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Community Empowerment in Strengthening Coastal Ecosystems Based on Ocean Guardian Village in Realizing an Eco-Friendly Village in Paluh Manan Village

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ABSTRACT

I The serious challenges faced by coastal areas are coastal ecosystem degradation due to exploitation of marine resources, abrasion and lack of public awareness of coastal area conservation. This study aims to analyze community empowerment strategies in strengthening coastal ecosystem resilience through Ocean Guardian Village, a community-based development model that emphasizes collaboration between local knowledge, community participation and the principles of sustainable marine ecology. The method used in this study is a qualitative approach with thematic analysis. The results of the study indicate that community empowerment through ecoliteracy training, strengthening local institutions, and integration of village programs with multi-stakeholder support is able to increase the role of residents in protecting mangrove areas, managing coastal waste and utilizing marine resources sustainably. The Ocean Guardian Village concept has proven to be relevant as an adaptive action framework in responding to climate change and environmental crises in coastal areas including in Paluh Manan Village in realizing an environmentally friendly village.

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INTRODUCTION

Indonesia is known as the largest maritime country in the world, with a sea area of around 6.4 million square kilometers and more than 17,000 islands. As a maritime country, Indonesia also has the second longest coastline in the world after Canada, which reaches more than 81,000 kilometers. This wealth includes coastal ecosystems including mangroves, coral reefs, and seagrass beds, which not only function as habitats for various marine species but also provide natural protection against abrasion and disasters such as tsunamis. In addition, the marine and fisheries sector contributes significantly to the national economy, both through capture fisheries, aquaculture, marine tourism, and international trade. However, Indonesia's status as a maritime country also presents various challenges. https://www.kompas.com/skola/read/2023/08/23/213000269/5-alasan-kenapa-indonesia-disebut-negara-maritim#google_vignette

Damage to marine ecosystems due to pollution, overfishing, and climate change has threatened the sustainability of marine resources. In addition, suboptimal management of marine areas and lack of public awareness of the importance of maintaining maritime ecosystems are problems that must be addressed immediately. As explained by (Akbar et al., 2024; Handiani et al., 2018; Tsilimigkas & Rempis, 2017) that in managing coastal areas, efforts are made to minimize environmental degradation that occurs by carrying out sustainable planning and implementing integration between biophysical conditions in coastal utilization and ecosystem-based management scenarios that are analyzed in various time dimensions. Then, Zubaedi argues

(Hajar, 2018) also explains two characteristics of environmental problems in coastal areas, namely 1) The problem of damage to natural resources that must be solved specifically with separate solutions; 2) Seeking solutions within the ongoing social, economic and political order so that systems can be changed that can support solving problems of environmental damage in coastal areas. (Mahruf et al., 2024) that the environment in coastal areas has been a topic of discussion in recent years such as marine pollution, so education and information related to the restoration of increasingly deteriorating natural conditions require people who understand how to maintain the health of nature. Then, (Bax et al., 2022; Hunt et al., 2024) explained that the coastal ecosystem is one of the most vital ecosystems in the world, which functions as a habitat for various types of flora and fauna, a provider of natural resources, a natural protector against disasters such as storms and has economic and social value for coastal communities. However, various threats such as pollution, overfishing, climate change, and unsustainable development have caused significant damage to this ecosystem.

