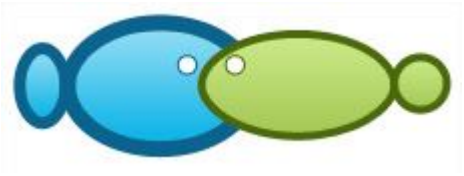

# Estimating the conservation value of mangrove forests in Marine Protected Areas: special reference to Karimunjawa waters, Indonesia

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**Abstract**. Indonesia has seven marine national parks, one of which is Karimunjawa National Park in Central Java. The IUCN has defined it by as a Marine Protected Area (MPA) - Category II. As the 6th largest marine park in Indonesia, Karimunjawa provides a variety of coastal and marine habitats. Mangrove forest is one of the critical ecosystems in MPA Karimunjawa. This area offers a range of services both ecologically and economically. The high level of overexploitation activities, such as timber theft and tourism could damage the preservation of mangrove forests in Karimunjawa as a marine conservation area now and in the future. Thus, proven mangrove forest management is required to ensure its sustainability, and it depends on how people value conservation from economic and environmental considerations. The objectives of this research are to estimate the conservation value of mangrove forest in Kemujan Island – Karimunjawa and to estimate the community participation towards the conservation of mangrove forest in Kemujan Island – Karimunjawa. Based on the mangrove inventory on Kemujan Island by BTNKJ, there are 25 mangrove species in the category of seeds, stakes, and trees. The willingness to pay of the community in the context of MPA Karimunjawa conservation is regulated by developing a hypothetical market consisting of four actions: inventory, monitoring, core zone tracking technical plan, and restoration. The total economic value of willingness to pay in preserving Karimunjawa National Park is Rp 440,813,000.00, with a population of 9,379 visitors in MPA Karimunjawa is calculated around Rp 47,000.00 WTP average value.
**Key Words**: ecosystem destruction, Karimunjawa National Park, compliance, willingness to pay, conservation, contingent valuation method.

**Introduction**. Indonesia has a marine national park that is very wide and has a variety of maritime potentials that vary in each region. Karimunjawa National Park is the only marine national park located on the island of Java, having an area of 111,625 ha, with marine potential namely coral reefs, fringing reef, barrier reef and taka (patch reef), roots of bahar / black coral and coral red (*Tubipora musica*) and marine biota, like the head of a goat, Karimunjawa National Park is one of the natural conservation areas in Jepara Regency, Central Java Province which has native ecosystems. This national park is managed with a zoning system that can be used for research, science, education, cultivation, tourism and recreation purposes (IUCN 1999).

The vast expanse of Indonesia's territorial waters and richness of the Indo-West Pacific seas further add to the country's biodiversity. It supports a rich variety of coastal and marine habitats. Karimunjawa is 6th largest of Indonesia's marine national park (Campbell et al 2012) which is defined by IUCN as Marine Protected Area (MPA) – Category II, which means as protected area managed mainly for ecosystem protection and recreation (IUCN 1999). Due to General Director Decree of Forest Protection and Natural Conservation number 28/IV-SET/2012 about zoning of Karimunjawa National Park, it is covering an area of 111.625 hectares and being divided into nine zones: core zone, jungle zone, protection zone, land-utilization zone, tourism zone, aquaculture zone, historical zone, rehabilitation zone, and traditional-fishing utilization zone. There are

several types of ecosystem in MPA Karimunjawa as shown in Table 1, such as coral reef, seagrass and seaweed, mangrove, coastal forest, and tropical rain forest (BTNKJ 2012).

Table 1

Karimunjawa National Park areas

| *Areas* | *Wide* |
|---|---|
| Land area on Karimunjawa Island: lowland tropical rain forests | 1.285,50 hectares |
| Land area on Kemujan Island: mangrove forest | 222,20 hectares |
| Marine area, based on the Decree of Forest Ministry 74/Kpts-II/2001 – March 15th 2001; this area is stated as Kawasan Pelestarian Alam (KPA) | 110.117,30 hectares |

Source: BTNKJ (2012).

Mangrove forest provides a variety of services which include provisioning services such as playing an important role in flood mitigation, buffering against saline intrusion and waves, and hydrological regulator. It is also an essential habitat for diverse wildlife, including fishes, shells, and microbes, and provides a variety of products used by local inhabitants such as fuelwood and timber resources (Latiff & Hanum 2014). The ecological role of mangrove forest was as the buffer zone in the coastal area and specific part as a spawning ground and nursery ground as well as for feeding ground for coastal organisms which are highly dependent to the mangrove forest. The mangrove role was as primary productivity with a large quantity of organic detritus from mangrove leaf and nutrients (Hartoko et al 2015).

