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EXECUTIVE SUMMARY

Living with changing climate

Impact, vulnerability and adaptation challenges in Indian Sundarbans

For residents of Indian Sundarbans, climate change is now a part of their daily survival battles. While the global negotiations towards mitigation of climate change have remained inconclusive over the years, sea level rise, cyclones, rainfall patterns have kept changing for the worse. Life is much more difficult now and development of the area more expensive. But climate change is not the only culprit for the hardship that people face today. There have been significant failures in development planning and strategies on the part of local and national governments, compromising the capacity of locals to adapt effectively. In absence of planning and institutional support, people have little choice but to adapt on their own. Till now, their only response has been to migrate out, which also underlines the absence of options for the poor to adapt meaningfully.

However, from an adaptation policy and strategy perspective, it is vital that various impacts (of climate change) and failures (in policy and governance) are understood clearly. In this study, the Centre for Science and Environment (CSE) disaggregates the impacts, vulnerability and adaptation requirements in Sundarbans from a policy perspective:

Observed changes

1. Sea surface temperature (SST) in Sundarbans is increasing at $0.5^{O}C$ per decade; globally observed SST warming rate is $0.06^{O}C$ per decade.
2. Sea level is rising in Sundarbans at a rate higher than the global average. In the past 25 years, sea level has risen at a rate almost double the global average. This is due to a combination of factors including land subsidence and faulty embankment design.
3. Though the exact nature of changes in rainfall pattern is still not clear, it has been observed that rainfall has become erratic and its intensity has increased.
4. The intensity of cyclones has also increased. It is estimated that the severe cyclonic storms over the Bay of Bengal has increased by 26 per cent over the last 120 years.

The development deficit

1. The Indian Sundarbans is one of the most underdeveloped regions in the country.
2. About 44 per cent of the population live below the poverty line.
3. The per capita electricity consumption is one-fourteenth of the national average. A majority of households doesn't have access to electricity.
4. About 60 per cent of the households don't have access to clean drinking water.
5. About 87 per cent people live with some sort of food shortage – food insecurity is high.
6. There is huge deficit in healthcare infrastructure. Sundarbans needs three-times more infrastructure (doctors, primary health centres, specialised hospitals etc.) to meet the guidelines specified by the Central Government. About one-third of the population doesn't even have access to a primary health care.
7. The education system is not helping people to seek alternative livelihood opportunities. There is just one degree/technical college in every 250 sq km area. The drop-out rate is very high at the secondary level.
8. Coverage of institutional banking and insurance facility in Sundarbans is very low. Only about 10 per cent of the population avail institutional banking and there is no agriculture insurance which is quite popular and supported by the state governments in the rest of the country.
9. Absence of marketing and value addition infrastructure do not allow better price for whatever the agriculture, fishery and forest yield.
10. Sundarbans still lacks any effective disaster warning protocol and disaster shelters. In fact, it lacks a comprehensive disaster management system itself.

The social and economic pressures

1. Sundarbans is probably the most densely populated rural part of India. The population density in 2001 was about 900 persons/sq km. In 2011 it is expected to increase to more than 1,000 persons/sq km. This will be four times the national average.
2. The population in Sundarbans is increasing at about 18 per cent per decade.
3. About 78 per cent of the economy and 65 per cent of workers are dependent on agriculture – directly or indirectly.
4. The cultivable land per agricultural worker is less than 0.5 hectare (ha) and about 85 per cent of the farmers are small and marginal.
5. Fishery and collection of non-timber forest produce (NTFP) supplement agricultural income, but both are under tremendous pressure due to overexploitation.

The cumulative impact — climatic and non-climatic factors

1. Sundarbans is losing land because of submergence and erosion at a fast pace. In the last 80 years it has lost about 250 sq km land, but the rate of land loss has doubled in the last decade.
2. Sundarbans is also losing agricultural land to settlements built to accommodate the rising population as well as due to land mismanagement like mushrooming brick kilns.
3. The soil salinity has increased because of sea water ingression and retention (largely due to the cyclonic activities and higher tidal height because of sea level rise) reducing the productivity of the agricultural land.
4. Land loss, soil salinity and land fragmentation have all resulted in reduced agricultural outputs.
5. Fish stock is dwindling because of a combination of overexploitation and climatic changes. Fish density in shallow waters has reduced and the catch of commercially important fish has declined.
6. There is a clear decrease in the yield of NTFP such as honey and wax.
7. Today the resource-base of Sundarbans is not able to sustain the lives and livelihood of people. The population of Sundarbans is therefore migrating to survive.

Adaption challenges in Sundarbans

While this sums up the ground realities, it brings us to the threshold of an intense policy research that is needed to design interventions to effectively plug the holes in governance deficits and future climatic stresses. This research must also help formulate future policies that we desperately need in order to help people of the region.

