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Confronting Climate Change in the Sundarbans in Coastal India and Bangladesh

Towards planetary well-being – supporting
research-based decision-making

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On the cover

Mangrove trees have an exceptionally high ability to absorb carbon. They also prevent erosion and protect the coastal communities from storms and flooding.

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Confronting Climate Change in the Sundarbans in Coastal India and Bangladesh

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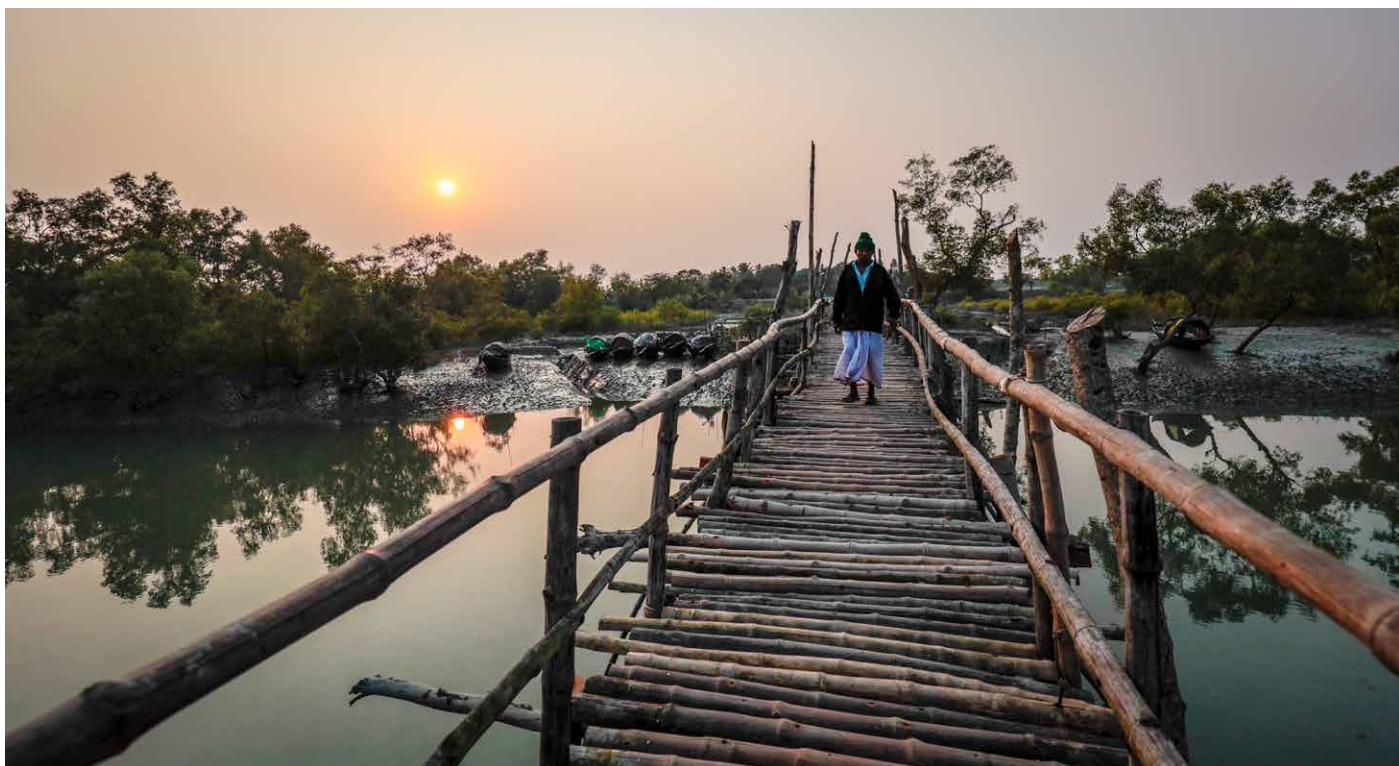
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The Sundarbans residents' multi-local strategies show the way forward on flexible resilience thinking.

This *Wisdom Letter* offers recommendations for residents, activists, NGOs, international organizations, and governments tackling climate change impacts in the Sundarbans region in India and Bangladesh. These insights can also be applied when looking to understand other similar coastal societies and ecosystems. The Sundarbans is one of the threatened mangrove ecosystems covering 15 % of the world's coastlines, which offer ecosystem services, contribute

to biodiversity, and reduce climate change impacts. However, the relevance of this *Wisdom Letter* extends beyond these coastal ecosystems. The example of the Sundarbans demonstrates that despite the global scale of climate change, its impacts are local and interlinked with regional social and political processes. We also demonstrate that people can shape climate change impacts by choosing policies that mitigate the impacts instead of exacerbating them.

