Mangroves rehabilitation in wetlands

Mangrove rehabilitation is a management intervention designed to restore mangrove forest cover and associated valuable ecosystem services of degraded, disturbed, or destroyed mangrove forests where self-renewal is no longer possible.

Rehabilitation creates an opportunity for stakeholders to be educated about restoring mangroves, the causes of successes and failures of restored mangrove ecosystems, as well as the value of mangroves and their restoration.

There are three types of rehabilitation principles and practices: i) planting alone (mangrove gardening), ii) hydrological restoration, and iii) excavation and fill. The underlying reason for degradation determines which principle or practice is implemented; however, in many cases, successful restoration involves a combination of all three.

Integration with international agreements

Sendai: Goal 3 – strengthening inclusive policy implementation through community engagement to improve livelihoods.

Duration

Results of mangrove restoration can be seen in 3 to 5 years after planting.

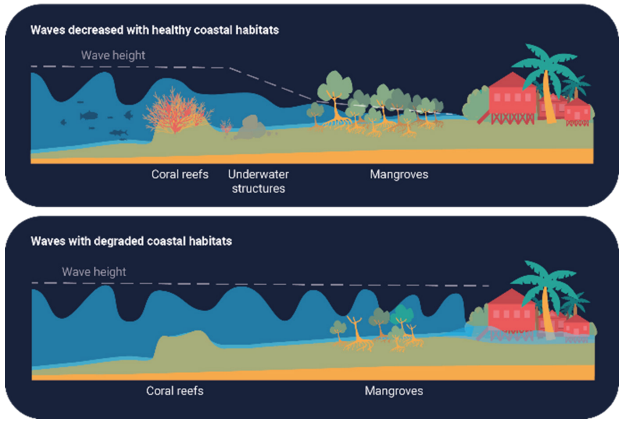
Place of implementation

- Mangroves are found in coastal and deltas environments in the tropical and subtropical latitudes.
- Where mangrove forest degradation is evident, and intervention is needed to avert the destruction of an entire ecosystem.
- Coastal communities which rely on forests to protect their property and livelihoods from climate change impacts.

Threats Addressed

- Sea level rise
- Intense rainfall
- Change in weather patterns

Coastal protection via coral reefs and mangroves



Main climate impacts addressed

Diminishes coastal flooding

Blue forest act as natural barrier by reducing wave heights with their dense vegetation and support coastline stabilization by trapping sediments in their roots systems during extreme events.

Reduction of salt intrusion and coastal erosion

Mangroves protects shorelines by reducing erosion from storm surges, waves, tides and currents. They support coastline stabilization as they reduce extreme events wave flow pressure and can dissipate wave energy. They reduce coastal water surges from extreme events, including hurricanes.

Social and economic co-benefits

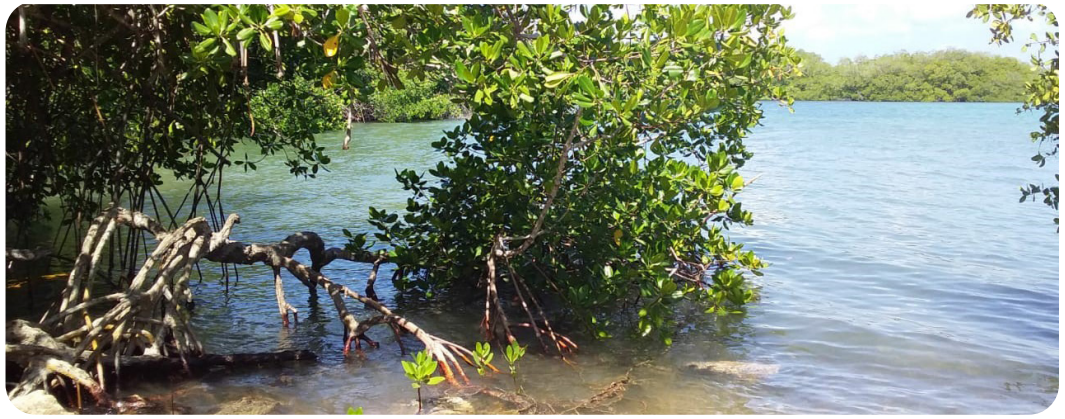
- **Improves water quality** by acting as filter for sediments and nutrients. They protect inland aquifers from salination, acting as pump and barrier between the see and the aquifer.
- **Provides habitat for species and promotes biodiversity** by providing food and shelter for various fish, marine invertebrates and birds.
- **Provides cultural services,** including recreation and education.
- **Provides direct economic goods and services** to communities for sustainable production and consumption of fuel, timber for construction, fishing, aquaculture, textiles, leather and a range of products such as pulp for paper and mangrove honey. It can also result in nature-based tourism opportunities.
- **Enhance education and awareness** on restoring mangroves, their value and the different ecosystems (sea grasses, coral reefs) they are connected with.
- **Contribute to climate mitigation** by sequestering and storing carbon dioxide from the atmosphere.

