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Ecological Restoration on East Coast of Ganga Island

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Abstract: ***Ganga Sagar Island, south of Kolkata, in West Bengal is a part of Sundarbans natural area. It has small patches of mangrove forests and small river tributaries. Unfor-gettable Sagar Island ensures a unique opportunity to watch and feel the serene beauty of the island surrounded by the sea and rivers dotted with several small creeks. At Ganga sagar every year on the day of Makar Sankranti (14 January), hundreds of thousands of Hindus gather to take a holy dip at the confluence of river Ganga and Bay of Bengal. But the coast experiences Natural cyclones, tidal waves and anthropogenic activities Hence this Island has been subjected to erosion by natural processes and to a little extent by anthropogenic activities over a long period. This paper mainly deals with the impacts, issues and challenges faced by this part of the ecosystem. Be-sides these some suggestions and recommendations for Restoration and plantation of Mangroves majorly focusing on banks of Ghoramara Island, Kuchuberia and Chemagudi Region on East Coast of Ganga Island has been recommended to restore its ecology.***

Keywords: Mangroves, Ecology, Restoration, Wave breakers, erosion

1. Introduction

Hooghly river traditionally called as 'Ganga', is approximately 260-kilometre-long (160 mi) distributary of the Ganga river in West Bengal, India. The River splits into the Padma and the Hooghly. The Padma flows eastward into Bangladesh, whereas the Hooghly flows south through West Bengal. The vast majority of the water that flows into the Hooghly River is provided by the man-made Farakka canal. Whereas the Bhagirathi-Hooghly river system is an essential lifeline for the people of West Bengal. This river provides a perennial supply of water to the plain of West Bengal for irrigation, human & industry consumption. The river is navigable and a major transport system in the region with a large traffic flow. Whereas for a longest time, the Kolkata Port was the biggest port of India.

Figure 1: Represents river Hooghly in West Bengal
Source: Shutter stock website

2. Need for Restoration

The Ganga sagar Island coast is tide-dominated and is characterized by tidal creeks, mud flats/salt marshes, mangroves and sandy beaches/dunes. Hence this Island has been subjected to erosion by natural processes and to a little extent by anthropogenic activities over a long period. These landforms are subjected to natural processes cyclones, waves and tides and anthropogenic activities. It experiences tidal amplitudes up to 6 m during extreme high tide which are very common. Sometimes these effects are much greater during cyclones, which frequently occur in this part of the coast. The foreshore sediments are characterized by silty, slightly sandy mud, slightly silty sand and sand samples 500 m inland.

Figure 2: Represents area near island
Source: Shutter stock website

This large Island of is buffeted by the worst effects of climate change – coastal erosion, rising sea levels, unpredictable tidal surges, land salinity and more violent cyclonic storms.

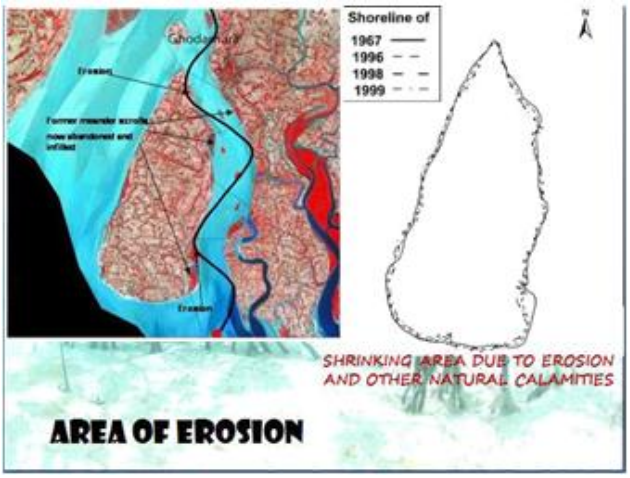

Figure 3: Represents Sagar Island is steadily losing land mass to the sea
Source: power point presentation by Creative Circle Architects – Planners, Nagpur.

