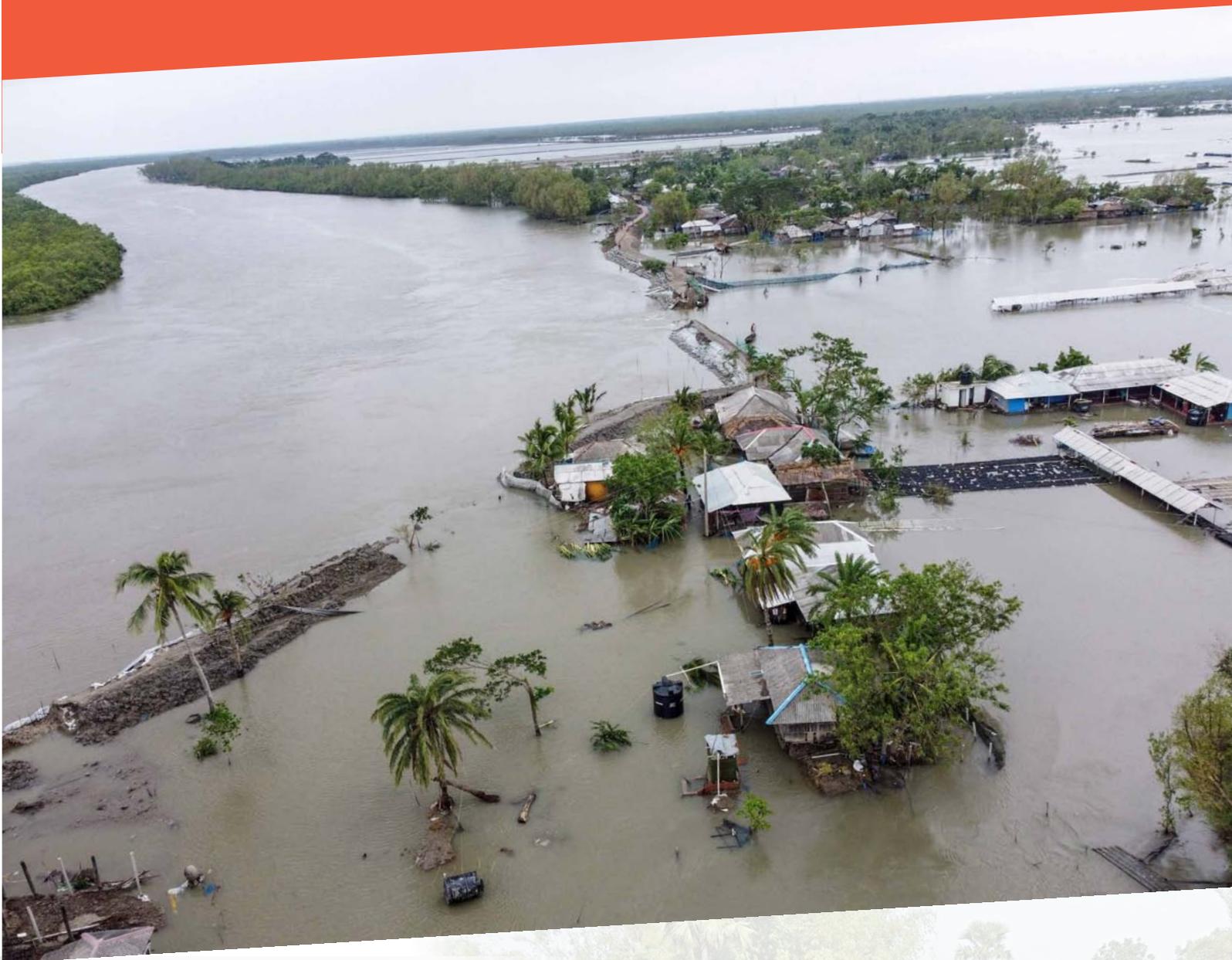


**LOCALLY-LED ADAPTATION PLANNING
COMMUNICATING GROUND REALITIES TO
BANGLADESH'S NAP PROCESS**



IMPRINT

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ABBREVIATIONS

BBS	Bangladesh Bureau of Statistics
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
CEGIS	Centre for Environmental and Geographic Information Services
CSO	Civil Society Organization
EIA	Environmental Impact Assessment
IGA	Income-Generating Activities
IPM	Integrated Pest Management
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NDCs	Nationally Determined Contributions
SDG	Sustainable Development Goals
SIA	Social Impact Assessment
TRM	Tidal River Management
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme





CHAPTER

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CONTEXT

Adaptation to the impacts of climate change has become one of the pressing development challenges and an undeniable concern of the climate-vulnerable communities and countries. The high degree of exposure to the climate change-induced disasters and the customary dependence on risk-sensitive sectors like agriculture, fisheries, tourism, etc. made the already risk-exposed countries and communities disproportionately vulnerable to any likely impacts of climate change. Essentially, vulnerabilities to the impacts of climate change are non-identical, predominantly are shaped by the local geographical settings (function of exposure), economic activities and means of livings (function of exposure and sensitivity) and people's ability (function of economic, social and cultural settings) to withstand and recover with full potentialities from a sudden shock or persistent impact. While exposure to a climatic hazard could provide a broader sense of situational vulnerability, this cannot provide a comprehensive understanding on the relative vulnerabilities of the people exposed to the same hazard. The relative vulnerability is a function of sensitivity and adaptive capacity, which are not alike. Usually, poor and the less privileged ones who already are with poverty, inequality and distributive injustice are at the highest level of relative vulnerability.

Hence, adaptation to the impacts of climate change should not only be based on the perceived vulnerability (e.g., considering the exposure only) and with some engineering solutions to mitigate the risks (e.g., cyclone and flood preventive infrastructures), rather it also should consider a human dimension in planning and deciding actions. And, this should follow a comprehensive, site-specific, bottom-up vulnerability analysis, while also

providing due attention to the existing fault lines of inequality and social exclusions such as gender discrimination, ethnicity and socio-economic deprivation. However, concern remains on the comprehensiveness of a site-specific and localized vulnerability analysis informed by the fault lines of the inequalities and exclusion. It seems unlikely, because the current practices of the centralized planning and the power dynamics around are dominated by individual and group interests (Alam et al., 2011) that provide little spaces for the excluded communities to interact. Bangladesh’s earlier climate-specific plans e.g., NAPA, BCCSAP and lately the NDCs all followed a centralized planning process; they neither were informed by the area-specific vulnerabilities and challenges nor did follow a participatory, transparent and accountable mechanism on deciding the actions and priorities. NAPA followed a top-down process in assessing adaptation needs, options and priorities and BCCSAP was merely a specialist-driven exercise that had been finalized through organizing a few workshops in Dhaka (Hossain, 2009; Raihan et al., 2010). Such a process structurally keeps away broad-based participation of stakeholders from the national planning and decision-making process.

Considering these systemic challenges of developing a comprehensive plan, a bottom-up (locally-led) process has been implemented in three agro-ecological zones (also the climate hotspots) e.g., in the a) lower Ganges-Brahmaputra-Meghna (GBM) river basin areas located in the South-central Bangladesh, b) South-west coastal areas exposed to tropical cyclones and sea-level rise, and c) North-west Barind areas experiencing less rainfall and drought-like condition, and home of plain-land indigenous communities. The process identified context-specific impacts and adaptation requirements through locally-led discussions and shared the study findings with the local as well as national policy stakeholders.

As a short-term objective, the process aims to inform the ground realities of climate change impact and adaptation requirements to Bangladesh's NAP process. The ultimate objective is to offer a way to promote autonomous and planned adaptation, while bridging the ostensible gap between adaptation ‘by the people’ and adaptation ‘for the people’ (Figure 1; Shamuddoha and Bijoy, 2015). The process also would help in complementing the central planning with the local priorities, and channeling adaptation resources to the most vulnerable communities and people.

