive commercial aquaculture in rural livelihoods. The mangrove ecosystem in Indonesia itself

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initially covered 23% from the total mangrove areas on earth, but it is estimated that Java Island alone had lost 75% of its original mangrove area from 1800 to 2012 [3].

Considering the importance of the role of mangroves to protect and conserve the ecosystem components of coastal and marine areas in north coastline of Java, the sustainability management of mangrove ecosystem in is absolute necessity. In the north coastline of Java, mangrove is one of the sources of livelihood of fishermen in various coastal areas in Indonesia; one of which located in Muara Gembong, Bekasi, West Java, especially in West Season (Musim Barat) when there is decrease in yield of catches. The West Season occurs in November to April each year, where during this season many fishermen do not conduct fishing operations in the sea because of the conditions of the ocean with large waves and relatively large rainfall. The current mangrove forest area in the village have experienced various conversions which are dominated by aquaculture activities, reaching 73.57% of the total village area up to 2016 [4]. However, due to the water pollution and abrasion, the aquaculture productivity decreases from time to time. They also experienced flood during tide due to the lack of mangrove belt. Therefore, on West Season, communities of fishermen who are not actively catch fishes started to replant mangroves for livelihood purpose.

The practice of community engagement is broadly known as community-based mangrove management (CBMM), which is now seen as crucial in minimizing human disturbance and achieving sustainable use of mangrove resources. It emphasizes community participation in resource identification, setting development priorities, and selection and adaptation of technologies for sustainable management practices [5]–[7]. CBMM initiatives have now been widely adopted in many developing countries including Indonesia, and considered applicable in Muara Gembong, West Java, due to the dwellers that depend on mangrove to sustain their livelihood. The community attempts to manage mangroves were mostly considerate profitable to raise their income. However, the ecological contributions were sometimes questionable as biodiversity issues were not always taken into consideration and in many instances, turned more towards commercial resource harvest than ecological conservation [8]. Moreover, the damage can be aggravated when the dwellers have the permit to harvest the mangrove wood as timber products, as the revenues considered to be one of the most important motivation in mangrove restoration [9].

There are various factors that cause mangrove damage to reach this critical level, which are generally grouped into three factors: (a) internal factors such as the conversion of mangrove land into ponds, settlements, industries and the presence of pollution, pesticides and heavy metals, (b) external factors such as upstream watershed damage that cause high sedimentation and accumulation of pollutants, and (c) other factors that have not been identified [10]. Some researches conducted after 2012 showed that abrasion phenomena also occurred in Pantai Bahagia Village, marked by the presence of fallen mangrove trees, precisely at Muara Beting Beach which is 173.05 ha [10]. The village also experienced sedimentation which formed the land that arose on the Muara Beting Beach covering an area of 11.42 ha, which connected to Muara Bendera to Muara Pecah up to 823 ha, which was then overgrown by pioneering mangrove species such as *Avicennia alba* and *Avicennia Marina* [5][11]. High levels of abrasion at some points continue to experience a reduction in the coast, and at other points, there are also those that experience additional land or called accretion. This can be seen from the results of the overlay of Landsat imagery between 1999-2014, the abrasion that occurred in Pantai Bahagia Village reached 1,269.5 ha [12]. Within the end of 2017, the total mangrove area reaches up to 491.53 ha.

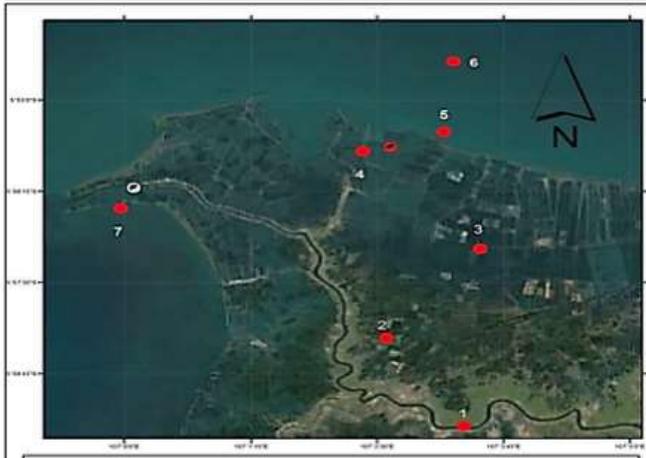


Fig. 1. Pantai Bahagia Village Area (No. 4).

The self-funding rehabilitation program for mangrove forests is done with the help from NGOs (Save Muara Gembong and Kelompok Mangrove Volunteer). Other efforts done is the workshop and training to process of mangrove-based foods and beverages, such as jeruju chips (*Acanthus ilicifolius*), mangrove dodol, Api-api flour (*Avicennia germinans*), jeruju tea (*Acanthus ilicifolius*), and pedada syrup (*Sonneratia alba*) have been carried out by members of the Travel Awareness Group (Pokdarwis) and the community of female dwellers, Kelompok Bahagia Berkarya (Ibu Kebaya) in Pantai Bahagia Village. The products are environmentally friendly because it comes from coastal forest plants that are taken by not damaging its ecological functions even the group takes care and maintains these various plants. Consumers who buy the products produced also support the conservation of mangroves conducted by Ibu Kebaya, so that it is expected to be able to improve the economic level of members' families and the products produced can grow rapidly. However, this conservation activity cannot be maximized due to limited funds and information, and good development strategies. Limited knowledge of the processing of mangrove products from this community, for example because it does not have a good inventory and distribution system, also makes the products sometimes wasted or not sold well in the market. This research aims to determine the factors that correlate to the degrees of tokenism and community conservation behavior.