One of the coastal areas experiencing quite serious ecosystem degradation is Paluh Manan Village in Hamparan Perak District, Deli Serdang Regency, North Sumatra. This area faces serious challenges due to coastal abrasion, declining mangrove quality, marine pollution from agricultural and domestic activities, and uncontrolled coastal land conversion. Based on data from the North Sumatra Marine and Fisheries Service (2023), the abrasion rate in the coastal area of Deli Serdang reached 1.2 meters per year, with a loss of natural mangrove areas of 35% in the last two decades. This is exacerbated by the high dependence of the community on marine resource exploitation activities without being accompanied by sustainable conservation practices. In fact, the existence of mangrove and seagrass ecosystems in this area is very important for maintaining coastal stability, marine biota spawning grounds, and natural protection from climate disasters such as storms and tidal floods. Coastal environmental damage is not only due to ecological pressures, but also reflects the weak capacity of the community to manage coastal resources in a participatory and adaptive manner. Many coastal communities are still in marginal conditions, with limited access to information, low levels of environmental education, and minimal involvement in the marine ecosystem-based village development planning process. Conceptually, community empowerment is very crucial as a transformative strategy in restoring the ecological and social functions of coastal areas in a sustainable manner. This makes it important to build a new paradigm in community-based coastal management that not only emphasizes environmental conservation, but also strengthens local social, institutional, and cultural capacities. One innovative approach that has begun to be implemented in various coastal countries is the Ocean Guardian Village concept, a coastal village development model that integrates the principles of marine conservation, community participation, environmental education, and strengthening local wisdom values within a sustainable development policy framework (UNEP, 2020). Ocean Guardian Village is not just an ecotourism or conservation concept, but an adaptive strategy in facing the challenges of climate change and socio-ecological resilience. This model assumes that village communities have the potential to be the main actors in marine protection if given adequate space, resources, and knowledge. In Indonesia, a similar approach has begun to be tested in several areas such as Raja Ampat (West Papua), Wakatobi (Southeast Sulawesi), and Nusa Penida (Bali), which have shown significant increases in community participation, increased mangrove cover, and marine habitat restoration (WWF Indonesia, 2021). However, in Paluh Manan Village, the absence of an integrated community-based approach in coastal area management makes this study relevant and significant. The potential of local communities as environmental guardians is not optimal because there is no sustainable and structured empowerment program. The village government and community are still reactive to environmental damage, not preventive. Therefore, it is important to present an intervention model that is able to build ecological awareness in the community, integrate local knowledge with marine science, and create an institutional ecosystem that supports conservation from below.

This research is also in line with the global agenda of the Sustainable Development Goals (SDGs), especially Goal 14 (Life Below Water) which emphasizes the importance of protecting marine and coastal ecosystems and Goal 13 (Climate Action) which demands increased community capacity in mitigating and adapting to climate change. At the national level, Indonesia's marine development policy through the Coastal and Small Islands Zoning Plan (RZWP3K) and the Indonesian Navy's Kampung Bahari Nusantara program also show strong signals that strengthening the role of communities in coastal management is a national priority issue (KKP, 2022). Moreover, the Ocean Guardian Village approach can also bridge social transformation in coastal communities from an exploitative approach to an ecological one. With this model, communities are no longer positioned as objects of development, but as subjects who have ownership of knowledge, territory, and development decisions. The implementation of this program in Paluh Manan Village aims to address local challenges faced by coastal communities. With an educational approach, it is hoped that the community will understand the impact of environmental damage on their lives, so that they are motivated to take preventive and curative measures. This education covers various aspects, ranging from the importance of the mangrove ecosystem, environmentally friendly household waste management, to sustainable fishing practices. In addition to the educational aspect, Ocean Guardian Village also emphasizes the importance of collaboration between various stakeholders, such as local governments, non-governmental

organizations (NGOs), academics, and the private sector. This collaboration is important to ensure that the program runs effectively and sustainably. For example, government support can be in the form of policies that support environmentally friendly practices, while the private sector can contribute through funding and technological innovation for environmental management. This program also pays attention to the social and cultural aspects of the local community. In many cases, coastal communities have local traditions and wisdom that contribute to environmental conservation. By utilizing and integrating this local wisdom, the program is expected to be more accepted by the community. For example, the tradition of mutual cooperation can be utilized in activities such as mass mangrove planting or periodic beach cleaning. The development of Paluh Manan Village into an environmentally friendly village is also expected to provide economic benefits to the community. However, it is important to ensure that this community empowerment is carried out sustainably, so as not to damage the environment. Overall, community empowerment through the Ocean Guardian Village program in Paluh Manan Village is a strategic step in realizing an environmentally friendly village. This program not only aims to preserve the coastal ecosystem, but also to improve the quality of life of coastal communities. With a holistic and collaborative approach, this program is expected to be a model for other coastal villages in Indonesia.

