TWO million Mangrove Planting

Sundarbans 2022-2023

EARTH DAY NETWORK

SUSTAINABLE GREEN INITIATIVE

Introduction

Mangroves are one of the unique plant groups, found primarily in tropical regions, river deltas, and along the coastline. Due to their biological adaptation, they come under an exceptional halophyte plant group that can tolerate a higher level of salinity and survive regular tidal inundation.

They also have a remarkable ability to preserve carbon beneath the soil and in woody biomass. This makes them one of the world's largest biomes that remove atmospheric carbon.

It isn't just about carbon sequestration, however. Mangroves are a complete ecosystem that prevents severe floods and storms, act as natural embankments, prevent soil erosion, and provide a nurturing ground for many aquatic species in time of spawning. They also shelter coastal communities that directly and indirectly rely on this ecosystem for livelihood -- from fishing to firewood.

At a time when climate change is a palpable reality, mangroves are set to play an essential role in tackling this anthropogenic (human impact on environment) phenomenon. Although they do not cover a vast landscape and are present only in tropical regions over an estimated area of 1,40,000 sq/ km, when it comes to removing the most abundant GHG CO2, they can store four times more carbon than rainforests, mainly beneath the soil, thus making the soil more fertile.

Despite their importance and unique advantage, mangroves are extremely vulnerable to anthropogenic pressure, and natural calamities such as high tides and cyclones. The ongoing degradation of these pristine forests is threatening native floral and faunal biodiversity and coastal communities, and exacerbating the effects of climate change. Studies estimate that between 2000 and 2015, around 122 million tonnes of carbon has been released due to mangrove forest loss. Tree cover loss has reduced significantly in the mangrove areas. Polluted rivers are also a major threat to their ecosystem, with some regions become choked with everlasting plastics.

To turn back the effects of climate change and fight it, ecological restoration of degraded mangroves is vital.

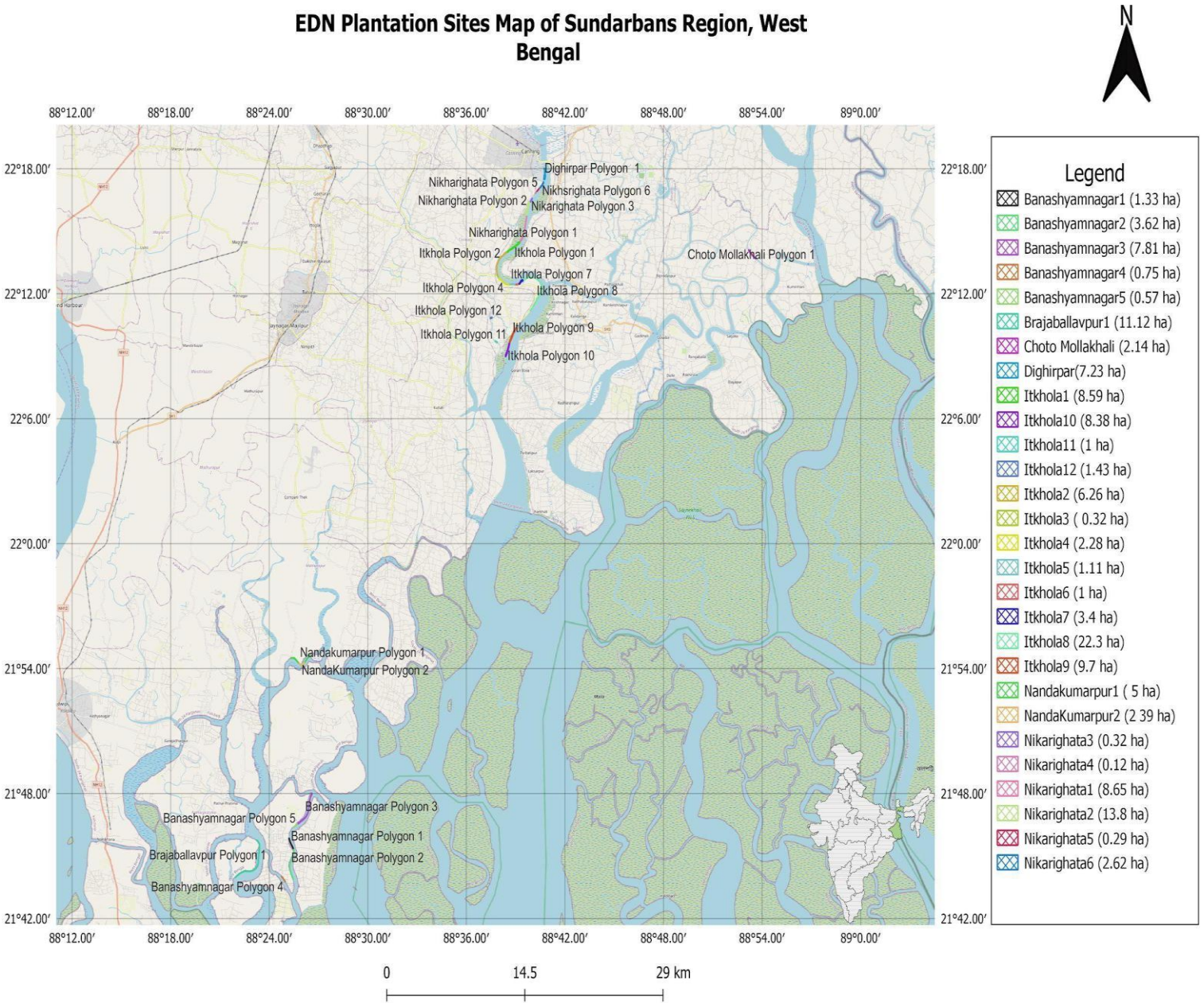
Sundarbans are the largest mangroves distributed between the two countries of India and Bangladesh; they are a transboundary forest covering approximately 1.1 million hectares. They are primarily made by the deltas of Ganges, Brahmaputra and Meghna in the Bay of Bengal, but are also fed by numerous other large and small regional rivers. India contributes to 3% of the world's mangroves, with the entire region intersected by a complex network of tidal waterways, mudflats and small islands. The region is famous for its rich biodiversity and aesthetic vistas, and is home to around 260 bird species, the Royal Bengal tiger and other threatened species such as the estuarine crocodile and the Indian Python.