The job appears two-fold, primarily:

Saving the ecosystem

Adaptation on the ground demands conserving the ecosystem to ensure sustainability of people along the east coast of India who depend largely on natural resources - Sundarbans remains the nursery for various kinds of animals, fishes and plants found along the entire east coast of the country. It is important that this ecosystem and biodiversity is conserved and its resources managed efficiently that will not push the people further into ‘ecological poverty’.

Saving people

While better resource management and conservation will help ameliorate survival struggles of the people, it will certainly not solve it. A large part of how peoples’ struggles can only be mitigated if pressure on this ecosystem and dependence of people on the natural resources can be effectively reduced. There has to be policies towards better regional planning and development to facilitate resettlement of people and offer them diverse livelihood options.

STRATEGY AND POLICY RESPONSES

What is needed in Sunderbans in short-term was very clearly spelled-out by the people in the household survey conducted by the Centre for Science and Environment – their concerns and priorities reflect the dire need to increase the adaptive capacity – assets, health, education, and governance. But for long-term sustainability, Sundarbans needs more than roads, hospitals and technical institutes. It needs a new development plan that will internalise climate change impacts.

The new plan for the Sundarbans must revolve around following major components:

- **Zoning Sundarbans according to vulnerability:** Strategically moving people to safety must be a priority, particularly those who live in the critically vulnerable areas of islands which are losing land at a faster rate is an urgent requirement. Zonal land maps need to be created, classified against a vulnerability scale across Sunderbans.
- **Regional planning and rehabilitation & relocation:** This necessitates a comprehensive regional planning. Proximity of Sundarbans to Kolkata and peri-urban settlements between Kolkata and Sundarbans seem to hold the key along with providing people with options.
- **Embankments:** Sundarbans needs a new embankment engineering and resources should be channelized towards in-depth research on what kind of embankment in which areas would last without causing collateral damages.
- **Developing efficient disaster management systems:** Right from generating early warnings, communicating them in real time, evacuation systems, disaster shelters need to be weaved into the system that will enable minimise damages. Aila was merely 110 km/hr speed, and the damage was devastating. There can easily be a cyclone with far greater intensity
- **Bolstering existing livelihood patterns:** This will also need both research and infrastructural support. Intensifying agriculture, crop diversification and introduction of saline resistant crops are must. So is the creation of a robust storage and marketing infrastructure. More options need to be made available to people in the longer projections.
- **Creating opportunities that don't depend on nature:** Conventional natural resource-based livelihoods will not be able to sustain the population in Sundarbans. Thus *education* that offers employability must be the focus. According to many respondents in the household survey, need for industrial technology institutes (ITI) and polytechnic institutes were keenly felt which would enable people to acquire skills.
- **Awareness and information:** As climatic conditions become more severe, people will need information to adapt. At a social level, people are at a peculiar crossroads where they have lost the traditional knowledge but have not been able to replace it with new or mainstream knowledge. Information generation, management and disimination strategy must be priorities at the local levels.

Adaptation Governance: Institutions hold the key

Management of Sundarbans has no room for climate change yet within the government's policies!

At the first level, successful adaptation governance in Sundarban will depend on carrying out extensive research about how the climate change impacts interact with developmental failures.

At the second, to understand how these findings lead to better management policies will be the key, followed by how effectively they can be implemented.

Success of these two steps will depend on how aware the population is about the changes in the natural systems, interpret their implications and make informed choices about the solutions provided by the government.

Sadly enough, climate agenda has no representation in the local or regional management practices at the moment.

Interestingly, there is little need for additional institutional arrangements in Sundarbans for effective climate change adaptation. Despite the fact that Sundarban Development Board is no longer the nodal planning agency that it was conceived as and has been relegated to a mere implementation agency, there seems to be enough room to accommodate adaptation planning and strategising within its mandate. Sundarbans' misery seems to hinge on this very aspect – while a large section of the land is administered by the Central government directly such as the 2500 sq km of project tiger, protected forests and coastal zone while the other – the human habitation part – is managed by the state government.

Fixing responsibility: global and local

Development itself is much more expensive, now that the additional burdens of climate change need to be dealt with. The additional cimate burden is a result of unchecked emissions in the developed world and has little to do with the way locals have lived here for ages. Surely we need international funding arrangements that will pay for this incremental cost of development and adaptation. They have to compensate the losses and damages that the changed climate has inflicted upon the poor. But this does not absolve the state, at least in the case of Sundarbans, of its own responsibilities and in addressing its own failures. An equal measure of both is required and it must start flowing soon enough. The time for action is now.