The South *Talpatti* Island disappeared: Can Bangladesh confront sea level rise?

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Abstract

Bangladesh, a low-lying delta country is highly affected by global warming. The problems due to climate change are made much worse by more severe storm surges, droughts and floods in the Sundarbans territory. Therefore, the study aimed to assess the predicted impact of sea level on the coastal and mangrove areas, and to find out the solutions for overcoming the challenges. Based on respondents' perceptions, the study revealed that minimum sea level rise will destroy the ecosystems of swampy mangroves and the dune biodiversity. A good number of species will be vulnerable and the maximum species on islands will face a high risk of extinction due to the medium level of rising sea. The coasts will be squeezed drastically with a high level of rise. The respondents stressed adopting an integrated approach so that natural and social scientists work together and find out how we project our future to unfold. The integrated approach includes using Dutch technology to prepare dams in the coastal areas; working with the flow of sediment and accelerating the accretion of new lands and investing to make seawalls and other coastal protections to reduce vulnerability sharply. Examining changes in biome areas under two scenarios: 1) shifts in biomes kept pace with shifts in climatic conditions and 2) biomes fail to shift to new areas due to migration limitation are highly warranted.

Keywords: Sea level rise, Sundarbans mangrove, global warming, Dutch technology, accretion of new lands, biome

Introduction

The South *Talpatti* was an uninhabited territory near the Bay of Bengal between India and Bangladesh, close to the mouth of the *Haribhanga* River. India and Bangladesh both claimed the empty Island. The Bangladeshis called it ‘South *Talpatti*', whereas India named it 'New Moore Island’. The South *Talpatti* measuring 81 square miles in the *Sundarbans* disappeared due to sea level rise and soil erosion (Hazra *et al.* 2013). The loss of this Island occurred from 1985 to 2000 from the analysis of multi-temporal satellite images (Hazra *et al.* 2013). In the last 25 years four islands, Bedford, *Lohachara*, *Kabasgadi*, and *Suparibhanga* have disappeared from the Indian *Sundarbans* lying adjacent to the northern Bay of Bengal (Sen 2022; Hazra *et al.* 2013; Phys.Org 2010). *Namkhana* Island has lost about 8 square kilometres (Samanta 2018) while *Sagar* Island has lost about 12 square kilometres (Bera *et al.* 2021; Mondal *et al.* 2020, Gopinath 2010). Hazra *et al.* (2013) found a close relationship between erosion, rising sea levels and disappearances of the islands in this region.

The surface water temperature in the Sundarbans has been rising at a rate of 0.5 °C per decade over the last three decades (Mahadevia & Vikas 2012). Due to global warming, the sea level of the Bay of Bengal is rising at a rate of 1.5 mm/year (Elahi & Khan 2015; Jabir *et al.* 2021). Bangladesh, a low-lying delta country will be highly affected by global warming (Sarwar & Khan 2007; Mohammed *et al.* 2018). Bangladesh faces the consequences of rising sea levels (Rahman a, b, c, d). Among the natural factors threatening the Sundarbans, climate change-induced sea-level rise is expected to reduce bio-diverse areas from 60% to 30% in the year 2100 with an 88 cm sea-level rise as reported by CEGIS (2006). Hence, the study aimed to assess the predicted impact of sea level on the coastal and mangrove areas, and to find out the solutions for overcoming the challenges.

Methodology

Both primary and secondary data were used for this study. The secondary data were collected from Meteorological. A focus group discussion was done incorporating the respondents from diverse stakeholders, notably environmentalists and conservation specialists. A total of ten key informants were interviewed to understand the future projections of sea level rise and its impact on Bangladesh. Content analysis was done to analyze the data.

