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Anthropogenic Impact of Climate Change: A Case Study from the Sundarbans

Arup Majumder
Research Investigator, Cultural Research Institute, Govt. of West Bengal, India Email: arupcri@gmail.com

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Abstract: The Sundarbans, the world's largest contiguous mangrove forest spanning India and Bangladesh, plays a crucial role in biodiversity conservation and carbon sequestration, absorbing approximately 41.5 million tonnes of CO_2. However, climate change threatens this unique ecosystem through rising sea levels, increased salinity, and more frequent extreme weather events, adversely affecting both wildlife and the livelihoods of around 4.37 million local inhabitants. Despite existing environmental laws and institutional efforts by India's Central and State Governments, overlaps and inefficiencies hinder effective action. Urgent global emission reductions, promotion of saline-resistant vegetation, and improved disaster response infrastructure are vital to safeguard the Sundarbans and its communities.

Keywords: Sundarbans, anthropogenic, climate change, UNESCO

Introduction

India, spanning approximately 3,287,263 square kilometers, ranks as the seventh-largest country in the world. Remarkably, about 20% of this landscape is still covered by diverse forests, despite a population exceeding 1.2 billion. Among these ecological treasures is the Sundarbans, the world's largest contiguous mangrove forest, covering around 9,630 square kilometers primarily in West Bengal.

The Sundarbans ecosystem is marked by rich biodiversity and complex geography, featuring numerous river channels, creeks, and about 102 islands, 54 of which are inhabited. This area is home to vital mangrove species like Heritiera fomes, commonly known as 'Sundari,' which lends its name to the region. Historically, the Sundarbans extended roughly 16,700 square kilometers and supported diverse wildlife, including species such as the Javan rhinoceros, wild buffalo, swamp deer, barking deer, and leopards.

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Today, the Sundarbans faces immense pressure from a rapidly growing human population, estimated at 4.37 million according to the 2011 census. Many inhabitants lead economically marginalized lives, struggling in a region plagued by inadequate infrastructure. The lack of industrial development forces the local populace to rely predominantly on agriculture, which is hampered by poor irrigation and infrastructure, leading to low crop yields and unstable livelihoods. Additionally, overexploitation of mangrove forests and fishing contributes to significant ecological damage, particularly through the farming of tiger prawn seeds.

The Sundarbans is also acutely vulnerable to the impacts of global warming and climate change. Rising sea levels and increased salinity threaten its delicate ecosystems, which are essential not only for biodiversity but also for the livelihoods of local communities. The region exemplifies the intersection of human activity, ecological preservation, and the urgent need for sustainable development in the face of environmental challenges.

Methodology

This paper is based on a thorough review and analysis of secondary data, information, and literature accessible in the public domain. Sources include official websites of various governmental agencies, scientific reports, and studies providing insights into the ecological and socio-economic dynamics of the Sundarbans delta.

The objective of this analysis is to highlight the unique challenges faced by the Sundarbans, a region rich in biodiversity yet burdened by significant environmental and developmental pressures. By synthesizing available data, we aim to present a comprehensive overview of the critical issues affecting this fragile ecosystem.

It is important to note that our use of data and scientific findings is strictly for the purpose of emphasizing these challenges. We have adhered to copyright regulations and do not claim ownership of the publicly accessible information utilized in this paper. Our intent is to contribute to the understanding of the Sundarbans' plight and promote awareness about the urgent need for sustainable practices and policies to protect this vital ecological treasure.

Importance

The Sundarbans, situated at the delta of the Ganges, Brahmaputra, and Meghna rivers, is renowned for its extensive mangrove forests and rich biodiversity. Designated as a UNESCO World Heritage Site in 1987 and later recognized as a protected biosphere reserve by the Government of India in 1989, the Sundarbans encompass a significant portion of the world's largest contiguous block of mangrove ecosystems.

Biodiversity and Endangered Species

The Sundarbans are critical for biodiversity, hosting the only population of the critically endangered Royal Bengal Tiger (Panthera tigris tigris) in a coastal mangrove habitat. The region is home to approximately 300 species of flora and around 425 species of wildlife, including notable aquatic mammals like the Gangetic Dolphin (Platanista gangetica) and the Irrawaddy Dolphin (Orcaella brevirostris). This unique ecosystem supports 85% of India's mangrove habitats, featuring 63 out of 69 documented mangrove plant species (Mandal *et al.*, 2019).