Ten recommendations

Address the multiple drivers of vulnerability in coastal communities

- 1 Generate employment and instant wage payments through a substantial part of the year.
- 2 Ensure that the most vulnerable part of the community is not excluded from governmental benefits and aid.

Foster sustainable livelihoods that do not exacerbate the adverse effects of climate change and harm the environment

- 3 Regulate the shrimp farming industry and prohibit its use of harmful chemicals.
- 4 Arrange guidance and provide resources for small farmers to adopt sustainable farming practices.
- 5 When conserving the mangrove forests, do not target forest dwellers' livelihoods, which do not harm the forests.

Adopt participatory approaches that enable the recognition of local communities' unique needs, perspectives, and innovative practices in tackling the climate change effects

- 6 Facilitate open communication and the exchange of diverse perspectives to develop better informed and effective policy decisions and promote accountability and transparency.
- 7 Build social safety nets that enable flexibility and mobility.

Improve coastal resilience to disasters

- 8 Upgrade and build embankments and elevate roads, bridges, and houses to mitigate the effects of flooding induced by climatic hazards and tidal surges.
- 9 Construct, control, and maintain sluice gates so that they benefit the majority of the residents.
- 10 Combat corruption in infrastructure building and aid distribution for effective disaster response and recovery.

The research project "Sustainable Livelihoods and Politics at the Margins: Environmental Displacement in South Asia" (2018–2023)

The recommendations in this *Wisdom Letter* are based on research findings. We draw from scholarly work on the Sundarbans and climate change in South Asia, especially the Research Council of Finland-funded research project *Sustainable Livelihoods and Politics at the Margins: Environmental Displacement in South Asia* (2018–2023).¹ The project, led by Sirpa Tenhunen, enlisted researchers Dayabati Roy, Mohammad Jasim Uddin, and Jelena Salmi. It unfolded at the University

of Helsinki from 2018 to 2021 and transitioned to the University of Jyväskylä from 2021 to 2023. The project delved into perceptions of climate-induced displacement and the pursuit of sustainable livelihoods in South Asia. By comparing policies and practices among vulnerable communities in the Sundarbans region of Bangladesh and India, as well as on the western coast of India among the Koli migrant workers and Koli fishing communities on Madh Island, Mumbai, it analyzed the di-

versity in policy responses and local practices. In this *Wisdom Letter*, we especially discuss the project sites in the Sundarbans region in India and Bangladesh. The research data from the Sundarbans region was collected through ethnographic research, including observation, loosely structured interviews, and discussions. Three researchers studied people in the most Aila-affected areas in India and Bangladesh, as well as those who had migrated from the Sundarbans to urban areas after Cyclone Aila.

The Sundarbans

The Sundarbans is one of the world's largest deltas, comprising a cluster of low-lying islands spread across the coast of India and Bangladesh. It is formed by the silt transported by the Ganges, Brahmaputra, and Meghna rivers. Hence, it is a transitional zone between the freshwater from the rivers and the saline water of the Bay of Bengal. Stretches of land (*chars* in Bengali) are part land and water, continuously shifting.² The delta includes the world's largest contiguous mangrove forest (10,000 sq km), of which 60 % lies in Bangladesh and 40 % in India. These wetlands

prevent erosion and protect the coastal communities from storms and flooding by acting as natural barriers. Moreover, the Sundarbans mangroves have an exceptionally high ability to absorb carbon.³

The Sundarbans hosts remarkable biodiversity: 334 plant species, 260 bird species, the Bengal tiger, and other threatened species such as the estuarine crocodile and the Indian python. Parts of the Sundarbans have been designated as sanctuaries, national parks, biosphere reserves, and World Heritage sites. The region produces a significant proportion of shrimp exports in

both India and Bangladesh to the extent that the rapid growth of shrimp production has emerged as a major threat to the mangroves and local livelihoods. Around 12 million people — 4.5 million in India and 7.5 million in Bangladesh — live in the delta area. 2.5 million people depend almost entirely upon the mangroves for their livelihoods.⁴ The population of the Bangladesh Sundarbans comprises Muslims and small Hindu and indigenous communities. The population of the Indian Sundarbans comprises Hindu and Muslim communities as well as indigenous communities.

