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SUNDARBANS: CLIMATE ANOMALIES AND THEIR IMPACT ON QUALITY OF LIFE

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CONTENT

EXTREME AND ERRATIC CLIMATE EVENTS IN SUNDARBANS: AN INTRODUCTION

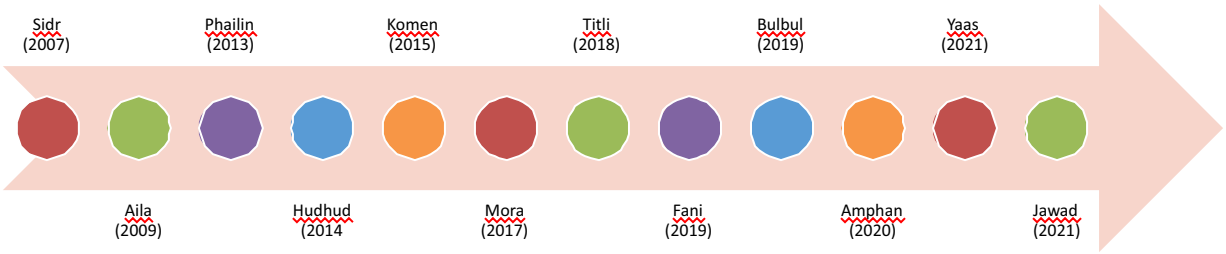
Suresh Pramanik, a 42-year-old resident of Basanti in the Sundarbans, lives in a small three-room house. It is 11:30 AM and his house is no less than a furnace. Ever since he suffered a heat stroke four years ago, he has not been able to work as a construction labour or a cycle van driver—the only two livelihood options he was left with after his fishery business was destroyed during consecutive cyclones—Fani and Bulbul—in 2019. When cyclone Amphan hit Sundarbans in May 2020, the storms pulverised his former house. When the stormwater and floods receded, he applied for Pradhan Mantri Awas Yojana and got some amount to build a new house. All his meagre savings were exhausted. He has four mouths to feed in hisher family, but he is barely able to venture out in the scorching sun and work as a daily wage labour.

Not too far away from him lives Pooja Sardar. The 28-year-old single mother had to build her house twice, once when cyclone Aila hit their village with ferocious intensity in 2009, and again when cyclone Yaas battered the region in 2021. Her house is right on the bank of Bidyadhari river, which swells up at least twice a year. Her husband—who had gone to Tamil Nadu as a migrant labour after cyclone Fani (2019) flooded his farms with saline water and ripped them of fertility—passed away of tuberculosis two years ago.

Pooja sustains herself by collecting prawn post larvae (prawn PL) for aquaculture farms. The With no access to mainland Sundarbans, and few alternative livelihood options, she has somewhat made peace with the fact that she must spend long hours in saline water to catch prawn PL, crabs, and fish despite the health risks it incurs.

The Sundarbans—a group of low-lying islands in the Brahmaputra-Ganga-Meghna River delta—is a conundrum for its residents and a puzzle for experts from different disciplines. Named after Sundari— a mangrove tree grown in abundance here—the 102 islands of the Indian Sundarbans delta are home to more than 4.6 million people. Ten times the size of Mumbai, one of the most ecologically sensitive regions covers an area of more than 4,000 sq. km.

The region has been in the eye of the storm, quite literally. In two decades, the Sundarbans has experienced 13 super cyclones, with the latest being Amphan cyclone in May 2020. The cyclone rapidly intensified from a wind speed of 14 kmph to over 200 kmph, which led to high tides of monstrous proportion. Experts attributed this rapid intensification to high sea surface temperatures of 32-34 °C in the Bay of Bengal. Worryingly enough, the last three years saw four powerful cyclones—Fani and Bulbul (2019), Amphan (2020), and Yaas (2021) making landfall in this region.