METHOD

This study uses a qualitative approach with a descriptive case study strategy to explore the process, dynamics, and practices of community empowerment in strengthening the coastal ecosystem based on Ocean Guardian Village in Paluh Manan Village. This approach was chosen because it allows researchers to deeply understand the social, cultural, and ecological contexts at the local level, as well as capture the meanings constructed by community actors in the transformation process towards an environmentally friendly village. The research location was centered in Paluh Manan Village, Hamparan Perak District, Deli Serdang Regency, North Sumatra, which is one of the coastal villages with characteristics of mangrove and shallow sea ecosystems that experience quite high environmental pressure. Data were analyzed using thematic analysis as developed by (Neergaard & Ulhøi, 2007), which emphasizes the identification, organization, and interpretation of meaningful patterns (themes) from qualitative data. This research method is designed to explore the transformative process that occurs in coastal communities in responding to environmental challenges through a participatory approach. Thematic analysis was chosen because it is able to capture the diversity of experiences and perspectives of the community and describe socio-ecological dynamics comprehensively. Thus, this research is expected to provide a real contribution to the development of an environmentally friendly village model based on local wisdom, collaboration, and sustainable empowerment.

RESULT

Paluh Manan Village is located in Hamparan Perak District, Deli Serdang Regency and is located in the coastal area of Belawan. Paluh Manan Village is a coastal area with coastal characteristics and has quite extensive mangrove vegetation. The coastal area is relatively flat with several areas prone to tidal flooding due to the ebb and flow of sea water. The village has a mangrove area which is an important habitat for biodiversity, such as mangrove crabs and small fish. Administratively, Paluh Manan Village has the following boundaries:

North side borders Paluh Kurau Village and the Strait of Malacca
South side borders Kota Datar Village
East side borders Lama Village and the Strait of Malacca
West side borders the Strait of Malacca.
https://bps.deliserdang.go.id

The population of Paluh Manan Village in 2021 was ± 3523 people, 1745 male and 1778 female, then the productive population that can be targeted in coastal ecosystem education activities through the Ocean Guardian Village program is aged 15-25 years. Most of the population works as fishermen, shrimp farmers, and other informal workers. The level of education of the community varies, with a dominance of elementary and secondary school graduates. The main source of income for the community, namely shrimp farming, fisheries and seafood processing which are the backbone of the economy, so that community income tends to fluctuate due to dependence on seafood and shrimp ponds.

The problems found in Paluh Manan Village, related to the disposal of plastic waste and organic waste in the wrong place so that it damages and affects the ecosystem in the coastal area, damage to mangroves due to land conversion into shrimp ponds and illegal logging, as well as rising sea levels and salt water intrusion are starting to be felt by coastal communities. With the problems found in the coastal area of Paluh Manan Village, it is very important to carry out coastal ecosystem education activities through the Ocean Guardian Village program, which can increase community knowledge and understanding in maintaining the sustainability of marine ecosystems. Coastal areas can also be used for conservation activities and learning about mangrove forest restoration which can become tourist attractions, especially

ecotourism in Paluh Manan Village, thus opening up new opportunities for the community's economy such as culinary businesses, conservation training and local tour guides as well as increasing village income through tourist attraction levies.

Coastal ecosystem restoration can also reduce beach waste which greatly affects coastal ecosystem processes, as stated by (Bax et al., 2022; Joesidawati & Suwarsih, 2022) that a healthy marine ecosystem must have a balance between nature and the surrounding environment, this is related to human activities such as excessive fishing, exploration of marine resources, and marine pollution will have a significant impact on marine and coastal ecosystems in general and can reduce the carrying capacity of coastal and marine ecosystems in meeting the needs of their communities. Restoration of coastal ecosystems in coastal areas is very important for the understanding of the surrounding community, as stated by (Tilman et al., 2017) that coastal communities often have low awareness of the importance of maintaining coastal ecosystems, especially mangroves which function as abrasion barriers and biodiversity habitats. Furthermore, (Akbar et al., 2024) emphasized that damage to mangrove ecosystems not only has an impact on biodiversity, but also on coastal protection from abrasion and potential natural disasters such as tsunamis.