Current estimates suggest that the Sundarbans may contain up to 140 species of mangroves and coastal flora. However, several mangrove species are under threat, necessitating immediate conservation efforts, including species like Aegiceras corniculatum, Heritiera fomes, Kandelia kandel, Nypa fruticans, Rhizophora spp., Sundarbania apetala, and Sundarbania caseolaris (Choudhury *et al.*, 2020).

Economic and Environmental Importance

Local communities depend heavily on the mangrove ecosystem for various resources, including fodder, fuelwood, tanbarks, fish, honey, and medicinal plants (Islam *et al.*, 2021). Furthermore, the Sundarbans provide crucial environmental services, such as nutrient input to coastal waters, with mangrove roots and biomass contributing significantly to nutrient generation. Research indicates that mangroves produce about 6,000 tonnes per hectare of litter annually, enriching the organic nutrient profile of the brackish waters that serve as vital nurseries for commercially and ecologically important aquatic species (Dahl *et al.*, 2022).

The mangrove swamps and backwaters of the Sundarbans also act as natural barriers against cyclones, tropical storms, and tidal surges, safeguarding inhabited areas and stabilizing shorelines. This protective function is essential for the resilience of coastal communities (Sundar *et al.*, 2020).

Climate Mitigation

Research from the University of Calcutta estimates that the Sundarbans have sequestered approximately 4.15 billion tonnes of carbon dioxide, valued at around $79 billion in the international carbon market (Basu *et al.*, 2023). This carbon storage capability underscores the critical role of mangroves in climate change mitigation and highlights the need for ongoing conservation efforts.

In conclusion, the Sundarbans are not only a biodiversity hotspot but also a vital resource for local communities and a significant contributor to global environmental

health. Preserving this unique ecosystem is essential for maintaining both ecological balance and human livelihoods.

Threats

The Sundarbans face significant challenges due to climate change, profoundly impacting its flora, fauna, and the communities that depend on its resources.

A. Increasing Temperatures

Between 1980 and 2007, water temperatures in the Sundarbans increased at an accelerated rate of approximately 0.5°C per decade, compared to the global average of 0.06°C per decade (Chaudhary *et al.*, 2019). This rise in temperature poses severe risks to aquatic life and disrupts the health of the mangrove ecosystems that are vital for both biodiversity and local livelihoods.

B. Rising Sea Levels

Over the past 25 years, sea levels in the Sundarbans have risen nearly twice the global average, primarily due to land subsidence and climate change (Sarkar *et al.*, 2021). This rise negatively impacts mangrove vegetation, leading to stunted growth, which in turn decreases photosynthesis rates. Additionally, increased sea levels hinder sediment availability, essential for establishing new mangrove groves. The disappearance of New Moore Island in 2010 underscored the threats posed by rising seas, with predictions that other low-lying islands may also vanish (Ghosh *et al.*, 2020).

C. Cyclones

From 1951 to 2010, there has been a noted increase in the intensity of cyclonic storms affecting the Sundarbans, likely linked to higher sea surface temperatures (Kumar *et al.*, 2019). Cyclone Aila in 2009 exemplified the devastation these storms can cause, breaching embankments and flooding vast areas, displacing over 2 million people and leading to long-term agricultural and water supply issues. Salinization of farmland due to seawater intrusion further exacerbates food insecurity and poverty, prompting increased migration to urban areas.

D. Rise in Salinity and Impact on Agriculture

In the last two decades, diminished freshwater runoff from eastern rivers has led to increased salinity in the Sundarbans, adversely affecting both mangrove health and agricultural productivity (Mukherjee *et al.*, 2022). High salinity levels resulting from

tidal surges and cyclonic activity have made farming increasingly challenging, with many traditional crops struggling to survive.

E. Change in Agricultural Patterns

According to the West Bengal Government, agricultural land in the Sundarbans shrank from 2,149.6 square kilometers in 2002 to 1,691.2 square kilometers in 2009 (Government of West Bengal, 2009). The prevalence of monoculture, particularly rice cultivation, limits agricultural diversity, and erratic rainfall patterns further threaten crop yields. Historically, farmers cultivated salt-tolerant rice varieties, but many of these have been lost over time, particularly during the Green Revolution (Bhadra *et al*., 2021).