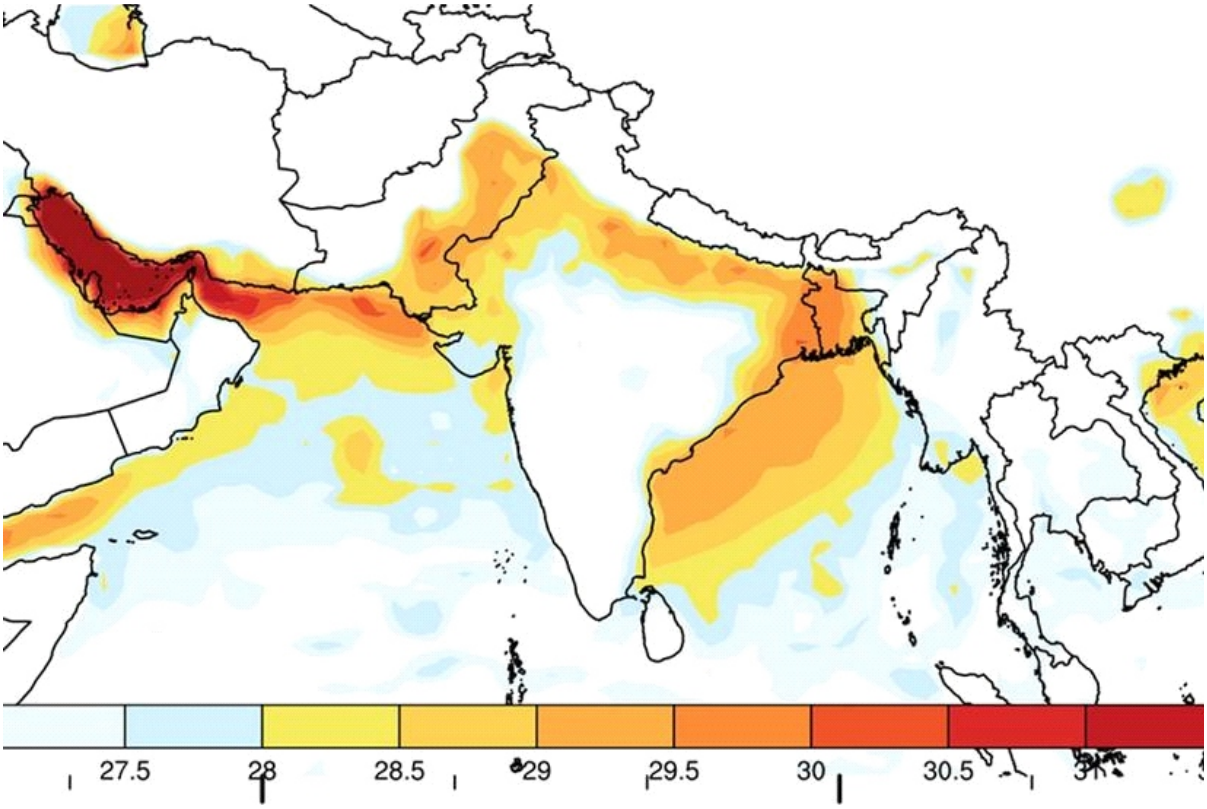
This trend is expected to get worse, with scientists predicting about 50 per cent increase in the frequency of post-monsoon cyclones by 2041-2060. Category 3-5 cyclones (extremely severe or super cyclones) are likely to make more frequent landfalls in Sundarbans and Kolkata. This increased intensity and frequency of cyclones is attributed to the increase in surface water temperature in Sundarbans (Bay of Bengal) over the last three decades. The temperature has increased at an accelerated rate of 0.5°C per decade, in comparison to global increase of 0.06°C every decade.

