

Evaluation of Global Warming Countermeasures by Introducing Mangrove Afforestation Technology in Southeast Asia

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Summary

The conservation and restoration of vegetated blue carbon (BC) habitats (e.g., mangroves, salt marshes, and seagrasses) is emerging as Nature-based Solutions (NbS) supporting biodiversity, climate change mitigation and adaptation, and additional ecosystem functions that support the well-being of humans and the planet. Therefore, the research effort to understand carbon stocks and fluxes within BC habitats has increased exponentially over the last decade. Mangrove forests are among the most productive blue carbon ecosystems, offering a range of ecosystem services including fisheries production, coastal protection, flood damage mitigation, and notably, carbon sequestration. Mangrove sediments hold approximately 70% of the whole ecosystem's carbon storage, varying in magnitude geographically, which is primarily determined by coastal environmental settings. Indonesia has the largest mangrove forest area in the world, estimated at around 3.36 million hectares, which represents 20-25% of the global mangrove area, and has extensively reforested mangroves to stabilize coastal ecosystems and mitigate climate change.

In this research, ecosystem carbon stocks were evaluated at the mangrove afforestation test area in Sumba Island in East Nusa Tenggara which is the southern province of Indonesia. This mangrove research site consists of two areas, the Padadita (Pd) district and Watumbaka (WT) district in the northeastern area of the island. Vegetation and soil physicochemical properties (pH, EC, water content, and dry density) in mangrove afforestation sites of no-growth and good-growth areas were examined in Pd district, and their results were compared to good vegetation area in 21 years after afforestation and new afforestation area in WT district.

As a result, ecosystem carbon stocks at the 21-year site were $860 \text{ MgC}\cdot\text{ha}^{-1}$ in the WT district, which was higher than the global mean value. In addition, the afforestation test around the reforestation site indicated good results in the initial growth and soil carbon stocks. Moreover, high correlation relationships between soil carbon stock and properties such as electrical conductivity and water content were confirmed. Therefore, the recovery of carbon stocks through mangrove afforestation can contribute to blue carbon ecosystem restoration as NbS.