



North Sumatra, Indonesia // Southeast Asia

Mangrove Restoration and Coastal Greenbelt Protection Project

Country Information

Population

278.1 Million
(World Population Review, 2023)

UNFCCC National Adaptation Plan

Yes, 2022

Intervention Information

\$2.1–6.3 Million (USD)
Cost

2011–Present
Timeline

Inequality adjusted HDI

(Scale of 0–1)



(UNDP, 2023)

ND-GAIN Vulnerability Score

(Scale of 0–1)



(ND-GAIN, 2023)



Rationale for Selection

Cases were selected for review based on general screening criteria, including timeframe of intervention, location of implementation, and evidence-based outcomes, as available. This effort highlights opportunities for co-benefits of mitigation and adaptation in community-based mangrove restoration initiatives with a focus on livelihoods.



Outcome Area(s)

Coastal Resilience, Climate Mitigation Disaster Risk Reduction, Income/Livelihoods, and Gender Equality



Funding Sources

Mangrove Restoration and Coastal Greenbelt Protection (North Sumatra): Yagasu, Livelihoods Carbon Fund, French Facility for Global Environment (Fonds français pour l'environnement mondial or FFEM), Global Environment Facility (GEF), Green Climate Fund, and other funders



Implementation

Mangrove Restoration and Coastal Greenbelt Protection (North Sumatra): Yagasu, Livelihoods Carbon Fund, World Agroforestry (ICRAF), Center for International Forestry Research (CIFOR), village and district-level officials, Global Mangrove Trust (GMT), and Oxford University and KUMI – Singapore

Context of Intervention

Indonesia is home to the most extensive and diversified mangrove cover in the world, which plays a critical role in global biodiversity conservation, coastal protection, and climate change mitigation. The Southeast Asian archipelago is home to approximately 20% of the world's mangrove areas; it provides essential ecosystem services, including nurturing rich biodiversity, limiting soil erosion, providing a protective barrier against climate hazards, and acting as significant carbon sinks. Efforts to restore and rehabilitate these valuable ecosystems in Indonesia can be traced back to the 1960s. Over 200,000 ha of mangroves were lost to the conversion of brackish water shrimp aquaculture or tombac.¹ Concurrent with the nation's tombac development was a surge in the demand for timber production, leading to the loss of an additional 800,000 ha by the 1990s.²

Unsustainable aquaculture and timber production as well as vulnerability to disasters, led to intensified efforts towards the rehabilitation of critical mangrove ecosystems. Indonesia is located in the Pacific Ring of Fire, a geographic area prone to volcano eruption, earthquakes, tsunamis, and tropical cyclones. Notably, interest in mangrove restoration increased after a magnitude 9.1 earthquake led to the 2004 Indian Ocean tsunami that claimed over 230,000 lives.³ The Government of Indonesia's Peatland and Mangrove Restoration Agency (BRGM) aims to restore 600,000 ha of mangrove forests by 2024.⁴

Description of Intervention

Community-based Mangrove Management (CBMM) is a strategy for management and restoration of mangrove forests that is community-based and involves resource users directly in the management. Amongst these initiatives in Indonesia is the Mangrove Restoration and Coastal Greenbelt Protection Project in North Sumatra, which is implemented by Yagasu (Yayasan Gajah Sumatera). Yagasu is an NGO that primarily works to enhance natural habitat conservation through nature-based solutions with socio-economic benefits. By collaborating closely with local communities to safeguard local ecosystems and cultivate additional income opportunities, the approach links ecosystem rehabilitation with community livelihood improvement.⁵ With the Government of Indonesia's ambitious targets for peatland restoration and mangrove rehabilitation, as well as newly launched, nationwide mangrove restoration efforts, Yagasu's programs in mangrove restoration provide key insights for sustainable environmental and community adaptation.⁶

Yagasu's mangrove restoration projects involve two key components: 1) restoration necessary for mitigation and disaster risk reduction, and 2) income-generating activities that are vital to livelihood transition.⁷ Each project covers 5,000 ha of community lands, with potential expansion to 10,000 ha, and involves a 5-year planting phase, followed by 15-35 years of carbon growth monitoring. These initiatives currently span 13 provinces, including Aceh, North Sumatra, and South Sulawesi.⁷ Each mangrove restoration site requires two steps. First, the team plants mangroves in degraded muddy areas—specifically, ponds, riverbanks, and coastlines—adhering to a predetermined density (2,500 seedlings per ha). The second step involves routine replanting in place of deceased trees, typically after 4 months, to uphold an 80-90% survival rate and ensure stable mangrove growth for up to 4 years. To ensure multifaceted benefits, the projects engage local actors in a range of essential activities, such as: land and social assessments of planting sites; research and awareness programs; ecosystem conservation; local community capacity building; socio-economic support of marginalized groups, and nursery works, tree planting, and monitoring, reporting, and verification (MRV).

Ensuring livelihoods are part of the design, projects have successfully combined mangrove restoration with diverse aquaculture. Integrating the concept of "silvofishery," projects create naturally fertile habitats that attract a plethora of aquatic species, such as fish, shrimp, and crabs. Through the introduction of a revolving microcredit fund, Yagasu provided fisherfolk loans averaging \$1,260 USD per setup to establish productive fishponds, and thereby stimulating the continuous planting and nurturing of mangrove trees.⁸ One study in 2016 found that the rehabilitation of mangrove ecosystems, coupled with the implementation of sustainable practices like organic shrimp and soft-shell crab farming, resulted in a remarkable 27% boost in fish production within the 25,000 ha protected mangrove forests.⁹ These mangroves, harmoniously integrated into and around fishponds, not only enhance local biodiversity but also diversified and bolstered income sources for local fisherfolk.

