

MANGROVE RESTORATION PROGRAM AS A DISASTER MITIGATION EFFORT IN TELUK AWUR BEACH, KECAMATAN TAHUNAN, KABUPATEN JEPARA

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Abstract: Mangroves are coastal ecosystems that play an important role in maintaining environmental sustainability and reducing the impact of natural disasters. In Indonesia, mangroves serve as natural barriers against various threats such as coastal erosion, tsunamis, and storms, all of which pose significant risks to coastal areas. The coast of Teluk Awur in Jepara is currently facing mangrove ecosystem degradation, a condition that can exacerbate disaster vulnerability. Therefore, a mangrove restoration program in this area is essential for ecological recovery and disaster risk reduction. This study aims to evaluate the effectiveness of mangrove restoration in disaster mitigation and assess its ecological and socio-economic impacts on coastal communities. A qualitative research approach was used, including fieldwork and interviews with relevant stakeholders. The study findings indicate that mangrove restoration in Teluk Awur contributes to coastal ecosystem recovery and increases community resilience to natural disasters and creates opportunities for sustainable economic development through ecotourism and fisheries.

Keywords: mangrove restoration; disaster mitigation; teluk awur; coastal ecosystem

INTRODUCTION

Mangroves are coastal ecosystems that are essential for the survival of various plant and animal species and play an important role in maintaining environmental benefits. Physiologically, mangroves can survive in muddy land and water areas. This ability helps mangroves in salty water withstand harsh weather and different coastal disasters because they have strong, tangled roots that can breathe and leaves that can handle high salt levels (Hamzah dkk., 2021).

In Indonesia, mangroves have a crucial function in disaster reduction. One of the most important strategies for managing coastal areas and reducing disasters is the implementation of mangrove repair programs, which restore damaged or lost mangrove ecosystems.

Mangrove ecosystems are ecologically valuable, especially with local supporters in coastal areas. The extraordinary stability of mangroves affects settlements in coastal areas (Sofian dkk., 2019).

Forest restoration is the process of returning ecological units in relation to improving the welfare of the community in forested areas, which have been degraded (Eddy dkk., 2019). Mangrove restoration is the process of restoring mangrove ecosystems that have been damaged or lost by human activities or natural disasters to restore the ecological, economic, and social functions of mangrove forests (Widagdo & Sugiri, 2014). Mohammad Basyuni, referencing the book Society for Ecological Restoration, defines restoration ecology as a

process that intentionally modifies the environment to reconstruct a specific original ecosystem, necessitating the restoration of its structure, functionality, type, and dynamics (Whisenant, 2011). This restoration process includes mangrove seed nurseries, planting, maintenance, monitoring mangroves, updating hydrological systems, and protecting the area against further obstacles.

Teluk Awur Beach is among the regions susceptible to environmental degradation in coastal zones. The degradation of mangrove quality, exacerbated by heightened human activity, may elevate vulnerability to natural disasters. The mangrove restoration effort in this area functions as a mitigation strategy to rehabilitate coastal ecosystems and diminish the effects of disasters.

Mangrove restoration efforts in Teluk Awur Beach should improve coastal environmental conditions and increase community resistance to natural disasters. Restoring the mangrove ecosystem is expected to create a more stable system that can protect the coast from the threat of abrasion, storms, and tsunamis. The purpose of this study was to assess the mangrove restoration program as an effort to reduce disasters in Teluk Awur Beach and to see its impact on the sustainability of the ecosystem and community life.

Research on the Mangrove Restoration Program as a Disaster Mitigation Strategy at Teluk Awur Beach, Desa Teluk Awur, Kecamatan Tahunan, Kabupaten Jepara, alongside a paper by Gunawan entitled Mangrove Planting Restoration Action in Disaster Mitigation published in *Asthadarma: Journal of Community Service*. The study on the Mangrove Restoration Program and the article by (Gunawan dkk., 2022) both aim to lower the risk of coastal disasters by restoring mangrove ecosystems. Both also use mangrove planting methods and collaborative approaches involving various parties. However, the two differ in

terms of location, scale of activities, and additional objectives. The study in Teluk Awur focuses more on empowering local communities and disaster mitigation in coastal areas, while the study by (Gunawan dkk., 2022). Emphasizes campus-based community service activities and increasing environmental awareness. Thus, despite having the same basis, the approach and focus of implementation in the two studies show different characteristics according to the regional context and objectives of each program. This study aims to evaluate the effectiveness of the mangrove restoration program in disaster mitigation and its impacts on the ecological and socio-economic conditions of coastal communities.