The Sundarbans also represent a great ongoing ecological process: delta formation, subsequent colonization of newly-formed deltaic isles by mangrove plant communities, sediment deposition, tidal inundation, and being constant molded by the tidal floods, resulting in a distinctive physiology.

This mangrove ecosystem harbors 34 true mangrove species, of which *Avicennia alba, Rhizophora apiculata, Sonneratia apetala, Excoecaria agallocha, Bruguiera cylindrica,* and *Acanthus ilicifolius* are predominant.

The human communities mostly live along the estuaries and core human settlement areas, The major occupation here is the collection of aquatic food and integrated aqua-agriculture farming. In recent years, migrant workers have also significantly risen. The population has increased dramatically and around 4.4 million people inhabit approximately 51 isles out of 102 isles on the Indian side.

Plantation Sites



In 2022, we have planted 2,010,150 mangrove saplings in 7 Gram Panchayats, over a total area of 134.01 ha. The largest site was established in Ikthola Gram Panchayat, where an area of 65 ha has been covered. To ensure maximum growth of saplings, the site selection was based on soil type, tidal inundation and the level of salinity.

EDN Mangrove Plantation Sites 2022

Sr. No.	Village Panchayat	Total Area (Hectares)
1	Dighirpar	7.23
2	Nikharaghat	26.14
3	Itkhola	65.77
4	Brajaballavpur	11.2
5	Banashyamnagar	14.14
6	Nandakumarpur	7.39
7	Choto Mollakhali	2.14
Total		**134.01**

Species Composition

So far, we have planted 12 different true mangroves species; two other species of *Sonneratia* will be planted in the upcoming months at the time of refilling.

Sr. No.	Common name	Scientific Name	Number	Total Number	% ge
1	*Jat Bain*	*Avicennia officinalis*	941185	2010150	46.822
2	*Kalo Bain*	*Avicennia alba*	409050	2010150	20.349
3	Peyara Bain	Avicennia marina	403365	2010150	20.066
4	*Garjan*	*Rhizophora mucronata*	64150	2010150	3.191
5	*Goran*	*Ceriops tagal*	15850	2010150	0.788
6	*Jhamti Garan*	*Cerioops decandra*	500	2010150	0.0248
7	*Kankra*	*Bruguiera gymnorhhiza*	90000	2010150	4.477
8	*Pashur*	*Xylocarpus mekongensis*	46950	2010150	2.335
9	*Sundari*	*Heritiera fomes*	100	2010150	0.004
10	Dhundul	*Xylocarpus granatum*	500	2010150	0.024
11	Hetal	Phoenix paludosa	500	2010150	0.0248
12	Bakul Kakda	*Bruguiera cylindrica*	38000	2010150	1.890
Total			**2010150**		100

Stakeholders Engagement

We conduct community awareness meeting and stakeholder engagement meetings near the plantation sites for the following:

1) Create awareness among coastal communities regarding climate change.
2) Educating coastal communities about how mangrove reforestation and afforestation will help them mitigate the effects of climate change.
3) Sensitization of coastal communities about mangrove reforestation and afforestation.
4) Discussion on suitable plantation site availability and project implementation.
5) Encourage communities to use their traditional knowledge for reforestation and afforestation activities.

Community awareness programme at Dighirpar Gram Panchayat

Standard Operating Procedure (SOP) Manuals

Standard Operating Procedures (SOPs) were followed for mangrove reforestation and afforestation in the Sunderbans. The SOPs have been largely designed from a practical understanding of previous plantation activities and pertinent literature.

The SOPs for different activities is given below:

Selection of plantation sites

Site selection is the primary step for a successful mangrove plantation project. SOPs have been followed to ensure the maximum survival of plants.

