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Utilization of mangrove wood by coastal communities: A study on the ecological and economic impacts

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ABSTRACT
Background: Mangrove forests have an important ecological and economic role for coastal communities, including in Torosiaje Village, Pohuwato Regency, Gorontalo Province. This study aims to analyze the utilization of mangrove wood by local communities and its impact on the ecosystem. **Methods:** The research method used is a survey with a qualitative descriptive approach, through observation, interviews, and secondary data analysis. **Findings:** The results of the study indicate that mangrove wood is used as household fuel with a selling price of around IDR 5,000 per bundle. Although the use of mangrove wood as fuel is still ongoing, public awareness of mangrove conservation is increasing, so that the use of wood is now more directed at wood that is no longer suitable for use. **Conclusion:** Uncontrolled exploitation of mangrove wood can result in a decrease in the area of the mangrove ecosystem which has a negative impact on the coastal environment. Therefore, a sustainable management strategy is needed to maintain the balance between mangrove utilization and conservation. **Novelty/Originality of this Study:** The novelty of this study lies in its analysis of shifting community practices in mangrove wood utilization, highlighting the balance between economic dependence and emerging conservation awareness in Torosiaje Village.

KEYWORDS: conservation; mangrove; Torosiaje Village; wood utilization.

1. Introduction

Mangrove is a type of dicotyledonous plant that lives in brackish water and seawater habitats. Mangrove is a plant resulting from cultivation activities or taken from nature. Mangrove plants are not protected/prohibited from utilizing parts of the plant, for example used as raw materials for cosmetics/pharmaceuticals or textile additives. Mangrove forests are one type of forest that is often found in estuary areas with swampy and/or solid soil structures. Mangroves are one of the most important solutions to overcome various types of environmental problems, especially to overcome environmental damage caused by the destruction of animal habitats. This damage not only affects animals but also humans. Mangroves have become a very large environmental protector).

Mangrove plants grow on the coast and are most commonly found on the border between the estuary and the river. The characteristics of this mangrove plant are that they live in groups in large numbers, have large roots and have fruit. On the coast, many farmers plant mangrove plants, because of their many benefits for the sustainability of the coast in their place. In addition, mangrove plants can also make the atmosphere around the beach more beautiful. On Pariaman beach, mangrove plants are used as a tourist spot, by boarding a

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boat that has been provided by the management. Where tourists can sit back on a small boat while circling the mangrove forest area. In addition, mangrove plants also have important benefits for life in the surrounding environment.

Mangrove forests are one of the main subjects for environmental development in Indonesia. Many social institutions engaged in the environmental sector continue to socialize the benefits of mangroves. This supports public awareness that mangroves are indeed important for protecting the environment. Preserving mangrove areas is a very good effort to stabilize environmental conditions and save all habitats in mangrove forests. Mangrove areas can be found in several areas in Indonesia, such as in the village of Torosiaje Laut.

2. Methods

The research method used in this study involves a qualitative descriptive approach with a survey method. The study was conducted in Torosiaje Village, Pohuwato Regency, Gorontalo Province, on December 9-11, 2022. The selection of this location was based on the existence of mangrove forests utilized by the local community, allowing researchers to obtain relevant data related to the utilization of mangrove wood.

In the data collection process, this study used two main sources, namely primary data and secondary data. Primary data was obtained through direct observation of the condition of the mangrove ecosystem and the practice of wood utilization by the community. In addition, interviews with local residents were conducted to obtain information on mangrove wood utilization patterns, reasons for its use, and the impacts felt by the community. In addition, questionnaires were distributed to obtain further information regarding community habits and preferences in utilizing mangrove wood.

Meanwhile, secondary data is obtained from various library sources, including academic literature, previous research reports, and data from related government agencies. This secondary data is used to support the analysis and provide a broader context to the research results. Data analysis was conducted qualitatively with an inductive approach, where the data obtained were categorized and analyzed to find patterns that could explain the phenomenon of mangrove wood utilization in Torosiaje Village. The research stages included initial observation, exploration of the mangrove area, data collection through interviews and questionnaires, and analysis of the impact of mangrove wood utilization on people's lives. The results of this analysis were then used to prepare recommendations related to more sustainable mangrove ecosystem management.