2 Material and methods

Descriptive method is used to analyze data on the degree of community participation in mangrove management in Pantai Bahagia Village, Bekasi Regency, West Java. The population studied were up many as 40 key actors from 15 households of the local communities, NGO, and government who had been directly involved in the implementation of the preservation and management of mangrove products. The data is collected through in-depth interview with mentioned respondents with open-end questions regarding activity engagement with mangrove forest. The determinants of internal and external factors to increase the community participation is collected with questionnaire regarding respondents' background, including age, gender, education level, household size, monthly income, and primary source of income (internal factors) and open end questions for external factors. In-depth interview is done to assess the degree of community participation using open-end question to increase the validity of community opinion with their inputs [13].

The behavior of the community in maintaining the sustainability of mangroves is influenced by their perceptions, attitudes, and conservation participation. Based on the conceptual framework created, the following hypothesis was proposed as conservation model.

1. There is a positive correlation between the participation of coastal communities in Pantai Bahagia Village and the current condition of the mangrove ecosystem.
2. There is a positive correlation between sustainable mangrove ecosystems and increased income of coastal communities in Pantai Bahagia Village.
3. There is a positive correlation between the increase in income of coastal communities in Pantai Bahagia Village and the level of community participation in preserving the mangrove ecosystem.

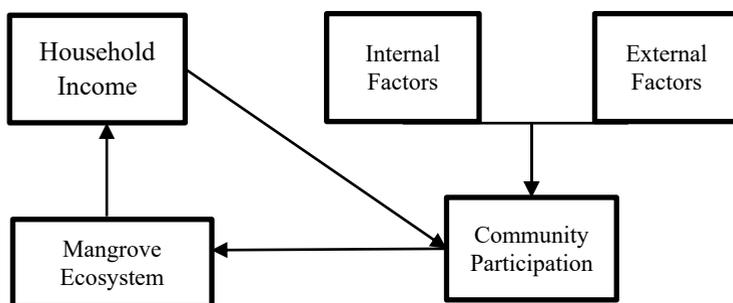


Fig. 2. Community participation in mangrove management concept framework.

3 Results and discussion

Figure 3 represents the village condition after rob flood in 2017, which is quite severe. Based from the assesment, the Pantai Bahagia Village mangrove current condition can be described as in Table 1. Within the table, it can be seen that the rate of rehabilitation is still low compared to the damaged total area, but progressive to the future. It was caused by the limited rehabilitation events, which solely depend on the voluntary actions from the community and NGO, and also Company Social Responsibilities programs.



Figure 3. Pantai Bahagia Village condition after rob flood.

Table 1. Pantai Bahagia Village mangrove area.

Criteria	Current Condition	Standard Value
Rehabilitation of damaged mangrove areas (ha)	20 ha	>800 ha
Species Diversity	3-4	5
Vegetation Density (per 100m ²)	11-15	>15-20
Mangrove Coverage	6.51% - 30% (Low)	83% - 100% (High)

Table 2. Degree of community participation in mangrove management in Pantai Bahagia Village.

Statement	Agree (%)	Disagree (%)	Do Not Know (%)	Degree of Tokenism
There is no dialogue or deliberation; the government has strictly determined any policies.	42.5	35	22.5	Manipulation
All have been disclosed and determined by the government; community submitted a few proposals, but no dialogue to respond.	50	27.5	22.5	Therapy
The government has disclosed some plans; community submitted a few proposals, with some dialogue to respond.	5	57.5	37.5	Informing
Communities are invited to make proposals, although not guaranteed to be accepted.	60	35.5	4.5	Consultation
All proposals were accepted, but the proposal was still assessed by the government to be feasible.	42.5	47.5	10	Placation
The community and the government jointly design and carry out activities in village development.	10	57.5	32.5	Partnership
The government has authority in designing, implementing, monitoring and evaluating village development activities; the community is given full responsibility.	77.5	12.5	10	Delegated Power
The community fully manages various activities for its own sake, which are mutually agreed upon. The role of the community is greater than the role of government.	45	32.5	22.5	Citizen Control

Based on monograph data in 2015, the total population of Pantai Bahagia Village as a whole was 7,161 people consisting of 3,737 men and 3,424 women scattered in 2,127 households with an average density of 3 people/ha. This population decreased from 2014, which was 8,166 people. This decline in population is likely due to population migration due to continuous flooding, resulting in the inundation of village roads, houses, and ponds, which are the source of livelihood for most people so that many residents leave their

homes, thus resulting the population decreases to only around 200-400 people left in half end of 2018.

Around 77.5% of respondents agree that the degree of community participation of the mangrove management is in level of delegated power, which means that they have been given the opportunity and permit by the local government to manage the mangrove area, as long as they follow the regulations. 14 from 15 fishermen households that being interviewed agree that they depend on the mangrove as food and income source during September to February each year when the numbers of catch decreases. Around 3% of the respondents initiatively conduct the rehabilitation (self-funded). Up to 80% of the stakeholders are well-informed about the function of mangroves to prevent abration and up to 32.5% of the stakeholders mentioned that they are aware that floods had decreased since mangrove rehabilitation began in 2014, from approximately twice a month to once a year.

5 Conclusions

Although the rate of rehabilitated mangrove area and mangrove coverage is still low, the degree of community participation of mangrove management in Pantai Bahagia Village, Muara Gembong, West Java is determined to be in delegated power level in 2018. The result supports the main theory that higher community participation increases the mangrove rehabilitation rate.

Acknowledgements

The authors would like to thank Dr. Mahawan Karuniasa as our supervisor and Universitas Indonesia to support our research under the Grant of Indexed International Publication for Final Project of Students *Hibah Publikasi Internasional Terindeks untuk Tugas Akhir Mahasiswa (Hibah PITTA)* Research Grant Contract No. 2581/UN2.R3.1/HKP.05.00/2018.

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