F. Deforestation

Between 1777 and 1971, the Sundarbans experienced significant deforestation and land reclamation, leading to a 5% loss of forest cover between 1989 and 2009 (Bhattacharyya *et al*., 2018). This loss not only increases human-wildlife conflicts but also disrupts the ecological balance, undermining sustainable agriculture and exacerbating salinity issues during high tides.

G. Pollution

The rivers of the Sundarbans face severe pollution challenges, primarily from untreated domestic and industrial waste. Heavy siltation and the impact of urban developments, such as the Haldia Port Complex, have compounded these issues, altering the delta's geochemistry (Banerjee *et al*., 2020). High levels of heavy metals and organochlorine pesticide residues have been detected in the area, posing serious threats to biodiversity and the health of the mangrove ecosystems.

The Sundarbans exemplify the intricate relationship between climate change and ecological health. As increasing temperatures, rising sea levels, intensified cyclones, and pollution wreak havoc on this fragile ecosystem, immediate and effective conservation

Challenges and Deficits in the Sundarbans

India has implemented several policies and laws at both the Central and State levels aimed at protecting the Sundarbans and addressing climate change impacts. Key initiatives include the National Coastal Management Program and the Mangroves Conservation and Management Program. Despite these legal frameworks, significant challenges persist, largely due to human encroachment, environmental degradation, and socio-economic factors.

A. Encroachment and Poverty

The Sundarbans, one of the most densely populated regions in India, had a population density of approximately 929 persons per square kilometer in 2001, rising to 1,082 persons per square kilometer by 2011. With around 44% of the population living below the poverty line, there is immense pressure on land and resources. The absence of adequate educational institutions—only one degree college exists for every 250 square kilometres—limits job opportunities and perpetuate poverty.

The economic indicators for the region are dismal; the per capita electricity consumption in the Sundarbans is only one-fourteenth of the national average. Many households lack access to basic services: about 60% do not have clean drinking water, and around 87% experience some form of food insecurity. Healthcare infrastructure is also inadequate, with approximately one-third of the population lacking access to primary healthcare services.

Institutional banking coverage is minimal, with only about 10% of residents utilizing these services, and there is no agriculture insurance available. The lack of marketing and value-added infrastructure further restricts economic growth, as approximately 78% of the local economy and 65% of the workforce depend on agriculture, yet there are virtually no local industries.

B. Over-exploitation of Forest Resources

The local population relies on fisheries and the collection of non-timber forest products to supplement their income. However, overfishing and rampant deforestation have severely impacted the environment. Fish stocks are declining due to a combination of over-exploitation and climatic changes, with studies noting a significant reduction in fish density in shallow waters.

The increased demand for prawn products has led many locals to abandon traditional, sustainable fishing practices in favor of excessive prawn seed cultivation. This shift has caused extensive damage to the mangrove ecosystem, compromising the mud dykes that protect the Sundarbans from the sea. The loss of mangrove trees, which play a crucial role in binding these dykes, threatens the entire aquatic food chain and undermines long-term livelihoods for local communities.

C. Lack of Effective Disaster Management

The Sundarbans are prone to cyclones and other natural disasters, yet there is a significant lack of effective disaster management protocols. Inadequate infrastructure—such as

roads and hospitals—coupled with the region's remoteness exacerbates vulnerability. The frequent inundations of agricultural lands and recurring cyclones have forced many families to migrate, creating environmental refugees.

Long-term mitigation strategies should include the construction of disaster-resistant homes and more disaster shelters to enhance community resilience.

D. Increase in Salinity

Historically, extensive land clearing for agriculture began during British colonization, leading to the construction of approximately 3,500 kilometers of embankments to prevent seawater ingress. While intended to protect land, these embankments have disrupted natural sedimentation processes, causing rivers to become choked with silt and their channels to shallow. Consequently, rainwater stagnates in floodplains, exacerbating salinity issues that further undermine agricultural productivity.

E. Spread of Diseases

Stagnant water resulting from poor drainage systems increases the risk of waterborne diseases, leading to higher morbidity and mortality rates. Additionally, the intensifying cyclones pose risks of injuries and fatalities, while rising temperatures threaten already insufficient agricultural yields, worsening food security.