3. Results and Discussion

3.1 Results and discussions

Research has been conducted on the use of mangrove wood by the Torosiaje village community, Pohuwato District, Gorontalo Province. Based on the results of research on the utilization of mangrove wood by the Torosiaje village community, Pohuwato District, Gorontalo Province, it was found that the local community makes use of mangrove wood, mainly as firewood for cooking. Field surveys showed that this firewood has a selling value, and interviews with local residents provided the price information used in this study.

Table 1. Utilization of mangrove wood by the Torosiaje village community

Utilization	Habits of using mangrove wood in households	Types of mangrove wood used by the community
Used for household firewood by the community	It is uncertain, because many people already use LPG gas for cooking. So only at certain times do people use mangrove wood as firewood.	The type of mangrove wood used is mangrove wood that is no longer suitable for use.

The selling price of mangrove wood is IDR 5,000 per bundle, the area of damaged mangrove is 36 hectares, and the number of respondents using mangrove wood is 5. Based on

these data, the value of mangrove wood as firewood under conditions of total mangrove damage was calculated. The selling price of firewood for the damaged area across all respondents is IDR 5,000 × 36 × 5 = IDR 900,000, while the value per unit of damaged area is IDR 900,000 ÷ 36 = IDR 25,000. Interviews also revealed that the Torosiaje community originally used mangrove wood to build stilt houses. However, since mangrove conservation was introduced, the community has turned to damaged mangrove wood as firewood.

Mangrove wood is used by the community as firewood because it is easy to obtain and has become a habit for the local community. In line with that, Pariyono (2006) stated that firewood as a source of energy for cooking needs is felt to be very beneficial because it can be obtained easily at an inexpensive price. Meanwhile, Haikal (2008) stated that the collection of mangrove wood for firewood is often carried out by people from low-income families. In line with that, Indriyani (2002) stated that the use of mangrove wood for firewood on Bengkalis Island refers to the large number of low-income families. Meanwhile, Inoue et al. (1999, as citied in Anwar & Gunawan, 2007) stated that wood from the *Rhizophoraceae* family is good-quality firewood because it produces high heat and is durable. Firewood becomes very important for poor people when the price of kerosene fuel soars. To meet the need for firewood, the method of collection depends on demand, either directly from consumers or through firewood collectors. There were 12 firewood producers (besides the cerocok wood collectors and charcoal panglongs) who produced firewood to be resold to consumers. Demand for the local level (around the community itself), the community can sell directly to buyers (consumers) such as restaurants, coffee shops, and the needs of community celebrations (receptions). Demand from outside the region (for example, Bengkalis), usually through collectors who will later pick up firewood in the community that produces firewood.

The level of mangrove resource utilization has caused a number of negative impacts, one of which is the decline in mangrove area. The cause of the decline in mangrove area is due to the increase in mangrove forest conversion activities such as opening ponds, developing industrial areas, mining, settlements in coastal areas, expanding agricultural areas, and large-scale retrieval of mangrove wood. Changes to the area of mangrove ecosystems must be addressed through sustainable mangrove ecosystem management, especially based on the economic value and function of mangrove ecosystems. One of the strategic steps that need to be taken to achieve sustainable mangrove ecosystem management is to manage mangrove ecosystems based on the economy of natural resources and the environment. The high level of mangrove forest damage due to conversion is thought to be due to the lack of understanding of the economic value of mangrove ecosystems (Miswadi, 2017).

4. Conclusions

Based on the research, it can be concluded that the utilization of mangrove wood by the Torosiaje village community, Pohuwato district, Gorontalo province shows that at the research location there is utilization of mangrove wood for the surrounding community. The utilization of mangrove wood is as firewood used for cooking by the community. The selling price of firewood is around IDR 5,000.00/bunch. The interview findings indicate that the Torosiaje community traditionally used mangrove wood to construct stilt houses. But now, because of mangrove conservation, the community finally uses damaged mangrove wood as firewood.

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