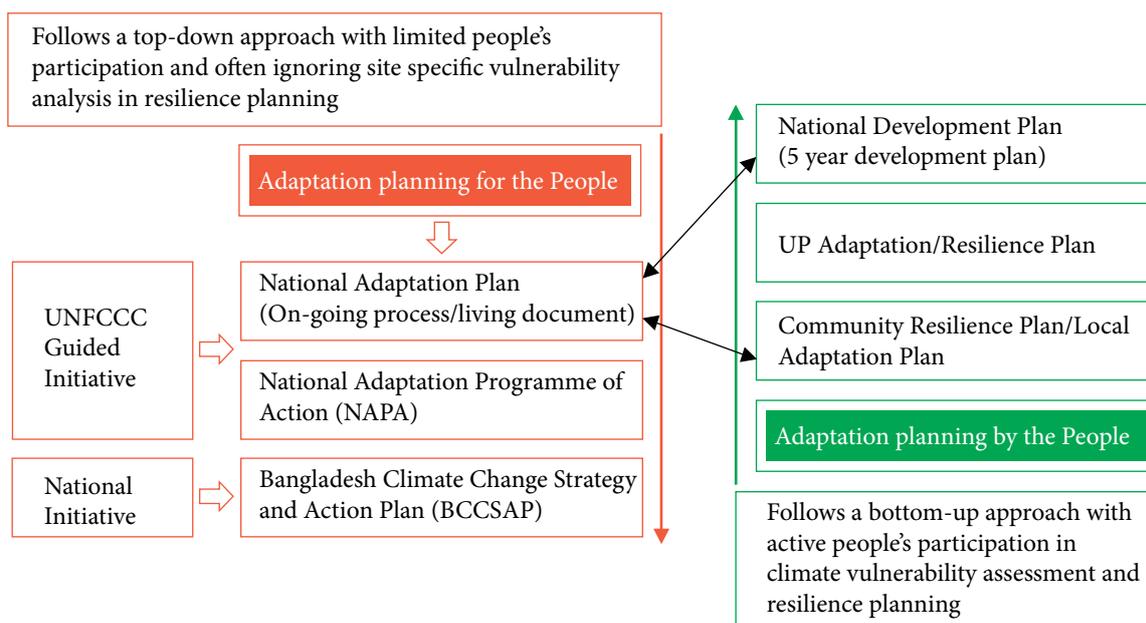


Figure 1: Adaptation Planning for the People Vs Adaptation Planning by the People.



CHAPTER 1 2 3 4 5 6

OBJECTIVES, LOCATIONS & METHODOLOGY

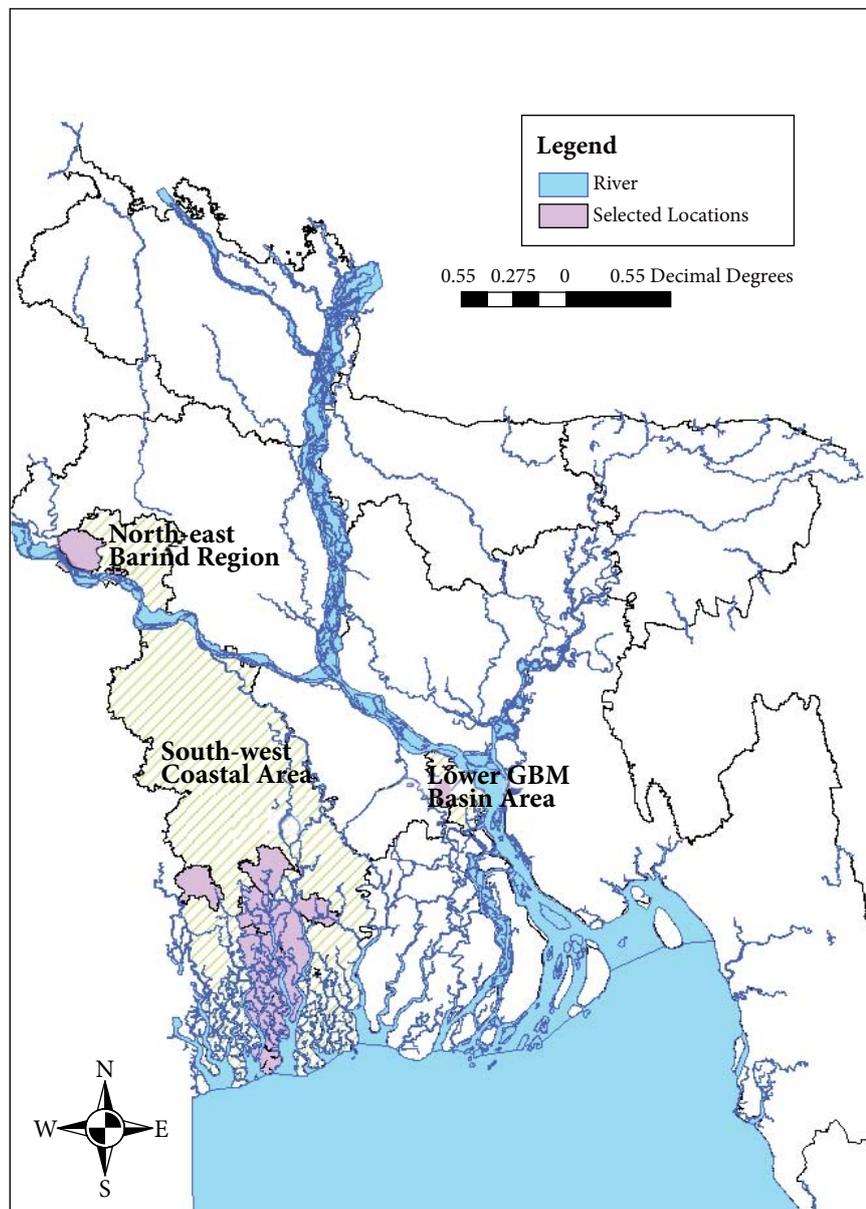
With the focused policy orientation towards climate change adaptation, Bangladesh meantime started developing its National Adaptation Plan (NAP) which is considered one of the prerequisites to mainstream adaptation to the national as well as to the sectorial plans and priorities. Literally, NAP would be the country-based operational vehicle for channeling resources from the Green Climate Fund.

Bangladesh's NAP process is supposed to follow the UNFCCC's guideline and a Roadmap that the government of Bangladesh developed years ago. Bangladesh's NAP Roadmap provided a holistic view and scope of mainstreaming adaptation to the development priorities through aligning it to the Sustainable Development Goals (SDGs), Bangladesh Delta Plan 2100, Perspective Plan, Five-year Development Plan, and the target of the country to graduate from LDC to a middle-income one (MoEF, 2015).

This locally-led process and sharing the ground realities with the policy stakeholders intended to complement Bangladesh's NAP process through communicating localized climate change impacts and adaptation requirements. This is also to set an example of a bottom-up, locally-led planning to be developed by the climate risk-exposed communities, CSOs and local government organizations.

The locations for the locally-led process have been purposively selected considering diverse geographical positions, agro-ecological settings and differentiated impact scenario. They are the South-west coastal areas, the North-west Barind region and the South-central river basin areas (Figure 2).

Figure 2: Selected Locations of the locally-led process



The South-west coastal areas of Bangladesh (Khulna), have a tropical monsoon climate with four distinct seasons-pre-monsoon (March to May), monsoon (June to September), post-monsoon (October to November) and dry season (December to February). These areas receive an average annual rainfall ranging from 1700 millimeter to 2200 millimeter and average annual temperature ranging from 25 degree C to 30 degree C (Setu et al., 2014).

The economy is mainly agriculture-based, having potential of rice, shrimp, fish and jute cultivation (BBS, 2014). It is the hub of shrimp cultivation that supplies 75 percent of the country's shrimp export. Currently, crab farming and export from the South-west coastal areas have also been increased significantly.