Intervention Funding

The Mangrove Restoration and Coastal Greenbelt Protection Project receives funding from the Livelihoods Carbon Fund (LCF); Yagasu receives between \$2.1 - \$6.3 million USD per project.⁷ It utilizes a carbon finance model, which encompasses both pre-financing and carbon offtakes from various carbon investors. Additionally, it secures grant funding from organizations like Green Climate Fund (GCF) and Global Environment Facility (GEF), which are primarily used to fund adaptation activities and pivotal capacity-building efforts.¹⁰ Yagasu uses grant funding for initiating mangrove planting and restoration but is also able to gain access to markets and other technical skills from LCF partners.

Outcomes from the Intervention and Dissemination

The Mangrove Restoration and Coastal Greenbelt Protection Project in North Sumatra project from Yagasu highlights the importance of community-based approaches for multifaceted outcomes, while providing examples of successful opportunities for both mitigation and adaptation.

Enhanced Environmental and Community Resilience to Natural Disasters

In the first three years (2011-2014) of the project, the organization restored 5,000 ha, equaling 18 million trees, impacting 20,000 people, sequestering 2 million tons of CO₂ over a period of 20 years.¹¹ This not only rejuvenated a vital coastal barrier but also rehabilitated agricultural lands that were previously rendered unproductive by saline water from intensive shrimp farming. This multifaceted impact has been vital in enhancing both environmental stability and community resilience against disasters.¹² While initially focused on mangrove restoration, Yagasu has begun to broaden its scope to encompass the establishment of a “coastal greenbelt corridor” that will integrate mangrove forests with traditional forests and fruit trees along the Indonesian coastline, further enhancing environmental and socio-economic outcomes.

Economic Development through Sustainable Aquaculture

The cultivation and exportation of soft-shell crabs have notably become a key economic activity, providing a robust economic support structure. According to the Director of Yagasu, adoption of sustainable aquacultures led to the production of 400 to 500 tons of fish every week from the mangrove wetlands. Local farmers and fisherfolk experienced increased sales of seafood products and greater prospects for marketing fish, crabs, and shrimp. According to USAID, local income rose by 57%, or \$128 to \$212 USD per family per month from 2009 to 2016.¹² In the period between 2016-2020, monthly family income rose again by 49% or \$220 to \$328 USD per family per month.

Supporting Inclusive Development

Emphasizing women's upward economic mobility, Yagasu also supported the production of organic batik (traditional fabric from mangrove plants' fibers and dyes), mangrove foods, and shrimp paste.⁷ Women were provided business and financial training (hygiene issues, licensing, marketing), along with technical skills training. The project also collaborated with French fashion house Hermès to enhance the processing techniques of dye extracted from mangroves, and enabled the commercialization of products like batik scarves in various outlets, such as Jakarta's airport terminal and Yagasu's boutique in East Java.

Ensuring Community Engagement through Cooperation

As a Community-based Mangrove Management (CBMM) initiative, Yagasu empowered 174 group cooperatives in product development through assisting with branding, marketing, and licensing permits.¹³ CBMM in Indonesia represents a proactive strategy employed to rehabilitate and oversee mangrove ecosystems, with the primary objectives being biodiversity conservation, coastal protection, and sustainable livelihoods. A study on CBMM projects in Central Java found that the model ensures long-term funding, increases community acceptance of protective laws, creates greater public support, and allows for a wider range of mangrove species and expansion for restoration.¹⁴

Considerations

Social Equity and Sustainability

Active community engagement can ensure that the project aligns with both environmental goals and local livelihood requirements, thereby increasing the likelihood of sustainability. In the example, aside from supporting agriculture cooperatives through local capacity building, Yagasu also ensured that the community is directly involved in implementation. A tenet of the Yagasu project involves creating a community patrolling unit, mobilizing village groups to protect and prevent damage on mangrove cover. Prior to deployment, the local community is trained on pertinent regulations and reporting systems.¹⁵ These actions ensure community ownership and increases the likelihood of successful mangrove restoration.

Economically Empowering Women

As with other comprehensive interventions, focusing on the benefits of putting gender equity is at the core of the strategy. Empowering women in the community increases the chance of upward economic mobility for households and helps to diversify the goods being produced for external markets. In this example, Yagasu emphasized women's livelihoods, such as organic batik production and mangrove foods. According to a case study on the project, women received 40% of the benefits.⁷

Diversification of Income Sources

Economic diversification is vital to increasing the likelihood of sustainable income in communities, making them more resilient and adaptive to market fluctuations and shocks. Yagasu's example with the silvofishery not only considered ecological balance but also anchored economic diversity through creating multiple income streams – spanning from carbon credits to sustainable commodities like seafood and batik.

Continual Monitoring and Evaluation

Continual monitoring and evaluation are key to the continued success and adaptation of a restoration project. In the Yagasu example, they will be using geospatial data with machine learning models from Kumi Analytics Carbon Sequestration Assessment Tool (KACSAT) to track progress in marine and mangrove conservation in partnership with Global Mangrove Trust (GMT), Oxford University and KUMI – Singapore.¹⁵ Yagasu will also utilize participatory mapping mechanisms to set up the Village Spatial Plan (VSP), Mangrove Protection Area (MPA), and Village Regulation (VR).

Citations

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⁷ South Pole (2022). Case Study: Mangrove Restoration and Coastal Greenbelt Protection. WWF. https://www.wwf.org.uk/sites/default/files/2022-07/case_study_livelihoods_yagasu_mangrove_restoration.pdf

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