Introduction

The densely populated coastal regions of Bangladesh and India are among the most vulnerable to climate change impacts in the world. Climate change is expected to alter temperatures and precipitation, oceanic and atmospheric circulation, the rate of sea level rise, and the frequency, intensity, and timing of cyclones and storms. The magnitude of the subsequent impacts of these changes will vary temporally and spatially.⁵ Simple numerical estimates of sea-level rise, for instance, in the Sundarbans due to climate change, can be misleading because it is influenced by a multitude of factors, including human influence and the amounts of silt transported to the delta by rivers.⁶ Nevertheless, rising sea levels cause erosion and the salinization of freshwater resources. Extreme weather events and flooding threaten coastal livelihoods, while salinity exposes people to numerous health hazards. Coastal communities are often heavily dependent on natural resources and climate-sensitive livelihoods, such as agriculture, fisheries, catching fish and fish fry, and crab harvesting, heightening vulnerability to climate change impacts. High poverty levels exacerbate the vulnerability (susceptibility to harm) to cyclones and slow-onset events, such as salinization, droughts, and freshwater shortages.⁷

India and Bangladesh have developed early warning systems, which have become instrumental in saving human lives during major cyclones. They have also introduced national climate change action plans, guidelines, and frameworks to build resilience—the ability to recover from or successfully adapt to actual or potential adverse events.⁸ However, the implementation has been slow, and investments in adaptation and climate-resilient green growth have remained low.⁹

This *Wisdom Letter* describes how communities in the coastal Sundarbans region in India and Bangladesh have dealt with climate change impacts, offering research-based insights and policy suggestions for mitigating climate change effects. We demonstrate how climate change impacts are one among many drivers of vulnerabilities, thereby, questioning climate reductionism or climatism,¹⁰ an ideology that interprets problems through the singular lens of climate change. We show that climate change impacts are interlinked with local economies and governance¹¹—people cannot choose climate change impacts, but they can shape them by adopting policies that mitigate the consequences instead of exacerbating them.¹²



Public Policies and Vulnerability

Local policies greatly influence the severity of the destruction caused by environmental hazards. Policies promoting climate change adaptation can even contribute to coastal people's vulnerability. In the 1980s, the endorsement of brackish-water shrimp aquaculture in the Bangladesh's Sundarbans area garnered significant backing from governmental bodies, as well as international organizations like USAID and the World Bank. Shrimp farming is also pursued as a lucrative venture on the Indian side of the

Sundarbans. However, a critical assessment of brackish-water shrimp aquaculture has brought to light multiple concerns regarding its environmental consequences and long-term viability as a livelihood. The promotion of shrimp farming has led to the conversion of vast stretches of agricultural land into saltwater ponds covering hundreds of hectares. Moreover, shrimp farmers often illicitly breach embankments to flood their ponds with saline water, exacerbating the salinization of adjacent agricultural lands and

Shrimp farms, which have proliferated in coastal Bangladesh and India, are causing ecological damage due to salinization and use of chemicals. The topsoil removed from the aquaculture clusters has become raw material for brick kilns, contributing to a deterioration in air quality.

residences. International donors have promoted brackish-water shrimp aquaculture as a response to climate change, although it has inflicted environmental harm, such as diminished soil fertility, salinization of freshwater sources, and heightened flooding risks.¹³ By severely curtailing the availability of fertile land and reducing crop yields, brackish-water shrimp aquaculture threatens food security and jeopardizes efforts made to foster biodiversity conservation.¹⁴

The outcomes of shrimp farming run counter to the tenets of sustainable development and inclusive economic growth, widening disparities and negatively affecting vulnerable populations. Shrimp farming contributes to unemployment as it is much less labour-intensive than agriculture. For instance, in Bangladesh, much of the land under shrimp cultivation is now controlled by absentee landlords, often in cooperation with national and local political leaders. Shrimp farming has led to dispossession, land seizure, displacement, and the erosion of marginalized groups' livelihoods.^{15 16 17} Moreover, the expansion of shrimp farming is a significant contributor to deforestation. For example, Bangladesh lost 8.3 % of its forest in its northern part due to shrimp cultivation during 2000–2010.¹⁸

The aftermath of Cyclone Aila in India and Bangladesh demonstrates the crucial impact of public policies amidst extreme weather events. Although many cyclones have hit the Sundarbans, in 2009, Cyclone Aila became a watershed in the ecological and socio-political history of the region. In Bangladesh, many coastal areas affected by the Aila cyclone have become iconic sites of land erosion and climate change due to governmental inaction, reinforcing the politics of retreat—the idea advocated by international donors that the coastal areas are not inhabitable and that agriculture is no longer viable.¹⁹ On the Indian side of the Sundarbans, the electoral

contest between the political parties ensured a flow of investments to the Sundarbans after the cyclone. The post-Aila period in India entailed providing victims with free food rations and direct cash transfers for building cemented houses as well as public investments in embankments.²⁰

