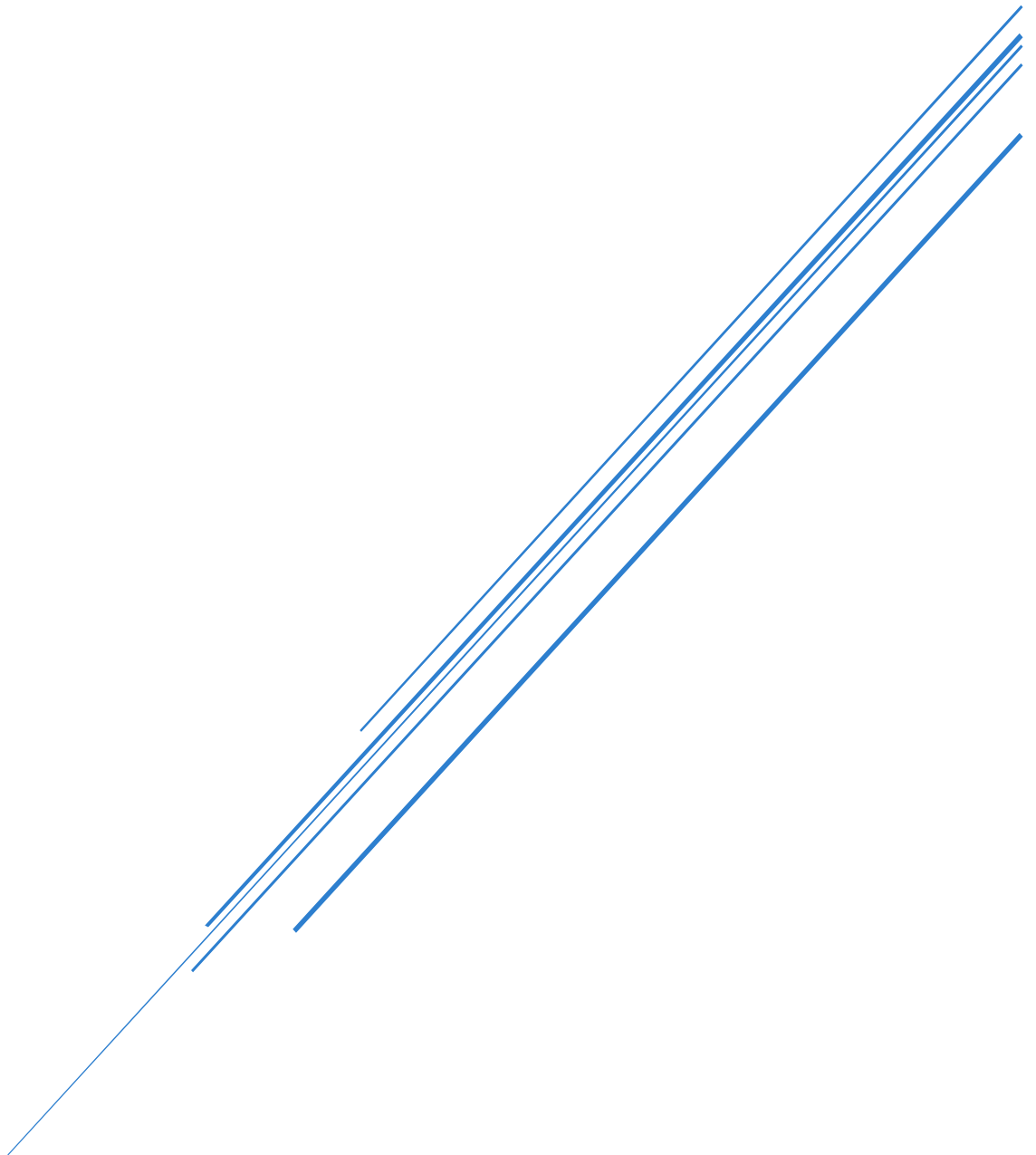


ENSURING HEALTH EQUITY IN THE SUNDARBANS: INTEGRATING MENSTRUAL AND REPRODUCTIVE HEALTH INTO CLIMATE ADAPTATION STRATEGIES



Jayati Chourey and Rajashree Laha

“Nestled within India's South 24 Parganas district, the Sundarbans region embodies the complex relationship between environmental vulnerability and human resilience. Recognized as the cyclone capital of India, this ecologically delicate area faces escalating challenges due to climate change, exacerbating pre-existing issues and widening disparities within its communities. Against this backdrop, the discourse surrounding menstrual and reproductive health emerges as a significant focal point for understanding the diverse impacts of environmental degradation, particularly on women. This introduction sets out to explore the multifaceted dimensions of climate change and its profound implications for women's menstrual and reproductive health in the Sundarbans. Through an examination of empirical research, community perspectives, and policy imperatives, this study aims to shed light on the pathways toward resilience, equity, and sustainable development in this dynamic landscape.”

1. Background

Sundarbans:

The Sundarbans, recognized as a UNESCO World Heritage Site, is one of the world's largest continuous mangrove forests, spanning approximately 140,000 hectares. Situated at the confluence of the Ganges, Brahmaputra, and Meghna rivers on the Bay of Bengal, it lies between latitudes 21°13'N and 22°40'N, and longitudes 88°3'E to 89°07'E. This extensive mangrove region covers around 10,200 square kilometers, divided between India (4,200 square kilometers of reserve forest) and Bangladesh (6,000 square kilometers of reserve forest) (Gopal and Chauhan, 2006). The Sundarbans plays a critical role in supporting a diverse range of terrestrial and aquatic life. Its mangrove forests are a sanctuary for many rare and globally threatened species, including the estuarine crocodile, royal Bengal tiger, water monitor lizard, Gangetic dolphin, Irrawaddy Dolphin, olive ridley turtle, Indian Python, and around 260 bird species, including several migratory ones like the Spoon-billed Sandpiper. It is also home to numerous fish species, such as the migratory Hilsa (WWF-India & UNEP CMS Factsheet). The Sundarbans is among the most important tiger habitats worldwide, sustaining a significant population of wild tigers. Beyond its biodiversity, the region is vital for 4.5 million people who rely on its ecosystem services. There are 102 islands in the Sundarbans Delta, with 48 inhabited by communities engaged in fishing, agriculture, and the collection of wood and honey.

