

Mangrove conservation based on local wisdom in North Maluku Province, Indonesia

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Abstract—Mangroves have ecological and economic functions for coastal communities in Indonesia. However, with the location of growth were very carefully to the community settlement causing mangrove vulnerable to exploitation. This study describes the utilization of mangroves in North Maluku Province and various conservation efforts with local wisdom approach. The study was conducted through a phenomenological approach and qualitative research by observation, interviews. The analysis of data was qualitative descriptive. The result shows that people in the village of Tuada District of Jailolo used mangrove forest products like building materials, boat making materials and as firewood. Furthermore, mangrove conservation endangered by using the rules of logging on mangrove, allowance for utilizing the type of mangrove and the regulation for replanting.

IndexTerms—Conservation, mangrove type, local wisdom.

I. INTRODUCTION

Mangroves are tropical coastal plant communities dominated by a few species that can grow and thrive in the muddy coastal tidal areas. Mangroves sometimes grow as individuals or plant communities in areas flooded by brackish water. Various terms that reveal about the group of mangrove plants, i.e., mangrove forests, bakau forests and brackish forests. The term connotes a mangrove plant or vegetation that is resistant to high salinity [1]. In the term of ecology, mangrove is a unique ecosystem and is one of the natural resources potentials for development. The unified physical elements, both terrestrial and marine biology, is creating a complex ecosystem between land and sea [2]. Mangrove forest is the producer of the material weathering (decomposer) which is a food source for small invertebrates eating material weathering (detritus). Small animals serve as a source of food for animals that are large, as a place to care for shrimp, fish, crabs, clams and an area for shelter, and breeding for birds and other animals, as a source of germplasm and as a natural habitat of various types of terrestrial and marine biota [3]. Besides the mangrove forest has socio-economic functions namely; as a producer of the wood fuel, industrial raw materials, pharmaceuticals, home furnishings, cosmetics, food, textile, glue, tanners, producing seeds/seedlings fish, shrimp, scallops, crab, as a tourist area, conservation, education, and research.

The mangrove forest is also a dominant life-supporting ecosystem in coastal and marine areas. Mangrove forest has ecological functions as a provider of nutrients for marine life, and act as nurseries for the care of a variety of marine life. The ecosystem is also retaining abrasion, retaining raging typhoons and tsunamis, absorbent waste, preventing intrusion of seawater into the land. Besides that, mangrove forest has an essential economic function as a provider of wood, as pharmaceuticals [4]. Mangrove forests provide ecosystem services as nutrient providers as well as carbon sinks. With the benefits of mangrove area, then total carbon emission can be reduced from 10 - 31 %. Therefore, mangrove conservation is a global climate change mitigation effort [5]

Many research about the critical function of mangrove forest for the community. In Mida Creek on Kenya, the life of the coastal population depend on mangrove resources; they utilize mangrove wood for home construction, firewood, charcoal, and shipbuilding. As a consequent mangrove species population to be reduced. [6]. In the Bintuni Bay of Papua on Indonesia, the potential for mangrove forests supports national trade activities. Exports of mangrove forest products to an ecosystem of 300,000 hectares intensified to a maximum of Rp40 billion / year (the US \$ 20 million / year). Also, the bay is also very potential for shrimp maintenance and export potential and an estimated economic value of Rp70 billion / year (the US \$ 35 million / year). Such economic activity causes a decline in mangrove quality. [7].

Mangrove forests in North Maluku province are also threatened with extinction. Local governments are developing conservation efforts involving local communities. One of the coastal areas is Tuada on Jailolo Sub District, West Halmahera District, North Maluku Province. The surrounding community develops mangrove conservation by utilizing local wisdom. Kecamatan Jailolo Selatan is included in the Halmahera Island cluster and administratively is one of the subdistricts in West Halmahera Regency, North Maluku Province. With the location adjacent to the beach, this area has a large enough mangrove area. Growing development in this region due to population growth causes ecosystem changes. The mangrove forest converts into a residential area, and its timber is exploited by the surrounding population as a building material and for firewood. Such exploitation actions can disrupt the ecology of coastal ecology.