These areas are part of recent time alluvium of the deltaic plain in the north

and Ganges tidal floodplain in the south (Roy et al., 2005) and subject to the influence of tidal surges. International Institute for Environment and Development (2009) identified these coastal areas highly susceptible to the recurrent floods, storm surges, cyclones, water-logging, saline intrusion, sedimentation, and riverbank erosion. These areas are also being increasingly exposed to soil and water salinity with their severity levels, which are affecting the Sundarbans (SRDI, 2010), the world's largest contiguous mangrove ecosystem in 20,400 sq km areas stretching along the coast of Bangladesh and India.

The North-west Barind region (Rajshahi Division) has always been a concern for its relatively higher temperature and lower rainfall than the national average. In the hot summer months, the average temperature exceeds 43 degree C with daily humidity ranging from 60 percent to 85 percent (Ahmeduzzaman et al., 2012). November to March are the driest months when the region receives literally no rainfall and water supply from the trans-boundary rivers. The flows of Ganges-Jamuna River systems and the rainfall are the key sources of surface water as well as groundwater recharge.

According to BBS (2005), 39 percent people of the Barind region depend on rice cultivation, livestock, and forestry, and 34 percent are agricultural labour (Clemett et al., 2006). However, agricultural activities are being hampered due to growing shortfall of the trans-boundary river flows as well as the rainfall. The situation is forcing the smallholders to switch from the cereals to the cash crop cultivation (e.g., mango, dragon fruit etc.), and also

to convert agricultural lands to water reservoirs, ponds, and brick kilns (Group Discussions).

Bangladesh's Nationwide Climate Vulnerability Assessment Report 2018 depicted the Barind region as a growing drought and desertification sensitive area, which could be extended to almost all the Upazillas by 2085 (Goosen et al., 2018).

The lower Ganges-Brahmaputra-Meghna (GBM) river basin areas are situated in the South-central part of Bangladesh. The downward confluence of the Padma and the Brahmaputra rivers and the isolated Chars are highly exposed to monsoon flooding, riverbank erosion and tropical cyclones.

The constant shifting of the riverbanks, especially in the Char areas of Shariatpur district, forces people to 'move' with the 'flows', making them destitute and homeless. More than 10 percent of the land areas of Shariatpur district is exposed and sensitive to riverbank erosion and about 323.64 sq. km is highly exposed to storm surges of 1 meter height or above (Sarker and Ahmed, 2015).

Bangladesh's Nationwide Climate Vulnerability Assessment Report 2018 ranked this river basin areas (Shariatpur district in particular) as the most vulnerable to the impacts of climate change, particularly to the high impact floods, river bank erosion, forced displacement and involuntary migration.

On the other hand, the Bangladesh's Poverty Map 2010 ranked this district with the highest poverty incidences with maximum poverty rate (52.6 percent) among the 17 districts in Dhaka Division.



As stated earlier, the locally-led process involves two major objectives; first, to complement Bangladesh's NAP development process through communicating localized and context-specific climate change impacts and adaptation requirements and, second, to set an example of bottom-up, locally-led planning developed by the local actors e.g., climate risk-exposed communities, CSOs, local government organizations etc.

Aligning to the stated objectives, a participatory consultative approach has been employed to understand the localized impacts of climate change in three different agro-ecological zones. The process involved several locally-led discussions with the people of the selected locations, including climate risk-exposed communities, CSOs, media, local government organizations, government agencies, indigenous and marginalized communities, local associations and trade organizations, women groups etc. who were divided into four sub-groups focusing on Water Resources and Infrastructure, Agriculture, Health, and Women. The group discussions were followed by a presentation on the country's overall vulnerability context, drawbacks of the traditional/centralized planning process and the scopes of integrating context-specific adaptation requirements to the country's adaptation plan (e.g., NAP). The group discussions identified climate change impacts and adaptation requirements of the most climate sensitive sectors/issues relevant to the selected areas. Findings of one group have been cross-checked and validated by the other groups and finally presented/shared with all the participants for final validation and endorsement.

A total of 12 group discussions (FGDs) (four in each location) were conducted keeping a representational balance in terms of gender, age and socio-economic status (Table 2). The process involved several key informant interviews (KIIs) (five from each location) with the officials/representatives of the local governments, community-based organizations (CBOs), climate risk-exposed communities etc., and a thorough review of the available literatures. Separate guidelines and checklists for the group discussions and KIIs were developed and followed.

On the second objective, a national level sharing event was organized to communicate localized climate change impacts and adaptation requirements to the policy stakeholders and experts, especially those who are involved in the NAP process. Table 1 presents an overview on the methodological tools employed in the locally-led processes.

Table 1: An overview of the methodological tools

Data collection methods	Instruments	Data sources	Total unit
Group Discussions	Guideline and Checklist	<ul style="list-style-type: none"> Officials/representatives of CSOs, media, local government organizations, government agencies, indigenous communities, local associations, trade organizations, women group 	<ul style="list-style-type: none"> 12 (four in each study area)
Key Informant Interviews	Guideline and Checklist	<ul style="list-style-type: none"> Climate risk exposed people, local government officials, members of the CSOs, Media and community organizations 	<ul style="list-style-type: none"> 15 (five in each study area)



CHAPTER

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CLIMATE CHANGE IMPACTS AND ADAPTATION REQUIREMENTS

SOUTH-WEST COASTAL AREAS

The South-west coastal areas of Bangladesh, influenced by the hydrology of the Ganges flood plain, comprise of Bagerhat, Khulna, Satkhira, Jessore, Narail and Gopalganj districts. The presence of the World's largest mangrove ecosystems along the edge of the South-western districts and the existence of creeks, canals and tidal wetlands have blessed this region with the richness of biological resources e.g., coastal and off-shore fisheries, forest-based goods and services etc. The unique geo-physical settings, embedded with the richness of natural resources, have historically been shaping livelihoods, culture, kinship etc. of the people living in these areas.

Yet, these areas are highly exposed to tropical cyclone that strikes almost every year usually in the Bangla months of Vadra (July-August) and Agrahayan (November-December). The areas were hard hit by Super cyclones SIDR in 2007 and Aila in 2009, also were affected by other high-impact cyclones including Fani in 2019, Matmo and Bulbul in 2019, Amphan in 2020 and Yaas in 2021. Among them, Cyclone SIDR and Aila caused huge economic loss and damages of nearly US\$ 1.1 billion and US\$ 1.7 billion respectively (CPRD, 2018).

The increased number of the ropical cyclones hitting Bangladesh's coast evidently confirms the propensity of the Bay of Bengal in generating frequent and intense rough sea events. A trend analysis of the prevalence of tropical cyclone in the Bay of Bengal from 1985 to 2009 confirmed rise of the rough weather events in

