

ENVIRONMENTAL CONSERVATION ACTION THROUGH COMMUNITY-BASED MANGROVE SEEDLING PLANTING IN EDUCATION AND SOCIETY: THE FOLU GOES TO SCHOOL

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Abstract. This community service activity aims to enhance students' and community members' knowledge, awareness, and participation in climate change mitigation efforts through socialization and mangrove seedling planting. The selection of mangrove seedling planting locations is based on observations of degrading mangrove forests that still have the potential for natural regeneration. In addition, the location is prioritized in areas experiencing anthropogenic pressure, coastal erosion, and excessive sedimentation. Socio-economic considerations are also a key factor. The planting location is close to residential areas to encourage public participation and environmental awareness. This activity is carried out in the mangrove forest tourism area, Oesapa village, Kelapa Lima sub-district, Kupang City, over a period of 2 months, namely November – December. The method for implementing the activity consists of three stages: socializing students about the role of mangrove forests; cleaning the area with the surrounding community; planting mangrove seedlings; and initial maintenance and monitoring. In addition to increasing knowledge and awareness of mangrove forests' functions, this activity also contributes to the rehabilitation of mangrove areas. It strengthens collaboration among students, the community, the government, and academics in the effort to preserve mangrove forests.

Keywords: climate change, environmental rehabilitation, mangrove, mitigation

Abstrak. Kegiatan pengabdian kepada masyarakat ini bertujuan untuk meningkatkan pengetahuan, kesadaran dan partisipasi pelajar serta komunitas masyarakat dalam upaya mitigasi perubahan iklim melalui kegiatan sosialisasi dan penanaman anakan mangrove. Pemilihan lokasi penanaman anakan mangrove berdasarkan observasi pada kawasan hutan mangrove yang mengalami degradasi namun masih memiliki potensi regenerasi alami. Selain itu, lokasi diprioritaskan pada area yang mengalami tekanan antropogenik, abrasi pantai dan sedimentasi berlebihan. Pertimbangan sosial ekonomi juga menjadi faktor utama. Lokasi penanaman berdekatan dengan permukiman masyarakat agar mendorong partisipasi publik dan kesadaran lingkungan. Kegiatan ini dilaksanakan di kawasan wisata hutan mangrove, Kelurahan Oesapa, Kecamatan Kelapa Lima, Kota Kupang, selama kurun waktu 2 bulan, yaitu November – Desember. Metode pelaksanaan kegiatan terdiri atas tiga tahap, yakni sosialisasi peran hutan mangrove kepada para pelajar dan pembersihan lahan bersama masyarakat sekitar, penanaman anakan mangrove, serta pemeliharaan dan monitoring awal. Hasil kegiatan ini, selain meningkatkan pengetahuan dan kesadaran fungsi hutan mangrove, juga berkontribusi pada rehabilitasi kawasan mangrove serta memperkuat kolaborasi antara pelajar, masyarakat, pemerintah dan akademisi dalam upaya pelestarian kawasan hutan mangrove.

Kata Kunci: mangrove, mitigasi, perubahan iklim, rehabilitasi lingkungan

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INTRODUCTION

Global climate change is a serious challenge that requires the active involvement of various stakeholders, including students and the community. One of the strategic efforts in climate change mitigation is the rehabilitation of mangrove ecosystems, which have a high capacity for blue carbon sequestration (Taillardat et al., 2018). Mangrove ecosystems have an excellent ability to absorb, capture, and store carbon in plant biomass and seabed sediments for thousands of years, making them more effective than terrestrial forests. Almost 25% of the world's mangroves are found in Indonesia, making it a crucial contributor to global carbon storage (Rosyada et al., 2021). Mangrove ecosystems also help protect coastal areas from

erosion, maintain water quality, and support biodiversity. When this ecosystem is damaged or repurposed, the carbon stored for hundreds or even thousands of years will be released back into the atmosphere, which can ultimately trigger climate change and endanger humans and the environment (Paramadani, 2024; Sidik, 2012).

Kupang City is the capital of the East Nusa Tenggara Province, located at the western tip of Timor Island in the coastal area of Kupang Bay. It has a vast coastline facing directly toward the Indian Ocean and the Sawu Sea. With an area of approximately 180.27 km², Kupang City has a population of around 474,801 (2024) and a high density, especially in its coastal urban areas. One of the sub-districts located in the coastal region with a high population and activity is the Kelapa Lima sub-district. Activities such as trade, tourism, fishing, office work, and transportation serve the needs of both residents and newcomers (BPS Kota Kupang, 2025).

One of the serious problems arising from the economic activities and life of the coastal community in Kelapa Lima District is pollution, especially plastic waste and land conversion. The presence of plastic waste can threaten coastal areas, including the ecosystems within them, such as mangroves and coral reefs. The conversion of mangrove land into shrimp farms, settlements, and the direct disposal of household waste into the sea further reduce the extent of mangrove forests, which indirectly impacts marine habitats, especially organisms living in mangroves and coral reefs, disrupts nutrient supply to the sea, weakens coastal defenses against waves and abrasion, and diminishes their function as natural carbon sinks (Toly et al, 2024; Situmorang et al., 2025; Uly et al., 2025).

