The Community Participation on Mangrove Conservation in Sayung, Demak from 2004-2016

S Astuti*, C Muryani and M G Rindarjono

Program Studi Magister Pendidikan Kependudukan dan Lingkungan Hidup
Universitas Sebelas Maret Surakarta, Jl. Ir. Sutami 36A, Jebres, Surakarta, Indonesia

*albittwoy33@gmail.com

Abstract. This study aims to examine: 1) the change of mangrove land from 2004 to 2016 in Sayung, Demak, and 2) the community participation on mangrove conservation forest in Sayung, Demak. This research used descriptive qualitative method with embedded research case design. Sampling techniques used in this study were Purposive Sampling and Snowball Sampling technique. The data collection techniques used are field observation, in-depth interviews, documentation, and literature study. This research adopted Miles and Huberman’s data collecting which consists of three activities, namely the data reduction, presentation, and withdrawal of conclusion/verification. The result of this study showed that: 1) the change of mangrove land in Sayung sub-district of Demak Regency from 2004 to 2016 has expanded the area, in which 32,48 Ha in 204 into 49.05 Ha in 2009, 115,65 Ha in 2014, and finally in 2016 has an area of 160.89 Ha. There are 4 villages that became the setting of research because of its location in Coastal area in North Coast of Java, namely: Sriwulan Village, Bedono Village, Timbulsloko Village and Surodadi Village. Some techniques were used by the community participants and resources management without damaging the conservation of mangroves. Bedono village became a region with high category participation. It reveals that the percentage of respondents was 45.36% for planting & maintenance and 46.39% for resource management. While the village of Sriwulan become the region with low category participation rate of 46.46% planting & maintenance and 43.43% resource management.

1. Introduction
Indonesia belongs to one of the countries with the widest mangrove ecosystem in the world. According to data from the Directorate General of RLPS, the Ministry of Forestry in 1999, the potential area of Indonesia mangrove ecosystems based on the distribution of potential land for mangrove planting area is 9.2 million hectares. The area consists of forest area (3.7 million hectares) and non-forest area (5.5 million hectares). The mangrove ecosystem has essential functions, including physical, ecological, and socioeconomic function for coastal and marine ecosystems and surrounding communities. According to references [1], mangroves are a small evergreen important habitat found in the inter-tidal zones of tropical and subtropical coasts. Mangroves are a very important ecosystem that usually found in tropical and sub-tropical zones. Mangrove ecosystem is widely functioned and converted for various development purposes, such as marine tourism, aquaculture, forestry, settlement, communications, and so on [2]. Much of the ecological service of mangroves lies in protecting the coast from solar UV-B radiation, “greenhouse” effects, and fury of cyclones, floods, sea level rise, wave action and coastal erosion.
As a result, conversion of mangroves to aquaculture has become highly controversial. For investors, the international demand for shrimp in particular makes a decline in price. For developing nations, shrimp aquaculture brings in export earnings and foreign exchange [4].

The most perceived effect of mangrove forests damage is the loss of settlements caused by seawater abrasion. For more than 2 (two) decades, the north coast of Demak experience a very rapid abrasion. Gamal and Sparke (2012) in their collaboration research resulted in the conclusion that coastal abrasion that occurred in Demak Regency for the last 12 years reached 16 villages. The covered area is approximately 3 kilo meters and along the 17 kilo meters along the coastline. There are some villages remaining but two villages, Senik and Tambaksari in Demak Central Java disappeared and then are removed from the Indonesian map [5]. In addition, the abrasion in 2005 has caused the sinking of residential areas in two sub villages. Those sub villages are Rejosari Senik and Tambaksari that are located in the borderline between Bedono village and Surodadi village. Both sub villages need to be relocated since the remaining area is often submerged rob or flood of seawater up to as high as 1.5 meters [6]. The presence of puddles in the houses becomes a very disturbing problem because of the potential to accelerate the house damage. In addition, the most severe impact of the ongoing tidal flood disaster is the sinking of both in-built land and non-built land [7]. Mangroves are highly resilient and flexible systems, adapting themselves to a wide range of environmental conditions. This characteristic makes the management of this system simpler, being limited to the conservation of the properties and processes that control them [8].

Based on the explanation, it is necessary to conduct research to find out more about community participation in the conservation of mangrove forests, especially in the coastal area Sayung District. This study is very interesting to investigate because it will get valid information about community participation in conservation of mangrove forest in accordance with the areas visualized through icons image of 2004-2016. The range of year is selected because it provides information on the significant development of the area of mangrove forest. Therefore, the novelty of this research lies on not only know the level of community participation but also the area with the development of certain mangrove forest area.