South-west Coastal Areas

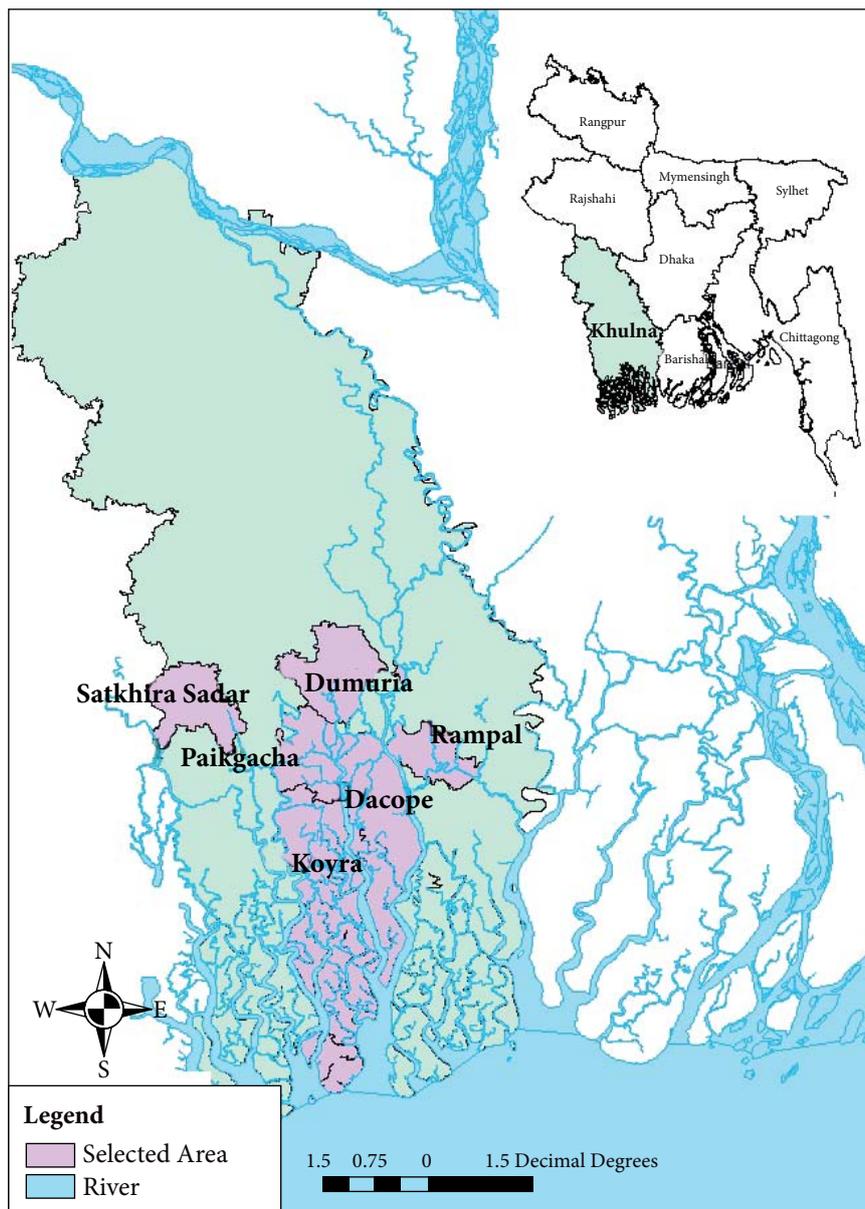


Figure 3 shows the locations (Satkhira Sadar, Dumuria, Paikgacha, Rampal, Dacope, Koyra) of the stakeholders' representation to the local consultations

Key Impacts

- Increased salinity and prolonged waterlogging;
- Increased frequency of cyclone and tidal surges;
- Massive changes in land-use due to reduced scopes of the agricultural activities;
- Drying-up of the surface water sources and depletion of ground water table;
- Increased incidences of hypertension, pre-eclampsia and miscarriage resulting from saline water intake.

Key Adaptation Requirements

- Introducing participatory and effective water management system;
- Introduction of tidal river management (TRM) in the water regulatory systems;
- Facilitating women's socio-economic empowerment through introducing climate resilient, locally adaptive income-generating activities (IGA);
- Combatting corruption in water infrastructure development and ensuring good governance in service delivery mechanism.

the Bay, an annual average from 5.48 to 7.94 resulting from the rise of sea surface temperature by 0.30-0.48 degree C (CPRD, 2012). The increased number of the rough sea events, which were unlikely even a decade ago, are now directly affecting the only means of livings of the coastal fishers (ibid). Along with the rise of sea surface temperature, a subsequent decline in pH level near Bangladesh's coast, especially in the winter and fall, has been reported by Sridevi et al. (2021).

Discussions in the South-west coastal areas also confirmed increased frequency of tropical cyclones, intensified tidal surges, irregular rough sea events etc. Such extreme events are not only causing immediate devastations of lives and assets but also causing long-term residual impacts, while outspreading the impact chain to the secondary and tertiary impact levels. It's almost one and a half decades since the Cyclone SIDR and Cyclone Aila hit the South-west coastal areas, yet the residual impacts of those cyclones e.g., logging of saline water, contamination of drinking water sources, acute drinking water crisis etc. have remained as the persistent problems. Still, more than 100000 cyclone-displaced people are believed to be living on the embankments and in makeshift shelters, many already are forced to involuntary as well as cross border migration (CPRD, 2015).

Aside from the cyclones, sea-level rise and the associated impacts like salinization of agricultural land, loss of vegetation, loss of agricultural production, freshwater crisis, health crisis etc. have been the evident impacts for a decade. The consistent rise of the sea level is causing gradual submergence of agricultural land, habitat, freshwater sources and critical ecosystems having both adaptation and mitigation potential. A recent estimation of sea-level rise by DoE (2020) indicated rising trends at different coastal locations of Bangladesh. Between 1901 and 2010 sea level has risen at a rate of 1.7 millimeter/year. Another analysis on tidal variation during 1993 to 2010 indicated 2.8 ± 0.8 millimeter /year sea level rise, which is further validated by satellite altimetry data with an increase of 3.2 ± 0.4 millimeter /year.

It's not only the sea level rise, the other causes like a) reduction of trans-boundary river flows due to diversion and withdrawal of water from its upstream, b) horizontal expansion of brackish water-based shrimp farm, c) inadequate maintenance of the water infrastructures and regulators e.g., sluice gates, embankments and dams, d) corruption and substandard construction of coastal infrastructures, e) governance failure in the public services delivery and management of the public commons etc. are also considered the salient causes of increased salinity front in the South-west coastal areas.

Consequently, saline water from the sea is gradually invading the freshwater areas, also contaminating underground water, leaving basically no option for irrigation-based crop production. The situation already has reduced crop and livestock production making the smallholders helplessly surrender (sell out) their small farmland to the corporate shrimp farms. The situation is making agricultural workforce (e.g., smallholders and agricultural labors) surplus who either stay there jobless or migrate elsewhere to make livings.

Salinity is also causing dire consequences to human health, especially on the women's reproductive health. Women, as a caregiver to other family members, shoulder the sheer responsibility of collecting potable water from the distant sources. Women, very often, try to save water for other family members, either consuming little by themselves or taking saline water instead. Consumption of saline water is reported to cause women's health problems like hypertension and pre-eclampsia, with more incidences in the dry season when salinity goes up (Group Discussion). The increased salinity front, on the other hand, has direct consequences on food security, health security, nutrition etc., while causing a disproportionate burden on women and adolescents.

The group discussions also confirmed increase of high blood pressure, miscarriage

Table 2: Climate change impacts as perceived by the people of the South-west coastal areas