F. Increase in Human-Wildlife Conflict

As climate change impacts biomass production and further encroachment occurs, human-wildlife conflicts are escalating. Wildlife, particularly the critically endangered Royal Bengal Tiger, is increasingly venturing into human habitats in search of food, resulting in tragic encounters. Fear of man-eating tigers has led to the culling of these animals, further threatening their survival.

The Sundarbans face a multifaceted array of challenges that hinder effective conservation and sustainable development. Encroachment, poverty, over-exploitation of resources, ineffective disaster management, salinity issues, disease prevalence, and human-wildlife conflicts create a complex web of challenges. Addressing these issues requires comprehensive strategies that integrate legal protections with socio-economic development, community engagement, and effective disaster preparedness. Only through a holistic approach can the Sundarbans be preserved for future generations while ensuring the livelihoods of those who depend on its rich resources.

Indian Laws and Regulations for Environmental Protection

A. Policies and Laws at Central and State Levels

Environmental protection in India is enshrined in the Constitution, particularly under Article 21, which guarantees the Right to Life. This right has been broadly interpreted by the judiciary to include the right to a clean environment, livelihood, and dignity. The Directive Principles of State Policy further obligate the state to protect and improve the environment, safeguarding forests and wildlife. Local bodies, consisting of elected representatives, are tasked with safeguarding local environmental resources.

India is also a signatory to several multilateral environmental agreements, including:

- UN Framework Convention on Climate Change (UNFCCC)
- *Kyoto Protocol*
- *Convention on Biological Diversity (CBD)*
- *Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)*
- *Ramsar Convention on Wetlands of International Importance*
- *Convention on Migratory Species*

Key Legislative Frameworks

India has established a comprehensive legislative framework for environmental governance:

1. **National Environmental Policy (2006):** This policy promotes sustainable development, aiming to protect critical ecological systems, ensure equitable access to environmental resources, and integrate environmental concerns into socio-economic planning.
2. **National Forest Policy (1988):** Aimed at maintaining ecological balance, this policy prioritizes environmental stability over direct economic benefits. It serves as the foundation for the National Biodiversity Action Plan (2008), which addresses climate change's impact on biodiversity.
3. **National Action Plan on Climate Change (NAPCC):** Launched in 2008, NAPCC links development with climate change, outlining eight missions focused on solar energy, sustainable agriculture, and other critical areas. The West Bengal State Action Plan on Climate Change has also been drafted, acknowledging the Sundarbans as a vulnerable region and proposing mitigation strategies.

Major Environmental Laws

- Environment Protection Act (1986)
- Water (Prevention and Control of Pollution) Act (1974)
- Air (Prevention and Control of Pollution) Act (1981)
- Indian Forest Act (1927)
- Forest (Conservation) Act (1980)
- Wildlife (Protection) Act (1972)
- Biodiversity Act (2002)

The Ministry of Environment and Forests (MoEF) is the principal authority for implementing international environmental conventions and conserving biodiversity.

B. Protection and Conservation of the Sundarbans

1. **Sundarban Biosphere Reserve:** In 1989, the MoEF designated the Sundarbans as a Biosphere Reserve, covering an area of 9,630 square kilometers, in line with UNESCO's Man and Biosphere Programme. This designation aims to:
   - Identify and demarcate the ecosystem
   - Promote ecologically compatible economic development
   - Support research and monitoring efforts

   The reserve includes the Sundarban Tiger Reserve, which consists of the Sundarban National Park and the Sajnekhali Wildlife Sanctuary. An additional 1,680 square kilometers of western Sundarbans includes several wildlife sanctuaries allowing limited human intervention for non-timber forest product extraction.
2. **Sundarban Tiger Reserve:** Covering 2,585 square kilometers, the Sundarban Tiger Reserve includes a core zone (Sundarban National Park) of approximately 1,330 square kilometers and a buffer zone (Sajnekhali Wildlife Sanctuary) of 362 square kilometers. The core area is designated as a 'Critical Tiger Habitat' with an inviolate zone of 1,699.62 square kilometers. Funding for conservation efforts under Project Tiger is shared between the central and state governments.
3. **Sundarban Affairs Department and Development Board:** Established in January 1994, the Sundarban Affairs Department aims to enhance developmental efforts in the region. The Sundarban Development Board, formed in 1973, operates under this department, focusing on:

- Formulating integrated development programs
- Coordinating and supervising plan execution
- Evaluating and revising policies based on progress

India's legal and regulatory framework for environmental protection is robust, with various policies and laws aimed at conserving biodiversity, particularly in ecologically sensitive areas like the Sundarbans. However, effective implementation and local engagement remain crucial for the success of these initiatives, especially in addressing the unique challenges faced by this critical ecosystem. The combination of national policies and state-specific action plans like those for the Sundarbans underscores India's commitment to balancing development with environmental conservation.