This research provides an important contribution to improving the understanding of the implementation of mangrove restoration programs in Teluk Awur Beach, with a research focus on disaster mitigation and impacts on coastal ecosystems and community welfare. The results of this study are also expected to provide practical recommendations for developing effective policies for mangrove restoration programs in other coastal areas, which face similar challenges in reducing the risk of natural disasters and improving the sustainability of marine ecosystems.

LITERATURE REVIEW

Mangrove forests play an important role in disaster mitigation in coastal areas, especially in overcoming abrasion, flooding, and tsunamis. Mangrove roots can dampen the energy of ocean waves and stabilize sediments, as well as prevent coastal erosion. In addition, mangroves also function as a source of carbon dioxide, helping mitigate climate change by storing carbon in biomass and sediments. This makes the mangrove ecosystem an effective natural solution in reducing the risk of disasters in coastal areas.

Since 2003, the coastal area of Teluk Awur Jepara has experienced significant mangrove damage, with damage reaching 90% of the total land area of 52 hectares. To overcome this, keSeMaT, a student organization from the marine sciences of Diponegoro University, began mangrove restoration by conducting regular mangrove nurseries, planting, monitoring, and counseling. The results of the restoration are that around 800 thousand ninit mangroves have been planted with a survival rate of 90%. This program aims to save the mangrove ecosystem from the threat of abrasion and coastal erosion, as well as to increase public awareness of the importance of environmental conservation.

Many studies provide information and insights into the significance of mangrove restoration for disaster mitigation, as outlined below. First, research by Bambang Gunawan et al. discusses mangrove restoration activities in the Gununganyar sub-district, Surabaya, as part of community service by the Merdeka University of Surabaya. With a method that emphasizes mangrove planting actions, this study shows that mangrove restoration is an important effort to reduce disaster risks in coastal areas. The similarity with my research lies in the focus of mangrove planting efforts as part of a restoration program, but this research focuses on activities for restoring mangrove planting in the Gunung Anyar sub-district area, Surabaya, while my research highlights the effectiveness of mangrove restoration programs in disaster mitigation in different places (Mulyani, 2018).

Second, research by La Ode Abdul Fajar Hasidu et al. discusses coastal disaster mitigation through empowering the Sipatua fishing community with mangrove planting in Kelurahan Tahoa, Kecamatan Kolaka, Sulawesi Tenggara. With a flow diagram method covering stages such as socialization, mangrove planting, mangrove

maintenance, and evaluation, this study shows that mangrove restoration is an effective way to reduce the negative impacts of natural disasters in coastal areas and provide knowledge to the community about the importance of mangroves. The similarity with my research lies in the focus on the importance of mangrove restoration as an effort to mitigate disasters in coastal areas, but this study highlights coastal disaster mitigation through empowering fishing communities with mangrove planting, while my research focuses on evaluating the effectiveness of the mangrove restoration program (Bantun dkk., 2023).

Third, research by Anshah Silmi Afifah et al. discusses the initiative of planting mangroves as an effort to mitigate tidal flooding in Kendal Regency, Central Java. With this qualitative literature study, we aim to analyze the strengths, weaknesses, opportunities, and threats (SWOT). The similarity with my research lies in the focus on mangrove restoration as an effort to mitigate disasters in coastal areas. However, this study focuses on planting mangroves as an effort to mitigate tidal flooding, while my research highlights the effectiveness of the mangrove restoration program as an effort to mitigate disasters in Teluk Awur Beach, Jepara, with an approach to the impact of the socio-economic ecological conditions of coastal communities (Afifah dkk., 2023).

