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PROJECT highlights

Emergency Tsunami Reconstruction Project in Tamil Nadu, India

Overview

Coastal Tamil Nadu, one of the most densely populated regions of the world, is facing major issues of sea level variation, shoreline erosion, salt water intrusion, and degradation of mangroves and existing shelterbelts. In addition, there are increasing commercial pressures to develop the coast. The combination of these detrimental effects has led to the dwindling of coastal resources, thus increasing the vulnerability of the area to natural hazards.

This situation took its toll during the 2004 Indian Ocean Earthquake and Tsunami, which impacted hundreds of thousands of people on the Indian coast. In response to this event, the Tamil Nadu Government launched the **Emergency Tsunami Reconstruction Project (ETRP)** with assistance from the World Bank. The objectives of the ETRP were to revive livelihoods and promote recovery in the tsunami-affected areas in the short-term. In the longer term, the goal of the program was to reduce the vulnerability of coastal communities and create a more resilient environment.

Photo above: While planting mangroves the land parcels mainly in the form of mudflats are divided by a network of manmade canals. This allows flow of water along these canals. Mangrove seedlings are then planted along the edge of these canals. Seen above is a main canal.

The Impact of Shelterbelts and Mangroves During the Tsunami

In 2004 in Pichavaram, Villupuram district, 1,100 m wide mangroves located between a lagoon and T. S. Pettai village absorbed most of the energy of the tsunami, resulting in zero damage to life and minimal damage to property. The neighbouring village of Muzhukkuthurai, which had no mangrove buffers, suffered five deaths and heavy damage to private and public assets.

Similary, Nagaptinam New Beach village was protected by a shelterbelt spreading 1 km north to south in length and 500 m east to west. This reduced the speed of the waves and restricted damage to 51 houses and resulted in no loss of life. On the other hand, Nallianthottam village in Chokkanatharkoil, which was located 2 km south and was not protected by the shelterbelts, suffered from heavy loss of life and property.

Coastal shelter belt in Allawandar Trust lands in Kancheepuram district where *Casuarina* ***equisetifolia*** is planted in neat rows at fixed intervals parallel to the shore. The *Casuarina* trees have reached a height and girth that makes them useful as scaffolding in construction sites. Each pole would yield Rs 150 and the branches would serve as fuel wood. This brings them under pressure for cutting by local population.

Raising Shelterbelt Plantations and Mangroves in the Coastal Areas of Tamil Nadu

Shelterbelts and mangroves are productive coastal ecosystems that survive in a harsh environment, buffering the land from the sea, checking erosion, and containing the impact of high velocity winds and cyclonic storms. Taking these aspects into consideration, shelterbelts and mangroves were included as components within the Emergency Tsunami Reconstruction Project (ETRP).

These ETRP components were implemented by the Tamil Nadu Forest Department from 2005 to 2009. Revenue and private lands in all 13 coastal districts were undertaken for the shelter belt plantation. Shelter belts on private lands were undertaken with the consent of the owners. In addition, Forest Department lands in Muthupet, Tiruvarur district were undertaken for regenerating mangroves.

This component aimed at augmenting the long term benefits to agriculture and water supply by stabilizing coastal sand dunes and conserving moisture. By raising mangroves, the initiative also sought the conservation of estuarine ecosystems. In addition, the extension of the coastal vegetal cover aimed to re-establish vegetation destroyed by the Tsunami. Through the Joint Forest Management (JFM) practices it targeted improving the livelihoods of the coastal poor by providing alternatives to activities that were not detrimental to the natural coastal habitats.

During the 2005-2007 implementation phase, the project raised 4,778 ha of shelterbelts along the 341.6 km length of the entire coast and 2,162 ha of mangrove plantations in the estuarine areas of the Koraioor River of the Cauvery Delta in Muthupet, Tiruvarur district. An additional 900 ha of shelterbelts on private lands were raised during the 2008-2009 implementation phase ensuring the continuity of shelterbelts along the coast and creating a bio shield that would act as a first line of defence against tsunamis, cyclones, storms, and other natural calamities.

P. Marianth, a Plant Watcher, proudly displaying the height the mangrove trees planted as part of the ETRP.

The project generated 13,000 days of direct employment for local communities and contributed long term livelihood opportunities by improving fishing, increasing ground water, and planting trees of economic value.