Riverine Landscape and Tidal Dynamics of the Indian Sundarbans:

The Indian Sundarbans is bordered to the west by the Muriganga River and to the east by the Harinbhanga and Raimangal Rivers. Essentially, the Sundarbans consists of a patchwork of low-lying islands interconnected by a complex network of tidal waterways, estuaries, creeks, and mudflats. A multitude of channels and creeks are interconnected, forming a complex riverine system within this estuarine ecosystem. The significant tidal activity facilitates the influx of large amounts of saltwater into this region. Bidyadhari, Matla, Thakuran, and Saptamukhi are among the most prominent rivers of the Indian Sundarbans. Matla and Bidyadhari, which flow southwestward, are undoubtedly the most crucial channels in the Indian Sundarbans. Due to siltation in the upstream regions, both of these rivers lack sufficient freshwater inflow (Manna et al., 2010). The confluence of these two rivers divides the core area of the Sundarbans Project Tiger from the buffer region. Saptamukhi is situated in the extreme western part of the Sundarbans and flows toward the Bay of Bengal through the mangrove transition zone on the west bank and the Lothian Island Wildlife Sanctuary on the other side. It is linked to the Hooghly River via the Muriganga. Thakuran flows between Matla and Saptamukhi through the buffer region and connects with Matla and Bidyadhari. During high tide, the entire area is inundated with brackish water, which mixes with freshwater from the inland rivers (Pramanik et al., 2019). The distribution of mangrove species depends on the salinity regime. According to Barik et al. (2017), each species within the mangrove ecosystem demonstrates a specific optimal range of salinity suitable for its preferred habitat. This preference, along with the species' tolerance level, can be altered in response to changes in the environmental conditions.

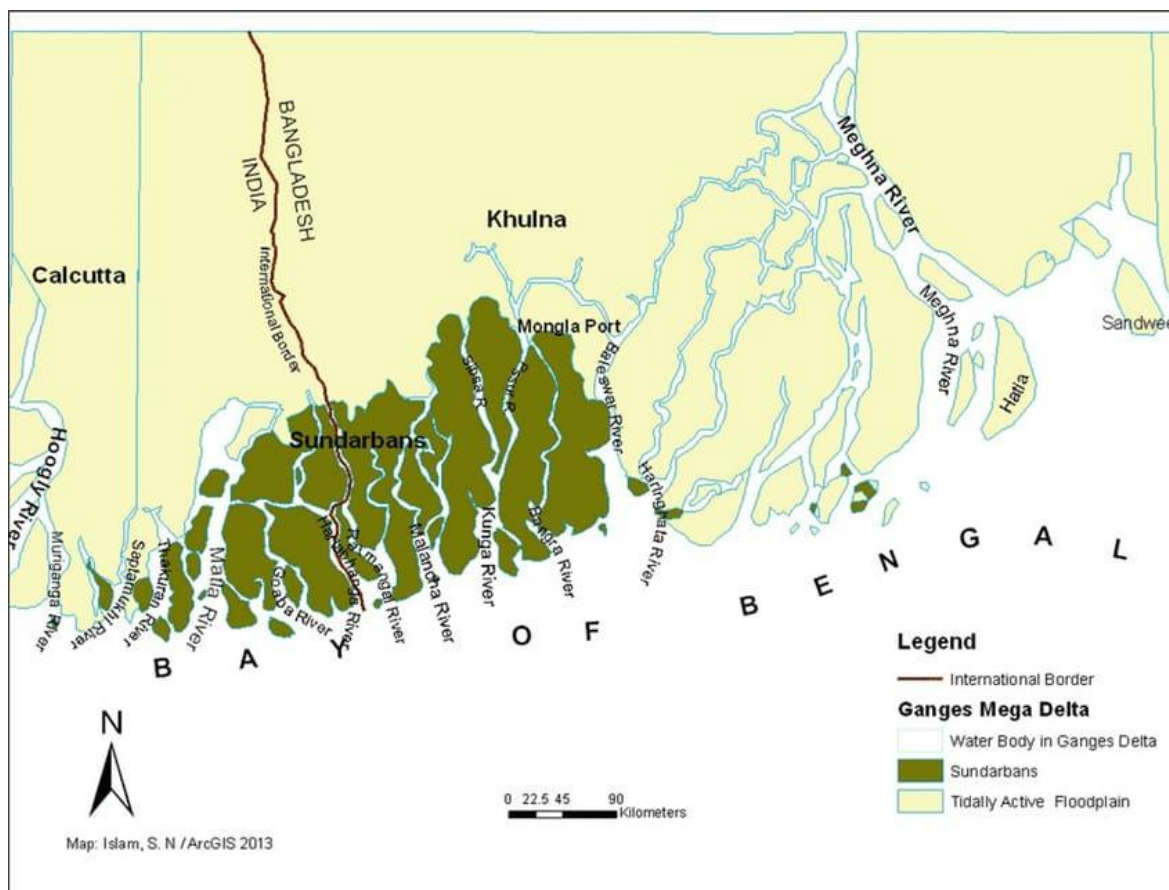


Figure 1: The map illustrates the intricate Sundarbans coastal mangrove delta and river system. (Source: Islam, 2019).

Climate Change threats to Sundarbans:

Climate change is impacting the Sundarbans in various ways. As a notable climate hotspot, the Sundarbans faces an existential threat due to climate change. Persistent pressures from water-related threats - such as sea level rise, soil and water salinization, intensifying cyclones, and flooding due to embankment overtopping and failure - have made life increasingly challenging in the Indian Sundarbans, and the impacts of global climate change are expected to further exacerbate these conditions (Sánchez-Triana et al., 2018).

The Sundarbans, located in a region known for frequent severe tropical cyclones, are significantly exposed to these natural disasters. Situated along the eastern coast of India, South 24 Parganas District in the Indian Sundarbans is recognized as the cyclone capital of India. Over the past 15 years, the Sundarbans region has experienced a surge in frequency and intensity of cyclonic storms. Notable among these events are Aila (2009), Phailin (2013), Hudhud (2014), Komen (2015), Mora (2017), Titli (2018), Fani (May 2019), Bulbul (November 2019), Amphan (2020), Yaas (May 2021), and Jawad (December 2021). These severe cyclones not only bring strong winds but also introduce saline seawater into the soil and surface and groundwater sources of island villages in the Sundarbans, exacerbating the impact by disrupting ecosystems, agriculture, harming aquatic life, and jeopardizing access to clean water for drinking, hygiene, sanitation, and other household needs.

In addition to cyclones induced by climate change, floods and tidal surges lead to increased salinity, contaminating water quality. Several scientific studies provide evidence of environmental pollution in the riverine system. Several tributaries carry pollutants from upstream industrial belts to the Sundarbans. Agricultural runoff containing fertilizers and pesticides is another reason for water quality deterioration in the Sundarbans.