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Cyclones bring strong wind, heavy rainfall and flooding, resulting in severe beach erosion. From 1967 to 1999 the net erosion of the island was 29.8 km sq. while accretion was 6.03 km sq. The north-eastern, south-eastern and south-western faces of the island are subjected to severe erosion. Deposition is found only in limited parts of the coast. Possible major causes for the overall coastal erosion are the reduction in fluvial supply for a long period, wave, tidal and cyclonic activities, sea level rise and land subsidence, and lastly human interference. A proper coastal zone management plan to balance the fragile ecosystem is urgently needed. Water quality is deceased day by day due to domestic unrestricted human usage including ritual practices, urbanization, and industrialization. Some of the restoration measures seem inevitable in this ecosystem to bring back to its sustainable, stable and healthy condition.

3. Observations

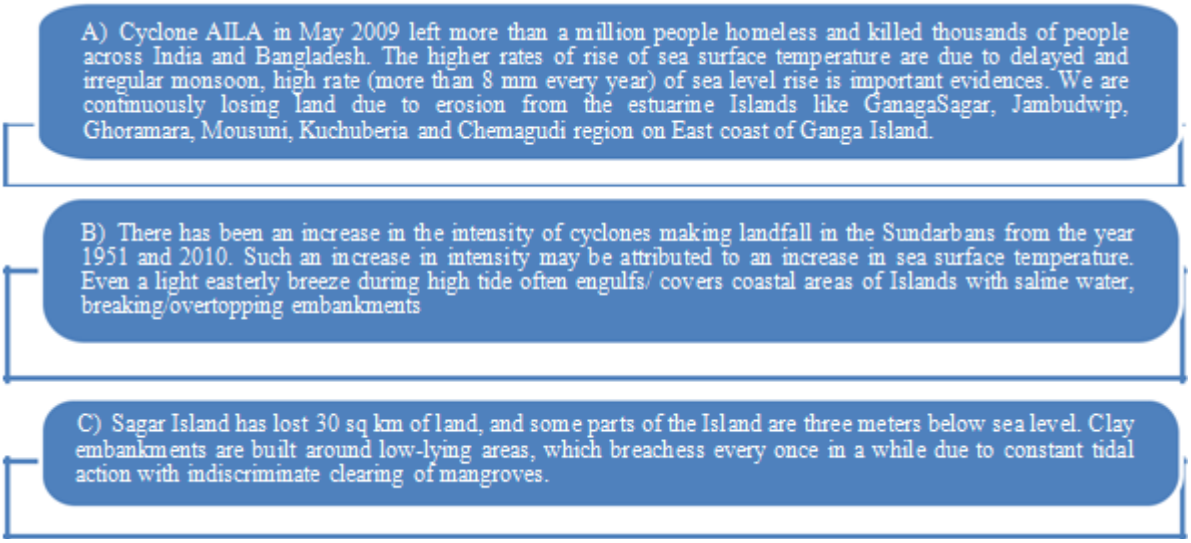

Figure 4: Represents graphical representation of observations

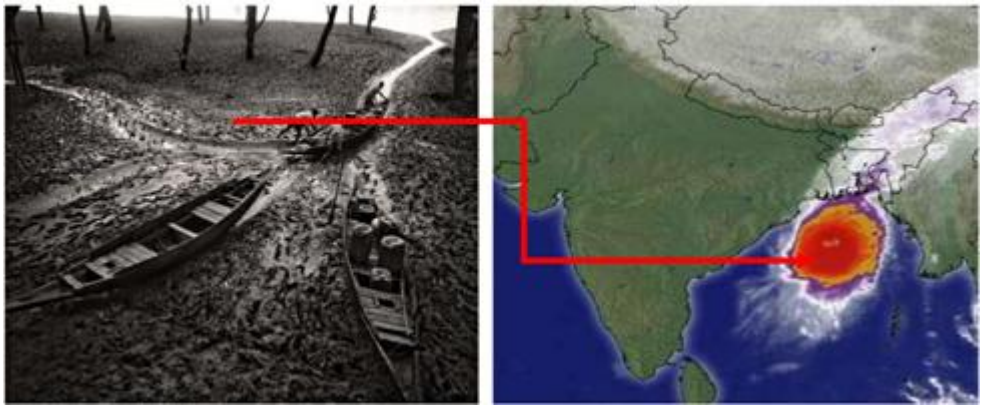

Figure 5: Represents shrinking area and clay embankments in low lying areas
Source: Shutter stock website