RESEARCH METHODS

This study uses a qualitative method with a field research approach. Sugiyono (Sugiyono, 2016) defines a research approach as one that concentrates on becoming fully acquainted with a phenomenon by collecting and analyzing descriptive and interpretive data. The researchers went directly to Teluk Awur Beach, Jepara, to collect data. Primary data was obtained through interviews with the director of the local government of the beach, Mr. Muhammad Ridwan; Mr. Ahmad

Fadli as the RT and manager of Teluk Awur Beach; Mr. Hendrik as the police officer who guards the Teluk Awur Beach area; Mr. Edi Parsanto as the security guard of the Undip Jepara Campus, part of the UNDIP MSTP guard; and Mr. Alex, S.Pi., M.Si., as the coordinator of the Fisheries and Marine Technology and Business Study Program (TBPK). Primary data is information gathered by looking at different sources, including studies by health experts, observations by policy analysts, scientific articles, surveys from independent organizations, research by public policy scholars, and written materials from various media, both print and online (Usman & Akbar, 2022)

Secondary data was obtained by documenting coastal management policies that are related to the mangrove restoration program. Secondary data is obtained from existing sources, not from direct collection in the field. Interviews were conducted in a structured manner with questions covering three main aspects, namely the effectiveness of the mangrove restoration program (How effective is the mangrove restoration program in reducing the impact of disasters in the coastal area of Teluk Awur?), the impact of the mangrove restoration program (Does the mangrove restoration program have an impact on the ecological and socio-economic conditions of the coastal community of Teluk Awur?), and the long-term potential of the mangrove restoration program (What is the long-term potential for the mangrove restoration program?). The collected data were analyzed using an interactive analysis model, which consists of the data collection stage. The data collection stage is a method or way used to collect the information needed in a study or research (Fathoni, 2023). Data reduction is the process of selecting, focusing attention, and simplifying all types of information that support research data obtained and recorded during the data research process in the field.

Data presentation is an activity when a set of information is arranged so as to provide the possibility of drawing conclusions and taking action. Qualitative data presentation can take the form of narrative text, such as field notes. Drawing conclusions is the final stage of data analysis, where conclusions are drawn based on the results of the data analysis that has been carried out. Drawing conclusions in order to gain a deep understanding of the effectiveness of the mangrove restoration program as an effort to mitigate disasters on the coast of Teluk Awur, Kecamatan Tahunan, Kabupaten Jepara.

RESULTS AND DISCUSSION

1. The Role and Efforts of the Mangrove Restoration Program in Reducing the Impact of Disasters in the Coastal Area of Teluk Awur Beach.

Mangrove restoration in the coastal area of Teluk Awur Beach, Desa Teluk Awur, Kecamatan Tahunan, Kabupaten Jepara, is one of the important efforts to reduce the impact of natural disasters, especially disasters related to coastal ecosystem damage such as abrasion, tsunamis, and floods. Teluk Awur, which is located on the north coast of Central Java, is an area that is categorized as rarely experiencing abrasion but protects against various natural disaster threats, especially abrasion, tsunami waves, and floods, by planting mangrove trees.

In this context, the existence of mangroves that function as natural protectors has a crucial role in reducing the impact of disasters and improving coastal environmental resilience (Gunawan dkk., 2022). Based on the results of observations and interviews related to the implementation of the mangrove restoration program in this area, the effectiveness of efforts made to mitigate coastal disasters can be discussed. The forms of mangrove restoration in Awur Bay include: **(1) Mangrove Nursery**, A wing (shade net) with a canopy cover of

about 50-75% covers a mangrove seedling on a raised nursery bed. This aims to protect the seed from pests such as crabs and to ensure optimal growth; and (2) **Mangrove Replanting**, Mangrove replanting is the first step in restoration, which involves selecting seedlings according to soil conditions and water salinity. The mangroves planted in Teluk Awur were by coastal managers, Diponegoro University students, and relevant agencies such as the TNI and POLRI. In September 2024, Kodim 0719/Jepara planted 650 mangrove trees in the same area, in collaboration with the Jepara Regency Environmental Service. KeSEMAT (Mangrove Ecosystem Study Group) routinely undertakes this mangrove restoration each year.