Sectors/Issues	Impacts/Concerns
Water Resource and Infrastructure	<ul style="list-style-type: none"> • Increased frequency of the tropical cyclones and tidal surges; • Over-topping of tidal water inside the polders/embankments and channeling brackish water in the freshwater areas for shrimp cultivation; • Increased salinity due to tidal water influx and prolonged waterlogging; • Contamination of the freshwater sources by inundation/intrusion of saline water; • Massive land-use change, especially converting agricultural lands to brackish water shrimp farms; • Reduced flows of the trans-boundary rivers • Silting-up of the riverbeds; • Encroachment of natural drainage/canals/rivers for shrimp cultivation; • Riverbank erosion due to tidal surge; • Unplanned development works, especially development of the embankments, roads and water infrastructures; • Bio-accumulation and bio-magnification of water pollutants; • Over extraction of groundwater;
Agriculture	<ul style="list-style-type: none"> • Changes in the seasonal weather pattern; • Prolonged flood, waterlogging, drought and increased salinity level; • Filling up of river-beds and canals (Siltation); • Shrinking of freshwater sources and hampered agro-farm irrigation; • Increased use of chemical fertilizers and pesticides; • Increased conflict between farmers and fishers; • Changes in land-use pattern (conversion of agro-lands to non-agricultural ones)
Health	<ul style="list-style-type: none"> • Malnutrition due to reduced crop and livestock production; • Increased water-borne diseases; • Increased psychological stress/mental trauma due to recurrent losses of the assets and properties; • Increased number of births with physical disabilities and pre-mature death; • Collapse of sanitation systems during disasters;
Women	<ul style="list-style-type: none"> • High blood pressure & miscarriage for consuming saline water; • Increased prevalence of the urinary tract infections; • Increased prevalence of skin and waterborne diseases; • Disempowerment and social exclusion due to increase of unemployment and social insecurity; • Extra burden with increased physical and mental stress for collecting potable water from longer distances; • Increased vulnerability of adolescent girls due to their dropping out from school, employing them in risky jobs and marrying them off at an early age;
Non-climatic Factors/Issues	<ul style="list-style-type: none"> • Centralized planning with limited/structured participation of local people and communities; • Corruption in coastal infrastructure development; • Governance failure in public services delivery and management of the local resources, public commons etc.; • Decline/denial of CSOs and local community participation in the planning and implementation of adaptation/development projects; • Coordination gap among the local administration and their authoritative attitude to the common people as a 'ruler, not as a 'duty-bearer 'of this people's republic; • Slow implementation of development activities /projects; • Lack of monitoring in the construction, follow-up and maintenance of coastal infrastructures.

and other reproductive complications of women, which are attributable to their consumption of saline water. Besides, skin related problems and dehydration have increased due to constant and long immersion in saline water (e.g., for fishing or collecting crabs, crab-let, shrimp fry etc.). Several discussants reported increase of child mortality in the relatively high salinity areas. They also reported child malnutrition, linked to reduced agricultural and livestock production. Some of them commented that ‘meat, eggs, milk are becoming scarcer and costlier even than in the Dhaka city’.

Women are also being increasingly exposed to the socio-cultural dimensions of climate change impacts. Several discussants (especially the women) shared their experiences of being assaulted and harassed while going far away from home for collecting potable water.

Given the context, the resilience/adaptation measures that the government has implemented so far are around physical infrastructure-based protection systems e.g., construction of polders/embankments, however, have entirely ignored socio-economic dimension of adaptation and resilience building. They also ignored addressing differentiated vulnerabilities of women, adolescent girls, indigenous peoples and marginalized professional groups like fishers, forest-based livelihood earners etc. Besides, polders/embankments in many areas get damaged by the repeated cyclones and tidal surges.

In many areas, the newly constructed polders are not developed maintaining proper structure

(e.g., height and width), and are built with sub-standard materials, hence either get damaged or over-topped even by a medium category tidal surge. Many discussants raised their grave concern and frustrations on the structured corruption in the entire process of coastal infrastructure development. A major portion of the resources allocated for infrastructure development gets embezzled by the people involved at the stages of construction and development. The group discussions identified corruption as one of the major barriers to adaptation and resilience building. They suggested an additional sector/theme in NAP outlining governance and institutional responsibilities to combat corruption in its implementation. The group discussions remarked that ‘the ultimate objective of resilience-building cannot be achieved unless good governance is established and the level of corruption is reduced’.

The group discussions also raised their frustration on the decline/denial of CSOs and local community participation in the planning and implementation of adaptation (development as a whole) projects. They also commented on the coordination gap among the local authorities and their authoritative attitude as a ‘ruler, not as a duty-bearer’ of this people’s republic. **Table 2** represents the climate change impacts as perceived by the people of the South-west coastal areas.

Adaptation Requirements of the South-West Coastal Areas

To address the impacts stated above, the group discussions recommended a number of measures



Consultation in the south-west coastal area

Table 3: Adaptation requirements of the South-west coastal areas as suggested in the group discussions

Sectors/Issues	Adaptation Requirements
Water Resource and Infrastructure	<ul style="list-style-type: none"> • Re-construction of damaged or breached embankments, polders and water regulators and ensuring their regular maintenance; • Management of forest, forest resources and increasing forest coverage (afforestation); • Keeping the rivers live and flowing through regular dredging of river beds; • Establishment of a Coastal Area Development Authority or Board for transparent and accountable implementation of adaptation and development activities; • Technological upgradation for rain water harvesting to ensure safe water supply round the year (water preservation for a longer time); • Re-excavation of the existing water reservoirs and excavation of new ones; • Introducing/promoting community-led management (e.g., co-management) of the public commons e.g., common water bodies, forests and grazing lands; • Recycling and reuse of water; • Raising awareness on the negative consequences of ground water extraction and promoting efficient water use practices; • Introducing tidal river management (TRM) system in the water regulating structures;
Agriculture	<ul style="list-style-type: none"> • Promoting the use of surface water through excavating/re-excavating water structures like ponds/canals; • Cancelling lease agreements of the public commons and keeping them open for mass people use; • Introducing salinity-tolerant crop varieties and organic farming practices to neutralize salinity impact and conserve soil fertility; • Ensuring quality in coastal infrastructure development and their periodic maintenance; • Conservation of sanctuaries and native fish species; promoting cage aquaculture/or paddy-fish mixed culture in the waterlogged areas; • Establishing producer friendly supply and value chain of the essential agricultural products (rice, vegetables, wheat, potatoes, onions, livestock and fisheries etc.);
Health	<ul style="list-style-type: none"> • Introducing special healthcare services, including behavioral communication program; • Promoting homestead-based production of vegetables, poultry, cattle etc. to meet nutritional requirements; • Promoting safe food production through the organic farming practices;
Women	<ul style="list-style-type: none"> • Introducing special social safety net program for those who are being trapped in the increasingly risk-exposed situation; • Raising awareness on reproductive health, while providing free access to the essential healthcare services; • Promoting entrepreneurship through IGA skill development and interest-free credit facilities; • Facilitating women's participation in supply and value chain of the agricultural products marketing; • Establishing community-based counseling centers on reproductive health and menstrual hygiene;
Combatting Corruption and Governance Failure (Non-climatic factors)	<ul style="list-style-type: none"> • Establishing a special authority at the Prime Minister's Office to oversee implementation of all adaptation projects; • Ensuring open access to information on project's decision making and implementation (including design, procurement, funding source etc.), also creating a complaint mechanism for the citizens; • Establishing a joint monitoring mechanism and monitoring cell involving local government authority, CSOs and project beneficiaries; • Strengthening locally-led bottom-up processes in project planning and implementation.

ranging from preventing saline water intrusion (through strengthening physical infrastructures) to harvesting rain water for household water supply; from ensuring community-based management of common water sources to re-excavation of the existing water structures and excavation of new ones; from vulnerability-based resource allocation to effective and transparent utilization of resources; from providing capacity and technological support for climate-resilient cropping practices to ensuring a fair price for the agricultural commodities; from creating jobs for women to ensuring a safe and secure social environment for them; and so on.

The group discussions suggested establishment of a 'Coastal Area Development Authority' or 'Board' to ensure effective, transparent and accountable implementation of adaptation and development projects, especially construction of the embankments, polders, water regulating structures etc. They consider reconstruction of damaged embankments/polders as an immediate priority, developing a master plan to protect the South-west coast from the rising sea level, water logging, salinization, tidal surge etc. A sound land use planning for industrial development, agriculture, shrimp farms, vegetation, wetlands and waterbodies etc. has also been prioritized in the discussions. Besides, the group discussions suggested an institutional/policy directive for introducing Tidal River Management (TRM) that has already been proved as a technically sound, socially acceptable and economically efficient water regulation system. The discussions also strongly urged for regular river dredging so that the rivers are live with stronger current downwards. This will reduce the impacts of flooding, riverbank erosion and salinity intrusion (through pushing the progression of saline water downward).

The group discussions emphasized renovation, re-excavation of the community-based water sources and keeping them open as common property resources. They criticized leasing out of the common waterbodies (e.g., ponds, canals, lakes etc.) for some revenue income while putting the climate risk-exposed communities to the increased water and food insecurity and in the conflicting situation. The group discussions termed this an injustice to the climate victims, also contradictory to the people's constitutional rights.