This compounded impact of climate change and environmental hazards has intensified water insecurity in various parts of the Sundarbans. Despite deteriorating water quality, many villages continue to consume contaminated water due to a lack of alternatives. In most island villages of the Sundarbans, the absence of treated piped water forces communities to rely on hand pumps for drinking water and ponds for other needs like bathing, household use, cattle rearing, and fishing. Furthermore, groundwater, which is relatively less contaminated compared to pond waters in the region, is also stressed due to high demand for irrigation. This lack of safe water for drinking, sanitation, and hygiene, along with food insecurity and limited healthcare access, has triggered a public health crisis in the region. Though the entire community is at the forefront of climate change impacts in the Sundarbans, certain groups, such as women, are more vulnerable than others due to multiple factors.

The impacts of climate change in the Sundarbans are complex and multifaceted, affecting men and women differently. While both genders experience the challenges posed by disasters and their aftermath, it's crucial to understand how these issues are interconnected and affect families as a whole. However, women often face unique and overlooked challenges that require closer examination. This paper explores the specific health issues women encounter, particularly concerning menstrual and reproductive health, to shed light on the complex gender dynamics of climate change impacts. By focusing on a case study in the region, we emphasize the urgent need for comprehensive and inclusive approaches to address these challenges. By understanding the specific vulnerabilities faced by women in the Sundarbans, we can better integrate gender-specific considerations into climate adaptation strategies. This research advocates for initiatives that prioritize the health and well-being of all community members, especially those most vulnerable to the effects of climate change.

2. Materials and methods

2.1 Study Area:

The study centered on the Sundarbans region, located in the South 24 Parganas district of West Bengal, as the primary area under examination. The selection of study areas followed a meticulous process, taking into account factors such as climate vulnerability, health risks, and water salinity issues. Two blocks, Patharpratima and Gosaba, were chosen through random sampling for their heightened susceptibility to these challenges. Within these blocks, four villages were randomly chosen, namely Chandipur and Hetalbari from the Gosaba block, and Mahendra Nagar and Durbachati from the Patharpratima block.

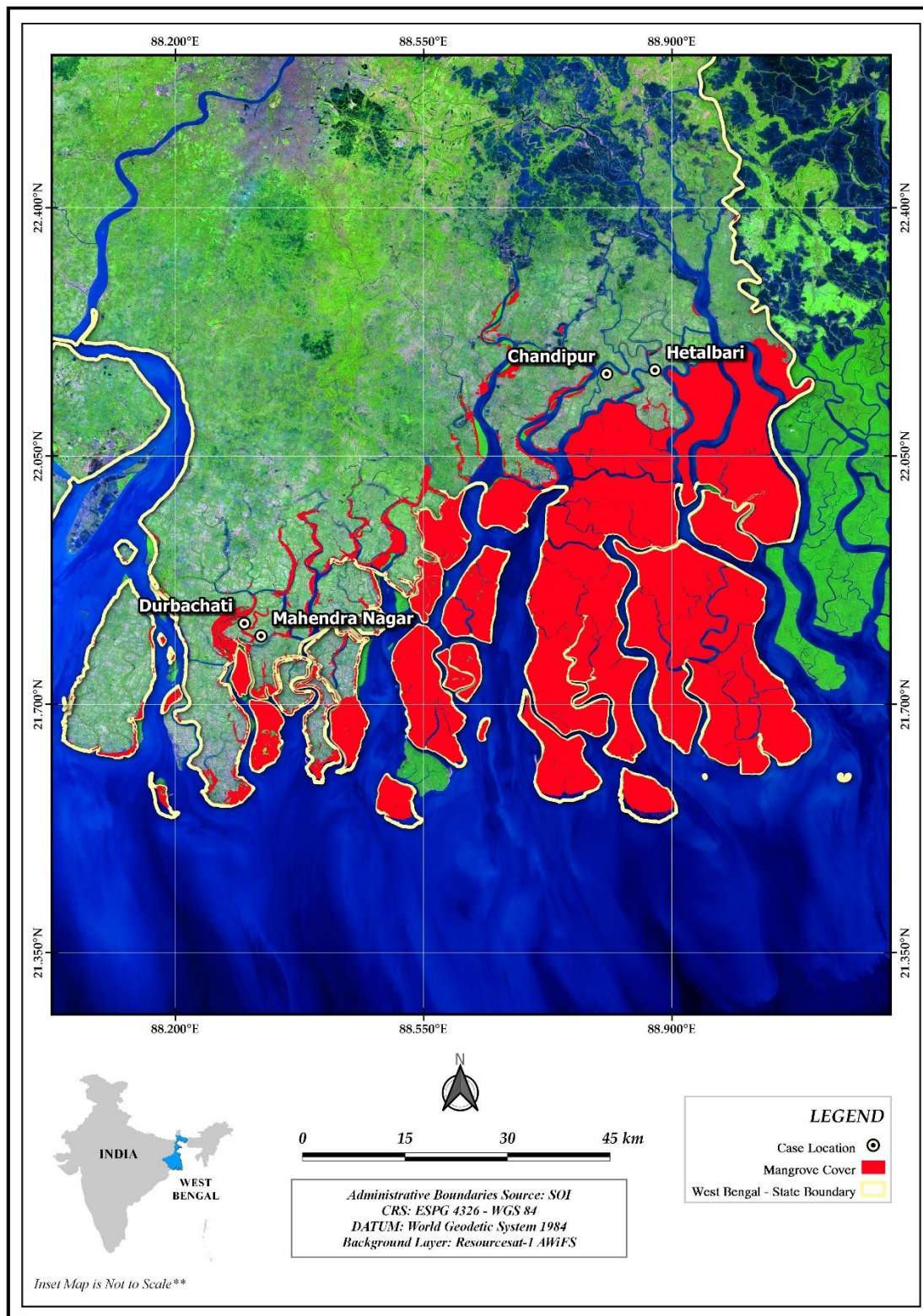


Figure 2. Study Area location map.

The region under examination has been classified as a High-Risk Zone according to the parameters of climatic hazards and disasters by the India Meteorological Department (IMD). This classification is attributed to frequent occurrences of cyclones, flooding, embankment breaches, storm surges, coupled with a high population density (Figure 3).