Nowadays, the actual condition of mangrove forest in Karimunjawa is not known well, though the community has taken advantage of certain types of mangrove to fulfill their needs. Moreover, an over-exploited activity which can be threatening mangrove forest starts to be revealed, such as timber theft. Given these threats, improved management is necessary to ensure the sustainability of mangrove resources in MPA Karimunjawa as an MPA now and in the future. The success of mangrove conservation management will depend on how people value the conservation from economic and environmental consideration. To enhance the conservation focus as stated on the Presidential Decree (Kepres) No. 32/1990, the width of the mangrove green belt in any coastal area should be set up about 130 × annual average of the difference between the highest and lowest tides (Kusmana 2014).

The increase in coastal activities, fisheries, and tourism in Karimunjawa National Park will also affect the environmental quality of the ecosystem preservation; the activity must also be balanced with proper management of relevant stakeholders. If activities increase but are not matched by good management, then the potential for environmental quality degradation will occur; until 2017, there were 15 known cases of violations and abuse, not including other violations that have not been detected and occur to date (Limbong & Soetomo 2014). According to Limbong & Soetomo (2014) there are tourists doing snorkeling activities that step on the reef and sometimes there are also those who take coral as souvenirs; this is because tourists are still laid knowledge of snorkeling, then the lack of tourist knowledge about the zoning of Karimunjawa National Park, lack of supervision on the activities of tourists who are scattered in areas that have the function of the core zone and protection of Karimunjawa National Park. The high construction of new lodging accommodation in Karimunjawa District has resulted in a reduction in open land, which has a negative impact, namely a reduction in the supply of clean water and the occurrence of natural disasters, namely landslides.

The enactment of Law Number 22 of 1999 concerning regional government encourages the Karimunjawa National Park Office to design a collaborative management system. Article 10 states the regional obligation to manage and conserve national resources in its territory. This management and conservation effort must involve all parties who have interests in Karimunjawa, such as the regional government, non-governmental organizations, universities, research institutions, communities, the private sector and other parties (BTNKJ 2004).

The contingent valuation method (CVM) approach has been widely applied in studies around the world, including Indonesia, specifically to measure the value of the use of natural resources and the environment that cannot be quantified in monetary value. Research with related topics in Indonesia was carried out by Baskara et al (2017) who examined the economic valuation of the management of the core zone Karimunjawa Islands and Susilowati et al (2018) discussion on economic valuation of tourism attraction. Purwanti et al (2010) researched and drafted the co-management on the development and management of Karimunjawa National Park, then Suharno et al (2016); Suharno et al (2017a, b), and Suharno et al (2018) also examined the weak compliance that inhibits the success of fishers in the waters.

Based on the description of the background above, the following problem can be formulated: how to estimate the conservation value of mangrove forests in marine protected areas of Karimunjawa National Park?

The objectives of this research are to estimate the conservation value of mangrove forest in Kemujan Island – Karimunjawa and to estimate the community participation towards the conservation of mangrove forest in Kemujan Island – Karimunjawa. Kemujan Island is the second-largest island (1,500 ha), which is adjacent to Karimunjawa Island and has the only airport in the group (Dewadaru Airport). Karimunjawa and Kemujan are connected by approximately 350 m of mangrove forest and a bridge, so it appears to be one single island (Susanto et al 2014).

**Material and Method**. The analytical method used in this study is quantitative analysis (descriptive statistics), an in-depth interview, and the contingent valuation method. Quantitative analysis (descriptive statistics) is an analytical method used to solve problems related to the measurement of quantity (number and data). This method is explained using a descriptive statistical approach which is used to explain the profile of respondents and the level of public awareness on the zoning of Karimunjawa National Park, the condition of the Karimunjawa National Park ecosystem and its management, and the community's concern to participate in managing Karimunjawa National Park.

Qualitative analysis (in-depth interview) is a process of exploring information in depth, openly and freely on the topic of research, namely mangrove restoration, by asking questions and meeting face to face with respondents. Following the purpose of the study, in-depth interviews were conducted to determine conservation and management efforts and estimate costs. In-depth interviews in this study were carried out through interviews with experts from several related agencies.