The discussions urged for launching mass awareness (through national/private TV channels) on the negative consequences of ground water extraction and irrational use of insecticides/pesticides in crop and fisheries production. There are evidences of using poisons for fishing in the creeks inside the

Sundarbans. This is destructive to other fishery resources, also to human health. Such an illicit act should be stopped by any means, as emphasized in the discussions. The discussions also demanded a comprehensive strategy for promoting organic farming with an incentive in production and marketing of organic products.

In regards to climate adaptive agricultural practices, some level of salinity tolerant rice varieties have already been introduced, however, they have the limitations to withstand in higher salinity level. The discussions demanded technological upscaling to innovate relatively higher salinity tolerant rice and other crop varieties. The discussions also suggested creation of alternative occupations for the smallholders and surplus agricultural labourers, including the women, to stop involuntary, risky and unlawful cross border migration.

With respect to addressing disproportionate impacts on women, the group discussions suggested introduction of a special safety net program for those who are increasingly being exposed to and trapped in the situation where climate change impacts have become irreversible leaving limited space/scopes for adaptation. The discussions also recommended introduction of special health packages, including behavioral communication programs, to reduce impacts on women's reproductive health.

Though there have been many indigenous adaptation practices being nurtured for years, many of them are at the risk of being lost. Strong policy influence and preference towards physical infrastructure-based solutions, modernization of agricultural practices, technological advancement etc. have been identified as the challenges of the inter-generational transformation of indigenous knowledge and practices.

The group discussions demanded an in-depth investigative study and documentation of the indigenous practices and promoting them as viable adaptation measures as appropriate. The discussions also emphasized for a locally-led, bottom-up process for understanding climate change impacts, identifying and prioritizing adaptation actions and community participation in their implementation. Resilience to the impacts of climate change cannot be achieved by the centralized planning processes and in a power dominated unaccountable governance practices, as the group discussions remarked.

Table 3 presents the adaptation requirements of the South-west coastal areas as suggested in the group discussions.

North-east Barind Region

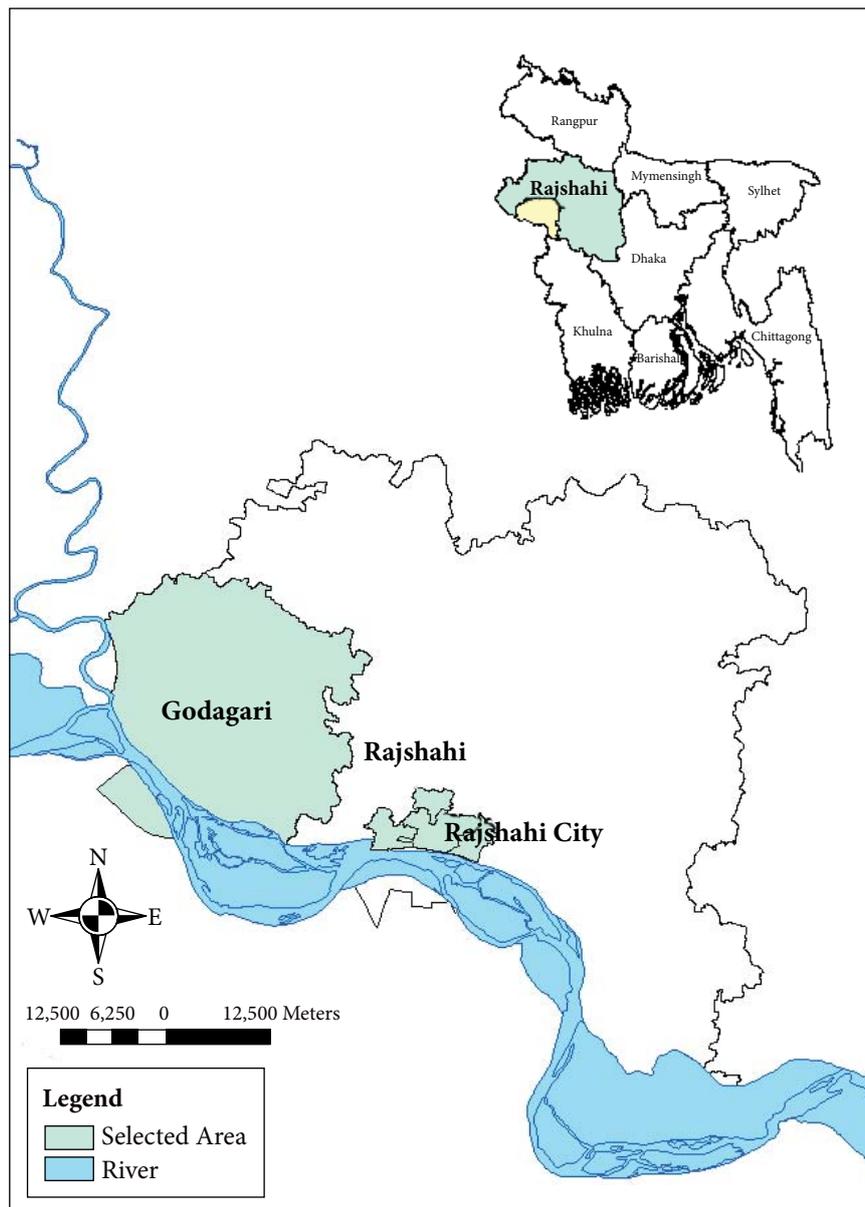


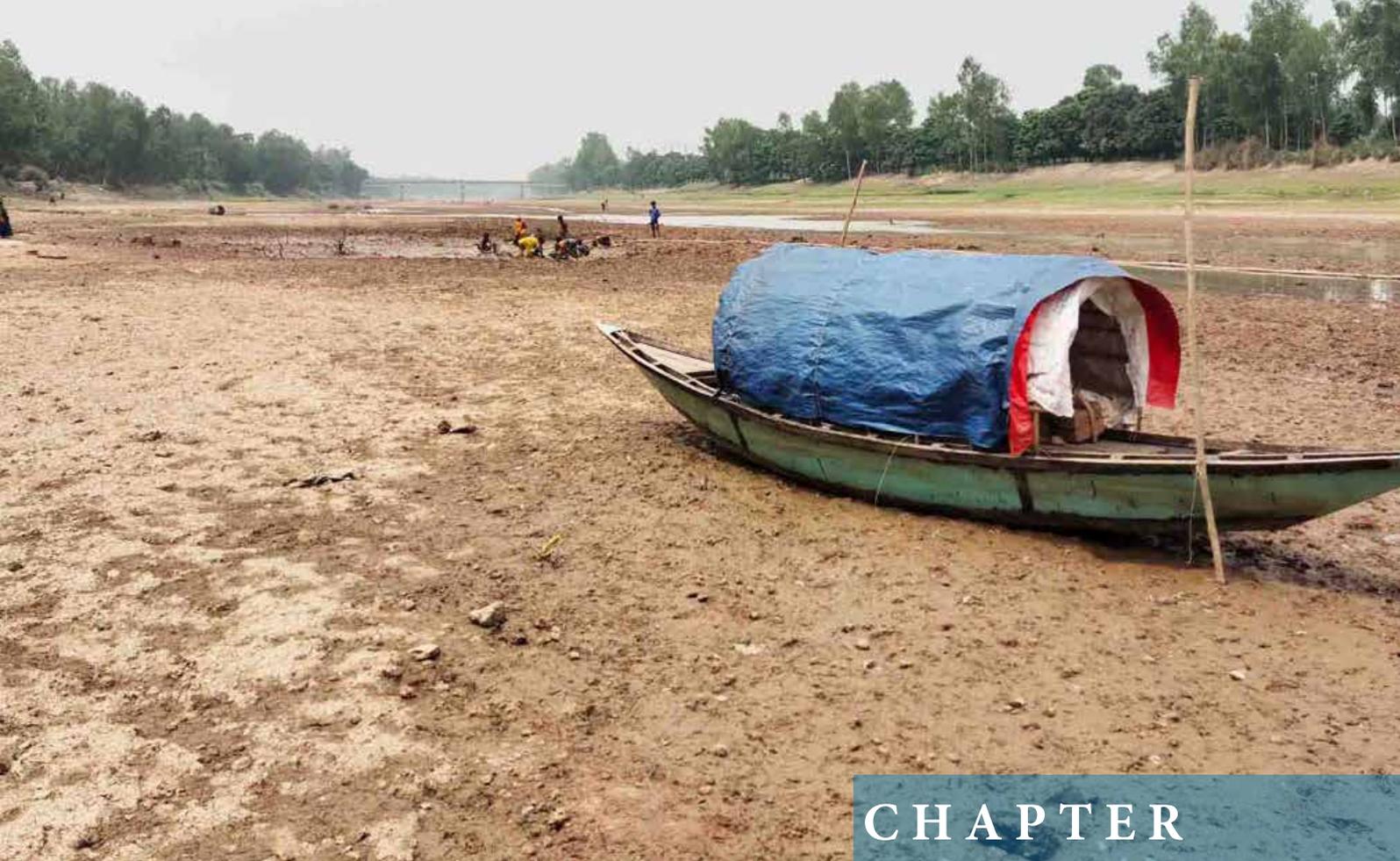
Figure 4 shows the areas (Godagari Upazila, Rajshahi City) of the stakeholders' representation in the local consultations