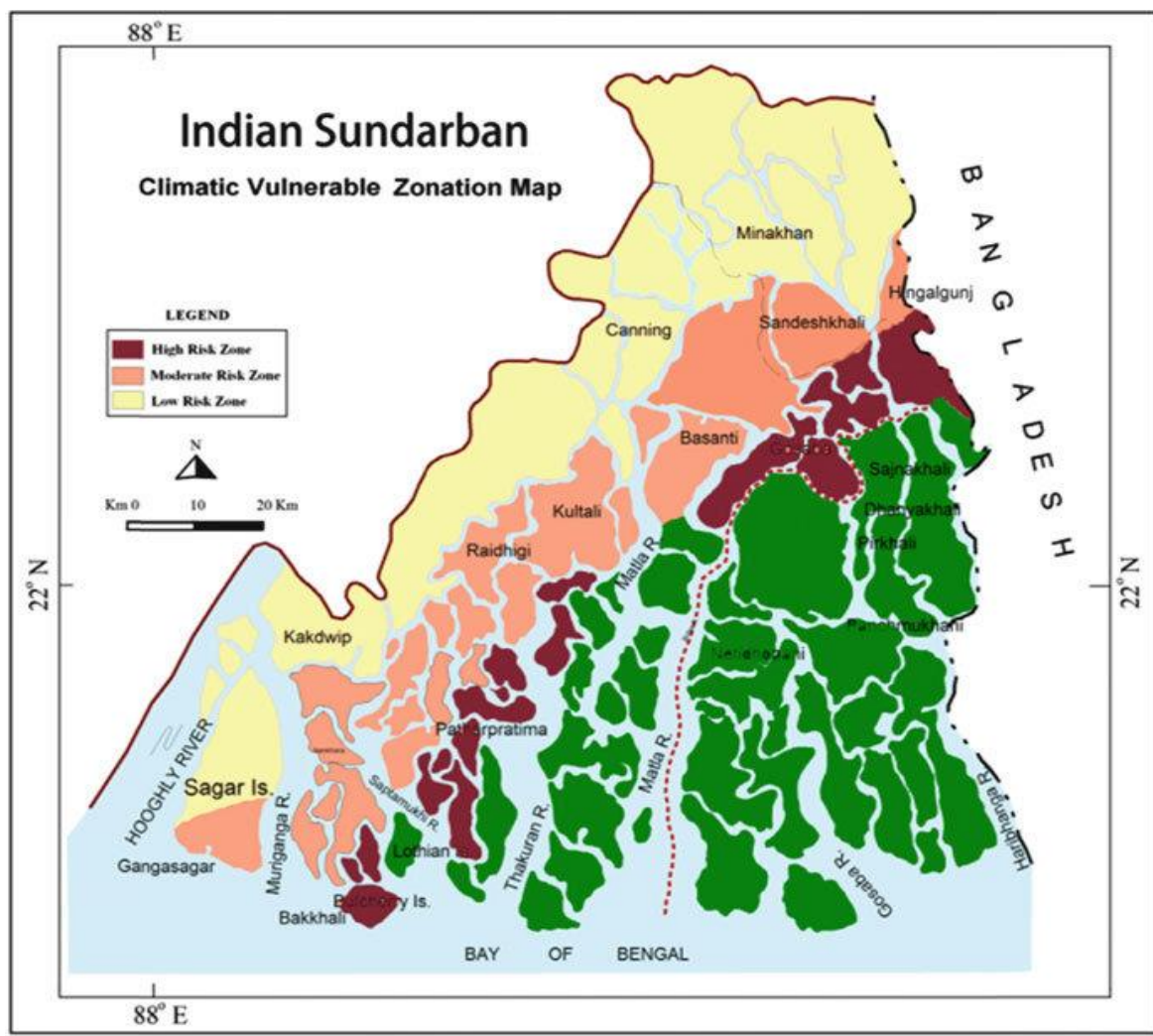


Figure 3. Climatic Vulnerability Zonation Map of the Indian Sundarbans Region by India Meteorological Department. Source: Haldar et al (2014)

2.2 Research Method:

The study adopts a participatory action research approach to center community voices and perspectives, engaging with community members, particularly women and marginalized groups, in the high-risk zone of the Sundarbans region. The methodology combines quantitative and qualitative research methods, participatory approaches, and stakeholder engagement to comprehensively assess challenges and opportunities related to menstrual and reproductive health management and water quality risks in the Indian Sundarbans region. Data collection methods include semi-structured interviews, focus group discussions, field observations, and the formation of participatory action research groups. This methodology is chosen to co-create knowledge and empower marginalized communities in developing resilience-building solutions throughout the research process.

Household surveys were conducted using the Kobo Collect App, interviewing 400 women, with 100 women from each village. These surveys explored various aspects such as the impact of climate change, livelihoods, water quality, sanitation practices, menstrual health management practices, and healthcare access.

Field visits were essential to the data collection process, allowing for personal observations and informal discussions with community groups. These visits provided invaluable insights into the challenges faced by the communities, ranging from cyclones and water salinity issues to healthcare accessibility and livelihood opportunities.

The research methodology also included the organization of Participatory Action Research Group (PARG) workshops. Eight PARG workshops were conducted, with two rounds held in each village. These workshops served as platforms for knowledge co-creation, capacity building, and engagement with village-level stakeholders. Discussions during the workshops centered on identifying adaptation solutions for menstrual and reproductive health management, establishing linkages between climate change, water quality, and women's hygiene management, and identifying community-driven interventions.

Furthermore, a state-level dissemination workshop was convened in Kolkata to share the research findings and engage with stakeholders from government agencies, NGOs, academia, and the community. This workshop facilitated discussions on policy implications and future actions based on the research outcomes.

Data collected from household surveys, field visits, and PARG workshops underwent rigorous analysis to identify key findings, trends, and challenges across the study area. The findings were synthesized into a comprehensive report, highlighting the methodology, key insights, recommendations, and implications for policy and practice.

It is essential to note that the findings presented in this study are exploratory in nature and are not derived from a clinical study. The health analysis conducted in this study relies on observations, experiences, and perceptions of key stakeholders rather than on actual clinical assessments.

Results:

3.1 Multifaceted Impacts of Climate Change in the Study Area:

The diverse effects of climate change in the study area encompass a variety of environmental, social, and economic challenges. These concerns were expressed and validated through extensive household surveys and participatory action research group (PARG) workshops. Key findings reveal the region's vulnerability to rising sea levels, intensified cyclones, soil and water salinization, and frequent flooding, all of which disrupt ecosystems, livelihoods, and community well-being. The increasing frequency and severity of cyclonic storms, as evidenced by events such as Aila, Phailin, and Amphan, have left lasting impacts on the landscape and livelihoods of communities dependent on the Sundarbans. Additionally, environmental pollution from industrial and agricultural sources further exacerbates water quality deterioration, posing significant health risks to residents.