Shelterbelt Plantations

The project involved consultations with all stakeholders and was built on traditional local knowledge. Sites were selected based on precise technical data. Environmental education programs were carried out to make stakeholders aware of the benefits of shelterbelts and to address the competing demands from agriculture, aquaculture, and grazing. Village Forest Committees (VFCs) were established allowing for greater participation in the planning and implementation of the project. Additionally, home stead planting involving 15,000 families was carried out in the vicinity of the plantations.

Casuarina equisetifolia, which forms 90% of the project plantation provides potential economic benefit given that its timber and firewood can be sold and that its acceptability amongst local populations is high. Other local species like *Cashew*, *Acacia planiferons*, *Ficus*, *Odina wodier,* and *Azadirachta indica* were chosen based on their ability to withstand harsh conditions near the sea.

Weeding, soil working, watering were carried out for two years, casualties were replanted in the first year. Borewells and open wells were sunk where necessary for watering the saplings.

Entry Point Activities (EPA) including the construction of roads, improvement of inflow channels and village ponds, construction of bus shelters and community sheds, creation of coconut groves, distribution of oil engines, and sinking of bore wells contributed to long term livelihood opportunities and made qualitative improvements to people's lives.

The shelterbelt as seen from the high tide line with *Ipomea* ***biloba*** in the foreground. Casuarina was removed to facilitate movement and nesting of Olive Ridley Turtles, and native vegetation like *Ipomea* has taken over. *Ipomea* is a runner species that also acts as a binder, holding together sand dunes and the sands above the HTL.

Results of Shelterbelt Project

The project resulted in a number of social benefits. *Casuarina* tree prunings were supplied to local SHGs for free to use as fuel wood. Formal community organizations were created. The poorest and most disadvantaged were involved in ecological activities, improving their habitat and livelihoods. Gender equity and empowerment issues were addressed through site specific and targeted programmes. All these activities have had long-term social spin offs well beyond the project period.

Ravi L. S., Divisional Forest Officer, Social Forestry Division, Changalpattu has commented that the division has been able to control sand drifts that would otherwise cover parts of the East Coast Road (ECR) and fill up private land. The activities have also protected agricultural lands from salty winds and sand, thus improving productivity. Additionally, there are other indirect benefits. For example, in Kancheepuram district, the planting of shelterbelt plantations on commercial and private lands has protected them from encroachment and land grab.

Mangroves - A Tidal Forest

Mangroves are a salt tolerant vegetation type in the intertidal zones of rivers and estuaries. Sediment deposition and availability of sheltered areas are two essential pre-requisites for mangroves. Mangroves perform a number of vital ecological functions such as nutrient recycling, maintenance of hydrological regime, coastal protection, and fish-fauna production. However, their locations coincide with high human densities, bringing them under immense anthropometric pressure that results in their decline and destruction.

Muthupet Mangroves

Muthupet, 'Land of Pearls' is the largest mangrove area in Tamil Nadu, and the 11 sq km Mullipalam lagoon in Muthupet is the second largest in the state. The six rivers of the Cauvery delta flow into these mangroves. According to S. Manickam, a forest ranger in Muthupet, the villages sheltered by the mangroves were not affected by the Tsunami whereas other non-sheltered villages were hit.

The degradation of the Muthupet mangroves has been primarily due to i) Clearfelling: Such activities were detrimental to forest growth were finally stopped in 1971; ii) Lack of fresh water: Dams and barrages upstream result in lack of fresh water supply except during the north-east monsoons, and increased salinity levels adversely affect the diversity of the mangroves; iii) Hyper-saline soil conditions: Due to lack of drainage channels, north-east monsoon flood waters stagnate in mudflats and evaporate, leading to the gradual formation of hyper-saline soils.

In the 1980s, the government realized that the issues related to the hyper-saline soils and the lack of tidal flushing needed to be addressed. The preliminary proposal was to dig channels in degraded areas to permit the entry of tidal waters. Regular inundation would bring down salinity levels and gradually render the area suitable for regeneration. This approach came to be known as the Canal-Bank Planting technique.

The most ideal regeneration sites are those adjoining existing natural vegetation with the growth of *Suaeda,* a salt extractor species. Channels are formed in pre-monsoon months so that the site is flushed with floodwater, leaching the soil of its salinity. Appropriate species selection, timely planting, de-silting of channels, casualty replacement, and after care all contribute to a successful regeneration.