Key Impacts

- Acute drinking and irrigation water crisis due to scanty rainfall and gradual depletion of groundwater level;
- Loss of agriculture-based livelihoods due to loss in agricultural production and changes in land-use pattern;
- Drying-up of the common waterbodies (e.g., rivers, canals etc.) and private control on them;
- Collapse of the means of livings of the natural resource dependent indigenous community people
- Involuntary migration due to collapse of the agricultural activities.

Key Adaptation Requirements

- Establishing “Northern Rajshahi Irrigation System” to enhance the use of surface water;
- Increasing bilateral/ regional diplomacy for the fair share of trans-boundary river water;
- Recognizing women as a farmer and ensuring their authority over production and marketing;
- Keeping public commons (wetlands, forests etc.) open and accessible to the indigenous peoples;
- Conducting a standalone climate change vulnerability analysis of the indigenous peoples and identifying their differentiated adaptation needs.



CHAPTER

1 2 3 4 5 6

CLIMATE CHANGE IMPACTS AND ADAPTATION REQUIREMENTS

NORTH-WEST BARIND REGION

The North-western part of Bangladesh, known as the ‘Barind tract’, is currently experiencing adversities of climate change-induced weather anomalies, especially erratic rainfall, depletion of groundwater level and gradual desertification (Islam and Bray, 2017). It is one of the country’s driest parts with a mean annual rainfall ranging from 1250 millimeter to 1750 millimeter, which is almost half of the country’s annual average rainfall of 2300 millimeters (Mojid, 2020). This region is also experiencing a distinct variation in temperature ranges, remarkably higher in the summer and lower in the winter. The situation becomes even worse in the hotter summer when the increased rate of evapotranspiration put additional stress on the prevailing water scarcity situation. Aside from the climatic factors, unsustainable development practices like grabbing of the public commons e.g., ponds, canals, wetlands etc. and converting them for agricultural production are also noted as the salient causes of water stress in the North-west region. Pal & Talukdar (2018) reported 35.78 percent loss of the wetlands in the Punarbhaba river basin areas in the last 30 years. The group discussions in the Barind region expressed a worrying concern on the unsustainable development practices and the associated impacts, which undoubtedly will be aggravated by the impacts of climate change. According

to them, the Barind region might turn into a barren dryland in the near future if the global warming continues to rise. The situation would add more areas to the country's existing 2.7 million hectares drought-prone areas (Alamgir et al., 2019). Already, some 15.68 percent land areas of Gaibandha, Thakurgaon, and Panchagarh districts, 33.15 percent land-areas of Bogra, Dinajpur, Nilphamari, Joypurhat, and Sirajgonj districts and 35.70 percent land-areas of Lalmonirhat, Nawabgonj, Pabna, Rajshahi and Rangpur districts are respectively experiencing a high, moderate and mild level of drought-like conditions (Murad & Islam, 2011). Muntarin et al., (2020) reported more frequent and severe drought-like conditions being aggravated due to falling of water table (due to lesser amount of precipitation) and by the unsustainable development practices.

Such a drought-like condition in the Barind region is hampering cultivation of major crops, including Aus and Boro rice, wheat, sugarcane, potatoes, and pulses (Hossain et al., 2016). Mojid (2020) estimated respectively 27 percent and 61 percent production loss of Aus rice and wheat in a business-as-usual scenario, and 55 percent to 62 percent loss in Boro rice production in an extreme climate change scenario.

The group discussions endorsed deepening of freshwater crisis throughout the Barind region. They raised concern on the gradual depletion of groundwater, primarily due to the declining trend in rainfall and excessive withdrawal/use of groundwater for household and agricultural use. An analysis of the groundwater levels between 2000 and 2010 reported depletion of 4 meter and 2.2 meter respectively in pre-monsoon and post-monsoon periods (Pal & Talukdar, 2018). Likewise, Rahman et al. (2016) reported a 4.51 meter to 4.73-meter depletion of water level between 1991 and 2010. If this trend continues, the groundwater level may further go down by 1.44 to 1.57 times by 2040 and 1.59 to 1.82 times by 2050 (ibid). In the group discussions, many were found apprehensive about the over-extraction of groundwater that might create a vacuum and cause permanent subsidence of large areas. Such incidence has been experienced in other countries where groundwater extraction was significantly high. Table 4 presents the climate change impacts as perceived by the people of the North-west Barind region



Consultation in the North-east Barind region

Table 4: Climate change impacts as perceived by the people of the North-west Barind region

Sectors/Issues	Impacts/Concerns	
Water Resource and Infrastructure	<ul style="list-style-type: none"> • Drying out of rivers and surface waterbodies, causing acute crisis of drinking and irrigation water; • Depletion of groundwater level and increase of arsenic level (contamination); • Acute water crisis in summer that increases cost of agricultural production; • Risk of land subsidence due to over extraction of groundwater; 	
Agriculture	<p>Crop Cultivation</p> <ul style="list-style-type: none"> • Severe damage of paddy seedbeds; low yield of rice and wheat; • Low yield of potatoes due to plague and diseases; • High production cost due to increased cost of irrigation and inputs; 	<p>Poultry and Livestock</p> <ul style="list-style-type: none"> • Fodder crisis and higher production cost; • Increase of plague and diseases; • Scarcity of open grazing lands;
	<p>Fishery</p> <ul style="list-style-type: none"> • Drying out of waterbodies, ponds and extinction of brood fish; • Inundation by sudden flooding in the late monsoon; • Higher cost of fish fingerlings and feed; • Shortage of dissolved oxygen level in the summer causing death of fisheries stock; 	<p>Forestry & Homestead Gardening</p> <ul style="list-style-type: none"> • Low productivity due to water shortage;
Women & Health	<ul style="list-style-type: none"> • Decreased accessibility to & authority over freshwater resources, farmlands and common resources; • Being forced to collect water from distant places; • Increased sense of disempowerment due to loss of ownership over land and agricultural practices (as smallholders are forced to sell-out lands to mango farmers); • Increased domestic and social level violence due disempowerment and poverty; • Increased food insecurity and malnutrition affecting women's reproductive health; • Increased health risk due to excessive use of chemical fertilizers and pesticides; • Hygiene and sanitation crisis due to water scarcity; 	
Indigenous Peoples	<ul style="list-style-type: none"> • Water, food and nutritional deficiency; • Reduced access to common resources (forest resources and water bodies); • Loss of agriculture-based livelihood opportunities, increased joblessness, crisis and insecurity; • Unplanned changes in land-use, switching from cereal crop to cash crop (mango farm) cultivation, making agricultural labor surplus and jobless; • Increased water, food and nutritional deficiency; • Politically marginalized and excluded, hence limited access to the government's service delivery facilities; • Increased living expenses; 	