4. Solution

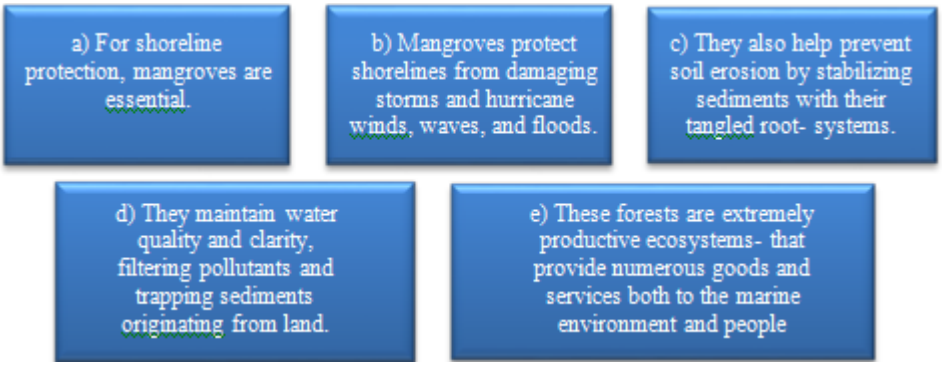

Figure 6: Represents graphical representation of factors responsible for restoration.

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Figure 7: Represents mangroves plantations along Sundarban Islands
Source: Shutter stock website

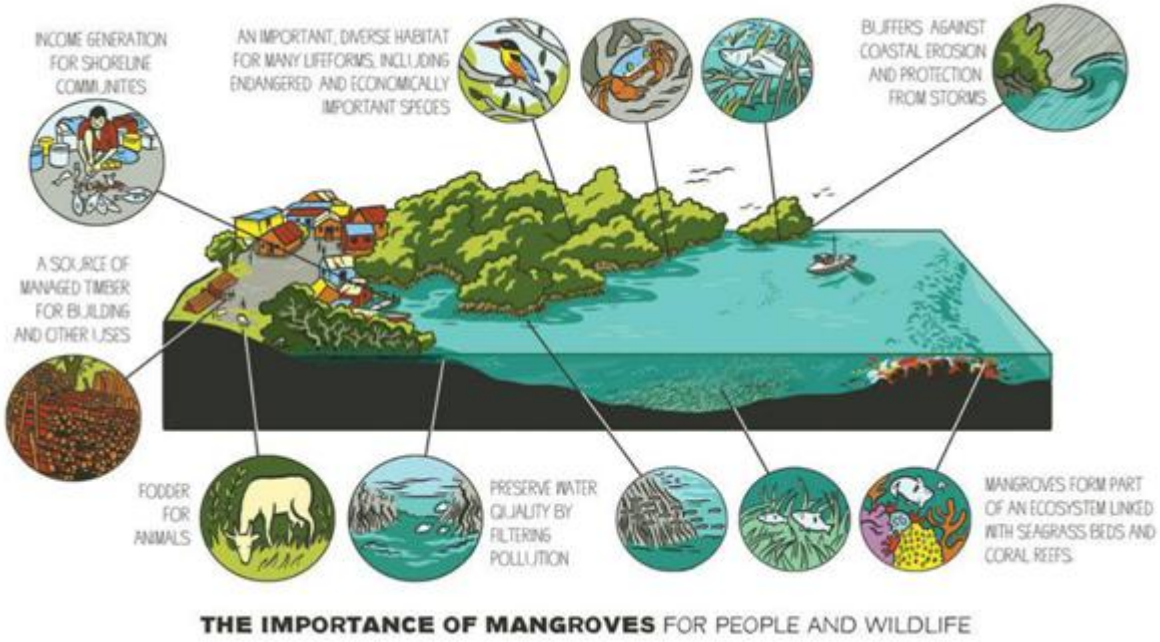

Figure 8: Represents Importance of mangroves plantations
Source: Shutter stock website

5. Area for Mangroves Plantations

Figure 8: Represents area demarcated for mangroves plantations
Source: power point presentation by Creative Circle Architects – Planners, Nagpur.

Area demarcated for Restoration and mangrove plantation are on the banks of Ghoramara Island, Kuchuberia and in Chemagudi region on East Coast of Ganga Island has been recommended to restore its ecology.

