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Community-Based Mangrove Restoration for Coastal Ecosystem Sustainability: A Case Study of Mangrove Park Lampulo in Banda Aceh

Nabila Fadhilah[1], Eka Octavian Pranata[2], Lyra Vellaniza Febrita[3], Ika Indah Smaradhani[4]
[1] Politeknik Negeri Sriwijaya, Palembang, Indonesia
[2] Universitas Islam Negeri Ar-Raniry Banda Aceh, Aceh, Indonesia
[3,4] Badan Riset dan Inovasi Nasional, Indonesia
Email: nabilafadhilh@gmail.com [1], e.octavianpranata@ar-raniry.ac.id [2], lyra001@brin.go.id[3], ikai001@brin.go.id [4]

Corresponding Author: Eka Octavian Pranata

ABSTRAK

Ekosistem mangrove memiliki peran penting dalam menjaga keberlanjutan lingkungan pesisir, seperti melindungi garis pantai dari abrasi, mendukung keanekaragaman hayati laut, serta berkontribusi dalam mitigasi perubahan iklim. Namun, kawasan mangrove di berbagai wilayah pesisir masih mengalami degradasi akibat tekanan lingkungan dan aktivitas manusia. Kegiatan pengabdian kepada masyarakat ini bertujuan untuk mendorong keberlanjutan ekosistem pesisir melalui inisiatif restorasi mangrove berbasis masyarakat yang dilaksanakan di Mangrove Park Lampulo di Banda Aceh, Indonesia. Program ini melibatkan partisipasi kolaboratif dari 10 mahasiswa Fakultas Ekonomi dan Bisnis Islam (FEBI) UIN Ar-Raniry Banda Aceh, dosen dari institusi yang sama, masyarakat lokal dari Gampong Pemangku, serta beberapa peneliti dari Badan Riset dan Inovasi Nasional. Kegiatan dilaksanakan melalui beberapa tahapan, yaitu edukasi lingkungan, kegiatan penanaman mangrove secara partisipatif, serta pemantauan sederhana terhadap bibit mangrove yang telah ditanam. Hasil kegiatan menunjukkan bahwa pendekatan berbasis masyarakat mampu meningkatkan kesadaran lingkungan peserta serta memperkuat kerja sama antara institusi akademik, lembaga riset, dan masyarakat lokal dalam upaya konservasi pesisir. Selain itu, kegiatan penanaman mangrove juga berkontribusi dalam mendukung restorasi ekosistem serta meningkatkan keterlibatan masyarakat dalam pengelolaan lingkungan pesisir yang berkelanjutan. Penelitian ini menegaskan pentingnya pendekatan kolaboratif dan berbasis masyarakat dalam mendorong konservasi mangrove serta keberlanjutan ekosistem pesisir dalam jangka panjang.
Kata Kunci: Banda Aceh, Keberlanjutan Pesisir, Konservasi Lingkungan, Partisipasi Masyarakat, Restorasi Mangrove.

ABSTRACT

Mangrove ecosystems play a crucial role in maintaining coastal environmental sustainability by protecting shorelines from erosion, supporting marine biodiversity, and contributing to climate change mitigation. However, mangrove areas in many coastal regions continue to experience degradation due to environmental pressures and human activities. This community engagement program aimed to promote coastal ecosystem sustainability through a community-based mangrove restoration initiative conducted at Mangrove Park Lampulo in Banda Aceh, Indonesia. The program involved collaborative participation from 10 students of the Faculty of Islamic Economics and Business (FEBI) at UIN Ar-Raniry Banda Aceh, lecturers from the same institution, local community members from Pemangku Village, and several researchers from Badan Riset dan Inovasi Nasional. The activities were carried out through several stages, including environmental education, participatory mangrove planting, and simple monitoring of the planted mangrove seedlings. The results indicate that a community-based approach can increase environmental awareness among participants and strengthen collaboration between academic institutions, research organizations, and local communities in coastal conservation efforts. Furthermore, the mangrove planting initiative contributed to ecological restoration and encouraged greater community involvement in sustainable coastal environmental management. This study highlights the importance of

collaborative and community-based approaches in promoting long-term mangrove conservation and coastal ecosystem sustainability.
Keywords: Banda Aceh, Coastal Sustainability, Environmental Conservation, Community Participation, Mangrove Restoration.