Frequency of Cyclones and Floods: In Chandipur, 88% of respondents report cyclone occurrences ranging from 1-2 times a year, with 11% indicating 2-3 times annually and 1% noting occurrences exceeding 4 times per year. In Hetalbari, 61% of respondents observe

cyclones 3-4 times yearly, 32% report 2-3 occurrences annually, 1% report 1-2 times a year, and 6% note more than 4 times annually. Durbachati respondents predominantly report cyclone frequencies of 2-3 times a year (87%), with 12% citing 3-4 occurrences and 1% noting 1-2 times a year. All Mahendra Nagar respondents report cyclones occurring 1-2 times annually.

Regarding flood and cyclone frequency trends over time, 87% of Chandipur respondents perceive an increase, with 3% reporting a decrease and 10% uncertain. In Hetalbari, 86% note an increase in occurrences, while 14% are unsure. All Durbachati and Mahendra Nagar respondents agree that flood and cyclone occurrences have increased over the years.

When asked about the impact of natural disasters, respondents from the surveyed villages highlighted numerous challenges. These include the destruction of agricultural crops, earthen roads, trees, and houses, resulting in collapsed roofs and walls. The aftermath extends to temporary bathrooms, often invaded by saline water, forcing individuals into open defecation practices. Additionally, saline water intrusion into ponds leads to fish mortality, while livestock also suffer losses. The infiltration of saline water into homes exacerbates health issues such as skin irritation and rashes, with unhygienic conditions facilitating the spread of infections. Moreover, animal carcasses in water sources contribute to pollution and emit foul odors. Soil quality deteriorates, and households bear the financial burden of rebuilding infrastructure and homes. Economic repercussions include disrupted businesses, reduced productivity, and increased unemployment. Overall, natural disasters disrupt daily livelihoods by impeding communication, power supplies, and transportation services, heightening the challenges faced by households in the aftermath of such events.

“My family has lost a significant portion of our farmlands near the Bidyadhari River due to river bank encroachment, and our freshwater pond has become saline due to frequent floods and cyclones. Our life in Sundarbans has changed since Aila struck the village. Every time a cyclone hits, we rebuild our lives, only for another one to come. We now live in constant threat and stress,” said Najma Sardar (50) from Chandipur village of Gosaba block during the village-level participatory action research group meeting organized by SaciWATERS.

The impact of climate change is multifaceted, intricate, and possesses many dimensions, some visible, and some hidden.

3.2 Climate Change, Water Quality Deterioration, and Impact on Community Health

Impact of Climate Change on Water Quality and Community Health

To gauge community awareness and perceptions regarding water quality degradation, respondents were interviewed, aiming to shed light on their understanding of environmental shifts in the Sundarbans region and their implications for community health and well-being.

In Chandipur, 47% of respondents acknowledge water quality alterations, likely influenced by habitual use of poor-quality water and limited environmental education. Conversely, all respondents in Hetalbari are cognizant of these changes. Similarly, in Durbachati, 96%, and in Mahendra Nagar, 99% of respondents are aware of the region's water quality shifts. Notably,

residents of Chandipur exhibit lower awareness levels, possibly due to educational differences compared to other villages.

Concerning variations in water quality changes, respondents in Chandipur attribute them to increased salinity (36%), turbidity (8%), and contamination (1%). In Hetalbari, predominant changes involve heightened salinity (88%), turbidity (86%), and contamination (65%). Similarly, in Durbachati, respondents cite increased salinity (76%), turbidity (38%), and contamination (29%). Mahendra Nagar residents note increased salinity (94%), turbidity (87%), and contamination (24%). Across villages, heightened salinity emerges as the primary factor contributing to water quality deterioration, followed by turbidity and contamination, often exacerbated by natural disasters such as floods and cyclones.

Regarding reasons for changes in water quality, respondents primarily attribute increased salinity to saline water intrusion during cyclones and floods. In Chandipur, 98% identify this as the leading cause, while in Hetalbari, agricultural runoff (100%) is prominently cited. Additionally, intrusion from cyclones and floods (88%), malfunctioning sewage systems (4%), and tube wells (67%) contribute to salinity in Hetalbari. Similarly, in Durbachati and Mahendra Nagar, respondents identify intrusion from cyclones and storms (87% and 94%, respectively) as the primary cause, supplemented by agricultural runoff and malfunctioning sewage systems. Tube well issues, such as impurities and odorous water, exacerbate water quality concerns across all villages.

Perceptions of water pollutants vary among respondents across villages. In Chandipur, 32 respondents identify water salinity as a primary pollutant, with one respondent attributing excess fertilizer use and other causes (3%). Conversely, in Hetalbari, all 100 respondents identify fertilizers as a pollutant, with water salinity (92%) and domestic sewage (32%) also recognized. Additionally, 28 respondents cite oil or petroleum as pollutants, while 2 respondents indicate other causes. In Durbachati, 69 respondents identify water salinity as a pollutant, followed by domestic sewage (37 respondents) and excessive fertilizer use (13 respondents). Fewer respondents cite metals like iron, mercury, and lead (7 respondents), and oil or petroleum (3 respondents) as pollutants. Similarly, in Mahendra Nagar, 82 respondents identify water salinity as a pollutant, while 17 respondents cite domestic sewage. Only 3 respondents mention oil or petroleum as pollutants. Across all villages, excessive water salinity emerges as the primary cause of water pollution, with additional factors such as domestic sewage and floating carcasses also recognized as contributors.

Apart from climate-induced salinity, environmental pollution exacerbates water quality degradation in the Sundarbans. Industrial pollutants from upstream areas via tributaries and agricultural runoff containing fertilizers and pesticides further worsen the situation. This compounded impact of climate change and environmental hazards has intensified water insecurity in various parts of the Sundarbans. Despite deteriorating water quality, many villages continue to consume contaminated water due to a lack of alternatives.

In most island villages of the Sundarbans, the absence of treated piped water forces communities to rely on hand pumps for drinking water and ponds for other needs like bathing, household use, cattle rearing, and fishing. Furthermore, groundwater, which is relatively less contaminated compared to pond waters in the region, is also stressed due to high demand for

irrigation. This lack of safe water for drinking, sanitation, and hygiene, along with food insecurity and limited healthcare access, has triggered a public health crisis in the region.