2. Methods
This research is administered under a qualitative descriptive research method with embedded research case design. The design of this study focuses on changes of mangrove land in Sayung, Demak district. The main variables being studied extensively and deeply are the community participation in the conservation of mangrove forests. The community participation is described to the extent that communities participate in the conservation of mangrove land. After that, the result is collaborated with changes in mangrove land in Sayung, Demak district.

Sampling technique used for this research is by Purposive Sampling and Snowball Sampling technique. To determine the number of samples, Slovin formula is used [9] as follows:

\[
n = \frac{N}{1 + Ne^2}
\]

Note:
n: Number of samples
N: Total population
e: The tolerance limit of error (error tolerance)

Based on the formula, the calculation of samples per village can be seen in the following table 1:

| No. | Village     | Total of residents | Sample (10%) |
|-----|-------------|--------------------|--------------|
| 1.  | Sriwulan    | 12.572             | 99           |
| 2.  | Bedono      | 3.536              | 97           |
| 3.  | Timbulsloko | 3.469              | 97           |
| 4.  | Surodadi    | 2.832              | 97           |
|     | **Total**   | **390**            |              |
Data collection techniques used in this study includes observation/field observation, in-depth interviews, documentation, and literature study. In addition, it also conducted a terrestrial survey and then mapped the change of conservation land of mangrove forest within 12 years (2004-2016). Geographic Information System analysis (GIS) is used in mapping the changes land conversion of mangrove forest.

The data obtained in the research is analysed using interactive model Miles & Huberman data analysis technique. According to References [10], the analysis consists of three simultaneous activity flows: data reduction, data presentation, and conclusion/verification. To know the change of mangrove land in the span of 12 years, from 2004 to 2016, it is used analysis of temporal image of year 2004, 2009, 2014 and 2016 which sourced from google earth. Furthermore, the four maps are overlaid to find out the change of mangrove area from 2004, 2009, 2014 and 2016. The result of map overlay will result in map of mangrove land change in each village of the coastal area, Sayung sub district.

To know the level of community participation in the conservation of mangrove forests in the coast of Sayung sub district, 2 criteria are used: a) Planting and maintenance activities of mangrove land; and b) Resource management which is generated from mangrove forest without damaging the conservation of existing mangrove land.

3. Results and Discussion
Sayung sub-district is one of the sub-districts of Demak Regency, Central Java Province. This district is located at the westernmost and directly adjacent to Semarang City. Astronomically, Sayung is located at coordinates 6º51'00 " - 6º57'00" and 110028'20 " - 110031'75 ". Geographically, Sayung is bordered by Java Sea in the north, Karangtengah sub district in the east, Mr.anggen sub district in the south, and bordering the city of Semarang in the west. Industrial development in this sub district is quite rapid when it is compared to other districts due to the expansion of industry and trade from Semarang City. Administratively, the Sayung consists of 20 villages, 101 hamlets, and 105 RW and 484 RT.

3.1. Change of Mangrove Land in Sayung Sub-district of Demak Regency from 2004 to 2016
The data of land change is obtained with the assist of google earth application adjusted with certain imagery date. The next step is an image interpretation based on hue and colour elements, shapes, sizes, textures, patterns, shadow, sites and associations. To do remote sensing on mangrove vegetation, there are two important properties namely mangrove habitat grow in coastal area and plant content which have green leaf substance (chlorophyll). To identify the type of objects in the image and to distinguish mangrove and non-mangrove vegetation is by looking at the distance with the beach. Sometimes, the two types of vegetation are separated by other objects such as housing, ponds, vacant land [11].

Satellite remote sensing is an efficient tool that has been adopted for the detection, description, quantification and monitoring of the Earth's natural resources [12]. To know the change of mangrove land in this area of land in Sayung, it uses multi temporal image with time unit in 2004, 2009, 2014 and 2016.