It is not surprising that Sundarbans also surpass global average when it comes to rise in sea level. The region, according to oceanographer Sugata Hazra, is witnessing over 5 mm rise in sea level annually, and over 60 per cent of Sundarbans coastlines are receding.[1]

EXTREME HEAT: A CLIMATE ANOMALY

Not just the surface water temperature, even the surface air temperature is rising. The delta is becoming unbearably hot. On analysing three decades of data (1984 - 2016) from the archives of the Department of Marine Science, University of Calcutta and Techno India University, West Bengal, researchers discovered an increasing trend in near surface air temperature during pre-monsoon (9.23 per cent), monsoon (7.12 per cent) and post-monsoon seasons (8.07 per cent) over this period.[2]

The fact that the region witnessed 188 hot days (in 2017) with temperature >/=32 degrees Celsius (an increase from 180 days in 1960) is yet another indictment of rising land temperatures in the Sundarbans. The number of such hot days is projected to increase to anywhere between 213 and 258 by the end of this century.



The entire Gangetic plain, including Kolkata and the Sundarbans, are already among the most heat-stressed regions of South Asia. Source

The Sundarbans, like its neighbouring Kolkata, faces the dual challenge of heat and humidity, according to the 6th Assessment Report of the Working Group II of Intergovernmental Panel on Climate Change (IPCC). The combination of high temperature and humidity in the entire Gangetic plain, makes the Sundarbans one of the most heat-stressed regions of the country. While most of India experiences 12 to 66 days of deadly heat and high humidity combination in a year, the Sundarbans experience 171 such days. It is projected that even in the best-case scenario (RCP 2.6), wherein carbon dioxide emissions start declining by 2020 and reach zero by 2080—the Sundarbans will experience 193 critical heat-humid days.

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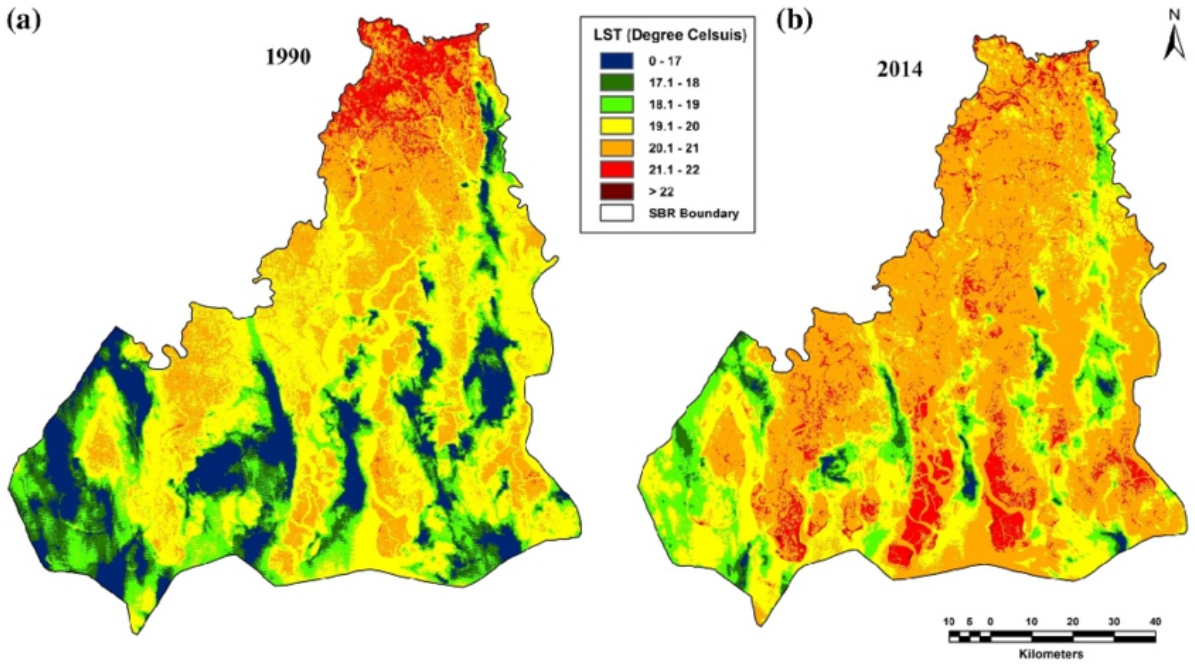