According to the results of the interview, this activity includes nursery, planting, maintenance, and monitoring. Over 90% of the 1,200,000 mangrove seedlings that have been planted so far in an area of about 25 hectares have survived. Mangroves can survive up to 30 years, according to one type of mangrove planted in Teluk Awur, namely the *Avicennia* spp. mangrove type. In total, there are 34 types (5 major species, 4 minor species, and 25 associated species). If the mangroves are old or almost dead, then nursery renewal and replanting are carried out.

Mangroves serve as natural barriers against erosion, abrasion, and tidal waves. Mangrove roots strengthen the soil structure and protect the coast from the impact of high waves. In addition, mangroves are also an important habitat for various marine species. Selecting the appropriate place is crucial for the survival and optimal advantages of mangroves. Additionally, installing bamboo stakes at a planting distance of 1 x 1.5 meters is essential for marking the locations of mangrove seedlings and subsequently securing the stems to the stakes to prevent

collapse or potential displacement by tidal currents.

Figure 1. Documentation of Mangrove Plants to be Restored



Source: Field Document, 2024

Mangrove maintenance involves regular care, such as watering and clearing weeds, to ensure optimal growth. Mangrove protection is also important to prevent illegal logging and land conversion. Such care includes strict supervision of activities that damage mangrove areas. Involving communities and coastal area managers and Diponegoro University students in mangrove management is also important for the sustainability of restoration, as they can help maintain and protect the ecosystem. Overall, mangrove restoration is a long-term investment that provides physical protection against natural disasters, restores coastal ecosystems, and supports the social and economic sustainability of coastal communities.

Figure 2. Mangrove Restoration Area on Teluk Awur Beach



Source: Field Document, 2024

Most of the informants, one of whom was Mr. Eko Parsanto, showed that damage caused by coastal abrasion and flooding was significantly reduced, especially during the rainy and storm seasons. A respondent living near the coast said, "After the mangrove forests were replanted, we saw that the coast was no longer easily eroded by large waves, and seawater no longer overflowed into our settlements as before." The statement shows that mangrove restoration affects ecosystem recovery and provides direct protection for settlements from threats from natural disasters.

The interwoven roots of mangrove forests serve as a natural barrier, diminishing the intensity of ocean waves, so decelerating saltwater movement and mitigating the risks of floods and erosion. The research substantiates that healthy mangroves substantially enhance the resilience of coastal regions to natural calamities. Additionally, interviews with community leaders, such as Mr. Ahmad, the RT and manager of Teluk Awur Beach, revealed a shift in awareness regarding the significance of mangroves. Many realize that the mangrove ecosystem not only functions as a natural resource but also as an important step in protecting themselves from the threat of disaster. This understanding is not only ecological but also social, because mangrove restoration contributes to improving the community's ability to deal with disaster risks.

This interview data provides evidence to support the claim that the Teluk Awur Mangrove Restoration Program effectively reduces the effects of coastal erosion. In addition, the program has succeeded in reducing the importance of maintaining and preserving the mangrove ecosystem to the community, which ultimately contributes to increasing social and economic resilience to natural disasters in the Teluk Awur coastal area.

2. Disaster Mitigation Efforts Through Mangrove Restoration Programs.

Data from interviews with coastal and mangrove managers indicates that they planted mangrove plants in both the southern and northern regions of the Teluk Awur coast. Communities involved in mangrove restoration are also more sensitive to environmental changes and disaster risks. In some cases, the Teluk Awur community involved in the mangrove restoration program felt safer because they had more knowledge about disaster mitigation steps that could be taken to protect themselves and their families. The involvement of the community and supporting agencies in this activity increases their resilience to disasters and strengthens the sense of togetherness in maintaining the sustainability of the coastal environment (Astuti, 2025).