Predicted Impact of sea level rise on Bangladesh

Sea level rise

The respondents predicted that a one-metre rise in sea level will destroy the whole ecosystem of Sundarbans mangrove and littoral forests of Bangladesh. They assumed that about 20% of the coastal area will be submerged and 20 million people will be displaced by 2050 if sea levels continue to rise at the current rate. Almost 75% of the Sundarbans, the world's largest mangrove swamp, located between Bangladesh and India, would be inundated by 2050 even at a moderate rise. They also added that a 1-meter rise in sea level will inundate half of the rice land of Bangladesh. The Ganges Delta comprises a network of swampy and low-lying islands. This area is unique both ecologically and culturally. This region of low elevation above sea level and its proximity to the coast made it vulnerable to storms. The problems due to climate change will be made much worse by more severe storm surges, droughts and floods in the Sundarbans territory (Ali 1999).

Low-level rise

The respondents opined that old-growth and successional forests will be able to keep pace with a sea level rise of 8-9cm/100 years. Few species will be highly vulnerable and many species will be threatened on islands. Minimum sea level rise will cause flooding of low-lying islands, intrusion of salinity, and change the level of water tables. The ecosystems of swampy mangroves and the dune biodiversity will be fully destroyed. Being adjacent to the sea, some small islands and villages will be eroded due to coastal erosion and inundations. The loss of land will force the migration of people from the coastal areas towards inland which will have remarkable impacts on the socio-economy of the whole country.

Medium level rise

The respondents described that the coastal areas including islands, mangroves, estuaries and littoral forests will be under stress with a sea level rise of 9-12cm/100 years. A good number of species will be vulnerable and the maximum species on islands will face a high risk of extinction. Destruction of the forest will ultimately result in the loss of biodiversity, valuable land, and natural barrier against disasters putting the coastal communities at higher risk.

High-level rise

The respondents added that the coasts will be squeezed by a sea level rise of above 12cm/100 years drastically. Loss of species will occur in a short period on islands. The whole dune vegetation will be submerged underwater. The pioneer of indicator plant species will be replaced by the stress-tolerant or invasive very quickly. All ground animals will lose their habitats. Herbivorous animals will face a shortage of food, and carnivores will face the same problem due to the lack of herbivores. Many marine animals will lose their breeding grounds and habitats as well. Hecht and Cockburn (2011) described our fate is tied to the fate of the forest.

How to confront it?

The respondents agreed that the only chance we have to limit sea-level rise is by reducing emissions very quickly. This effort needs natural and social scientists to work together and to find out an integrated approach to how we project our future to unfold. The integrated approach may include the following steps:

* Adopting an integrated approach to issues of environmental preservation and sustainable development

* Assessing vulnerability through analysing ecosystem sensitivity and adaptive capacity of both people and biodiversity

* Using human-environment models such as LPJ-DGVM for analysing sensitivity

* Determining the changes in habitat-biomes relationships by using the GVM simulation model

*Mapping the native and endemic species of this territory

*Initiating a database system of biological responses to climate change

*Examining the change of species distribution, the rate and direction of species dispersal, population density, growth, dispersal distances and the location of 'refuges' to climatic amelioration

*Examining the temporal variation of the responses of the biota in changing environmental conditions to find some indication of the predicted responses

*Using Dutch technology to prepare dams in the coastal areas

*Working with the flow of sediment and accelerating the accretion of new lands

*Investing to make seawalls and other coastal protections to reduce vulnerability sharply

*Develop of vulnerability information system which can guide stakeholder approaches to understanding the future of ecosystem services, coping mechanisms and interactions, and facilitate sustainable management

* Examining changes in biome areas under two scenarios: 1) shifts in biomes kept pace with shifts in climatic conditions and 2) biomes fail to shift to new areas due to migration limitation

* Finding ways to exploit the eroding Himalayas as a way to counter the erosion of the coasts

* Reducing CO_2 emissions, and nitrogen and phosphorus deposition at all levels

* Adopting the triage approach of prioritising species and habitats conservation

* Exploring habitat restoration opportunities

* Emphasising reforestation and afforestation to accelerate carbon sink

*Initiating dialogue between scientists and different stakeholders

* Planting appropriate mangrove species, as a bio-shield

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