INTRODUCTION

Mangrove ecosystems are among the most productive and valuable coastal ecosystems in the world. They provide a wide range of ecological services that are essential for maintaining the sustainability of coastal environments. Mangroves function as natural barriers that protect coastlines from erosion, reduce the impact of storms and tidal waves, and stabilize coastal sediments. In addition, mangrove forests serve as critical habitats for various marine organisms, including fish, crabs, mollusks, and other aquatic species. These ecosystems also play a significant role in global climate regulation through their high capacity for carbon sequestration, making them important components in efforts to mitigate climate change (Choudhary et al., 2024; Das et al., 2026; Dinakarkumar et al., 2026).

Beyond their ecological significance, mangroves also provide substantial socio-economic benefits for coastal communities. Many local communities depend on mangrove ecosystems for their livelihoods, particularly in fisheries, aquaculture, and small-scale coastal economic activities. Mangrove areas can also support sustainable ecotourism development, environmental education, and recreational activities. Therefore, the conservation and restoration of mangrove ecosystems are essential not only for environmental protection but also for improving community welfare and supporting sustainable coastal development (Lee et al., 2025; Rönnbäck, 1999).

Despite their importance, mangrove ecosystems in many parts of the world, including Indonesia, continue to face significant environmental challenges. Rapid coastal development, land conversion for settlements and aquaculture, pollution, and unsustainable exploitation of natural resources have contributed to the degradation and loss of mangrove forests. The destruction of mangrove ecosystems can result in serious environmental consequences, such as increased coastal erosion, reduced marine biodiversity, and heightened vulnerability of coastal communities to natural disasters and climate change impacts (Alongi, 2002).

Indonesia is recognized as one of the countries with the largest mangrove areas in the world. However, many mangrove forests have experienced degradation over the past decades. As a response to these environmental challenges, various mangrove restoration and conservation initiatives have been implemented by the government, academic institutions, non-governmental organizations, and local communities. Among these approaches, community-based mangrove restoration has gained increasing attention as an effective strategy to ensure the long-term sustainability of conservation programs (Inaku et al., 2026; Richards & Friess, 2016).

Community participation plays a crucial role in environmental conservation efforts. Engaging local communities in mangrove restoration

activities can increase environmental awareness, strengthen a sense of ownership toward natural resources, and promote sustainable environmental practices. Community-based approaches also encourage collaboration between different stakeholders, including academic institutions, research organizations, local governments, and civil society. Such collaborative efforts are essential in addressing complex environmental challenges and ensuring the success of ecosystem restoration programs(Nuraeni & Kusum, n.d.; Portz et al., 2019).

One of the areas that has become a focal point for mangrove conservation and restoration activities is Mangrove Park Lampulo located in Banda Aceh, Indonesia. This mangrove park has been developed as both a conservation area and an ecotourism destination that promotes environmental education and sustainable coastal management. The area provides an important opportunity for community engagement in mangrove conservation while also serving as a learning site for students, researchers, and visitors interested in coastal ecosystem sustainability.

The involvement of academic institutions in community-based environmental programs is particularly important in bridging scientific knowledge with practical conservation efforts. Universities can contribute through research, environmental education, and community service activities that aim to empower local communities and promote sustainable environmental practices. In this context, collaborative initiatives involving universities, research institutions, and local communities can significantly enhance the effectiveness of conservation programs.