II. RESEARCH METHOD

This research is a qualitative phenomenological (*etnosains*) which is the study of mangrove species conservation efforts based on local wisdom. Phenomena related to natural events that threaten the population of mangrove species in an area. Etnosains qualitative research refers to Battiste (2002)[8]. The research activities were gathering information from community leaders,

fishers, village officials and religious leaders, about the types of mangrove conservation efforts with local wisdom in the village Tuada. The research instrument is observation sheet, and interviews about the conservation of the mangrove species are diminishing in number.

III. RESULT AND DISCUSSION

The Utilizing of Mangrove

Observation results in Tuada Village showed that the typical mangrove species were *Sonneratia Alba* (family of *Sonneratiaceae*) or *PosiPosi* (local name) and *Xylocarpusgranatum* (*Meliaceae* family) with local name *Kira Kira*. Utilizing the mangrove species for the manufacture of the furniture and boats. The smooth and strength characteristics of wood are the reason for choosing this material. Based on the interviews with the community who conducted mangrove logging, that the logged timber was first dried. After dried, mangrove forest product was cutting according to the size of the needs for making furniture. Various conditions of wood species that can be felled such as stem and tree thickness conditions. Besides that, mangrove wood was also used as a shipbuilding material. The type of mangrove wood has strong properties and is resistant to the chemical conditions of sea water. Type of mangrove wood that can be used for shipbuilding with a diameter of more than 30 cm and length of 3 meters. The results are regarding with Kohlmeyer et al. (1995)[9], that mangrove wood is classified as wood with good density, very hard, strong and durable. This type of wood can be used for the construction of dock pier and railway bearings and fishing boats because it is not easy to leak.

The processing of mangrove wood products as cutting and drying into boards is presented in Fig. 1 and 2.



Figure 1. Vertically drying of wood



Figure 2 Horizontally drying

Another fact about the utilization of mangroves in Tuada Village is as firewood. Utilization of mangrove wood as a substitute for kerosene and LPG gas. The fuel is considered quite expensive and sometimes difficult to find. Sales of firewood mangrove forest products measuring 30 cm - 40 cm with a diameter of 15 cm - 20 cm. Each bundle is sold for between Rp. 5,000 to Rp. 10,000. Mangrove wood is cut first with the desired size and then dried for five days - 7 days until the wood is dry.

Exploitation of mangrove forests at the study sites is also accompanied by conservation activities. Awareness of the ecological benefits of mangrove forests encourages conservation efforts. The results of interviews with the community show that the mangrove forest area is also beneficial in environmental protection. The informant described that mangrove forest protects the land and ponds from abrasion. In the estuary area of the river with damaged mangrove forest conditions or wood is taken on a large scale, then abrasion reduces the quality of land. Fishers also understand the function of mangroves as a habitat for fish and crabs. Some community groups look for crabs in mangrove debt areas and feel the difficulties due to land conversion into settlement land.

Local Wisdom on Mangrove Conservation

Exploitation of mangroves that threaten the quality of ecosystems can be controlled by looking for ancestral customs associated with forest protection. Based on the results of interviews with customary figures obtained information that about 20 years ago, the people of Tuada Village guard the mangrove forest with the support of local wisdom. Various local terms related to mangrove conservation are:

- *Siatormawaktuuntukoro hate*. The term contains the agreement for the timing of mangrove logging based on deliberations by customary leaders. Deliberations between customary leaders discussed logging areas, those responsible for logging activities and communities that could benefit from logging. Historically, communities have complied with the rules, and there have been no logging activities without an agreement.

- *Oro hatetapiharussiutoadi*. Terms govern the party who responsible for conservation. The conservation rule was that people who use mangroves have to replant in previously logged areas.
- *Lahijjinssekolanodesa*. This term contains a rule that before the cutting mangroves to be made fishing boats, the community must first request permission to the customary leaders or community leaders.
- *Oro enamalamoenamaicisipelihara*. The term means that people can cut down trees that have large stems, while small trees should be allowed to grow and should not be felled.
- *Hakawarosemanciadofu*. The term is governing that before the felling of trees, the community must perform the ceremony as a praying procession. Moreover, after logging, the community should be made a traditional ceremony at the village hall.

