



ENHANCING SUSTAINABILITY EFFORTS TO ADAPT TO CLIMATE CHANGE THROUGH MANGROVE PLANTING ON AMBALAT BEACH

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<p>Info Article</p> <p>Received : 01 Januari 2026</p> <p>Revised : 02 Februari 2026</p> <p>Accepted : 01 Maret 2026</p> <p>Publication : 31 Maret 2026</p>	<p>Abstract: <i>The purpose of this community service activity is to revitalize the degraded coastal ecosystem of Ambalat Beach through mangrove planting while also enhancing community awareness and capacity for sustainable coastal conservation. The methods applied include site surveys to determine suitable planting areas, participatory education to improve community understanding of mangrove importance, and direct planting activities (action learning). A total of 1,000 mangrove seedlings of the species <i>Rhizophora mucronata</i> were successfully planted on selected potential land agreed upon by the local community. A participatory approach integrating local knowledge with scientific principles became a key factor in the implementation of this activity. The results indicate an increase in community understanding of the ecological functions of mangroves and proper planting techniques. Evaluation shows that some seedlings did not grow optimally due to environmental factors such as wave exposure, substrate conditions, the need for improved planting.</i></p> <p>Abstrak: Tujuan kegiatan pengabdian masyarakat ini adalah untuk merevitalisasi ekosistem pesisir Pantai Ambalat yang mengalami degradasi melalui penanaman bibit mangrove sekaligus meningkatkan kesadaran serta kapasitas masyarakat dalam upaya konservasi lingkungan pesisir secara berkelanjutan. Metode yang digunakan meliputi survei lokasi untuk menentukan area tanam yang sesuai, pendidikan partisipatif kepada masyarakat mengenai pentingnya mangrove, serta kegiatan penanaman langsung (action learning). Sebanyak 1.000 bibit mangrove jenis <i>Rhizophora mucronata</i> berhasil ditanam pada lahan potensial yang telah dipilih bersama masyarakat setempat. Pendekatan partisipatif yang mengintegrasikan pengetahuan lokal dengan prinsip ilmiah menjadi faktor penting dalam pelaksanaan kegiatan ini. Hasil kegiatan menunjukkan adanya peningkatan pemahaman masyarakat mengenai fungsi ekologis mangrove dan teknik penanaman yang tepat. Namun demikian, evaluasi menunjukkan bahwa sebagian bibit tidak tumbuh optimal akibat faktor lingkungan seperti gelombang laut, kondisi substrat, serta teknik penanaman yang masih perlu ditingkatkan.</p>
<p>Keywords: Keywords: Coastal Ecosystem, Mangrove, Rehabilitation, Ambalat Beach, Community Participation.</p> <p>Kata Kunci : Ekosistem Pesisir, Hutan Mangrove, Rehabilitasi, Pantai Ambalat, Partisipasi Masyarakat.</p>	
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INTRODUCTION

Mangrove ecosystems play a vital ecological role in maintaining and supporting marine biodiversity, particularly in coastal areas. Mangrove forests serve as natural habitats for various marine and coastal organisms such as fish, shellfish, crabs, and plankton, which depend on stable environmental conditions to survive and reproduce. In addition, mangroves contribute significantly to coastal protection, water quality regulation, and climate change mitigation through carbon sequestration (Alongi, 2008 ; Barbier, dkk 2011).

Indonesia possesses one of the largest mangrove ecosystems in the world, making it a key area for biodiversity conservation and coastal sustainability. However, these ecosystems are increasingly threatened by human activities such as land conversion, pollution, and unsustainable resource exploitation (Kusmana, C., 2024). Mangrove ecosystems also provide important economic and social benefits, including supporting fisheries productivity, ecotourism potential, and local livelihoods. However, degradation of mangroves leads to increased vulnerability to coastal hazards such as abrasion and reduces the resilience of coastal communities (Marfi, K. P., 2025).