Mangrove regeneration was a major component of ETRP. Starting from the main water source, main channels of 2 m top width, 1 m bottom width and 1 m depth were dug out. Feeder channels of 1.5 m top width and 0.75 m bottom width and 0.75 m depth that were connected to the main channel were dug out at intervals of 10 m. This channel network

A *Rhizophora* mucronata mangrove tree planted at the junction of the main and feeder canal as part of the ETRP. The *Rhizophora* displays prop roots that not only help anchor the tree but also help the tree breathe. It was reintroduced in Muthupet in 1992 based on studies that confirmed that it was present in this region 150 years back.

helps perpetuate the continuous flow of water and keeps the pH values in check, which is necessary for the survival and growth of the mangroves. Mangrove seeds were planted in the soil between October and January on both sides of the main and feeder channels at a spacing of 0.5 m. Seedlings of 10 mangrove species from Pichavaram and Orissa were used. During the first year, channelling and casualty replacement activities were carried out. In the second year, maintenance and de-silting of trenches/channels were implemented. Such adequate protection and care have assured a high rate of success of the mangrove regeneration component of ETRP.

Challenges

The shelterbelt plantations were taken up to the High Tide Line (HTL), but it was later realized that Olive Ridley Sea Turtles nest in a zone beyond the HTL. This was brought to the attention of the authorities as these plantations would affect the turtles' movement and nesting. After due review, the government sanctioned the removal of casuarinas sufficiently away from the HTL to ensure turtle nesting and free movement. The Society for Social Forestry, Research, and Development in Tamil Nadu was engaged to monitor the movement and nesting of the Olive Ridley Sea Turtles in the Chengalpattu and Madurantagam Ranges in Kancheepuram district and the Vedaranyam Range in Nagapattinam district, and their recommendations were shared with the Forest Department.

The efforts of the department have shown encouraging results with over 5000 turtle eggs being collected in the year 2008-09, as against few hundred eggs collected in the previous few years. The Department works closely with local fishermen communities and NGOs working on wild life conservation, in carrying out these activities.

In the case of the shelterbelt plantations, community participation was low despite the Entry Point Activities (EPAs). The social fencing principal, which has been fairly successful in other social forestry and protected area management projects, has not had the same traction in Tamil Nadu. Unlike other similar government schemes, there is no provision for controlled the harvesting of the shelterbelt trees that would result in additional revenues for the local panchayats. The shelterbelt is perceived as a loss of open land that was used for cattle grazing and other activities. Since the community does not see any monetary benefits, their participation in its upkeep is low.

According to Mr. Rama, the Forest Range Officer, the Forest Department was not present in the coastal districts before the tsunami and its existence was barely recognized by the local population. The department was understaffed and though it is a uniformed service, patrolling and protection remain a challenge. Since the lands under the shelterbelts are either commercial lands or private lands, the Forest Department can only take action through the police. The trees in some shelterbelts have reached a level wherein their harvest could yield Rs 150 each. As such, even though patrolling by landowners is high, the pressures to cut trees on commercial and private lands remains a challenge.

V. Ramakrishnan, a Forest Watcher in the area, says that one of the main aspects of his job is to talk to people and raise awareness of the benefits of shelterbelts. Even though he has had to report cases to the local police, these efforts have gradually reduced the tree-cutting activities in the area.

V. Ramakrishnan, Forest Watcher

In case of mangrove regeneration, the natural factors pose the greatest difficulties. Mangrove saplings typically need supervision for five to seven years, meaning higher cost of protection, replanting, and maintenance. The Koraioar River is not a perennial source of water anymore, with fresh water seeping into the estuary only when it rains. This results in high salt and unfavourable pH values and poses challenges to the survival of the mangrove saplings. As a result, salinity resistant *Avicennia marina* dominates the Muthupet Mangroves, account for 95% of the vegetation.

The coastal shelterbelt plantation and mangrove regeneration sub-components of ETRP have successfully fulfilled the project's objectives. These include reviving livelihoods and promoting recovery in the tsunami-affected areas in the short-term. Overall, these activities have contributed to the long term goal of ETRP**,** which is to reduce the vulnerability of coastal communities and promote safer living standards across the region.

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