Land surface temperature map of the Sundarbans Biosphere Reserve in 1990 (left) and 2014 (right)

The oppressive heat and humidity are the reasons why many in the region suffer from heat stroke, according to local doctors. The 6th assessment report AR6 of the IPCC has claimed that heat stress conditions reduce outdoor labour productivity (farming and construction). It is this extreme heat that has forced construction workers in Sundarbans to work after sunset as people working in the sun frequently called in sick.

LOSS AND DAMAGE

How difficult it must be to build everything from scratch, knowing fully well that they, too, may not last? How agonising is the feeling of seeing the land beneath your feet being swept away and your lifelong savings going into nothingness? Well, the residents in large swathes of Sundarbans have been living with this feeling for decades now.

Cyclones, according to climate scientists, are working in tandem with other climate change-driven extreme weather events such as intense rainfall. According to them, Sundarbans is experiencing 'compound events', wherein several factors (like high tide) add up to fuel the impact of such events.

The trail of devastation that these compound events leave behind is staggering. Cyclone Sidr, which slammed the islands in 2007, killed at least 3,000 people. Two years later, cyclone Aila destroyed nearly 25 per cent of the 3,500 km of mud-based embankments in the Sundarbans. According to the Department of Horticulture & Agriculture in South 24 Parganas district, 1,05,075 hectares of land was inundated with saline water during the cyclone, affecting Gosaba, Basanti, Namkhana, Sagar, and Patharpratima blocks, killing about 200 people.

When cyclone Fani made a landfall in 2019, it killed another 81 people and caused over $8 billion in damage. That was the strongest pre-monsoon storm that Sundarbans had ever recorded, until Amphan hit the islands in May 2020. Winds at a speed of 111 miles per hour washed away houses, cattle, trees, and electric poles, broke through the protective embankments—the only protection against saltwater intrusion into farms, ponds, and houses. The saline floodwater flooded the paddy fields with standing crop. The agricultural department estimated that 1,08,000 farmers across 17,800 hectares of crop field incurred heavy losses. People were reduced to begging after relief aid also stopped coming in.

Even before the region could limp back to near-normalcy and start thinking of rebuilding its hopes and houses, another cyclone (Yaas) made a landfall on May 26, 2021, exactly at the same time as the high tide. The waves destroyed embankments at about 200 places, further inundating the land with saline water, destroying crops, and killing fishes in the ponds. Lands were rendered unfit for cultivation, not just for that season, but for many more years to come.

The extent of damage has clearly increased over the years. There are two possible explanations. Firstly, the coverage of mangrove forests—a crucial shock absorber in case of natural disasters—has been decreasing at an estimated annual rate of 1.3 per cent. Secondly, the health of mangrove forests has deteriorated due to increased salinity, temperature rise, and rainfall reduction. Hence, the once impregnable fortress is now brittle and fragile.

Climate Hazards	Rural Livelihoods Affected	Specific Impacts on Life and Livelihoods
Cyclonic Storms	• Agricultural workers • Fishermen • Prawn and Crab Collection • Daily wage earner (Farm & Non-Farm activity) • Cattle and Poultry rearing	• Standing crops get damaged • Fish farms get damaged • People unable to go to their places of work; no possibility of wage labour • Houses get damaged, water connection and electricity disruption take place
Tidal Surge	• Agricultural workers • Fishermen • Prawn and Crab Collection • Daily wage earner (Farm & Non-Farm activity) • Cattle and Poultry rearing	• Standing crops get damaged • Fish farms get damaged • People unable to go to their places of work; no possibility of wage labour • Houses get damaged, water connection and electricity disruption take place • Embankment failure and damage of roads
Sea level rise and Salinity intrusion	• Farm based activities like agriculture, horticulture, and homestead gardening • Cattle and Poultry rearing	• Increased salinity in water and soil • Scarcity of water for irrigation • Problem related to drinking water and sanitation • Unavailability of fodder and pasture