After interpreting the image and data GIS through ArcGis software, it can be presented map of mangrove land in 2004, 2009, 2014, and 2016. Based on the analysis, information about change of mangrove land in 4 village of Sayung sub-district expands every year. After the overlay (map overlay) of mangrove land from 2004, 2009, 2014, and 2016, it can be obtained from the development of land that expands from year to year. From 2004, the mangrove land of Sayung district reached 32,48 Ha, in 2009 has wide 49,05 Ha, in 2014 has wide of 115,65 Ha and in 2016 has wide of 160,89 Ha. The figure shows a significant change in the area although coastline rises each year. This means that there is public awareness of their environmental damages if mangrove land is not maintained. Thus, the increasing change in the area of land is considered as the result of community efforts to conserve mangrove land in more optimal way. Mangrove land began to be developed as ecotourism so that it is likely opening new income potency. Map can be seen as follows figure 1:
3.2. Community Participation in Mangrove Forest Conservation in Sayung Sub-district, Demak District

3.2.1. Sriwulan Village. Sriwulan is the only village that has the greatest impact of rob water compared to other villages in Sayung Sub-district. This condition influences community participation in conservation efforts of surrounding mangrove land. It is proven by the mangrove land in Sriwulan Village that is quite small compared to other coastal villages. In addition, Sriwulan village location is adjacent to the city of Semarang. It influences the coastal environment to be disturbed due to the presence of industrial and flooding activities that is severely increased. As reported in some media, the rob flood disaster in Sriwulan brings concerns and bring great loss to society [13].

Table 2. Level of community participation seen from mangrove land investment and maintenance in the Sriwulan village

| No. | Category | Score | Frequency (person) | Total Score | Percentage (%) |
|-----|----------|-------|--------------------|-------------|----------------|
| 1   | Low      | 1     | 46                 | 46          | 46.46          |
| 2   | Moderate | 2     | 28                 | 56          | 28.28          |
| 3   | High     | 3     | 20                 | 60          | 20.20          |
| 4   | Very High| 4     | 5                  | 20          | 5.05           |
|     | Total    |       | 99                 | 182         | 100.00         |

Source: Results of research data of 2017

Table 3. Level of community participation seen from resources management without damaging mangrove conservation in the village of Sriwulan

| No. | Category | Score | Frequency (Person) | Total Score | Percent-age (%) |
|-----|----------|-------|--------------------|-------------|-----------------|
| 1   | Low      | 1     | 43                 | 43          | 43.43           |
| 2   | Moderate | 2     | 23                 | 46          | 23.23           |
| 3   | High     | 3     | 24                 | 72          | 24.24           |
| 4   | Very High| 4     | 9                  | 36          | 9.09            |
|     | Total    |       | 99                 | 197         | 100.00          |

Source: Results of research data of 2017
Based on the table 2 and table 3, it can be seen that the level of community participation in mangrove conservation are classified into 4 levels, namely: low (score 1), medium (score 2), high (score 3) and very high (score 4). Each village in Sayung district has different characteristics. As a result, it is very interesting to do research. According to the table above, the level of community participation in the village of Sribulan belongs into the low category, both in form of planting and maintenance of mangrove land and resource management without damaging the mangrove conservation. There are 46 respondents with 46.46% of people having low participation in mangrove land management. On the other hand, there is very high participation from 5 respondents with percentage of 5.05%. This category also appears in resource management efforts without damaging the conservation of mangrove land. There are at least 43 respondents with 43.43% of respondents having low participation and 9 respondents with 9.09% having very high participation.

This very apprehensive condition is rooted from the community who are less concerned about the importance of mangrove land. Based on the results of in-depth research, this condition occurs due to the influence of coastline advances and rob flood that comes at any time with a large area. The community is hopeless and pessimistic with government and their own effort to save mangrove land. It is because mangrove land will be damaged by submerged seawater and land conditions that are not normal because of the influence of industrial activity. In addition, the area is close to Semarang City. The community is already tired of the programs, socializations, and training for mangrove management because the land is not supported to plant various kinds of mangrove plants.

3.2.2. Bedono Village. Based on the data table below, community participation on the conservation of mangrove land is generally included in the high category. This is evident from the characteristics of planting and maintenance of mangrove land as much as 44 respondents with have high participation rate (45.36%) and 6 respondents with low category (6.19%). In addition, the characteristics of resource management without damaging the conservation of mangrove communities also have a high participation rate of 45 respondents (46.39%), while the low category only is selected by 8 respondents with 8.25%. Based on the data on table 4 and table 5, it shows that there is a relationship between one characteristics and another.