According to data from the DLHK Kota Kupang in 2022, mangrove vegetation cover in the Kupang city area decreased by approximately 40% in the Kelapa Lima sub-district. The decline is caused by two factors: human activities and natural disasters. Human activities such as illegal logging for firewood, settlement without environmental impact analysis, and unsustainable reclamation activities are further exacerbated by the 2021 natural disaster Cyclone Seroja, which struck NTT. This storm is known to have damaged nearly 70% of the mangrove area in the Oesapa Barat village, which is still within the Kelapa Lima sub-district (Uly et al., 2025).

The mangrove forest ecosystem rehabilitation activities in Kelapa Lima involve cross-sector collaboration, including academics from Nusa Cendana University (Undana), students (teachers and students) from SMPN 20 Kupang, environmental volunteers or activists, and the community living around the mangrove forest. The Ministry of Environment and Forestry provides funding for this activity through the FOLU Net Sink 2030 program. This collaborative approach has several advantages: for academics, the rehabilitation activities represent an integration of theory and practice; for students, it helps build a generation of environmental enthusiasts from an early age; for the community, it enhances community capacity, accelerates the transfer of knowledge and skills within the community, so that rehabilitation efforts are not only the responsibility of the government but also a collective movement (Ismail et al., 2025; Kamaluddin et al., 2025; Rahman et al., 2024).

METHODS

The mangrove seedling planting activities were carried out from November 27 to December 19, 2025, through several stages, including site surveys, socialization, land clearing, seedling planting, and monitoring. The parties involved include the teachers and students of SMP Negeri 20 Kupang, a team of lecturers from Universitas Nusa Cendana, the coastal community of Oesapa, especially the residents of RT 024 RW 011, the local village government, the committee, and the volunteers of FOLU Goes to School. The site survey was conducted to determine the areas most in need of rehabilitation, tidal factors, sediment types, and suitable mangrove species.

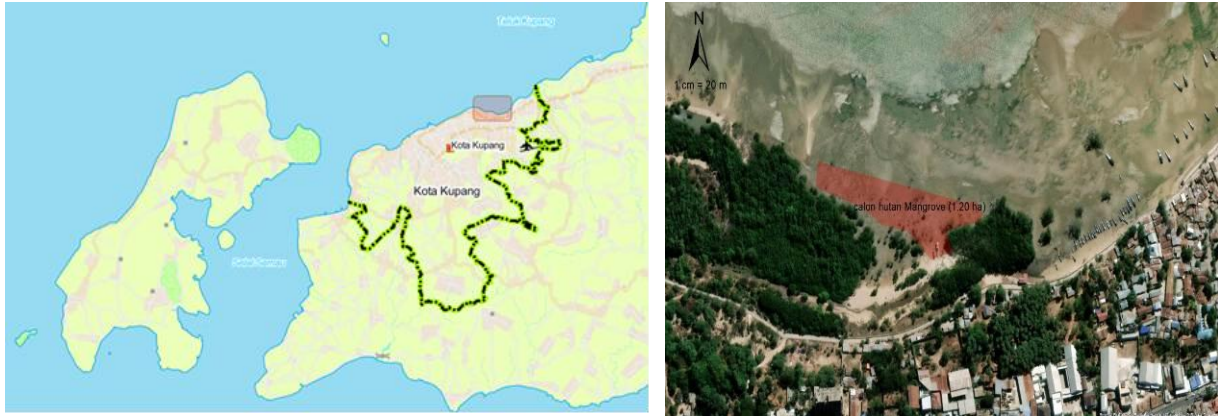


Figure 1. Location of mangrove seedling planting

Socialization was conducted for the students of SMP N 20 Kupang regarding the importance of the mangrove ecosystem, its ecological and economic functions, and the role of the younger generation in preserving the coastal environment (Maulidah et al., 2023). The activity continued with cleaning the coastal area of trash and other materials that hinder mangrove growth. This stage involves students and the local community (Akram et al., 2023). Planting is carried out in stages in the coastal region of Oesapa waters, considering tidal conditions, substrate types, and appropriate planting techniques. The mangrove planting technique applied in this activity, besides using *anjir* as a support for the mangrove trunks, also uses *sokal* (organic bags made from woven young siwalan leaves), which serve as a growth medium for the mangroves. After planting, initial monitoring and maintenance are carried out.

RESULTS AND DISCUSSION

As one of the island provinces, East Nusa Tenggara (NTT) has mangrove forests. However, its area is not as large as the mangrove forests in other provinces, especially in Papua. One factor hindering the growth of mangrove forests in NTT is the small size of river estuaries. The total area of mangrove forests in NTT is approximately 40,695 hectares, and around 9,989 hectares (2.25%) are experiencing anthropogenic pressures (Toly et al, 2024)). Moreover, the implementation of coastal management policies, particularly in mangrove areas, has not been optimal. Several aspects,, such as policy content, rehabilitation programs, long-term strategies, and community capacity building, have not been adequately supported by resources (Uly et al., 2025).