Dr. Saheed Parvez, the General Duty Medical Officer at Madhabnagar Rural Hospital in Pathar Pratima block, shared, *“The majority of patients visiting the hospital suffer from hypertension, hypothyroidism, dermatological issues, diarrhea, and various stomach ailments, along with UTI and reproductive health-related issues. Approximately 60% of patients visiting the hospital experience dermatological problems, genital and urinary tract infections due to the usage of polluted water with higher salinity. Many women who come to the hospital for delivery are affected by genital infections, increasing the risk of infections for the unborn child.”*

While both men and women in the community face the consequences of disasters and their aftermath, it's crucial to acknowledge the interconnectedness of these challenges and their collective impact on the overall well-being of families. However, women's challenges, often unique and overlooked, warrant closer examination. This paper delves into the distinct health challenges faced by women to unravel the gendered and complex nature of climate change impacts.

While data and studies exist for other diseases, there is a significant lack of discussion and awareness surrounding women's health issues, particularly menstrual health, due to taboos and social stigma surrounding it.

"Climate Change's Varied Impact on Women's Reproductive Health:"

Climate change manifests differently in men and women. In the Sundarbans, women's health is profoundly influenced by climate change, particularly through its intricate effects on menstrual and reproductive health. The complexities of this impact are not straightforward; rather, they arise from a multitude of factors. Traditionally, women in the Sundarbans use pond water for bathing, a practice fraught with health challenges due to the water's saline and contaminated nature. Exposure to such water, whether during bathing, washing menstrual cloths, or spending extended periods fishing in the river, predisposes women to infections.

Potable Water Management: The management of drinking water sources varies across villages in the Sundarbans. In Chandipur, all respondents (100%) rely on government-provided community tubewells (hand pumps) as their primary source of drinking water. Similarly, in Hetalbari, the majority (99%) depend on community tubewells, while some use shallow pumps (6%) or purchase RO water cans (21%). Likewise, in Durbachati, the vast majority (99%) rely on community tubewells, while a small fraction (2%) have taps at home. In Mahendra Nagar, respondents mainly rely on both community (49%) and home taps (50%), with a few (1%) purchasing RO water cans. Access to clean drinking water varies; for example, in Chandipur, the majority (97%) obtain drinking water directly, while a few (2%) use cloth for purification and one person employs a home filter. In Hetalbari, 95% consume water directly, with only 5% using a home filter. In Durbachati, 90% use cloth for purification, 1% boil water, and 9% consume water directly. In Mahendra Nagar, all respondents (100%) use cloth for purification.

Water, Sanitation, and Hygiene (WASH) Practices: Bathing practices also differ among the surveyed villages. In Chandipur, all respondents use ponds as their primary bathing place. In Hetalbari, most (69%) use ponds, while a significant portion (23%) resort to using others' ponds, and a few rely on water from the panchayat tube well (3%) or bathe at home (5%). Similarly, in Durbachati, the majority (86%) use ponds, while some use water from the panchayat tube well (11%) or their own or others' bathrooms. In Mahendra Nagar, nearly all (99%) rely on nearby ponds, with a minority using water from the tube well (1%).

The widespread use of ponds for bathing, driven by limited access to alternatives like home bathrooms or tube wells, presents challenges during summers when pond water becomes saline. The absence of water treatment facilities leads to makeshift methods like filtering pond water with lime, which doesn't ensure clean water. Consequently, individuals are unwittingly exposed to contaminated water, resulting in skin irritations and infections in sensitive areas."

Menstrual Hygiene Management (MHM) Practices: The survey findings unveil disparities in MHM practices among respondents across various villages in the Sundarbans region. In Chandipur, the majority (55%) of respondents use cloth during menstruation, while 45% opt for sanitary napkins. Similarly, in Hetalbari, 40% of respondents use cloth, whereas 62% prefer sanitary napkins. In Durbachati, 50% of respondents rely on cloth, while 45% choose sanitary napkins. Conversely, in Mahendra Nagar, a significant majority (93%) of respondents use cloth, with only 21% utilizing sanitary napkins. The discrepancy in sanitary napkin usage across villages can be attributed to factors like the accessibility and affordability of menstrual products. Limited availability of healthcare centers and medical shops, particularly in areas like Chandipur 4 no., may contribute to lower sanitary pad usage. Conversely, in Hetalbari and Durbachati, where access to such facilities is relatively better, there is a higher prevalence of sanitary pad usage, especially among adolescent girls and young women who are more active outside the home. Additionally, age emerges as a significant factor influencing sanitary napkin usage, with younger women more likely to adopt these products due to increased health awareness and the necessity of using them while working outside the home.

Moreover, several women reported using cloth for menstrual hygiene but resorting to sanitary napkins only when traveling outside their villages. Among those using cloth, there is a common practice of washing menstrual cloths with contaminated water and drying them indoors, often in secluded and dimly lit areas to maintain privacy. However, this practice heightens their susceptibility to genital infections. Another notable issue is the financial strain of replacing sanitary napkins regularly, resulting in less frequent changes among users. This reluctance to change napkins frequently heightens the risk of infections, exacerbating the challenges women face in upholding menstrual hygiene and health.

Menstrual and Reproductive Health Concerns: Dr. Pallab Mondal, General Duty Medical Officer at Gosaba Rural Hospital, observed, "*There are increasing cases of white discharge, recurring UTIs, irregular bleeding, and cysts among women over 30.*" The absence of advanced diagnostic facilities complicates diagnosis and treatment, often leading to referrals to larger, distant government hospitals. Despite recommendations against pond bathing, many women in the region find it unavoidable due to practical constraints. Hand pumps are scarce, situated far from most homes, and designated mainly for drinking and cooking due to limited supply.

A significant 77% of the 400 women interviewed reported menstrual and reproductive health issues. However, perceptions about water quality's impact on menstrual health differ among women from various Sundarbans villages. In Chandipur 4 no., only 25% of respondents recognize water quality changes affecting menstrual health, whereas 75% do not. In contrast, all respondents in Hetalbari acknowledge this effect. Similarly, in Durbachati, 77% see a direct correlation between water quality and menstrual health, with 23% dissenting. In Mahendra Nagar, 88% believe water quality issues impact menstrual health, with 12% disagreeing. These differences highlight diverse community perspectives. The minority agreement in Chandipur suggests a potential lack of environmental awareness compared to other villages, possibly due to educational disparities and awareness levels about environmental health issues.