In general, the measurement of economic valuation aims to provide economic value to the resources used by the real value and community perspective. The method of economic valuation analysis used in this study is the contingent valuation method. The CVM approach is often used to measure passive values (non-use values) of natural resources or often also known as the value of existence. CVM in this study aims to find out: a. Estimation of the core zone conservation and security investment costs for willingness to pay (WTP) of the Karimunjawa National Park community, b. WTP of the Karimunjawa National Park community to conserve and secure the core zone of the Karimunjawa Islands.

This research was located in the Marine Protected Area of Karimunjawa Island and mangrove tourism zone (tracking mangrove), Kemujan Island as shown in Figure 1. Kemujan Island is chosen because it has relatively good mangrove forest for ecotourism development (Simanjuntak et al 2015). The economic valuation was applied to answer the objective of this research. CVM was designed to estimate the economic value in conserving mangrove forest in MPA Karimunjawa using secondary data obtained from Balai Taman Nasional Karimunjawa (BTNKJ) final year report 2017. CVM is the most widely used method for estimating non-market values (Zhang & Cai 2005). Thus, the selection of CVM in this study is due to its reliability in valuing non-market goods, such as mangrove forest.

MPA Karimunjawa is one of seven marine national parks in Indonesia. It is located in the Karimunjawa Archipelago, 120 km north of Semarang. Administratively, the park is located within Karimunjawa sub-district, part of Jepara district, Central Java, Indonesia.

Karimunjawa Islands is made up of 27 individual islands, 22 islands are managed by the park, which covers 7,033 ha of land and 104,592 ha of marine waters including several natural ecosystems (Sumaryati et al 2007 in Susanto et al 2014). The archipelago has a human population of 8,733 living in villages on four main islands – Karimunjawa, Kemujan, Parang and Nyamuk Island (BTNKJ 2012).