Criticism of Protection Strategies

Fragmented Institutional Framework

One significant criticism of the protection strategies implemented by the Government of India pertains to the fragmented institutional framework overseeing the Sundarbans. Multiple agencies, both at the Central and State levels, have been established to manage conservation efforts, leading to confusion and inefficiencies. For instance, while the entire Sundarbans area, including both forested and inhabited regions, is designated as a biosphere reserve by the Central Government, the management of protected forests and coastal zones falls under the purview of Central authorities. In contrast, the inhabited areas are governed by the State Government of West Bengal.

This division of responsibilities has resulted in several challenges:

1. **Communication Breakdown:** The split governance structure often leads to miscommunication and a lack of coordinated efforts between the Central and State organizations. This disjointed approach hampers effective implementation of conservation policies.
2. **Resource Duplication:** Overlapping responsibilities can cause duplication of efforts and confusion regarding budg*et al*locations. For example, both the Sundarbans Affairs Department and the Sundarbans Development Board may inadvertently split financial resources and manpower for similar projects, diluting the impact of their initiatives.
3. **Inefficient Resource Use:** The inefficiencies arising from this fragmentation can lead to delays in action, wasted resources, and ultimately less effective conservation efforts.

Urgent Need for Integrated Water Management

As the Sundarbans faces increasing threats from climate change, particularly rising sea levels and salinity, there is an urgent need for effective water management strategies. Conservationists have highlighted the following concerns:

1. **Freshwater Inflow:** The Sundarbans requires a consistent supply of freshwater to combat the adverse effects of rising salinity. However, domestic water management policies often prioritize other regions or uses, resulting in inadequate freshwater release into the Sundarbans.
2. **Management Challenges:** Competing interests, including agricultural needs and urban development, often impede the necessary initiatives for improving freshwater management in the region. This lack of coordinated action further exacerbates the challenges faced by local ecosystems.
3. **Policy Gaps:** Current policies often fail to address the holistic management of water resources, neglecting the interconnectedness of environmental health and community livelihoods. A more integrated approach that considers the ecological needs of the Sundarbans is essential for sustainable management.

The criticisms of protection strategies for the Sundarbans underscore the need for a more cohesive and integrated approach to environmental governance. The fragmentation of responsibilities among various agencies has led to inefficiencies and challenges in resource management. To effectively address the pressing issues of climate change and habitat degradation, it is crucial for the government to streamline its efforts, enhance coordination between Central and State agencies, and prioritize comprehensive water management strategies. Only through unified action can the Sundarbans be adequately protected and preserved for future generations.

Mitigation Strategies for the Sundarbans

India has increasingly recognized the need for comprehensive strategies to address climate change and its impacts, particularly in vulnerable regions like the Sundarbans. The Central Government, along with the State Government of West Bengal, is finalizing the West Bengal State Action Plan on Climate Change to tackle these pressing issues. Given the ecological significance of the Sundarbans and the socio-economic dependencies of its residents, a balanced approach that incorporates both conservation and human welfare is essential. Below are the proposed mitigation strategies:

Immediate Mitigation Strategies

1. **Zoning the Sundarbans According to Vulnerability**
   - **Identification of High-Risk Areas:** The West Bengal Government should demarcate zones most susceptible to cyclonic storms and rising sea levels.
   - **Relocation Efforts:** Residents in critically vulnerable areas, particularly those in low-lying islands, should be strategically relocated to safer inland regions.
   - **Conflict Management:** Increased human-animal interactions necessitate the establishment of protection patrols and rapid response teams to manage conflicts, thus safeguarding both wildlife and human communities.
2. **Construction of Disaster-Resistant Homes**
   - **Building Interventions:** Following the success of disaster-resistant homes constructed by organizations like GOAL after Cyclone Aila in 2007, the government should partner with NGOs to scale up these initiatives.
   - **Support for Low-Income Families:** Assistance with construction materials will help ensure that vulnerable communities can rebuild stronger, more resilient homes.
3. **Awareness and Education**
   - **Climate Change Education**: Both Central and State Governments must prioritize educating local populations about climate change, its impacts, and adaptive strategies.
   - **Training Programs:** Collaborations with NGOs can facilitate mass awareness campaigns, helping communities regain traditional knowledge and adopt modern sustainable practices.
4. **Promotion of Eco-Tourism**
   - **Regulating Tourism:** The State Government must ensure that tourism in the Sundarbans adheres to eco-tourism principles to minimize environmental impact.
   - **Local Economic Opportunities:** Eco-tourism can provide jobs for locals, fostering economic incentives for conservation.
5. **Re-evaluating Embankment Structures**
   - **Research on Embankment Engineering:** The State Government should focus on innovative engineering solutions for embankments that prevent water stagnation and protect against storm surges.

- **Heightened Protection:** Upgrading existing embankments to better withstand climate-related pressures is crucial.

6. **Adaptation Governance**
   - **Integrated Management Policies:** Effective adaptation requires research into climate change impacts on local development, leading to informed policy-making.
   - **Community Awareness:** Educating residents about environmental changes will enable informed community participation in adaptation strategies.
7. **Enhancing Freshwater Inflows**
   - **Addressing Salinity:** The government must increase the flow of freshwater into the Sundarbans to counteract rising salinity levels caused by climate change.
   - **Managing Water Resources:** Sustainable water management practices should be prioritized to maintain ecological balance.
8. **Afforestation Programs**
   - **Restoring Mangrove Ecosystems:** The government should initiate afforestation in designated deforested areas, particularly in the uninhabited regions of the Sundarbans.
   - **Research on Mangrove Species:** Studies should identify mangrove species capable of withstanding changing environmental conditions.
9. **Protection of Threatened Species**
   - **Conservation Initiatives:** Joint efforts by the Ministry of Environment and Forests (MoEF) and West Bengal Government are necessary to protect endangered species, including the Sundari mangrove.
10. **International Funding Mechanisms**
    - **Seeking Global Support:** To mitigate the financial burdens of climate adaptation and emissions reduction, India should pursue international funding opportunities, particularly given its limited resources.
    - **Investment in Cleaner Technologies:** Funding can facilitate the transition to energy-efficient technologies while alleviating the socio-economic pressures faced by local populations.

Long-Term Mitigation Strategies

1. **Bolstering Existing Livelihood Patterns**
   - **Diversification of Agriculture:** Research and support for diversifying agricultural practices beyond rice monoculture will enhance resilience.
   - **Saline-Resistant Crops:** Investment in the development and distribution of saline-resistant crop varieties will be critical for food security.
2. **Regional Planning and Rehabilitation**
   - **Job Creation Initiatives:** Relocation efforts must be accompanied by the provision of alternative job opportunities, such as roles in conservation or tourism.
   - **Utilizing Urban Proximity:** The closeness of Sundarbans to urban areas like Kolkata offers potential for tourism-driven economic growth.
3. **Creating Opportunities Independent of Nature**
   - **Infrastructure Development:** Investments in infrastructure that provide non-natural job opportunities can enhance resilience.
   - **Access to Education and Health Services:** Improving access to education and healthcare will empower local communities.
4. **Developing Effective Disaster Management Systems**
   - **Real-Time Early Warning Systems:** Establishing robust warning systems for natural disasters is crucial.
   - **Improving Evacuation and Response:** Rapid action teams and adequate supply chains for emergency relief will strengthen community resilience.
5. **Protecting and Distributing Saline-Resistant Grains**
   - **Seed Preservation:** Efforts should focus on protecting traditional saline-resistant rice varieties and distributing these seeds at subsidized rates.
6. **Research and Investment in Adaptation**
   - **Dedicated Governance Structures:** Establishing governance frameworks to oversee adaptation efforts is essential for managing the significant investment anticipated under the 12th Five-Year Plan, which allocates approximately ₹2 trillion for climate resilience initiatives.

In summary, the proposed mitigation strategies aim to balance the urgent need for environmental protection with the socio-economic realities of the Sundarbans. By

adopting a comprehensive and collaborative approach, it is possible to enhance the region's resilience against climate change while improving the livelihoods of its residents.

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