Therefore, this community engagement program aimed to promote coastal ecosystem sustainability through a community-based mangrove restoration initiative conducted at Mangrove Park Lampulo in Banda Aceh. The program involved collaborative participation from 10 students of the Faculty of Islamic Economics and Business (FEBI) at UIN Ar-Raniry Banda Aceh, lecturers from the same institution, local community members from Pemangku Village, and several researchers from Badan Riset dan Inovasi Nasional. The activities included environmental education sessions, participatory mangrove planting, and simple monitoring of the planted mangrove seedlings.

Through these activities, the program sought to enhance environmental awareness among participants, strengthen cooperation between academic institutions, research organizations, and local communities, and contribute to the restoration and sustainability of coastal ecosystems. Furthermore, this initiative highlights the importance of collaborative and community-based approaches in addressing environmental challenges and promoting long-term mangrove conservation in coastal areas.

METHOD

This study employed a community-based participatory approach aimed at supporting mangrove ecosystem restoration and promoting coastal environmental sustainability. The participatory approach emphasizes collaboration between academic institutions, research organizations, and local

communities in implementing environmental conservation activities. Through this approach, community members and participants were actively involved in the planning and implementation of mangrove planting activities, enabling the program to foster a sense of environmental responsibility and collective participation in coastal ecosystem conservation.

The activity was conducted at Mangrove Park Lampulo located in Banda Aceh, Indonesia. This location was selected because it represents one of the coastal conservation areas that has been developed as a mangrove restoration site as well as an ecotourism destination. The mangrove park provides suitable environmental conditions for mangrove growth and serves as an important location for environmental education and community-based conservation initiatives.

The participants involved in this program consisted of 10 students from the Faculty of Islamic Economics and Business (FEBI) at UIN Ar-Raniry Banda Aceh, lecturers from the same institution, local community members from Pemangku Village, and several researchers from Badan Riset dan Inovasi Nasional. The students participated as volunteers who assisted in implementing environmental education and mangrove planting activities. Lecturers played a role in coordinating the community engagement program and providing academic guidance during the implementation process. Meanwhile, local community members contributed their local knowledge and supported the field activities, while researchers provided technical insights related to mangrove ecosystem restoration.

Data in this study were collected through observation, documentation, and participatory engagement during the implementation of the mangrove planting activities. Direct observation was conducted to assess the level of participation among participants and to monitor the overall implementation of the mangrove restoration program. Documentation methods were also used to record the activities, including photographs, field notes, and records of the mangrove planting process. In addition, the participatory nature of the program allowed researchers to observe participants' responses, collaboration, and awareness regarding environmental conservation initiatives.

The implementation of the program was carried out through several stages. The first stage involved preparation and coordination with relevant stakeholders, including local community representatives and supporting institutions. This stage also included the preparation of mangrove seedlings and planning the planting locations within the conservation area. The second stage involved environmental education activities aimed at providing participants with knowledge about the ecological importance of mangrove ecosystems, their role in protecting coastal areas from erosion, and their contribution to biodiversity and climate change mitigation.

The third stage consisted of the mangrove planting activity, where participants were directly involved in planting mangrove seedlings in designated areas within Mangrove Park Lampulo. Participants were guided on proper planting techniques to ensure that the seedlings were planted effectively and had a higher chance of survival. This participatory activity not only contributed to

ecological restoration but also strengthened participants' understanding of the importance of mangrove conservation.

The final stage involved simple monitoring and evaluation of the planted mangrove seedlings as well as the overall implementation of the program. This stage aimed to observe the initial condition of the planted seedlings and evaluate the level of community participation during the activity. The collected data were then analyzed using a descriptive qualitative approach to understand the effectiveness of the community-based mangrove restoration initiative and its contribution to supporting coastal ecosystem sustainability.

RESULTS AND DISCUSSION

The implementation of the community-based mangrove restoration program at Mangrove Park Lampulo in Banda Aceh demonstrated positive outcomes in terms of community participation, environmental awareness, and collaborative engagement among stakeholders. The activity involved students, lecturers, researchers, and local community members who collectively participated in mangrove planting and environmental education activities aimed at supporting coastal ecosystem sustainability.