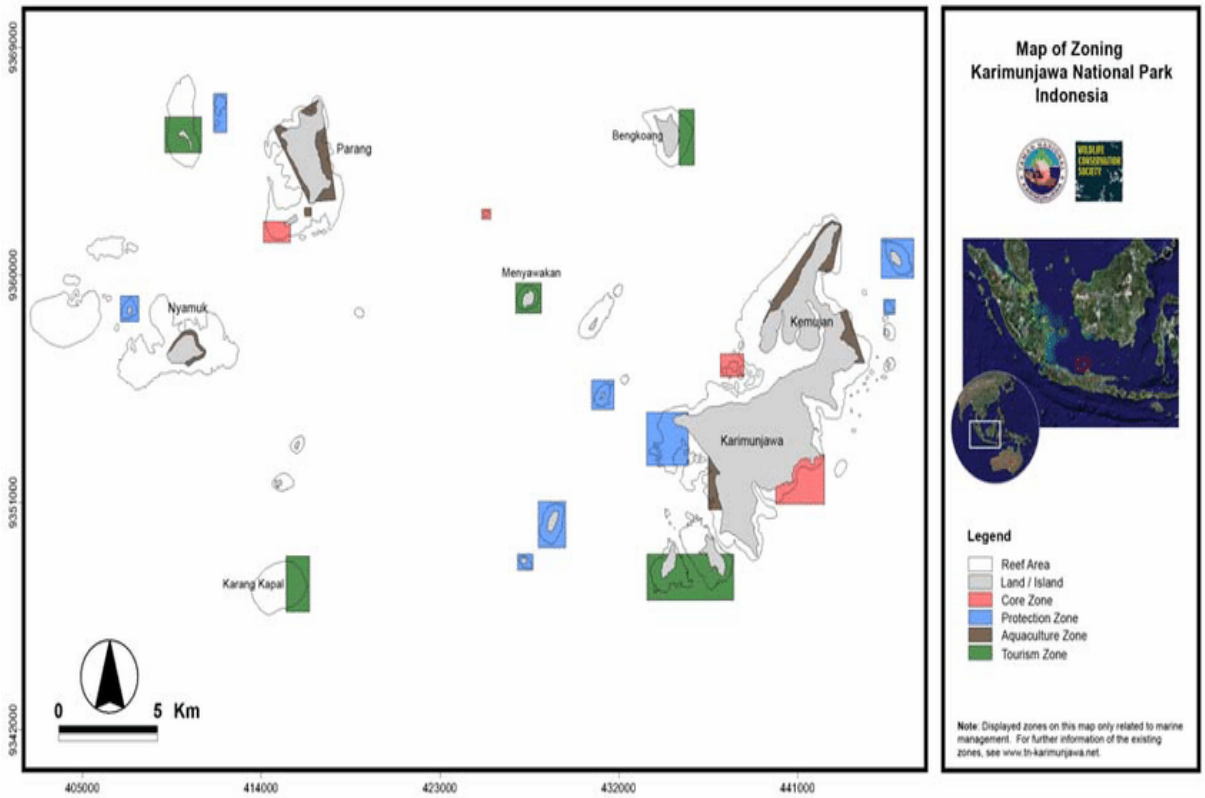


Figure 1. Marine Protected Area of Karimunjawa Island Jepara Indonesia.

Hanley & Splash (1993) describe the stages of applying the contingent valuation method approach through five stages of activity, including:

1. Building hypothetic market scenarios: the first stage that must be done in research that uses the CVM method is to build a hypothetical market first of the resources to be evaluated. The activity scenario must be clearly described in the survey instrument (questionnaire) so that respondents can understand the environmental objects in question as well as community involvement in the action plan. The prepared questionnaire must also describe whether all consumers will pay a certain price if the environmental changes are actually implemented. This questionnaire can be first tested in small groups to find out the reaction to activities that will be carried out before these activities are actually carried out. Panel discussions from each relevant stakeholder are needed for hypothetical market objectivity to be made. In creating a hypothetical market scenario, researchers conduct surveys and field observations and in-depth interviews with key persons to determine the best scenario strategy in order to conserve and secure the core zones of Karimunjawa National Park;

2. Obtaining bids: the next stage in the operation of CVM research is to obtain the auction value after the hypothesis market is compiled. This is done by conducting surveys, either through direct surveys with questionnaires, telephone interviews or by mail. From the three ways, the direct survey will get better results. The purpose of this survey is to obtain the maximum value of desire to pay (WTP) from respondents to a project, for example, environmental improvement. In this stage, the researcher uses the Bidding Game method, in which the respondent is asked questions about whether they want to pay a certain amount. This value can then be raised or lowered;

3. Calculate the average WTP or WTA value: the next stage in CVM operations is to calculate the average WTP value of each individual. This value is calculated based on the auction value (bid) obtained in the second stage. This calculation is usually based on the mean and median. At this stage must be considered the possibility of outliers (very far deviate from the average). So, for example, 99 respondents from 100 prescriptions only gave the maximum auction value for the WTP of Rp. 1 million, while the 100th respondent gave a maximum WTP value of Rp. 10 million. So in statistical calculations, this value is called an outlier and is usually not included in the calculation. It should also be noted that the calculation of the average WTP value is easier to do for surveys that use structured questions rather than question-based referendum (yes or no). The calculation of average WTP was the value of the total WTP divided by the number of respondents (Fauzi 2006):

$$EWTP = \frac{\sum_{i=1}^{n} W_i}{n}$$

Where: EWTP = suspected average WTP value;
Wi = i WTP value;
n = number of respondents/samples;
i = respondents who are willing to pay (i = 1, 2, 3, ..... n);

4. Estimating auction curve (bid curve): Fauzi (2006) states that the WTP bid curve can be estimated by regressing the WTP/WTA as a dependent variable (dependent variable) with several independent variables. This curve can be used to estimate changes in WTP values due to changes in a number of independent variables related to environmental quality. In addition, the WTP curve can also be useful to test the sensitivity of the number of WTPs to variations in changes in environmental quality. The relationship between independent variables and dependent variables can be linearly correlated with the form of general equations as follows:

$$WTPi = f ( I, E, A, Q)$$

where the WTP is a dependent variable, and other notations are factors that affect the average WTP, including income (I), level of education (E), age level (A), and several other variables that can be a measure of environmental quality ( Q);

5. Aggregating data: the last stage in the CVM technique is to aggregate the average auction obtained in stage three. This process involves converting the average sample data to the overall population average. One way to convert this is to multiply the sample average by the population number (n). The total value of community WTP can be calculated (Fauzi 2006).