Ambalat Beach, a coastal area with significant fisheries and tourism potential, faces serious challenges in the form of mangrove ecosystem degradation. This degradation is caused by land conversion, unsustainable fishing practices, and environmental pressures. Ineffective rehabilitation efforts are often linked to inappropriate site selection, poor planting techniques, and limited community involvement (Primavera, J. H., & Esteban, 2008). Therefore, sustainable rehabilitation and conservation efforts through mangrove planting and community engagement are essential to restore ecosystem functions and improve coastal resilience.

METHOD

The activity was carried out in June 2024 in the mangrove conservation area of Ambarawang Laut Beach, West Samboja, through three main stages:

- a. **Preparation Stage:** A site survey was conducted to identify suitable intertidal zones, levels of degradation, and substrate types. Participatory Rural Appraisal (PRA) was used to explore local knowledge and community needs. The selection of *Rhizophora mucronata* was based on its ecological suitability (Kusmana, C., 2024).
- b. **Implementation Stage: Education and Training:** A field school was conducted involving 25 members of the Tourism Awareness Group

(Pokdarwis) and 55 university students. The materials included mangrove ecology, nursery techniques, planting methods, and monitoring. Ecotourism concepts were also introduced to enhance economic value. **Planting Action:** Planting was carried out using a zigzag pattern with a spacing of 1x1 meter. A stake system was applied to improve seedling stability, which is considered an important factor in increasing survival rates(Primavera, J. H., & Esteban, 2008).

- c. **Evaluation and Mentoring Stage:** Monitoring was conducted one month after planting to assess survival rates, growth, and disturbances such as waves and waste.

RESULTS AND DISCUSSION

Mangrove rehabilitation activities have demonstrated positive impacts not only on ecological aspects but also on community capacity building. Following the implementation of the activities, participants' understanding of the ecological function of mangroves, particularly in maintaining coastal ecosystem stability, increased. Furthermore, technical skills in mangrove planting also improved significantly, with 92% of participants able to apply correct planting techniques, including selecting healthy seedlings, determining planting depth, and installing stakes to support the seedlings. This capacity building is a crucial factor in supporting the initial success of mangrove rehabilitation.

A total of 1,000 seedlings were successfully planted in potential land selected based on its suitability for environmental conditions. However, monitoring one month after planting showed that some of the seedlings were not growing optimally, and some were even lost due to being washed away by the current.



Figure 1 & 2. Land Survey with Pokdarwis and Village Officials



Figure 3 & 4. Mangrove Ecological Extension



Figure 5 & 6. Mangrove planting process



Figure 7 & 8. Mangrove trees that have been planted

The significant loss of mangroves after planting aligns with previous studies, which found that mangrove seedling mortality is generally caused by physical disturbances, particularly plastic waste that inhibits growth, and competition with algae that cover the seedlings' rooting areas. Despite this, the success rate of this project was quite good due to intensive community involvement. This demonstrates that a participatory approach, through active community involvement in the planting and monitoring process, plays a crucial role in increasing the success of mangrove ecosystem rehabilitation (Ostrom, 1990). The long-term sustainability of mangrove rehabilitation is strongly influenced by the socio-economic aspects of the community. This activity has encouraged the emergence of tourism awareness groups (Pokdarwis) to develop ecotourism

interpretation trails around the planting sites. The development of these trails has the potential to provide economic benefits to the community while strengthening mangrove conservation efforts by fostering a sense of ownership and responsibility for the environment. In addition to serving as an alternative source of income, the interpretation trails also serve as a medium for environmental education for visitors. The synergy between academic institutions as providers of technical knowledge and community groups as implementers and guardians of the ecosystem has proven to be an effective collaborative model in supporting the sustainability of mangrove rehabilitation, in line with the findings of (Kusmana, C., 2024).

CONCLUSION

Mangrove planting activities at Ambalat Beach successfully contributed to ecological restoration and community empowerment. The success of the program was influenced by appropriate species selection, proper planting techniques, and strong community participation. To ensure long-term sustainability, it is recommended to conduct regular monitoring, strengthen community-based management, and develop sustainable mangrove ecotourism programs.

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