Impact of multiple hazards on life and livelihoods in the Sundarbans and other parts of coastal West Bengal. Source

MIGRATION

Sundarbans is no stranger to climate change induced migration. Each year, people migrate from the Indian Sundarbans to mainland West Bengal and even to distant states. With extreme climate events robbing them of their house and livelihood, migration is looked upon as the only way to escape the fate back home. In fact, it is touted as the largest movement of climate migrants in Asia.

Migration from Sundarbans is linked to the layers of vulnerability among its residents. Reports suggest that areas near the coastline, where inundation and salinization are more common, have higher incidence of poverty. The residents living in low-salinity areas farther from the coastline are relatively affluent. Largest migration happens from the former region. A household survey conducted after Cyclone Aila (2009) revealed three broad patterns of migration from the Sundarbans:

1. long-term migration to distant big cities in search of work,
2. seasonal migration during paddy-sowing and harvesting seasons to neighbouring districts as farm labour, and
3. short-term migration to the nearest big city, Kolkata, for informal employment in masonry, sanitation services and public works

Economic necessity drives out-migration, especially among working-age males. However, do the residents of Sundarbans, who are fleeing intense cyclones, rising sea levels, poverty, and an endless cycle of rebuilding homes get to turn the tables in their favour? According to a multidisciplinary study by the World Bank 3, "out-migration–induced impacts increase the incidence of poverty for the population left behind." The study observed that this poverty stems from two factors: a) very low levels of human capital available to the family left behind;, and b) considerable time needed for migrant family members to save sufficient funds to remit some money home.

Migration that the Sundarbans witnesses is not always about fighting livelihood crisis, it is also about finding a safer place to stay. Substantial intra-island migration has been happening for decades now, wherein residents fleeing risk of submergence and moving to more elevated islands. Climate extremes influence an individual's decision regarding migration and the not-so-encouraging news is that the Sundarbans is likely to remain a hotspot of climate-induced migration in the coming decades. The region is expected to see up to 60 cm rise in sea level by the end of the century, which can potentially displace millions.

Media reports quoting different studies hint at six times increase in climate migrants between 2020 and 2050. But migration is not an answer to growing environmental risks. It "deepens climate change-related injustice" as the migrants become "environmental refugees" in other states that do not have the capacity and resources to accommodate them as it will put pressure on already meagre resources.

POVERTY AND FOOD SECURITY

The same reasons that force people out of their native villages in the Sundarbans also compel residents to live in abject poverty. Most of the residents survive on subsistence agriculture and fishing, but the damages done by frequent and intense cyclones are hard to reverse. Saline water, which enters farmlands and ponds because of cyclones, disturbs the water balance, which can be restored only after a good rainfall. Thus, people are unable to cultivate crops and fish for several years.