**Results and Discussion**. Karimunjawa National Park consists of 27 (twenty-seven) large and small islands. Karimunjawa Island is the largest island and the main island in the Karimunjawa National Park area. Based on the Decree of the Director General of Forest Protection and Nature Conservation number 79/IV/Set-3/2005 concerning revision of zoning of Karimunjawa National Park, the Karimunjawa Island covers an area of 4,301.5 ha, has a function on land as a core protection zone in the tropical rainforest low and mangrove forests, settlement zones, rehabilitation zones to the west of Karimunjawa Island, and cultivation zones. The function of the waters around Karimunjawa Island is as a core zone in Tanjung Bomang waters and traditional fisheries utilization zones.

Land and water activities are quite high compared to other islands in the Karimunjawa Islands. Karimunjawa waters are traversed by residents who go and go home from fishing and the arrival of passenger ships to Karimunjawa National Park. A summary of the socio-economic characteristics of respondents is presented in Table 2.

Table 2

Socio-economic characteristics of respondents

| *Characteristics* | *Description* | *Frequency* | *%* | *Information* |
|---|---|---|---|---|
| Sex | Male | 48 | 56.47 | |
| | Female | 37 | 43.53 | |
| Age (years) | 21 – 30 | 16 | 18.82 | Mean: 39.76 |
| | 31 – 40 | 30 | 35.29 | Min: 19 |
| | 41 – 50 | 26 | 30.58 | Max: 67 |
| | 51 – 60 | 11 | 12.94 | |
| | > 60 | 2 | 2.35 | |
| Marital status | Married | 46 | 54.11 | |
| | Not married | 39 | 45.88 | |
| Graduated | Non-school | 0 | 0 | |
| | Elementary school | 8 | 9.4 | |
| | Junior High school | 19 | 22.35 | |
| | High school | 29 | 34.11 | |
| | College | 29 | 34.11 | |
| Number of family members | No-family | 49 | 57.65 | |
| | 2 | 26 | 30.59 | |
| | 3 | 4 | 4.71 | |
| | 4 | 4 | 4.71 | |
| | 5 | 2 | 2.35 | |
| | 6 | - | - | |
| | >7 | - | - | |
| Income level | Rp 500,000,- - Rp 1,000,000,- | 7 | 8.23 | |
| | Rp 1,100,000,- - Rp 2,000,000,- | 24 | 28.23 | |
| | Rp 2,100,000,- - Rp 3,000,000,- | 20 | 23.52 | |
| | Rp 3,100,000,- - Rp 4,000,000,- | 22 | 25.88 | |
| | Rp 4,100,000,- - Rp 5,000,000,- | 2 | 2.35 | |
| | > Rp 5,000,000,- | 10 | 11.76 | |

Source: primary data processed, 2018.

***Share from the community for the conservation and safeguarding of the core zone of the Karimunjawa National Park through the contingent valuation method and willingness to pay approaches***. The CVM is used to analyze the amount of respondents' WTP value to conservation efforts and to secure the core zone of Karimunjawa National Park. Through the CVM, commodities that do not have market prices can be known of their value or worth. Following are the results of the application of the CVM method in this study:

1. Setting up the hypothetical market: respondents are given an explanation about the importance of maintaining the Karimunjawa core zone because the core zone as an absolute protected zone serves to protect ecosystems, preserve typical flora and fauna and their habitats that are sensitive to disturbances and changes, germplasm sources of wild plants and animals, for the benefit of research and development of science, education, supporting cultivation. Activities that are permitted are activities of protection and security, inventory and monitoring of resources, education, research and or supporting cultivation. The community will maintain and adhere to the core zone and not enter the core zone area and utilize the resources within the core zone. The current condition of the core zone of Karimunjawa National Park is increasingly degraded due to the many violations and misuse due to human activities. After being given information about the condition of the degraded ecosystem, then the respondent is given an explanation that the relevant government will make conservation and safeguard measures that aim to maintain the functions and benefits of the inti zone. Conservation efforts and safeguards that will be carried out also involve the community so that the role and active participation of the community is needed.

Because the government has limited budgetary funds for the Karimunjawa in the implementation of this activity, the community is invited to participate through contributions. The contribution rate is based on the hypothetical market scenario that was built in this study, including:

a. Package 1 scenario (Rp. 17,000 / year):
- coral reef transplants;
- maintenance of coral reef transplants.
b. Package 2 scenario (Rp. 28,000 / year)
- coral reef transplants;
- maintenance of coral reef transplants;
- Karimunjawa core zone security patrol.
c. Package 3 scenario (Rp. 53,000 / year)
- coral reef transplants;
- maintenance of coral reef transplants;
- Karimunjawa core zone security patrol;
- installation and maintenance of core zone boundaries.