Local Government encourages mangrove conservation activities by involving fishing communities. Community empowerment by getting used to planting mangrove with direct planting system. This system is elementary because the community only planted directly mangrove fruit that has been cooked on the location that has been prepared. Also, there are also fishermen who planted mangrove seeds in the nursery area. The community first ripens the mangrove fruit that is ripe then if the seeds have shown root stability, then the seedlings are planted in the area that has been prepared.

Discussion

Local wisdom is the strength of every ethnicity to maintain the culture and beliefs held. Local wisdom as a source of past noble values that is maintained in a region. Indonesia with a variety of ethnic groups has many types of local wisdom. The belief of society to obey the noble values can be an indicator of the life of the local community. The strength of local wisdom is essential to unite community groups and to be. Local wisdom is characteristic of the research area. Most residents of Jailolo sub-district live in coastal areas with livelihoods as farmers and fishers. With the condition of the area adjacent to the coast, causing the population is highly dependent on the ecological conditions of the area including the mangrove forest. The mangrove ecosystem depends on tidal conditions. The mangrove forest that is very close to the settlement area causes the higher exploitation activity.

The concept conservation development of mangrove area at research location can be developed its function. In addition to its economic function, the aesthetic function of this area can be optimized through ecotourism approach. This concept focuses on the development of the region as a tourist attraction with its green power. The development can be in the form of educational tracking, bird watching, fishing, tree plantation, adoption, and Canoeing. This development concept can optimize the role of customary institutions as a control group for all exploitation activities.

IV. CONCLUSION

People in Tuada Village, South Jailolo District, West Halmahera District, feel the benefits of mangrove forest as a fish and crab habitat. Also, communities were also aware of the protecting environmental benefits, especially for against abrasion. On the other hand, the exploitation of mangrove forests is related to the needs of building materials and boat materials. The result of mangrove forest wood is also used as fuelwood substitute fuel. With the awareness of the importance of mangrove forests for the community, there is various local wisdom that supports the efforts of mangrove conservation.

REFERENCES

- [1] I. M. Dutton, D. G. Bengen, and J. J. Tulungen, "The challenges of coral reef management in Indonesia," *Oceanogr. Process. Coral Reefs Phys. Biol. Links Gt. Barrier Reef*, pp. 315–330, 2001.
- [2] K. Kathiresan and B. L. Bingham, "Biology of mangroves and mangrove ecosystems," *Adv. Mar. Biol.*, vol. 40, pp. 81–251, 2001.
- [3] I. Valiela, J. L. Bowen, and J. K. York, "Mangrove Forests: One of the World's Threatened Major Tropical Environments: At least 35% of the area of mangrove forests has been lost in the past two decades, losses that exceed those for tropical rain forests and coral reefs, two other well-known threatened environments," *Bioscience*, vol. 51, no. 10, pp. 807–815, 2001.
- [4] A. Tolangara, H. Tuaputty, and A. D. Corebima, "Comparing Several Mangrove Seedlings," 2015.
- [5] D. Murdiyarso *et al.*, "The potential of Indonesian mangrove forests for global climate change mitigation," *Nat. Clim. Chang.*, vol. 5, no. 12, pp. 1089–1092, 2015.
- [6] F. Dahdouh-Guebas, C. Mathenge, J. G. Kairo, and N. Koedam, "Utilization of mangrove wood products around Mida Creek (Kenya) amongst subsistence and commercial users," *Econ. Bot.*, vol. 54, no. 4, pp. 513–527, 2000.
- [7] H. J. Ruitenbeek, "Modelling economy-ecology linkages in mangroves: economic evidence for promoting conservation in Bintuni Bay, Indonesia," *Ecol. Econ.*, vol. 10, no. 3, pp. 233–247, 1994.
- [8] M. Battiste, *Indigenous knowledge and pedagogy in First Nations education: A literature review with recommendations*. Apamuwek Institute Ottawa, 2002.
- [9] J. Kohlmeyer, B. Bebout, and B. Vlkmann-Kohlmeyer, "Decomposition of mangrove wood by marine fungi and teredinids in Belize," *Mar. Ecol.*, vol. 16, no. 1, pp. 27–39, 1995.