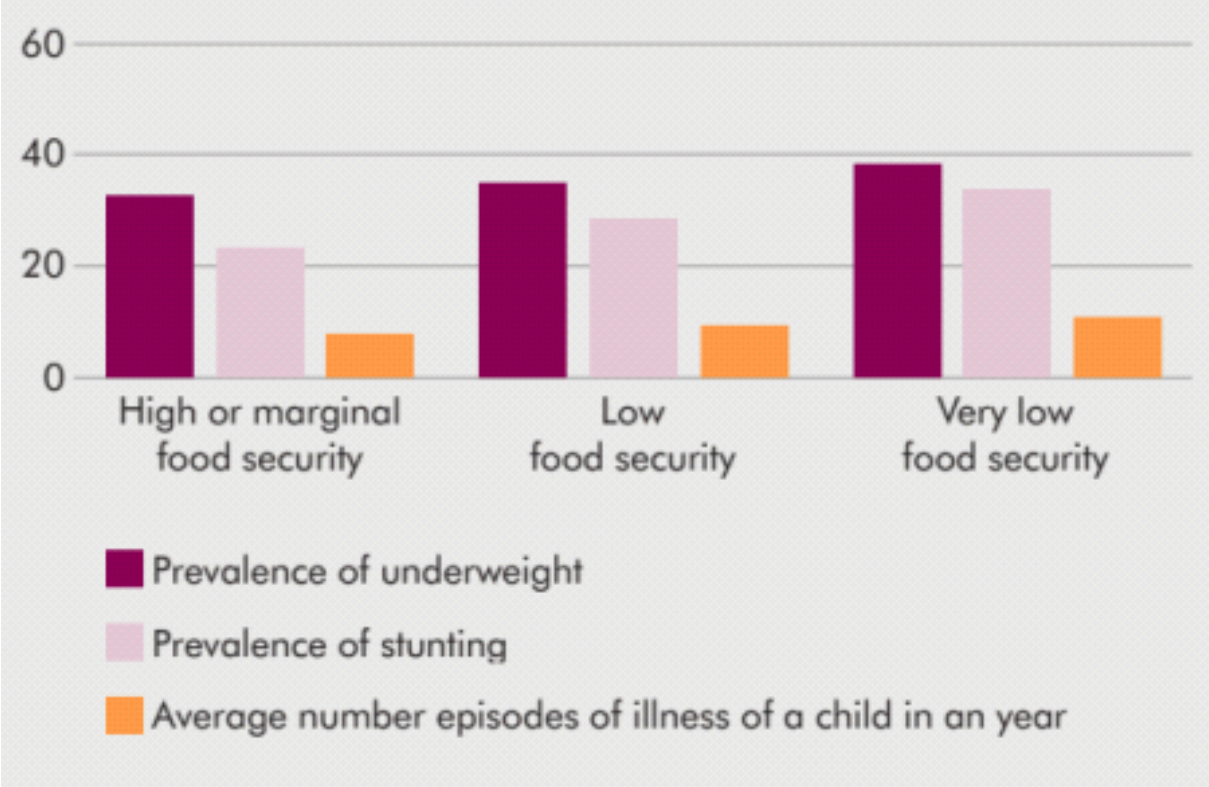
What we are witnessing here is a three-pronged challenge:

1. households in the region face food shortages due to a reduction in crop and fish production
2. climate extremities lead to food supply shocks, hence, increasing food prices.
3. dwindling income due to recurrent climatic shocks and long-term climatic variability leads to reduced purchasing power.

Sushanta Sardar, a 28-year-old resident of Jyotishpur, used to earn INR 15,000 per month from his fish business. The six-member family was doing just fine till Cyclone Amphan tore down a few embankments near their village and swept away fishes and rendered their pond incapable of cultivating fish. "Even after two years have passed, fish in my ponds don't seem to survive. Often, I see dead fish floating," says Sushanta.

Experts explain the reason for this. According to them, freshwater ponds are witnessing a spurt in the growth of algae because of high saline levels. These algal blooms cut off a large amount of biological oxygen in the water, which is necessary for fish to survive. Sushanta is not very hopeful of seeing his fish business revive. He now earns INR 4,500 per month by driving a cycle van for transporting goods and working as a construction labour. With monthly income having reduced by 70 per cent, Sushanta's family now lives on less nutritional food options.