Health issues related to water quality and menstruation vary among women in the Sundarbans. In Chandipur, 62% of respondents do not associate water quality changes with menstrual health issues. Among those who do, reported problems include skin irritation around the genital area (21%), irregular menstrual cycles (1%), increased white discharge (3%), painful cramps (5%), light bleeding (2%), and other symptoms like vomiting and stomach infections. In Hetalbari, respondents link menstrual health problems to water quality, reporting increased white discharge (54%), light bleeding (28%), skin irritation around the genitalia (31%), uterine cancer (2%), irregular menstrual cycles (33%), painful cramps (29%), heavy bleeding (21%), and UTIs (1%). In Durbachati, common issues are skin irritations around the genitalia (26%), heavy bleeding (23%), increased white discharge (16%), irregular menstrual cycles (15%), painful cramps (10%), and light bleeding (11%). In Mahendra Nagar, respondents report increased white discharge (66%), skin irritations around the genitalia (56%), UTIs (31%), painful cramps (16%), uterine cancer (1%), heavy bleeding, light bleeding (1% each), and irregular menstrual cycles (20%). Notably, Mahendra Nagar shows higher instances of UTIs and uterine tumors and cysts, suggesting a need to explore possible links between water quality and these health issues.

Discussions revealed a trend of normalizing skin and menstrual/reproductive health problems among women in the Sundarbans. These issues have become so commonplace that they are often seen as routine unless they become severe. Consequently, many women initially claimed to have no health issues. However, further probing and mentioning specific symptoms like white discharge, heavy bleeding, UTIs, and irregular periods led them to acknowledge these problems. This normalization underscores the urgent need to raise awareness and address these health concerns, ensuring they are properly recognized and managed.

Seeking Medical Assistance for Menstrual and Reproductive Health Issues: The tendency to seek medical consultation for menstruation-related health problems differs across the Sundarbans villages. In Chandipur 4 no. and Hetalbari, a substantial portion of respondents, 82% and 83% respectively, reported seeking medical advice. However, in Durbachati and Mahendra Nagar, only 47% sought medical help. Notably, many respondents considered advice from ASHA workers as medical help, which blurs the lines between professional medical care and community health assistance. Financial constraints and limited access to medical facilities were significant barriers, particularly in Mahendra Nagar. Additionally, a significant number of respondents across all villages do not deem it necessary to consult a doctor for menstrual health issues. They often manage these problems independently, reflecting a lack of awareness or prioritization of menstrual health within the community.

3.3 Factors Increasing Women's Vulnerabilities:

Male Migration Dynamics

Male migration significantly contributes to the heightened vulnerabilities of women in the Sundarbans. The high incidence of male migration, driven by the decline in livelihood opportunities due to climate change, leaves women, children, and the elderly to manage household responsibilities. In this scenario, even non-commercially fishing women often resort to fishing in rivers and ponds to secure food for their families. This intricate relationship between climate change, loss of livelihoods, agricultural yields, property loss, and economic burden further intensifies the challenges faced by women.

Livelihood Types and Health Risks

Women in the Sundarbans are highly susceptible to menstrual and reproductive health issues due to direct contact with contaminated and saline pond water. This exposure is nearly universal among women in the surveyed villages. Occupations such as waist-deep fishing result in prolonged exposure to contaminated river water, increasing health risks. Infections are particularly severe among those who spend more time in the river, highlighting the occupational hazards faced by women in these activities. These insights underscore the need for targeted interventions to mitigate these risks and promote reproductive and menstrual health equity in the region.

Economic Constraints and Period Poverty

Period poverty is a prevalent issue in the Sundarbans, exacerbating menstrual health challenges. Due to economic constraints and limited access to menstrual hygiene products, many women resort to using unhygienic alternatives like cloth, leading to infections and other health complications. The lack of proper menstrual hygiene management affects their physical health, overall well-being, and dignity. The stigma surrounding menstruation further marginalizes these women, preventing them from seeking support or accessing essential resources.

Lack of Access to Healthcare and Hygiene Resources

Limited access to healthcare facilities and hygiene resources emerged as a critical concern among women. The surveys indicated that inadequate access to menstrual hygiene products and healthcare services exacerbated women's vulnerability to health issues.

Lack of Awareness

There exists a significant gap in awareness regarding reproductive and menstrual health in the Sundarbans, perpetuating misconceptions and taboos. This lack of understanding leads to women's reluctance to prioritize their health and seek timely treatment, exacerbating existing challenges. Consequently, inadequate healthcare access persists, resulting in poor health outcomes for women in these communities.

Among elderly women in the Sundarbans, there is a prevailing perception that menstrual and reproductive health issues are unrelated to water quality. Many elderly women, accustomed to using pond and river water for decades, attribute health problems to misfortune or the

physical demands of their daily labor. This perception reflects a lack of awareness about the connection between water quality and reproductive health.

Dipali Bhunia, a 35-year-old from the fishing community in Mahendra Nagar village, mentioned, *"We have 15 patients with uterine tumors in our Purbo Para hamlet, which has 100 households. Women in the village feel shy and don't share early symptoms with anyone. If the symptoms are treated at the early stages, these kinds of major complications can be avoided."*

This reluctance to prioritize their health and seek timely treatment further complicates these issues.

4. Discussion:

The South 24 Parganas district in the Sundarbans is recognized as one of the regions most vulnerable to climate change in India, earning it the label of the cyclone capital. This vulnerability is due to its unique geographic location, ecological fragility, and socio-economic conditions, which together make it highly prone to the negative impacts of climate change, thereby worsening existing vulnerabilities and inequalities within the communities.

Research conducted in the Sundarbans, India, has provided a deep insight into the complex vulnerabilities created by climate change, especially emphasizing the gender-specific aspects of these challenges. By examining the experiences of local communities, particularly women, the study reveals the diverse effects of environmental degradation on livelihoods, health, and overall well-being.

One of the most notable findings is the severe impact of climate change-induced natural disasters on the resilience and livelihoods of communities. For example, the stories from residents of Chandipur, Hetalbari, Durbachati, and Mahendra Nagar highlight the repeated hardships faced by families as they attempt to recover after cyclones and floods. The destruction of crops, infrastructure, and livelihood resources not only increases economic vulnerabilities but also perpetuates cycles of poverty and food insecurity, especially affecting women who often carry the burden of household chores and caregiving.

The research also highlights the critical connection between deteriorating water quality and women's health in the Sundarbans. Surveys and participatory workshops reveal that women, who primarily rely on contaminated and saline water sources for daily activities, face increased risks of reproductive and menstrual health issues. For instance, the accounts from women in Chandipur and Hetalbari show the difficulties in maintaining menstrual hygiene without access to clean water and adequate sanitation. These problems are worsened by limited access to menstrual hygiene products and healthcare services, leading to ongoing poor health outcomes and reinforcing gender inequalities.