**Table 4. Level of community participation seen from mangrove land and maintenance in Bedono village**

| No. | Category | Score | Frequency (Person) | Total Score | Percent-age (%) |
|-----|----------|-------|--------------------|-------------|-----------------|
| 1   | Low      | 1     | 6                  | 6           | 6.19            |
| 2   | Moderate | 2     | 32                 | 64          | 32.99           |
| 3   | High     | 3     | 44                 | 132         | 45.36           |
| 4   | Very High| 4     | 15                 | 60          | 15.46           |
|     | Total    |       | 97                 | 262         | 100.00          |

Source: Results of research data of 2017

**Table 5. Level of community participation seen from resources management without damage conservation mangrove in Bedono village**

| No. | Category | Score | Frequency (Person) | Total Score | Percent-age (%) |
|-----|----------|-------|--------------------|-------------|-----------------|
| 1   | Low      | 1     | 8                  | 8           | 8.25            |
| 2   | Moderate | 2     | 28                 | 56          | 28.87           |
| 3   | High     | 3     | 45                 | 135         | 46.39           |
| 4   | Very High| 4     | 16                 | 64          | 16.49           |
|     | Total    |       | 97                 | 263         | 100.00          |

Source: Results of research data of 2017

Bedono village has a high participation rate due to good land condition and initiator agent in improving mangrove land management participative. The mangroves in Bedono village are very well developed and well laid out. Now, it is directed to be the potential of mangrove ecotourism. The participation comes from not only the community, but also government and private stakeholders contributing to sustainable mangrove management. It is known that Bedono village gets support from
environmental management of mangrove land. They receive support directly from OISCA Japan because the community-based management can run well.

Based on interviews with Annas Haris (21 years old) who is a mangrove conservation activist of Sayung Sub-district, it is stated that every 3 months the community/students in elementary/junior high school perform undertake mangroves management program, covering rozhopors makronata, SP, and aphisemia (brayo). This activity is very useful to introduce environmental awareness to the next generation in order to preserve mangroves for sustainable development. Mangrove in Bedono village has been under the direct guidance of OISCA and its management has coordinated with KLH, DKP and local district government. Due to the management and the high level of community participation in the conservation of mangrove land, mangrove land has grown from both the area and the quality of the plants. Compared to the other coastal villages in Sayung sub-district, it has significant difference since there is an initiator group and a community that is already aware of the importance of mangrove plants for the life to come.

3.2.3. Timbulsloko Village. Based on the table 6 and table 7, it can be seen that community participation in the category of planting and maintenance of mangrove land has a high level of 42 respondents with 43.30%. However, the participation rate in the low category is also quite big as many as 18 respondents with a percentage of 18.56%. While the characteristics of resource management without damaging the conservation of mangrove Timbulsloko Village has a high participation rate with 50 respondents with 51.55%. However, it is just as for the category of low participation is still quite a lot of 18 respondents with a percentage of 18.56%.

| Table 6. Level of community participation seen from mangrove land investment and maintenance in Timbulsloko village |
|---------------------------------------------------------------|
| **No.** | **Category** | **Score** | **Frequency (Person)** | **Total Score** | **Percent-age (%)** |
|--------|--------------|-----------|------------------------|----------------|-------------------|
| 1      | Low          | 1         | 18                     | 18             | 18.56             |
| 2      | Moderate     | 2         | 24                     | 48             | 24.74             |
| 3      | High         | 3         | 42                     | 126            | 43.30             |
| 4      | Very High    | 4         | 13                     | 52             | 13.40             |
| **Total** |             | **97**    | **244**                |                | **100.00**        |

Source: Results of research data of 2017

| Table 7. Level of community participation seen from resources management without damage mangrove conservation in Timbulsloko village |
|---------------------------------------------------------------|
| **No.** | **Category** | **Score** | **Frequency (Person)** | **Total Score** | **Percent-age (%)** |
|--------|--------------|-----------|------------------------|----------------|-------------------|
| 1      | Low          | 1         | 18                     | 18             | 18.56             |
| 2      | Moderate     | 2         | 22                     | 44             | 22.68             |
| 3      | High         | 3         | 50                     | 150            | 51.55             |
| 4      | Very High    | 4         | 7                      | 28             | 7.22              |
| **Total** |             | **97**    | **240**                |                | **100.00**        |

Source: Results of research data of 2017

Timbulsloko village which in direct borders with Bedono village has different characteristics of community participation. When viewed from the average score of Timbulsloko Village is still lower than the Village Bedono (Timbulsloko Village = 2.52 and Bedono Village = 2.70). This means that the village has a high participation but still lacking because the number of categories with low participation is also high.