The challenges faced in preserving coastal ecosystems to create an environmentally friendly village in Paluh Manan Village are:

Mangrove cutting, land use for ponds, and plastic waste polluting the coast cause damage to coastal ecosystems. This reduces environmental quality and threatens the survival of species that depend on mangroves.

Low public awareness and community participation in conservation, so that scientific coastal ecosystem preservation is still low.

3. The economic dependence of communities on fisheries and ponds makes them vulnerable to ecosystem damage that can reduce fish catches and pond productivity.

The results of this study also show that mangrove restoration carried out by local communities has greater recovery potential and more optimal results compared to government intervention alone. The Ocean Guardian Village approach encourages the birth of various participatory practices of community-driven environmental management. In Paluh Manan, these practices include:

Regular mangrove planting by youth and women groups.

Household-based coastal waste management, including the creation of simple waste banks.

The “Adopt a Mangrove Tree” program involving migrants and CSR partners in funding conservation.

Community-based pond water quality monitoring system.

These practices show that empowerment not only increases awareness, but also builds the technical and institutional capacity of the community. This is reinforced by findings from (Fadhlinsyah et al., 2023; Rosado-González et al., 2023) which state that active community participation in coastal management has a direct impact on improving ecosystem quality and the socio-economic resilience of residents. Ocean Guardian Village is a coastal community-based empowerment model that unites local ecology, traditional knowledge, and collaboration between stakeholders: government, academics, NGOs, and the private sector. This model moves to strengthen local capacity in mangrove conservation, coastal waste management, ecotourism, and adaptation to climate change—through environmental education, training, and community institutions.

DISCUSSION

Community empowerment is an important process in encouraging active participation of citizens in decision-making, resource management, and increasing self-capacity to achieve independence and sustainable welfare (Abdillah et al., 2023; Hajar et al., 2018). In the context of environmental management, empowerment means providing space for communities to play a direct role in maintaining and restoring the ecosystems that support their lives. One step in community empowerment is increasing ecological awareness of the community regarding the importance of maintaining coastal ecosystems. Previously, most people considered environmental damage as commonplace or the sole responsibility of the government. However, through environmental education activities, mangrove conservation training, and the “Jaga Laut Kita” campaign, residents began to understand the relationship between the balance of coastal ecosystems and the sustainability of their lives as fishermen and shrimp farmers. Community empowerment is carried out through collaboration between several parties together with the village government to increase awareness in understanding the ecological function of mangroves by minimizing the impact of marine plastic pollution, as well as community-based coastal restoration techniques. (Widaningsih, 2017) conveyed from the results of her research that ecological literacy is a key factor in encouraging environmentally friendly behavior in coastal communities. Therefore, in this community empowerment program, it is necessary to involve school children and youth groups in mangrove planting activities to help expand awareness across generations. Community empowerment also has an impact on strengthening local institutions, especially Pokmaswas