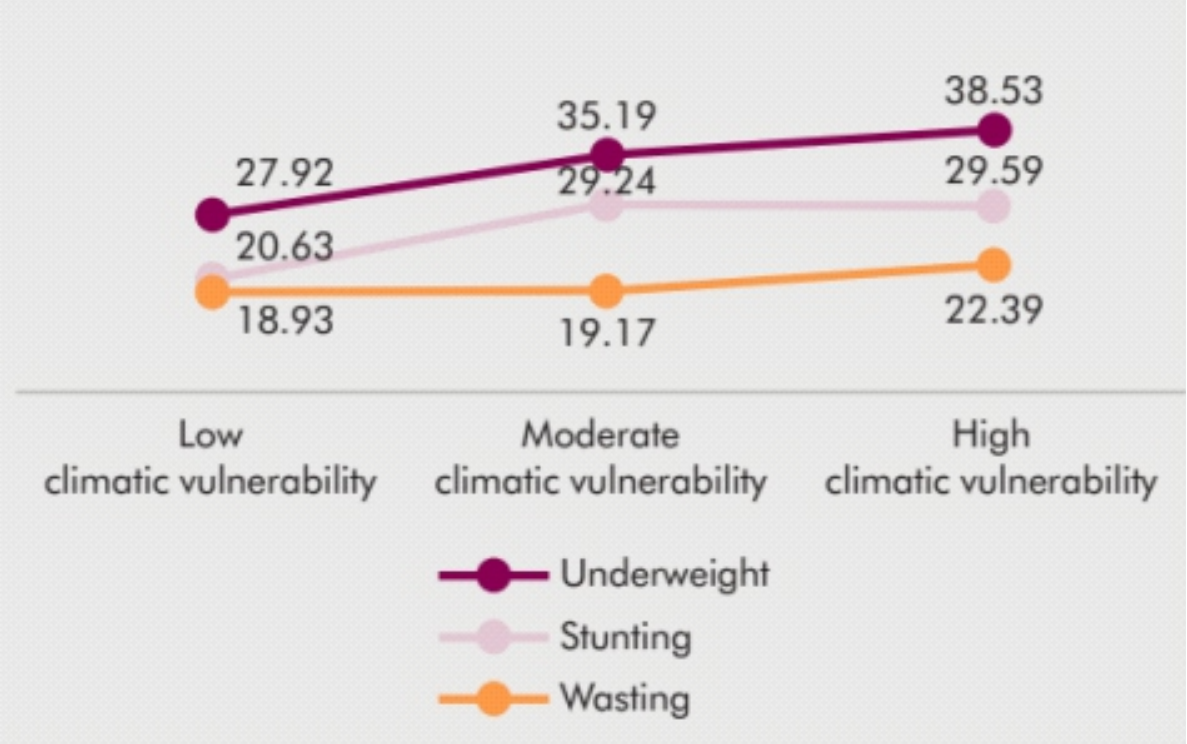
Leafy vegetables grown in the wild have replaced fish and chicken, and only rice and starch have become the staple. "We mostly have panta bhaat (cooked rice soaked in water overnight) with salt and onion, and on some days, we are able to buy eggs for children," says Sushanta.



Child malnutrition, morbidity pattern and household food security (%age) in a climatically vulnerable pocket of Sundarbans. Source: Future Health Systems

According to Future Health Systems—a research consortium—food insecurity level has a positive correlation with climatic vulnerability of households. "Recurrent climatic shocks and long-term climatic variability has downgraded all four dimensions of food security—availability, accessibility, utilisation and food system stability across the Indian Sundarbans," says their research [4].

It also suggests that over 25 per cent of households in the Sundarbans faced "extremely high losses to food resources during climatic emergencies in the last five years," and 30 per cent of children (0–6 years) in climatically vulnerable households face chronic malnourishment.



Malnutrition by climatic vulnerability of households. Source: Future Health Systems

ADAPTATION

While the Central and State government have invested in rebuilding life in the Sundarbans after every major cyclone hit the region, those living on water's edge are expecting timely and effective intervention for overcoming the dual crisis of environmental hazards and chronic poverty. Policy prescription in longterm is the pathway, but it will be good to prioritise some of the strategies. For a region such as the Sundarbans, it is a no-brainer that in-situ strategies of adaptation like building community resilience to climate risk will go a long way in climate-proofing their lives, however, one cannot deny the need of a "planned and managed retreat of inhabitants living in the transition zone to more stable zones."