Although the mangrove restoration program in Teluk Awur provides many benefits, there are several challenges that must be faced to ensure its sustainability and effectiveness (Oktavianita & Putri, 2020). One of the main challenges is the low public awareness of the importance of mangroves in disaster mitigation. Some individuals may prioritize the direct economic benefits of using coastal land for activities such as agriculture, fisheries, and coastal ecotourism, thereby overlooking the vital role of mangroves as protectors of the coast (Ibrahim dkk., 2023a). Efforts to mitigate natural disasters, including abrasion, coastal erosion, floods, and tsunamis, are focused on mangrove restoration. According to observation results, there are several stages, namely mangrove nurseries, planting, maintenance, and monitoring of mangroves in the coastal area of Teluk Awur (Edi, n.d.). Most of the mangrove seeds from *Rhizophora mucronata* and *Avicennia marina* have been planted along the coast of Teluk Awur as part of their disaster reduction and environmental protection

efforts. This planting was carried out by various agencies, including local governments and government agencies, to restore the function of the mangrove ecosystem, which has been exacerbated by natural factors such as abrasion and human activities, because these mangroves have a significant ecological impact. The tight and strong root structure of mangroves, especially rhizome species, can slow down the speed of sea waves and retain current sediments. These forests will maintain coastal stability, prevent landfall, and play an important role in creating new habitats for various coastal biota. Therefore, planting mangrove forests serves not only as a step in environmental recovery but also as an effective strategy for reducing coastal disaster risks.

In addition to mangrove restoration, there is hydrological restoration. One of the main objectives of the effort is to improve the hydrological cycle to support the natural growth of the mangrove ecosystem (Brown, 2006). In addition to mangrove restoration, there is hydrological restoration. One of the main objectives of the effort is to improve the hydrological cycle to support the natural growth of the mangrove ecosystem (Dewi dkk., 2022). In addition to mangrove restoration, there is hydrological restoration. One of the main objectives of the effort is to improve the hydrological cycle to support the natural growth of the mangrove ecosystem

In addition, damage to the mangrove ecosystem caused by previous human activities, such as land conversion into residential or agricultural areas, complicates the restoration process. Restoration programs must involve intensive and sustainable rehabilitation efforts to ensure that mangroves can grow well on damaged land (Fikri dkk., 2023). Better monitoring and careful management are also needed to address problems such as plastic waste pollution, which often inhibits mangrove

growth, dense mangrove vegetation, erosion, and abrasion processes.

3. Long-term potential impact of the Mangrove Restoration Program on the ecological and socio-economic conditions of the coastal communities of Teluk Awur.

The mangrove restoration program in Teluk Awur not only has a positive effect on the environment but also has a significant impact on the socio economic situation of coastal communities (Pratiwi, 2025). Mangrove restoration will help improve the condition of coastal ecosystems and provide protection against natural disasters while also opening up new opportunities for community economic well being (Romadoni dkk., 2023).

From an ecological aspect, mangrove restoration restores the ecological function of damaged mangrove forests. Mangrove forests can strengthen soil structure, prevent coastal abrasion, and reduce erosion that often damages beaches. Mangrove roots that grow in muddy soil contribute to maintaining soil stability. This process protects agricultural land and settlements from threats from tidal waves and damage from tropical storms. In addition, mangrove forests are biologically diverse ecosystems, with mangrove restoration improving habitat for various species of fish, shrimp, and birds. The presence of healthy mangrove forests improves the quality of fish and shrimp ponds, which provide protection and breeding for various marine life (Indrajaya dkk., 2022). On the other hand, mangroves act as an effective carbon sink, reducing the impact of climate change, and as a natural protection against tsunamis and large-scale storms by reducing energy and wind waves.

The socio economic impacts of mangrove restoration are also significant. This program will increase the resilience of coastal communities to natural disasters caused by mangrove forests, which function

as natural barriers to waves and erosion (Hariyadi, 2020). Natural disasters like tsunamis and tropical storms can save coastal towns from infrastructural destruction and economic loss. Furthermore, local inhabitants have actively participated in mangrove restoration initiatives, encompassing planting, maintenance, and monitoring of mangrove regions. This participation raises public awareness of the importance of mangrove ecosystems and strengthens new skills in environmental management (Jadin & Rousseau, 2022).