Respondents are given 3 (three) choices of market scenario as above. Furthermore, the community is given an explanation that the contribution funds collected will be managed and allocated for the conservation and security of the core zone.

2. Obtaining bids: the technique used to determine the WTP value of respondents in this study was obtained through the game bidding approach. Game bidding method is applied by giving the bid value to the respondent starting from the smallest value to achieving the desired WTP value by the respondent. The bid value is obtained through estimating conservation investment costs and safeguarding the core zone. After designing the efforts carried out in the framework of conserving the core zone of Karimunjawa National Park, it is necessary to know the estimated costs needed for conservation and safeguarding of the Karimunjawa core zone. Estimated conservation investment costs and safeguarding Karimunjawa's core zones are obtained through in-depth interviews with agencies related to mangrove management, such as the marine and fisheries service, the forestry service, and the Karimunjawa National Park Office, academics, and governments (Tables 3, 4, 5, 6, and 7).

Table 3

Conservation scenario 1 (coral reef transplant artificial patch reef method)

| *Coral reef transplant (1 zone area)* | | | | | |
|---|---|---|---|---|---|
| *Description* | *Times* | *Number* | *Units* | *Price* | *Total* |
| Subtract made (modular from concrete) | 4 | 1 | Piece | 5,000,000 | 20,000,000 |
| Artificial installation (deploying) | 4 | 1 | Time | 10,000,000 | 40,000,000 |
| Purchase of scuba sets | 1 | 5 | Piece | 15,000,000 | 75,000,000 |
| Scuba diver honor | 4 | 5 | Work day | 250.000 | 5,000,000 |
| Grand total | | | | | 140,000,000 |
| *Maintenance for 1 year* | | | | | |
| Scuba diver honor | 6 | 10 | Work day | 250,000 | 15,000,000 |
| Cleaning brush | 6 | 5 | Piece | 50,000 | 1,500,000 |
| Air spray compressor | 1 | 1 | Piece | 5,000,000 | 5,000,000 |
| Grand total | | | | | 21,500,000 |
| Scenario 1 Bid Value, Scenario 1 Cost : Population<br>= Rp. 161,500,000 : 9.379<br>= Rp. 17,219.31 per year<br>= Rp. 17,000,000 per year | | | | | |

Source: primary data processed, 2018.

Table 4

Conservation scenario 2 (safeguarding core zones)

| *Core zone security patrol* | | | | | |
|---|---|---|---|---|---|
| *Description* | *Times* | *Total* | *Unit* | *Price* | *Total* |
| Salary of security personnel | 24 | 10 | Work day | 300,000 | 72,000,000 |
| Speedboat fuel (premium gasoline) | 24 | 200 | Liter | 6,450 | 30,960,000 |
| Grand total | | | | | 102,960,000 |
| Scenario 1 Bid Value, Scenario 1 + 2 Cost : Population<br>= Rp. 161,500,000 +102,960,000 : 9,379<br>= Rp. 28,197.035 per year<br>= Rp. 28,000.00 per year | | | | | |

Source: primary data processed, 2018.

Table 5

Conservation scenario 3 (installation and maintenance of core zone boundaries)

| *Installation of mooring buoy (core zone boundary sign)* | | | | | |
|---|---|---|---|---|---|
| *Description* | *Times* | *Number* | *Unit* | *Price* | *Total* |
| Moring buoy (single point mooring) and sinker | 4 | 12 | Piece | 3,000,000 | 144,000,000 |
| Kili-kili (swivel) and horse nails (hooks) | 4 | 12 | Piece | 1,500,000 | 72,000,000 |
| Buoy chain (5mm) | 4 | 12 | Per 10 m | 325,000 | 15,600,000 |
| Installation of buoys (deploying) | 4 | 4 | Work day | 1,000,000 | 16,000,000 |
| Grand total | | | | | 247,600,000 |
| Scenario 1 Bid Value, Scenario 1 + 2 + 3 Cost : Population<br>= Rp. 161,500,000 + 102,960,000 + 247,600,000 : 9,379<br>= Rp. 54,596.44 per year<br>= Rp. 54,000.00 per year | | | | | |

Source: primary data processed, 2018.