(Community Monitoring Groups) and coastal women's farmer groups. Before the Ocean Guardian Village program was introduced, the role of these institutions tended to be passive and unorganized. Through organizational management training, community-based planning facilitation, and equipment support from the Marine and Fisheries Service, these institutions began to be active in initiating environmental monitoring activities, patrolling mangrove areas, and handling marine debris. Coastal ecosystems are areas that are very vulnerable to degradation due to pressures of exploitation, urbanization, and climate change. Therefore, a top-down management approach has proven to be less effective, and needs to be replaced by a community-based coastal management (CBCM) model. According to (Hermawan & Rofiq, 2020; Joesidawati & Suwarsih, 2022) community-based coastal management can produce more stable ecological and social effects because it is based on local values and direct community involvement in planning and action. In many cases in Indonesia, strengthening the role of coastal communities is a determinant of the success of conservation programs such as mangrove rehabilitation, coral reef management, and reducing marine pollution. Revitalizing local institutions is key to managing coastal areas collaboratively. Research (Hasselman, 2017; Zhuang et al., 2024) emphasizes the importance of adaptive co-management in natural resource management, namely combining the roles of local communities, the state, and scientific knowledge in a flexible and adaptive framework. In Paluh Manan Village, cooperation between village institutions, Pokmaswas, and environmental NGOs has succeeded in forming a community-based work unit that is actively involved in protecting mangrove conservation areas. Thus, an important aspect of the Ocean Guardian Village approach is the combination of local knowledge of coastal communities with a scientific approach to conservation. For example, local fishermen have the wisdom to read sea currents and seasons, which are then used as a reference in determining the time for planting mangroves and restoring ponds. The Ocean Guardian Village concept is an approach to coastal village development that emphasizes community involvement as guardians of the sea through a combination of environmental education, community-based conservation, and strengthening the blue economy. (Sungkawati, 2024) calls this approach a form of climate-resilient community development, because it is able to strengthen village resilience to the impacts of climate change. Although it has not been widely implemented in Indonesia, this model has been successfully adapted in several areas such as Nusa Penida and Wakatobi as part of a coastal economic conservation and empowerment strategy. This approach is in line with the view of (Zhuang et al., 2024) which states that the integration of local knowledge with ecological science is an important foundation for building a contextual and effective community-based management strategy. This integration is also evident in the use of participatory zoning maps created by the community and displayed in the village office. The map shows conservation zones, cultivation zones, and disaster evacuation routes, which are used as a guide in preparing an environmentally friendly Village Medium-Term Development Plan (RPJMDes). The empowerment process that places the community as the main actor in environmental protection creates a more responsive and sustainable governance ecosystem. This success shows that the development of eco-friendly villages is not just a matter of technology or infrastructure, but the result of a transformative process in community awareness, institutions, and collective action. The concept of eco-friendly villages proposed in this study is based on the principles of sustainability, social inclusion, and local sovereignty over natural resources. This is in line with the SDGs, especially Goal 14 (Life Below Water), Goal 13 (Climate Action), and Goal 11 (Sustainable Cities and Communities), and in line with the direction of national development policy in the 2020–2024 RPJMN which emphasizes the importance of strengthening villages based on the environment and climate resilience (Bappenas, 2020). Environmental education plays a strategic role in shaping the collective awareness of the community regarding the importance of environmental sustainability. (Chigbu, 2024) noted that communities that have access to formal and informal environmental education tend to demonstrate stronger environmentally friendly behavior. In the Ocean Guardian Village program, environmental education is carried out through a contextual approach such as conservation training, field schools, and public campaigns based on local culture.

CONCLUSIONS

The Ocean Guardian Village approach can be an effective strategy in empowering coastal communities to create environmentally friendly villages. In Paluh Manan Village, community empowerment has not only had an impact on increasing ecological awareness, but also encouraged the formation of social collaboration and strengthening local institutions in environmental management. Increasing community capacity through training, environmental education, and strengthening the role of institutions such as Pokmaswas has succeeded in changing the community paradigm from exploitative to protective of the coastal environment. The integration of local knowledge and ecological science has resulted in contextual, participatory, and sustainable conservation practices. However, challenges in the form of unequal participation, limited access to resources, and policies that are not yet fully supportive still need to be addressed systematically. Overall, the Ocean Guardian Village model has the potential to be replicated in other coastal villages in Indonesia as a transformative community-based framework in dealing with environmental degradation and the climate crisis.

Based on this conclusion, the recommendation is:

Strengthening village policies related to coastal ecosystems, by compiling and ratifying Village Regulations (Perdes) that specifically regulate coastal environmental protection, mangrove management, and environmentally friendly spatial planning to support the continuation of the Ocean Guardian Village program.

Educational programs targeting the Paluh Manan Village community, especially the younger generation, to understand the importance of preserving coastal ecosystems by introducing the coastal area Ocean Guardian Village program.

Developing a coastal ecosystem education module based on the Ocean Guardian Village to explain the impacts of coastal ecosystem damage, as well as ways to reduce waste and pollution and manage plastic waste on the coast.

Training programs for villagers, especially the younger generation, in developing environmentally conscious groups that can be a strategic step through the GARIS community (Coastal Area Love for the Environment and Sea Movement)

Developing a mangrove and beach-based ecotourism program that not only educates visitors about the importance of coastal ecosystems but also provides alternative sources of income for village communities.

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