Municipalities may utilize mangrove regions for tourist and the growth of fish, shrimp, and shellfish. This activity creates supplementary revenue opportunities. Mangrove restoration creates sustained economic prospects via ecologically responsible natural resource management (Silaen dkk., 2013).

Communities can develop the ecotourism sector and use marine resources in the form of fish and shrimp ponds that are sustainably managed by the Teluk Awur community as their livelihood. Income from these sectors can be a stable source of economy for local communities. In addition to being an effort to mitigate disasters, mangrove forests also have aesthetic value that can be used for mangrove forest tourism. Not only that, mangrove forests can also be used as an opportunity for fascinating education for people outside the coast and local communities. Mangrove restoration also enhances the quality of life in coastal communities. Mangrove ecosystems maintain a healthier environment, increase the availability of fish for local consumption, and open up new job opportunities. This program also helps reduce economic losses from natural disasters that often damage agricultural and fishery products (Salminah & Alviya, 2019). Teluk Awur Beach, located in Kabupaten Jepara, is an ecologically important coastal area with a rich diversity of marine life and mangrove ecosystems

(Nanlohy & Masniar, 2020). This place is one of the strategic locations for mangrove conservation in Indonesia due to the high pressure from abrasion and environmental degradation (Setiawan, 2013). Based on the results of observations since the early 2000s, the mangrove restoration program has been implemented by the KeSemat community, which has planted more than 1.2 million mangrove seedlings with a high success rate of 90% (interview with Mr. Edi Parsanto, a security guard at Undip Jepara, on April 6, 2025).

This restoration not only restores ecological functions such as abrasion defense but also increases marine biodiversity, including as a place for fish spawning and shelter for fish and other marine biota (Pradana dkk., 2013). Several key aspects regarding the long-term potential of the mangrove restoration program should be understood, including:

a) Reduce Abrasion

Coastal abrasion is a phenomenon of coastline erosion caused by sea waves, currents, tides, and human activities such as land conversion and sand mining. On the coast of Teluk Awur Jepara, abrasion has occurred, making it a serious threat that can cause loss of productive land, damage to coastal infrastructure, and disruption of the economic activities of the local community (Ibrahim dkk., 2023b).

Mangrove restoration has been scientifically proven to be an effective natural solution to reduce the rate of abrasion. Strong and widespread mangrove roots function as a natural barrier that can dampen the energy of ocean waves before they reach land, thereby reducing the power of waves hitting the coast. In addition, mangrove roots also help stabilize coastal sediments, prevent them from being carried away by ocean currents, and accelerate the process of accretion or land addition (Dewi dkk., 2022).

With the sustainability of the mangrove restoration program in Teluk Awur, the coastal area can be expected to become more stable without reducing the need for expensive physical interventions such as the construction of concrete embankments. Furthermore, a healthy mangrove ecosystem offers several additional benefits, including serving as habitat for various species of fish and other marine organisms.

b) Supporting Fish Ecosystems and Biodiversity

The mangrove ecosystem is recognized as a highly productive system that offers ecological advantages for both marine and terrestrial organisms. The presence of mangrove trees in Awur Bay, Jepara, is crucial for sustaining diverse types of fish, shrimp, crabs, and other marine organisms. The intricate and dense mangrove roots serve as a habitat for spawning, sheltering, and nurturing offspring for various commercial and non-commercial species. This ecosystem also generates sediment that serves as a food source for diverse aquatic organisms (Pamungkas dkk., 2024).

Teluk Awur Beach has a mangrove ecosystem that has great potential in maintaining the life cycle of fish and supporting the sustainability of local fishermen's catches. This study shows that the mangrove ecosystem in Teluk Awur functions as a spawning, growing, and feeding ground for various species of fish and other marine biota.