Agriculture can remain a viable livelihood in the Sundarbans despite the adverse land and water conditions if the problem of surface drainage in the monsoon season is tackled and water availability during the post-monsoon season is ensured. Despite frequent cyclones and floods, freshwater aquaculture could be developed through rainwater harvesting in the Sundarbans.²¹ Rainwater can be stored in on-farm reservoirs and canals. Floods can be managed by channelization of the catchment and regulated operation of the sluice gates. Improved crop planning can help tackle challenges to farming, including the drainage congestion during the monsoon and the limited water availability during dry periods.²²

There is a prevailing sentiment among the coastal residents that their voices are disregarded in decision-making. According to many informants²³, the government tends to prioritize the interests of politically influential figures. Corruption often mars the construction of vital infrastructure, resulting in subpar quality of essential facilities like roads and embankments. The neglect of equity and justice concerns, along with poor coordination, have also severely hindered disaster response and recovery efforts. Developing sustainable, community-driven solutions to climate change impacts on coastal areas necessitates a grassroots approach to policy-making that considers the needs and insights of marginalized populations.

Both sides of the Sundarbans (India and Bangladesh) have been influenced by the local manifestations of global climate change policies,

especially the forest conservation initiatives.^{24 25}
²⁶ Locals are increasingly banned from using forests for their livelihoods, even if livelihoods such as fishing and honey harvesting do not hinder forest protection. Embankments have been constructed to safeguard low-lying land from the saline ocean water; yet, while embankments play a critical role in offering protection from seawater surges, they also worsen water-logging and prevent saline water being flushed out. Moreover, they have disrupted the natural flow of coastal rivers, leading to silt accumulation, which, in turn, has increased salinity levels of both soil and water.²⁷ Nevertheless, coastal embankments play an indispensable role in shielding communities

from sea-level rise, tidal storms, and cyclones. Although residents acknowledge the problem of silting, their main concern is why embankments, which frequently break due to storm surges, are not repaired and maintained.

In addition to rising sea water levels and extreme weather events, the deteriorating flows and water quality of the rivers upstream in different places in India contribute to the salinity levels of the delta. Decreasing river flows also cause flooding and siltation, hampering local livelihoods. Consequently, safeguarding the delta from ecological problems requires mutual agreements to be drawn up between India and Bangladesh.²⁸



SHEKH DIDARUL ALAM

The embankment in coastal Bangladesh is not durable nor sufficient for protecting people from the surges of seawater.

The Sundarbans is formed by the silt transported by the Ganges, Brahmaputra, and Meghna rivers. Stretches of land (chars in Bengali) are part land and water, continuously shifting.



Migration and multi-local resilience

People migrate from their villages to work in the urban informal sector due to the environmental hazards and social and economic marginalization. Environmental vulnerabilities are compounded by the absence of sufficient social safety nets both in rural and urban areas. The benefits available for cyclone-affected people tend not to reach the most vulnerable, especially those unable to cultivate relationships with local political elites. There is no sufficient support system for people coping with a lack of work or slow-onset events such as salinization. Nonetheless, despite low earnings and insecure housing, migrants often expressed satisfaction that at least they could now earn a living and sleep peacefully instead of having to depend on fragile embankments for protection.²⁹ Migration provides an adaptation strategy to deal with climate change and environmental hazards; yet, it does not absolve the state of its responsibility to address environmental hazards or justify transferring the burden of adaptation to migrants.³⁰

Local governance in India and Bangladesh is

based on the assumption that people must belong to bounded localities to qualify for benefits. For instance, most resilience-building initiatives and ideas designed for the Sundarbans either focus on sustainable rural livelihoods or relocating vulnerable populations to new locations.^{31 32} The problem with large-scale displacement proposals, however, is that they lack realistic plans to rehouse and build livelihoods for the displaced.³³ Moreover, the era of climate change exacerbates uncertainty; hence, policies must embrace uncertainty.³⁴ The Sundarbans, which is influenced by a myriad of unpredictable factors, is no exception; in addition to global warming and sea-level rise, the fluctuations in the upstream river flows contribute to silt movement and salinity downstream. Migrants often do not choose to stay or leave but maintain their rural homes and networks, treating their rural governmental benefits as assets while earning a precarious living in urban areas. The Sundarbans residents' multi-local strategies show the way forward on flexible resilience thinking.³⁵



Recommendations

Address the multiple drivers of vulnerability in coastal communities

- › **Generate employment and instant wage payments through a substantial part of the year.**
- › **Offer support for vulnerable people during both environmental and economic crises.**
- › **Ensure that the most vulnerable part of the community is not excluded from governmental benefits and aid.**

Women who do laundry and fish in saline water are especially susceptible to health problems caused by salinity exposure. They suffer from a range of reproductive and skin diseases due to the exposure, while

families encounter difficulties in arranging marriages for their daughters. Ensuring accessible healthcare addresses these health challenges and promotes the well-being of coastal communities.