Table 6

Distribution of WTP (values of respondents who are willing to pay)

| *No* | *WTP* | *Respondents (person)* | *Percentage (%)* | *WTP x respondents who are willing to pay* |
|---|---|---|---|---|
| 1 | Rp. 17,000,- | 7 | 8.53 | Rp. 119,000,- |
| 2 | Rp. 28,000,- | 10 | 12.19 | Rp. 280,000,- |
| 3 | Rp. 53,000,- | 65 | 79.26 | Rp. 3,445,000,- |
| | Total | 82 | 100 | Rp. 3,844,000,- |

Source: primary data processed, 2018.

Table 7

Total WTP for conservation and security of the core zone of Karimunjawa National Park

| *Average WTP Value (a)* | *Number of research populations (b)* | *Total WTP per year (a x b)* |
|---|---|---|
| 47,000,- | 9,379 | Rp. 440,813,000 |

Source: primary data processed, 2018.

3. Calculate estimated mean WTP (estimating mean WTP): BTNKJ has conducted an inventory of mangrove forest on October 16th-25th, 2013 in Kemujan Island. There are 25 species of mangrove in the seedling, sapling, and tree category. The species that dominates seedling and sapling category in Kemujan Island is *Bruguiera cylindrica* and *Ceriops tagal* with Importance Value Index of 74.47% and 68.03% in a row for the

seedling category, and 59.47% and 57.96% in a row for sapling category, respectively. While the species that dominates for tree category is *Excoecaria agallocha* with Importance Value Index of 62.50%. *Scyphiphora hydrophyllacea* is found for 209 individuals with the most composition in sapling category. *Sonneratia ovata* is found for 34 individuals in sapling and tree category, but none in the seedling category. *Pemphis acidula* is found for 1 individual in sapling category (BTNKJ 2012).

The economic value of mangrove forest conservation in Kemujan Island is calculated using the CVM. The economic value of conserving mangrove forest in a marine protected area can use the set up of the hypothetical market in Kemujan Island as shown in Table 8. The hypothetical market in conserving mangrove forest consists of four actions: inventory of mangrove, monitoring of mangrove, technical plan of mangrove tracking, and restoration.

Table 8

Economic value in conserving mangrove forest

| *Action* | *Amount (Rp)* |
|---|---|
| Inventory of mangrove | 55,800,000 |
| Monitoring of mangrove | 39,000,000 |
| Technical plan of mangrove tracking | 42,249,000 |
| Restoration | 96,080,000 |
| Total | 233,129,000 |

Source: BTNKJ (2012).

Community participation towards the conservation of mangrove forest in Kemujan Island is calculated by dividing the economic value in conserving mangrove forest with the number of households in MPA Karimunjawa. Based on Statistic Indonesia (2017), the number of households in MPA Karimunjawa is about 2,929 households. Thus, community participation towards the mangrove conservation is estimated for about 75% of 2,929 households in MPA Karimunjawa is willing to contribute for conserving mangrove forest in Kemujan Island. The total amount of 75% (2,197 households) community contribution is calculated for about Rp 8,900.00 per month per household for a long 12 months / a year. It can be used as a reference in determining the contribution for communities to be allocated in conserving mangrove forest in Kemujan Island. Thus, the money collected from the community in conserving mangrove forest in Kemujan Island is for about Rp 233,129,000.00.

**Conclusions**. Based on the inventory of mangrove in Kemujan Island by BTNKJ, there are 25 species of mangrove in the seedling, sapling, and tree category. The conservation value of mangrove forest in Kemujan Island – MPA Karimunjawa is arranged by setting up the hypothetical market which consists of four actions: inventory, monitoring, technical plan of mangrove tracking, and restoration. The total economic value in conserving Karimunjawa National Park is Rp 431,434,000.00, with a population of 9,379 visitors in MPA Karimunjawa is calculated around Rp 46,000.00 WTP average value.

Considering the value of conservation in marine protected areas in Karimunjawa, it is recommended: a) replant the types of mangroves found at the tree level, but not found at the seed and stake level. It is feared that this type of regeneration cannot occur naturally, so there needs to be planting intervention to save its sustainability. b) The willingness of visitors to pay higher is a form of awareness of conservation so that it is expected to facilitate management policies and sustainability of coastal resources and preservation of coral reefs in Karimunjawa National Park.

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