This emphasizes the importance of mangrove conservation in supporting local fisheries productivity. The mangrove ecosystem in Teluk Awur not only sustains other biota but also serves as a habitat for diverse species, including migratory and resident birds, numerous insects, reptiles, and other terrestrial organisms. This diversity serves as a crucial measure of ecosystem health, contributing to the

equilibrium of the food chain and long-term ecological stability (Romadoni dkk., 2023)

c) Ecological, Economic, and Educational Benefits

Mangrove ecosystems play a vital role in maintaining the balance of the coastal environment. Ecologically, mangroves function as carbon dioxide (CO₂) absorbers, helping mitigate climate change by storing carbon in biomass and sediment. Bismark et al. (2008) assert that mangrove vegetation can sequester carbon dioxide from the atmosphere, thereby mitigating the greenhouse impact (Nanlohy & Masniar, 2020; Nasruddin; Efendi, 2022). In addition, complex mangrove roots act as natural biofilters to filter pollutants such as heavy metals (Pb, Cd, Cu) and excess nutrients from water, thereby improving the quality of seawater and maintaining the health of coastal ecosystems. This function is important in maintaining the sustainability of habitats for various marine species and the productivity of local fisheries (Efendi dkk., 2022; Setiawan, 2013).

From an economic perspective, the mangrove ecosystem supports the development of sustainable nature-based ecotourism. In Teluk Awur, the mangrove restoration program has been developed into a conservation education and training center through MECoK Ecopark, which was established by KeSEMaT in 2003.

This area attracts tourists and creates jobs, alternative sources of income, and increased public awareness of the importance of environmental conservation. Educational ecotourism in the mangrove area provides first-hand experience for visitors, including schoolchildren, students, and environmental organizations, to learn about the mangrove ecosystem, the importance of conservation, and environmental preservation practices. Activities such as educational tours, tree planting, and conservation training have

been carried out regularly, which play a role in building an environmentally conscious generation.

Ecologically, mangrove restoration is effective in stabilizing soil structure and preventing abrasion through complex root systems, as well as providing important habitat for various marine species, supporting biodiversity, and ecosystem productivity. Socio economically, mangrove restoration increases the resilience of coastal communities to natural disasters by providing natural protection against waves and storms, opening economic opportunities through ecotourism and sustainable fisheries, improving the quality of life of communities, and strengthening skills in environmental management and awareness of the importance of mangrove conservation.

The findings of the study in Teluk Awur directly show that the existence of mangroves plays an important role in reducing the risk of disasters in coastal areas. These results strengthen existing theories and provide a real picture of how mangrove restoration works in the coastal area of Teluk Awur. Mangroves protect against abrasion and sea waves and are linked to the community's disaster readiness and resilience. This shows that, as explained by the sources in scientific research, mangroves actually function as natural protectors.

Furthermore, the results of this study also show changes at the community level. Active participation by residents in planting and supporting mangroves shows that successful restoration does not only depend on technology and plants but also on community participation. They view mangroves as coastal plants and interpret them as an important part of protecting their lives from disasters as well as being an opportunity in the economic sector, such as fish, shrimp, and ecotourism ponds.

Research in Teluk Awur Beach provides a deeper understanding of the role of mangroves. It not only serves as an

ecological coastal protection but also to strengthen community awareness, responsibility, and resilience to the risks of natural disasters.

CONCLUSION

The mangrove restoration program on the shores of Teluk Awur has proven effective in reducing the impact of natural disasters such as abrasion, flooding, and tsunami potential. Restoration activities are carried out continuously by various parties, including the community, academics, the government, and the military/police, resulting in the planting of more than 1.2 million mangrove seedlings with a success rate of over 90%.

This restoration strengthens soil structure, preserves biodiversity, absorbs carbon, and provides long-term socio-economic impacts through ecotourism and fish farming. Although there are still challenges such as the low awareness of some communities and the pressure of land conversion, this program serves as a real example of ecosystem-based disaster mitigation.

With ongoing support, mangrove restoration in Teluk Awur has the potential to become a model for integrated coastal management, supporting conservation, disaster risk reduction, and sustainable local economic development.

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