- ▶ **Offer meaningful education and functional health care to help vulnerable people build assets and resilience instead of falling into poverty.**

Foster sustainable livelihoods that do not exacerbate the adverse effects of climate change and harm the environment

- › **Promote drought-tolerant, short-cycle crops and fish and tree species adapted to saline conditions.**

- › **Arrange guidance and provide resources for small farmers to adopt sustainable farming practices.**
- › **Develop agroforestry—land-use systems where woody perennials (trees, shrubs, bamboo, palms, etc.) are integrated on the same land as crops and/or animals.**
- › **When conserving the mangrove forests, do not target forest dwellers' livelihoods, which do not harm the forests.**
- › **Diversify income sources by promoting off-farm employment opportunities and reducing the reliance on climate-sensitive activities.**
- › **Target women for these alternative livelihood options to empower them economically and socially, as they are often disproportionately affected by the impacts of climate change.**

The promotion of shrimp farming is an example of a livelihood that exacerbates climate change impacts as it causes soil salinity and decreases job opportunities.

- › **To protect the land, water, and biodiversity, regulate the shrimp farming industry and prohibit its use of harmful chemicals.**
- › **Implement best management practices for shrimp farming, such as reducing stocking densities, improving water treatment and recycling, and minimizing the use of chemicals and antibiotics.**
- › **Develop policies to encourage farmers to diversify their income sources by cultivat-**

ing salt-tolerant and shorter-cycle crops, eco-tourism, and sustainable freshwater aquaculture.

- › **Support smallholder farmers interested in transitioning from saline-water shrimp farming to rice cultivation.**

Adopt participatory approaches that enable the recognition of local communities' unique needs, perspectives, and innovative practices in tackling climate change effects

- › **Facilitate dialogue on coastal issues such as natural resource management and promote long-term resilience to climate change impacts among the general public, local government representatives, and NGOs.**
- › **Facilitate open communication and the exchange of diverse perspectives to develop better informed and effective policy decisions and promote accountability and transparency.**
- › **Build social safety nets that enable flexibility and mobility. For instance, many environmental migrants urgently require basic amenities like water, power, and sanitation in their urban settlements.**
- › **Ensure the long-term maintenance and effectiveness of embankments by involving the local communities and establishing dedicated community-based monitoring teams.**



Improve coastal resilience to disasters

- › **Upgrade essential infrastructure, particularly embankments, to safeguard coastal communities from the intrusion of saline water and the devastating impacts of storm surges.**
- › **Develop embankment infrastructure which does not disrupt ecological processes.**
- › **Construct, control, and maintain sluice gates so that they benefit the majority of the residents.**
- › **Elevate crucial structures, such as local roads, bridges, and houses, to mitigate the effects of flooding induced by climatic hazards and tidal surges.**
- › **Construct more cyclone shelters equipped with gender-sensitive facilities and accessibility features to ensure the safety and well-being of all community members, including women, disabled, and older people.**
- › **Establish livestock shelters so people do**

not have to leave their livestock when they seek shelter.

- › **Assist coastal households in the construction of cyclone-resilient housing.**
- › **Combat corruption in infrastructure building and aid distribution for effective disaster response and recovery.**

Key corruption reduction strategies include empowering anti-corruption agencies, increasing transparency, fostering community accountability, implementing merit-based public sector employment, and leveraging technology to reduce corruption. Change will be gradual, necessitating long-term commitment, adaptive strategies, and collaboration between government, civil society, and international partners to shift cultural norms and incentive structures.

- › **Prevent shrimp farmers from illicitly excavating holes in coastal embankments, as such actions significantly undermine the structural integrity of the earthen embankments crucial for flood defense.**

The newly built high-rise buildings that characterise the new parts of Kolkata have been constructed and are serviced by migrants from the Sundarbans. Informal sector workers often live in informal settlements which lack basic amenities.

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32 men and eight women in Khulna city among families impacted by Aila in Bangladesh. In rural areas of Khulna district, he interacted with people from 55 households, conducting four focus group discussions with ten participants and interviewing 11 men and four women individually.

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