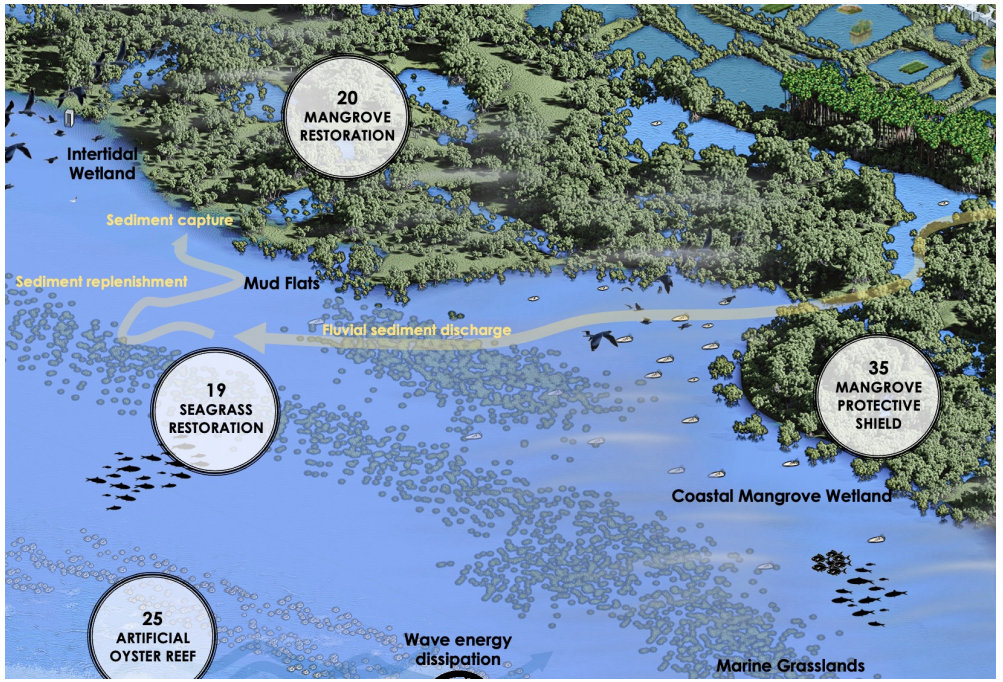
NbS-20: MANGROVE FOREST RESTORATION



Mangrove Forest Restoration focuses on rehabilitating tropical and subtropical coastal ecosystems dominated by salt-tolerant mangrove trees. These forests are critical for supporting biodiversity, providing nursery habitats for marine life, protecting coastlines from erosion and storm surges, improving water quality, and storing significant amounts of carbon. Restoration efforts often involve replanting native mangrove species, restoring natural tidal hydrology, and removing barriers such as dikes or seawalls that hinder water flow. In areas where soil degradation or erosion has occurred, sediment enhancement or stabilization techniques may be employed to create suitable conditions for mangrove regrowth. Successful projects typically adopt a holistic approach, connecting mangroves with adjacent ecosystems like salt marshes, seagrass beds, and coral reefs to establish resilient and interconnected coastal landscapes.

LANDSCAPES SUPPORTED

EbA (ECOSYSTEM-BASED APPROACHES)

- ECOSYSTEM BASED ADAPTATION
- ECOSYSTEM-BASED DISASTER RISK REDUCTION
- ECOSYSTEM RESTORATION
- INTEGRATED COASTAL ZONE MANAGEMENT
- FOREST LANDSCAPE RESTORATION

MAIN PROBLEMS ADDRESSED

- DISASTER RISK REDUCTION
- BIODIVERSITY LOSS
- FLOOD CONTROL
- CARBON SEQUESTRATION
- FOOD SECURITY

ECOSYSTEM SERVICES AND ACTIONS

SUPPORTING

- Serve as nurseries and breeding grounds for fish, crustaceans, and other marine species.
- Play a key role in nutrient cycling, recycling organic matter and maintaining soil fertility in coastal areas.
- Contribute to high rates of carbon sequestration and biomass production.

REGULATING

- Act as natural barriers against storm surges, tsunamis, and coastal erosion.
- Sequester large amounts of carbon, reducing greenhouse gas emissions.
- Filter pollutants, sediments, and nutrients, improving water quality and reducing eutrophication in coastal waters.
- Regulate tidal flows and reduce the risk of coastal flooding during extreme weather events.

PROVISIONING

- Source of wood for construction, firewood, and traditional practices.
- Harvest of honey, medicinal plants, and tannins derived from mangrove bark.
- Enhances productivity of nearby aquaculture farms by maintaining water quality and providing habitat for aquaculture species.