1. Organize a community meeting and discuss with local coastal communities our project strategies, and the numerous benefits they will receive from mangrove plantation such as natural embankment, and protection from natural calamities such as cyclone and inundation.

2. Extensive field study with the help of local community to check soil conditions, land availability, and natural regeneration, to carry out risk assessment survey.

3. Sites are considered from midland and lowland areas along rivers and creeks, and those that receive 8-30 days of natural tidal inundation.

4. Lowland areas during neap tides are taken as the lowest point up to where plantation can be done.

5. Newly formed mudflats which are less than three years old and does not exhibit any natural regeneration is not selected as a plantation site.

6. Only those midland areas that receive at least 8-10 days of natural tidal inundation are selected.

7. We only plant in those river mudflats with brackish water that are suitable for mangrove plantations; species selection is also based on water salinity.

8. We carry out risk assessment surveys and do not consider sites with severe natural and anthropogenic pressure such as grazing, encroachment, floods, etc.

9. After site selection, we meet local administration and apply for written permission to carry out the planting project in that area.

10. The area for each plantation site is measured manually with the help of land surveyors and spatially with GIS applications.

11. Other aspects such as seed availability, transportation, monitoring, and workers' availability are also considered before selecting a site.

Selection of suitable sites for mangrove plantation (Itkhola Gram Panchayat)

Seed Collection and Germination Process

1) Mature seeds and propagules are collected from April to September from nearby forests; no seeds are collected directly from reserve forest.
2) Most seeds and propagules are collected in monsoons during the spring tide, when they are naturally carried from forests to the shore, riding on tidal waves. With the help of nets, seeds are collected near the shores during the spring tide, and stored in gunny bags or germination nets. Most seeds are collected by our staff. Some seeds were also bought from local coastal communities.
3) The seeds are collected, transported and stored in the nursery where they are grown and readied for planting based on species requirements. Species that have long propagules such as Bruguiera, Rhizophora, and Ceriops are grown and matured in the nursery for planting. Non-viviparous seeds are germinated in nursery and then planted.

Collection of *Avicennia officinalis* seeds by a local community member

Nursery Management

1) For the Nursery, 1 m X 10 m long beds are used, and seeds planted accordingly.
2) Local people are employed for day-to-day maintenance such as watering the plants.
3) During the spring tide, some seeds are kept under the net to prevent them from being washed away.
4) Before the saplings germinate, the plants are shifted and kept in polythene sheets.
5) To prevent pathogens, regular pest check-up is done, and if required, organic pesticides such as neem oil extract is sprayed.
6) To avert waterlogged conditions, adequate drainage systems are regularly maintained.

Nursery bed preparation

Propagules plantation in nursery for germination

Germination of Xylocarpus granatum

young germinated seedlings of Xylocarpus granatum

Bruguiera gymnorhiza saplings

Carrying saplings from Nursery for Plantation

Nursery plants watering

Canning Mangorve Nursery

Preparing Nursery Saplings for Plantation

Heriteria fomes saplings

Land Preparation

Land preparation is required mainly for hard land. Based on soil character and inundation level, we select hard land and make pits manually in selected areas. The pits are kept for around 25 days to one month for sedimentation. After sedimentation is accomplished, we begin with plantation.

Pit cutting work

Plantation

Plantation is done based on seed availability, germination and sapling growth in the nursery and usually happens from mid-August to mid-November.

1) In lowland areas, it is primarily species such as Avicennia, Sonneratia, Rhizophora, and Nypa that are planted.
2) A total of 15,000 propagules saplings are planted in one hectare.
3) The space between two saplings is kept at 3 ft and they are planted in a triangular pattern.
4) In hard land, planting is done in the pits after sedimentation is completed.
5) The species are selected based on land characteristics and inundation.
6) Local coastal communities are involved in the plantation and some basic-level training programmes are demonstrated to them before plantation.

Plantation of mangrove saplings by coastal community members

Monitoring

1) Watchers from local coastal communities are employed in plantation sites wherever required. They protect the sites from livestock, fishing activities, and encroachments and assure maximum survival of plants.
2) SGI staff periodically visit all plantation sites to ensure availability of resources and to monitor plant growth, their health and survival rate.
3) Sample plots are prepared in each village Panchayat and we assess growth rate and survivability.
4) Considering the volumes of planting, collecting data from the entire population is a near-impossible task, thus sample plots are designated to analyze the entire population situation.
5) Sample plots are laid out, and an area of 500 square meters is allotted for each plot. A similar number of seedlings have been raised inside the plot, consisting of several species.
6) Measurement data is collected during extremely low tide, so that each seedling is raised out of the water, and the full extent will be covered.

Collecting sapling growth data with standard method

Conclusion and the Way Forward

Mangroves provide vital ecosystem services to coastal communities and are one of the richest biomes on earth. They also create a huge impact on climate regulation by removing atmospheric carbon.

However, the continuous depletion of these plant group can present major threats to the environment, and the restoration of degraded mangroves is imperative to secure continuous flow of ecosystem services.

The 2 million mangroves saplings planted this year will provide a livelihood to the coastal communities and will help in mitigation of climate change.