Those who support the idea say that about one-third of the 4.6 million people who live in the Sundarbans already find the area unlivable. Moreover, maintaining and creating new embankments in the areas closest to the sea is becoming more challenging and expensive. The experts who contest the idea, do that on the premise that resettling such a huge population will mean robbing them of whatever limited livelihoods they had and pushing them to live in urban slums.

A middle ground is emerging out of the two viewpoints: identifying at-risk locations prone to erosion and submergence and evacuate these locations and identifying at-risk households and providing them with income-generating opportunities, improved access to public social services, and finances at their locations." Improved access to public social services, includes access to safe shelters in the time of climate hazards. At present, Sundarbans is ill-prepared to provide safe and hygienic shelters to villagers during cyclones, with an average of 180-250 people along with their cattle taking refuge in two-storied buildings for weeks.

A cyclone shelter near Bamonpukur in the Sundarbans

The issue of mangrove afforestation also finds a prominent place in any discussion on climate adaptation in the Sundarbans. Dr Pradeep Vyas, former Chief Wildlife Warden, West Bengal, is of the opinion that cyclones, which have become frequent due to climate change, may do far more damage to those living in the Sundarbans if mangrove shields are not there. While pushing for mangrove afforestation, Dr Vyas recommended planting specific species of mangroves that can tolerate high levels of salinity.

Recurrent breaches in the earthen embankments have put the spotlight back on introducing new embankment technology as one of the adaptation strategies. Amid growing demands of improved and stronger embankments, an expert committee constituted by the Environment Department of the Government of West Bengal released a report in 2021 stating that embankments may not be enough. Apart from embankments, the committee pushed for "a second line of defence in the form of circuit/parallel embankment". This, according to them, should be treated as a priority project to ensure the safety of the people.

GLOBAL DISCOURSE ON THE SUNDARBANS

The global leaders have started acknowledging the fact that the Sundarbans is home to some of South Asia's poorest and most vulnerable communities. Concerns over the largest single mangrove forest in the world increasingly facing climate threats figure in climate change discourse, globally.

India recently joined the Mangrove Alliance for Climate (MAC), which was launched at the 27th Session of Conference of Parties (COP27) on November 8, 2022. The alliance, which includes Australia, Indonesia, Japan, Spain, Sri Lanka, and UAE, "seeks to scale up, accelerate conservation, restoration, and growing plantation efforts of mangrove ecosystems for the benefit of communities globally, and recognize the importance of these ecosystems for climate change mitigation and adaptation."

Calling mangroves the "most productive ecosystems" of the world, Union Minister for Environment, Forest and Climate Change, Bhupender Yadav said that the mangrove shrubs can absorb four to five times more carbon emissions than the tropical forests, making their preservation critical for controlling carbon emission levels in the world. Even when the mangroves die, the carbon stored in them percolates to the ground, instead of getting released outside. Mangrove forests in the Sundarbans act as natural barriers against rising tides and storms. They also provide "breeding grounds for marine biodiversity and 80% of global fish populations depend on healthy mangrove ecosystems," according to MAC.

A cyclone shelter near Bamonpukur in the Sundarbans

The COP 27 also saw mobilisation of global support towards restoring mangroves ecosystem. The COP27 Presidency launched the Sharm-El-Sheikh Adaptation Agenda 5, which outlines "30 Adaptation Outcomes" to enhance resilience for 4 billion people living in the most climate-vulnerable communities by 2030. It envisions investing $4 billion to secure the future of 15 million hectares of mangroves through collective action to halt loss, restore, and ensure sustainable finance for all existing mangroves. It emphasised the need to finance the loss and damage that occurred to Sundarbans due to climate change.

This much-needed global attention on the plight of coastal communities will hopefully lead to mobilisation of collective resources for mitigating and adapting to the impacts of climate change.

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