One of the key outcomes observed during the program was the active participation of participants in the mangrove planting activities. A total of 10 students from the Faculty of Islamic Economics and Business (FEBI) at UIN Ar-Raniry Banda Aceh worked together with lecturers, local community members from Pemangku Village, and researchers from Badan Riset dan Inovasi Nasional in carrying out the planting activities. This collaborative involvement created a learning environment where participants were able to directly engage with environmental conservation practices. Students gained practical experience in ecosystem restoration, while local community members contributed their knowledge of the coastal environment and mangrove management.

Figure 1. Nursery: Mangrove Park Lampulo

Another important result of the activity was the increased environmental awareness among participants. Prior to the planting activity, environmental education

sessions were conducted to introduce participants to the ecological functions of mangrove ecosystems. Through these sessions, participants gained a better understanding of the role of mangroves in protecting coastal areas from erosion, maintaining marine biodiversity, and supporting climate change mitigation through carbon storage. As a result, participants demonstrated greater appreciation for the importance of mangrove conservation and expressed their willingness to support future environmental initiatives.

The mangrove planting activity itself contributed to the ecological restoration efforts in the coastal area of Banda Aceh. Participants planted mangrove seedlings in several designated locations within the conservation area of Mangrove Park Lampulo. The planting process followed basic mangrove planting techniques to ensure that the seedlings were placed in suitable environmental conditions. The presence of newly planted mangrove seedlings is expected to contribute to strengthening coastal ecosystem stability and supporting habitat restoration for marine organisms in the future.

In addition to ecological benefits, the program also strengthened collaboration between academic institutions, research organizations, and local communities. The involvement of lecturers and students from UIN Ar-Raniry Banda Aceh alongside researchers from Badan Riset dan Inovasi Nasional created opportunities for knowledge exchange and interdisciplinary collaboration. This partnership also demonstrated the important role of higher education institutions in supporting environmental conservation through community engagement programs.

Furthermore, the participation of local community members from Pemangku Village played a crucial role in ensuring the sustainability of the mangrove restoration efforts. Community members not only assisted in the planting activities but also provided local insights regarding environmental conditions in the coastal area. Their involvement reflects the importance of community-based approaches in environmental management, where local knowledge and active participation contribute to more sustainable conservation outcomes.

Overall, the results of this community engagement program indicate that community-based mangrove restoration initiatives can effectively promote environmental awareness, encourage stakeholder collaboration, and contribute to coastal ecosystem sustainability. The program conducted at Mangrove Park Lampulo demonstrates how participatory environmental activities can support ecological restoration while simultaneously strengthening community involvement in environmental protection efforts.

CONCLUSION

The community-based mangrove restoration program conducted at Mangrove Park Lampulo in Banda Aceh demonstrates the important role of collaborative initiatives in supporting coastal ecosystem sustainability. The involvement of students and lecturers from UIN Ar-Raniry Banda Aceh, local community members from Pemangku Village, and researchers from Badan Riset dan Inovasi Nasional created a participatory platform for environmental conservation and knowledge exchange.

The results of the activity indicate that community-based mangrove planting initiatives can effectively increase environmental awareness and encourage active participation in coastal conservation efforts. The direct involvement of participants in mangrove planting activities not only contributed to ecological restoration but also enhanced participants' understanding of the importance of mangrove ecosystems in protecting coastal areas and supporting biodiversity.

Furthermore, the collaboration between academic institutions, research organizations, and local communities strengthened the implementation of the mangrove restoration program and highlighted the significance of interdisciplinary partnerships in addressing environmental challenges. Such collaborative efforts are essential for ensuring the sustainability of environmental conservation programs and for promoting long-term community engagement in ecosystem protection.

In conclusion, community-based mangrove restoration initiatives represent an effective approach to supporting coastal ecosystem sustainability. Future programs should continue to emphasize community participation, environmental education, and continuous monitoring of mangrove growth to ensure the long-term success of mangrove conservation efforts in coastal areas.

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