SOCIAL BENEFITS

- Support traditional fishing communities and local economies dependent on mangrove resources.
- Serve as living laboratories for environmental education, promoting awareness of coastal conservation and climate resilience.

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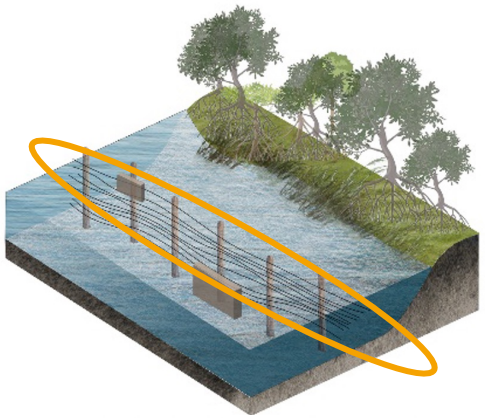
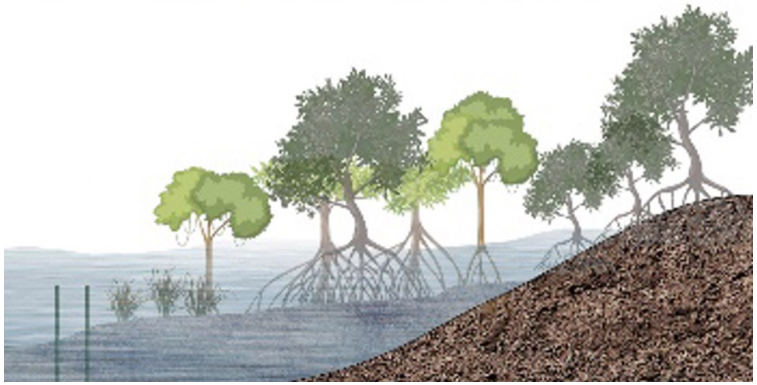


Small water permeable dams filter sediments creating a fertile environment for mangrove trees to grow and develop. They are semi permeable and made from woden poles and mesh.

Permeable wooden dam



Over time, there is sediment deposition regain that allows mangrove to grow and expand. The mature mangrove belt can then better protect the coastline.

Mangrove forest restoration and growth.
Source : Citilinks

PROJECT'S CHALLENGES & RISKS

- **Site Unsuitability**: Restoring mangroves in areas with altered hydrology, poor soil conditions, or excessive erosion can lead to project failure.
- **Biodiversity Imbalance**: Poor species selection or monoculture planting can lead to reduced ecological diversity and functionality.
- **Conflicting Land Use**: Mangrove restoration often competes with other land uses such as aquaculture, agriculture, or urban development.
- **Overreliance on Planting**: Some projects focus too heavily on planting mangroves without addressing underlying ecological issues, such as hydrology or sediment flow.

NbS co-BENEFITS AND THEIR INDICATORS

- **Biodiversity Enhancement**
  Increased species richness and abundance of flora and fauna, presence of indicator species such as mangrove crabs, fish, or birds.
- **Carbon Sequestration**
  Rate of carbon dioxide absorption by restored mangroves, reduction in greenhouse gas emissions from adjacent degraded areas.
- **Improved Ecosystem Connectivity**
  Movement patterns of marine species across restored habitats.
- **Disaster Risk Reduction**
  Decrease in damages caused by storm surges and tidal flooding, reduced coastal erosion and land loss.
- **Sustainable Fisheries and Aquaculture**
  Increased fish and shellfish catch volume and diversity, improved yields from aquaculture farms near mangrove areas,

COST ANALYSIS

- **Direct Costs**
  Planning, planting, restoration, hydrological improvements, maintenance : $26K to $160K/ha.
- **Indirect Costs**
  Opportunity costs, community engagement and education, governance.
- **Time Horizon**
  Short-term (1-5 years): Initial planting, monitoring, and immediate community benefits.
  Long-Term (20+ years): Full ecosystem services.
- **Direct Benefits**
  Biodiversity recovery, coastal protection, carbon sequestration.
- **Indirect Benefits**
  Improved livelihoods, climate resilience, air quality improvement.
- **Risk Assessment**
  Hydrological risks, storms and natural disasters, invasive species, financial risks.

REFERENCES:

Indonesia, Mahakam Delta, Total E&P Indonesia planted over 3.5 million mangrove trees, covering an area of 646 hectares.
Singapore, Pulau Tekong, The National Parks Board (NParks) initiated coastal protection and restoration works.

IMPLEMENTATION OPPORTUNITIES:

Philippines, Palawan, UNESCO Biosphere Reserve.
Myanmar, the Ayeyarwady Delta has lost extensive mangrove cover due to agriculture, shrimp farming, and timber extraction.