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S.No	Place	Area (Sqm.)
1	Sapkhali to Phuldubi	766980
2	Krishnanagar to Naraharipur	333872
3	Chandipur	414090
4	Mahishamari to Beguakhali	475695
5	Dheusagar	286708
6	Ganga Sagar to Bisalakshmipur	569247
7	Bankimnagar to Mrityunjonagar	700902
8	Sikarpur	81861
9	Collectorganj to kachuberia	470817
10	Kachuberia to Kastala	222372
TOTAL AREA		4322544

Figure 9: Represents area required for restoration from erosion
Source: power point presentation by Creative Circle Architects – Planners, Nagpur.

6. Methods of Soil Testing for Mangroves Plantations

In appearance the soils are often clayey mud or sand. Mangroves grow on water-logged soils that are often lacking in oxygen. These are known as anaerobic soils, literally, soil without air.

Figure 8: Represents methods of soil testing for mangroves plantations
Source: Shutter stock website

Mangroves soil is of marine alluvium, transported as sediment and deposited by rivers and the sea. Soils are made up of sand, silt and clay in different combinations and mud actually refers to mixture of silt and clay, both of which are rich in organic matter. The following images refer to the two different types of soil suitable for mangroves plantation.

a) Sandy Type Topsoil

b) Clayey Type Top Soil

Source: Shutter stock website

a) Here, in sandy type topsoil: topsoil is loosely formed as sandy. The lighter-coloured topsoil is porous and facilitates water percolation and aeration during low tide. Whereas the darker-coloured clayey topsoil is less well aerated.
b) This type of soil attributes such as salinity, iron sulphide concentrations, soil red ox potential, nutrients, organic

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matter and physiographical position are the key factors in determining mangrove species composition and structure.

7. Different types of Mangroves species found in Island

In total, 24 species of true mangroves in Indian Sundarbans, belonging to 9 families, of these, Rhizophoraceae showed maximum richness at each of the generic and specific categories assessed. The dominant mangrove species Heritiera fomes is locally known as Sun-dri or Sundari.

Besides the Sundari, other tree species in the forest includes Avicennia, Xylocarpus me-kongensis, Xylocarpus granatum, Sonneratia apetala, Bruguiera gymnorhiza, Ceriops decan-dra, Aegiceras Corniculatum, Rhizophora mucronata, and Nypa fruticans plants.

Figure 9: Represents Mangroves species found in Sundarbans
Source: Shutter stock website

7.1Aquatic life in mangroves

The Island is home to number of endangered species such as Olive Ridley turtle, Hawks billturtle, green turtle, sea snake, dog-faced water snake, estuarine crocodile, chameleon, kingcobra, russell's viper, house gecko, monitor lizard, pythons, common krait, green vine snake, checkered keel back and rat snake. The river terrapin, Indian flap-shelled turtle (lissemyspunctata), peacock soft-shelled turtle (trionyx hurum), yellow monitor, asian water monitor, and Indian python.

Fishes and Amphibians which breeds in these mangroves includes sawfish, butterfish, electric ray, common carp, silver carp, barb, river eels, starfish, king crab, fiddler crab, hermit crab, prawn, shrimps, gangetic dolphins, skipping frogs, common toads and tree frogs. One particularly interesting fish is the mudskipper, a globoid that climbs out of the water into mudflats and even climbs trees.

8. Suggestions and Recommendations

To Avoid Damage and Erosion to the Shore Structure – Break water for wave breakers should Be Implemented and designed. Break water - primary function is to break the wave energy that hits the shore, thereby saving the shore structure from damaging. They may also be small structures designed to protect a gently sloping beach to reduce coastal erosion. Tetrahedrons can be best suited for such areas. Such tetrahedrons are often found near reclamation works. It is made of marine concrete (corrosion resistant cement and certain additives) and weights upwards of tonne these tetra-pods are placed in an interlocking pattern; they tend to form a porous boundary. So when the roaring waves travel till this boundary, a portion of its energy is absorbed by the rocks. Being porous, they let some water flow around, rather than against it.

Figure 10: Represents proposal of wave breakers on shore front
Source: Shutter stock website

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