Implementation stages

1. Evaluate historical and current area coverage and site reconnaissance to determine the cause of degradation.
2. Install water level loggers to determine the depth, duration and frequency of tidal flooding if hydrology is suspected as the reason for degradation.
3. Decide on the rehabilitation goal and finalize the rehabilitation plan, including hydrological restoration and solid waste removal. Consider prioritizing natural and local materials, such as baboo and brushwood, and providing enough supply of sediment.
4. Obtain requisite permits and licences from government authorities. Doing this with enough time is crucial under a project timeline.
5. Engage community members to plant the seedlings, creating capacities and awareness on the benefits of these blue forests.
6. Implement the rehabilitation plan which may include creating channels to improve or restore hydrology and planting of seedlings if natural colonisation does not occur.
7. With the input of community members, monitor planted or self-generated seedlings to evaluate growth and success. Develop a maintenance plan to control and adjust the growth of the blue forest.

Implementation stages

- Planting seedlings without a detailed prior investigation can lead to waste and damage public trust in the process.
- Community engagement and involvement are critical to successful rehabilitation, especially in the case of heavily used, urbanized mangroves such as the Kingston Harbour.
- Mangrove seedlings should benefit from 'head-starting' or a period of hardening in a nursery or other controlled conditions.
- Seedlings should not be planted in rows or columns. Instead, they should be planted in clusters, with at least one metre of separation between clusters.
- Seedlings must be placed according to the typical mangrove zonation pattern or position to which the species are adapted.
- Installation of permeable structures can maximize the sediment capture to facilitate the mangrove recovery in a degraded area



Costs and inputs

Main inputs in determining the approximate cost for rehabilitation of 2 hectares of degraded mangrove area (Planting 2500 seedlings) include acquisition of equipment, transportation (via boat), removal of solid waste from the area, implementation of wetland modification, and ecosystem monitoring for 1 year.

Mangrove Rehabilitation	Cost in USD
Equipment and Tools	$4,664.20
Labour	$6,510.20
Transportation (Boat & Solid Waste Removal)	$5,887.20
Administration	**$4,260.40**
Total	**$21,302.00**

How to monitor implementation

Implementation is monitored by i) seedling density (number), ii) survival rate (percentage), iii) height, iv) node production (number), v) animal presence (number) and vi) natural recruits (number).

How to gauge impact

Implementation	• Number of seedling density • Number of node production • Wetland Status (hectares) {type of biodiversity}
Quantitative impact	• Survival rate of plant species (%) • Mortality rate of plant species (%) • Mean temperatures per annum (%) • Estimated Affected Population Due to Heavy Rainfall and Flooding
Qualitative impact	• Presence of permitting framework and guidelines that facilitate forested wetland • Mortality rate of plant species (%) • Mean temperatures per annum (%) • Estimated Affected Population Due to Heavy Rainfall and Flooding

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