Mangrove socialization activities for coastal communities are an essential effort to raise awareness and understanding of the role of mangrove ecosystems in the environment and daily life (Maulidah et al., 2023). Through this socialization, the community gains knowledge of the benefits of mangroves, including coastal protection from abrasion, habitat provision for various species, and their contribution to economic development through non-timber forest products (Das et al., 2022). In addition, this activity encourages active community participation in maintaining and preserving mangroves, ensuring the balance of the coastal ecosystem and the sustainability of future generations (Koda, 2023).

The first stage is a survey to determine the appropriate location for planting mangrove seedlings. The monitoring results show that the mangrove ecosystem in the coastal waters of Oesapa, specifically in the areas of RT 034, RW 011, Pantai Oesapa, Oesapa village, Kelapa Lima sub-district, requires sustainable rehabilitation and recovery efforts, not only through mangrove planting but also through increasing environmental awareness, especially among the younger generation (Sasmito et al., 2023).



Figure 2. *The condition of the land that will be planted with mangrove seedlings*

The next stage involves conducting socialization activities for the students of SMPN 20 Kupang. This session is designed to provide students with a comprehensive understanding of mangrove ecosystems. The material presented includes an introduction to mangrove forests and the various types of mangroves, their ecological and economic functions, the impacts of mangrove degradation on coastal environments, and proper techniques for planting mangrove seedlings (Arifanti et al., 2022; Akram et al., 2023).

Through this activity, students not only gain theoretical knowledge about the importance of mangroves in preventing coastal erosion, supporting marine life, and mitigating climate change, but also develop awareness of the consequences of environmental damage (Putra et al., 2025). Following the socialization session, students participate directly in land cleaning and mangrove seedling planting activities. This hands-on experience strengthens their understanding and encourages active involvement in preserving and conserving mangrove ecosystems in their local environment (Gunawan et al., 2025).



Figure 3. *Socialization of the functions of mangrove forests to the students*

The selection of high-quality seedlings is an essential stage in ensuring the success of mangrove forest ecosystem rehabilitation. The selected seedlings must be at least 4 months old, have strong roots, and be free from pests and diseases. Bamboo poles are chosen to support the mangrove seedlings, enabling them to withstand waves and ocean currents. The planting containers for mangrove seedlings use *sokal*, which is a type of woven basket (an organic bag made from young siwalan palm leaves). The use of woven baskets is an environmentally friendly alternative. Natural materials such as bamboo, coconut leaves, or palm leaves have strong air and water circulation, supporting optimal root growth (Eyupoglu, 2020). In addition, woven materials decompose easily in nature and do not pollute the environment. Selecting this woven basket also supports reducing plastic waste while promoting the use of sustainable, local products (Conilie et al., 2021).



Figure 4. *Mangrove seedlings, sokal, and bamboo stakes for support*

The planting of mangrove seedlings involves students, the community, and volunteers working together while paying attention to proper planting techniques. The planting is carried out during low tide so that the planting location is easily accessible and the saplings can be planted in a stable position (van Bijsterveldt et al., 2022). Each participant ensures that the seedlings are firmly planted and protected from potential disturbances. The monitoring process is carried out 1 week after planting and involves the community living near the area. Monitoring is carried out by cleaning plastic waste and wooden branches stuck to the seedlings, as well as replacing lost or damaged seedlings. Community involvement from the planting stage to monitoring is expected to foster a shared sense of responsibility for preserving the mangrove ecosystem.



Figure 5. *Mangrove seedling planting activities*

Ecologically, this activity directly contributes to increased mangrove coverage along the Oesapa coast, which serves as a natural protector of the beach from abrasion, a habitat for coastal biota, and a carbon absorber (Ben-Natan & Shashar, 2025). Socially and educationally, this activity has successfully increased students' and the community's knowledge, awareness, and active participation in preserving and conserving the coastal environment (Rahabav et al., 2025). The involvement of students in field activities also serves as a contextual learning tool that instills values of care and responsibility toward the environment from an early age (Ratnasari et al., 2024).

CONCLUSION

The mangrove seedling planting activities carried out by students, community members, and volunteers have made a meaningful contribution to mangrove forest rehabilitation and the strengthening of environmental awareness. Their involvement goes beyond the planting process itself, as participants also take part in monitoring and maintaining the seedlings to ensure healthy growth and long-term survival. To maintain the sustainability of this program,

continuous socialization efforts, technical training on proper planting and maintenance methods, and regular post-planting monitoring are necessary. These follow-up activities help improve participants' skills and reinforce their commitment to environmental conservation. Furthermore, support and collaboration from various stakeholders—both private institutions and government agencies—are crucial to ensure the long-term success and sustainability of the mangrove ecosystem in Kelapa Lima Sub-district, Kupang City.

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