The level of community participation in the conservation of mangrove land depends on various factors such as age, occupation, length of stay, recent education and environmental conditions. The occupation in this case lies in what areas the dominant people do in everyday life. Farmers will be very different from private employees. Farmers will participate more in conservation of mangrove land because every day they struggle in their fields. On the other hand, private employees are less participation because of the limited time to see the surrounding environment.
3.2.4. Surodadi Village. Based on the results of research, Surodadi village has certain characteristics, especially community participation in mangrove land management. The more details can be seen in the following table 8 and table 9:

**Table 8.** Level of participation of people seen from mangrove land investment and maintenance in Surodadi village

| No. | Category | Score | Frequency (Person) | Total Score | Percent-age (%) |
|-----|----------|-------|-------------------|-------------|-----------------|
| 1   | Low      | 1     | 29                | 29          | 29.90           |
| 2   | Moderate | 2     | 30                | 60          | 30.93           |
| 3   | High     | 3     | 32                | 96          | 32.99           |
| 4   | Very High| 4     | 6                 | 24          | 6.19            |
|     |          |       | **Total**         | **209**     | **100.00**      |

Source: Results of research data of 2017

**Table 9.** Level of community participation seen from resources management without damage mangrove conservation in Surodadi Village

| No. | Category | Score | Frequency (Person) | Total Score | Percent-age (%) |
|-----|----------|-------|-------------------|-------------|-----------------|
| 1   | Low      | 1     | 30                | 30          | 30.93           |
| 2   | Moderate | 2     | 23                | 46          | 23.71           |
| 3   | High     | 3     | 34                | 102         | 35.05           |
| 4   | Very High| 4     | 10                | 40          | 10.31           |
|     |          |       | **Total**         | **218**     | **100.00**      |

Source: Results of research data of 2017

Based on the table 8 and table 9, it can be seen that the perception of the community on the characteristics of planting and maintenance of mangrove land has a high level. There are 32 respondents with a percentage of 32.99%. However, participation rate with low category of society is also quite high about 29 respondents with 29.90%. This means that the characteristics of participation in this characteristic are moderate that resembles the previous village of Timbulsloko village. When it is viewed from the characteristics of resource management, it does not damage the conservation of mangroves. The community has a high participation rate of 34 respondents with 35.05%. When viewed from the category participation, low participation scores are obtained by the village community Surodadi as many as 30 respondents with 30.93%.

Viewed from the mean score of total public perception, the characteristics of planting and maintenance of mangrove land has a moderate perception with an average of 2.15. While based on the characteristics of resource management, community perception level has a moderate level. It also reaches the average score of 2.25. By knowing the average score of each characteristic, there will be a conclusion about the number of community participation at most based on the distribution of coastal villages of Sayung sub-district.

4. Conclusions

Based on the results of data analysis and discussion, it can be concluded that:

a. The change of mangrove land in Sayung sub-district, Demak Regency from 2004 to 2016 has expanded, that is in 2004 has wide of 32.48 Ha, in 2009 has wide of 49.05 Ha, in 2014 has wide of 115.65 Ha, and in 2016 has an area of 160.89 Ha. There are four villages that become the research setting because it is located in Coastal area of North Coast of Java, namely: Sriwulan village, Bedono village, Timbulsloko village and Surodadi village.

b. Community participation in the conservation of mangrove forests in Sayung Sub-district, Demak District has two characteristics: 1) Planting, maintenance of mangrove land and 2) Management of resources without damaging the conservation of mangroves. Bedono village became a region with high category participation rate with the percentage of respondent as much as 45.36% planting & maintenance, and 46.39% resource management. While Sriwulan become the region with low category participation rate of 46.46% planting & maintenance and 43.43% resource management.
Based on the conclusions and research results, the researcher offers some suggestions as follows:

a. Efforts to conserve mangrove land will run effectively if all parties including community, government and private sector can collaborate to create good environmental management. It can be realized if there is a grand design that is made thoroughly and involves various parties in the conservation of mangrove land in the coastal district Sayung and the surrounding areas.

b. Government as a stakeholder should be more participative, so that regulations and policies can be well-implemented. In addition, management of seed distribution and stuffs is not only at the beginning of the program. Monitoring, supervision and counselling is necessary to achieve the optimal result.

c. The development of mangrove land is not merely an effort to conserve the environment but it should be able to revive the existing microeconomics. For instance, it can develop the tourism sector, ecotourism, or field study. Thus, mangrove land can be used to educate community in general and students in particular.

Acknowledgments
Thanks to all those who have assisted the research completion. To all Sayung-Demak coastal residents, stakeholders, government and civil society organizations engaged in mangrove conservation. Thanks also to Annas Haris for taking the time to collect data and become an agent of mangrove forests conservation in Sayung-Demak.

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