Additionally, the study brings attention to the compounded vulnerabilities women face due to factors such as male migration and economic hardships. For example, women from Mandra Nagar share how the departure of men in search of work leaves them with greater household and livelihood responsibilities. The widespread issue of period poverty further highlights the

need for solutions that address the economic barriers to accessing menstrual hygiene products and healthcare.

In Chandipur, where low levels of education contribute to a lack of awareness, accessing healthcare is particularly challenging. Accounts indicate that women often struggle to get timely medical help for menstrual and reproductive health issues due to financial constraints and a lack of awareness about available services. Period poverty adds to these difficulties, as many women cannot afford basic menstrual hygiene products, leading to negative health outcomes and perpetuating cycles of poverty.

The study reveals a significant lack of data on menstrual and reproductive health issues in the Sundarbans. Despite the prevalence of these issues among women, health centers mainly focus on common ailments like malaria and dengue, neglecting menstrual health management (MHM) and related risks. Health centers are not required to record issues such as white discharge, irregular periods, early menopause, or heavy bleeding, nor are urinary tract infections (UTIs) systematically documented. Existing health programs prioritize pregnancy and mother-child health, overlooking menstrual and reproductive health. This neglect continues even during disasters like cyclones and floods. To address this gap, it is crucial to integrate menstrual and reproductive health into the healthcare system, giving these issues the same priority as other waterborne diseases. Efforts should be made to ensure that health centers systematically collect data on these health issues, enabling informed decision-making and targeted interventions to protect women's health in the face of climate change.

In light of these challenges, the study emphasizes the need for context-specific and gender-responsive adaptation strategies that focus on the needs and priorities of vulnerable communities in the Sundarbans. Initiatives to improve access to clean drinking water, enhance sanitation infrastructure, and promote menstrual hygiene management can greatly improve women's health outcomes and resilience to climate impacts. Additionally, involving women and marginalized groups in decision-making processes can ensure that adaptation strategies are more inclusive, participatory, and sustainable in the long term.

In conclusion, the research conducted in the Sundarbans highlights the urgent need for comprehensive and gender-responsive approaches to climate adaptation that address the intersecting vulnerabilities faced by communities, especially women. By prioritizing the voices and experiences of marginalized groups, policymakers and practitioners can develop more effective and equitable strategies to build resilience and promote sustainable development in the face of climate change.

5. Moving Forward:

Despite the urgency of addressing the intersecting challenges of climate change and women's health in the Sundarbans, significant gaps exist in policy recommendations and their execution. One notable gap is the lack of integration between climate adaptation and menstrual health policies. While some initiatives acknowledge the importance of water quality management for overall health, there is a limited focus on menstrual hygiene management as a specific component of climate resilience strategies. Additionally, the translation of policy recommendations into actionable programs faces numerous execution

challenges. Limited financial resources, bureaucratic hurdles, and competing development priorities often hinder the effective implementation of policies targeting women's health and climate resilience. Moreover, the top-down approach to policy formulation may overlook the insights and needs of local communities, leading to disengagement and resistance to proposed interventions. Addressing these gaps requires a paradigm shift towards participatory policy development processes that involve women and marginalized groups as key stakeholders. Furthermore, capacity building, multi-stakeholder collaboration, and innovative financing mechanisms are essential to overcome execution challenges and ensure the successful implementation of gender-responsive climate adaptation policies in the Sundarbans.

Creating a resilient future for the women of the Sundarbans requires a multifaceted approach that addresses the dual challenges of climate change and menstrual and reproductive health. The region's water quality is a major concern, as it directly affects the health of women who rely on contaminated sources for daily use. There is an urgent need for additional scientific research to provide evidence-based interventions tailored to the specific health issues faced by the women in this region.

Moving forward, it is crucial to integrate health and climate strategies, mainstreaming menstrual and reproductive health into these plans. This includes promoting gender-responsive adaptation and ensuring women are active participants in decision-making processes. Raising awareness, developing cost-effective water quality improvement technologies, and implementing community-driven solutions are key steps. Collective action from policymakers, local authorities, and community members is essential to foster resilience and sustainability. Immediate, inclusive policies and practical interventions are needed to protect the well-being of women in the Sundarbans. The urgency of the situation cannot be overstated—delays in action will only increase their suffering and vulnerabilities.

Recommended Actions:

- **Expand Scientific Research:** Conduct comprehensive scientific studies and clinical research to generate detailed evidence for addressing women's health challenges in the Sundarbans. This should include the involvement of women's self-help groups in maintaining health records to enable targeted interventions.
- **Increase Awareness:** Educate communities about the risks and challenges they face, empowering them to make informed decisions and take proactive measures.
- **Implement Gender-Responsive Policies:** Develop and enforce policies that address the specific needs and vulnerabilities of women, promoting gender equality and empowering women. These policies should enhance women's access to resources, financial services, and social protection mechanisms.
- **Integrate Menstrual and Reproductive Health:** Incorporate menstrual and reproductive health into primary healthcare services and climate adaptation strategies. This includes ensuring access to affordable menstrual hygiene products, raising awareness, and adopting gender-sensitive approaches in climate action plans.

- Empower Women: Provide education, skills training, and leadership opportunities to women, encouraging their involvement in decision-making processes related to climate adaptation and disaster preparedness.
- Ensure Resource Equity: Guarantee fair access to essential resources such as clean water, healthcare facilities, and livelihood opportunities, addressing socioeconomic disparities to enhance resilience among marginalized communities.
- Develop Climate-Resilient Infrastructure: Invest in infrastructure and technologies designed to withstand environmental challenges, such as flooding and salinity intrusion. Utilize nature-based solutions, like mangrove restoration, to offer natural disaster protection.
- Enhance Community Capacity: Offer training programs to improve communities' ability to manage climate-related risks. This includes education on sustainable agricultural practices, disaster response strategies, and health awareness.
- Support Research and Innovation: Encourage research to better understand the intersections of gender, climate change, and health in the Sundarbans. Promote innovative adaptation strategies, including low-cost technologies and community-based solutions.
- Foster Partnerships: Build collaborations among government agencies, NGOs, academia, and local communities to coordinate efforts and maximize resources. These partnerships should aim for holistic and sustainable solutions to complex challenges.

By adopting these strategies, we can work towards a future where the women of the Sundarbans are empowered and resilient, capable of thriving despite the challenges posed by climate change.

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