The group discussions remarked that the scanty fresh water supply (in the context of insufficient rainfall, falling of groundwater table and failing to conserve surface water sources etc.) has been hindering agricultural production and livelihoods, while adversely affecting the smallholders and

agricultural labor. The increasing trend of drought-like condition, especially in Naogan, Godagari and Sapahar, is forcing the smallholders to convert agricultural lands to less water demanding cash crop cultivation, for instance, mango, dragon fruit etc., which also require less labor involved (Islam & Shamsuddoha, 2017). The group discussions

reported that the smallholders have only two options: either abstaining from agricultural activities or selling out pieces of the agricultural lands. The situation contributes to surplus agricultural labor, forcing them to routine economic migration which ultimately leads them to permanent migration. Usually, family's male member migrates leaving women burdened with extra work and uncertainties along with increased psychological stress.

The consequences are even worse to the indigenous peoples. Once, they had rich economic and cultural existence that were evolved and nurtured by generations centering around traditional agricultural practices. However, they, by choice, had remained out of the socio-political power structures. Hence, in every political and social upheaval, both in the pre- and post-liberation periods of Bangladesh, the indigenous peoples in the North-west Bangladesh (known as plainland Adibasi) lost their assets, agricultural land and adaptive preferences. Many of them became landless, turned to agriculture laborers, yet agriculture is their only way of livings.

Therefore, the collapse of agricultural activities in the North-west Bangladesh means the collapse of the livings of the plain land Adibashi's. Aside from the traditional agricultural practices, livelihoods of many landless Adibasi's are natural resource-dependent. They, by generations, used to collect food, fodder and wood from the forests, fish from the rivers, and corn from the wild sources. They used to fulfil their nutritional requirements not only by farming, but also by harvesting and collecting food from the nature. Evidently, water scarcity in the North-west Bangladesh is causing differentiated impacts to the indigenous communities while making them jobless and poverty inflicted. They also are suffering from food insecurity and nutritional deficiency. The group discussions remarked on food and nutritional impoverishment of the indigenous peoples and the already marginal agro-based families.

The situation becomes even worse in 'Monga' (workless) condition, when people, especially the pregnant women and lactating mothers, are compelled to eat insufficient food and suffer from nutritional deficiency. It's not only the indigenous peoples, the entire North-west region might suffer from food and nutritional deficiency, the group discussions remarked. Except for the cereals, the prices of animal protein e.g., fish, meat, egg etc. have gone up either due to less supply from the local sources or due to higher fodder/feed price of the poultry, fisheries and livestock.

On the human/social dimension of climate change impacts, the group discussions reported an increase in gender-based violence mostly when the family's male members don't get enough food ready upon their return from the outside work. The scarcity of freshwater is also affecting women's health and hygiene differently. The propensity of drinking insufficient water, especially in the dry season, is also causing urinary tract infections and metabolic disorders.

Adaptation Requirements of the North-west Barind Region

The climatic events in the North-west Barind region are not as diverse as those in the South-west coastal areas, however, the impacts are diverse, long-standing and, to some extent, irreversible. As discussed above, the unavailability of freshwater has been affecting every dimension of human life and livelihoods. Yet, people are coping with the adversities through diversifying agricultural practices, for instance, setting up tube-wells in the pond, introducing mixed cropping, deep and drip irrigation, planting trees in the paddy fields, converting moderately dry farmlands to mango gardens etc. (Ali et al., 2021).

Table 5: Adaptation requirements of the North-west Barind Region as suggested in the group discussions

Sectors/Issues	Adaptation Requirements
Water Resource and Infrastructure	<ul style="list-style-type: none"> • Ensuring access to surface water facilities through conservation and management of the existing water bodies and excavating new ones; • Establishing community-based water supply facility; • Coordination among local and national authorities for dredging/re-excavating rivers and canals; • Establishing “Northern Rajshahi Irrigation System” with enhanced scope of using surface water; if necessary, introducing location specific policy for water use and conservation; • Establishing facilities for surface water use and re-use and recharging of ground water; • Developing an artificial system for underground aquifer recharging; • Increasing bilateral/ regional diplomacy for the fair share of the trans-boundary river water;
Agriculture	<ul style="list-style-type: none"> • Reducing underground water use, excavating and re-excavating ponds and canals for enhanced surface water capturing for irrigation use; • Promoting less water demanding crops and water efficient cropping practices and technologies; • Introducing drought resilient crops and cropping practices; • Promoting organic farming practices, while avoiding irrational use of chemical fertilizers and pesticides; • Promoting tree plantation/ social forestry in homestead and open spaces; • Imposing strong regulation for not converting agricultural lands to harmful industries and brick kilns; setting them away from the habitats;
Women & Health	<ul style="list-style-type: none"> • Recognizing women as farmers and ensuring their authority over production, and marketing; • Promoting family-based farming practices and cooperative farming; • Preventing gender-based violence through awareness raising and social mobilization; empowering women economically and socially, while creating skill-based job opportunities; • Providing interest free loans and free inputs services to the marginal farmers; • Increasing maternal and reproductive healthcare services, especially for the indigenous women;
Indigenous community	<ul style="list-style-type: none"> • Re-excavation of ponds, canals and using surface water sources for multiple use; • Keeping public commons (wetlands, forests etc.) open and accessible to the indigenous people for ensuring their natural resource-based livelihoods; • Conducting a standalone climate change impacts and vulnerability analysis for the indigenous communities and identifying their differentiated adaptation needs; • Ensuring indigenous people's accessibility to the safety net and other government services; • Social and economic integration of indigenous community people through facilitating their engagement and participation in the local planning and decision-making process.

They also are adopting advanced agricultural practices, which include a) adjusting irrigation frequency and level, b) cultivating drought-tolerant, less water demanding and short-maturing crop varieties and c) substituting crop farming with the off-farm activities etc. (Anik, et al., 2021). In the context of flood uncertainties, which is predominantly linked to erratic rainfall and regulation of trans-boundary water flows, people

are cultivating two rice cropping (Aus and Aman) together (Rasid & Mallik, 1995). However, farmers' such adaptation practices are not sufficient to withstand and adapt to the simultaneous and increased impacts of flooding and desertification (Ali et al., 2021). The region requires crop varieties that could sustain the stresses/adversities of drought and flooding.

In either situation, flooding or drought, the marginalized smallholders are forced to compromise their food intake (in terms of frequency and amount). The other coping measures include taking loans from institutional (e.g., NGOs, local cooperatives etc.) and non-institutional sources (local money lenders, neighbors, relatives etc.), selling labor in advance, selling assets like land, livestock, jewelry etc.

Considering the growing gap between climate change impacts and adaptation requirements, the group discussions emphasized construction of water reservoirs and management of the existing surface water sources (e.g., rivers, canals, ponds etc.) to ensure water supply round the year. They also suggested to explore and deploy technological solutions for groundwater recharge. They all urged to increase forest coverage through planting less water demanding local plant varieties. Aside from these, the group discussions recommended launching of mass awareness on tree plantation, conservation and management of surface water sources, and use of surface water instead of extracting groundwater. They referred to a local initiative 'Northern Rajshahi Irrigation System' that proved effective in irrigation management as a small-scale initiative. This initiative could be evaluated for upscaling if required, and could be replicated in other areas.

Evidently, the gradual process of desertification has shrunk agriculture-based means of livings, especially of women and indigenous peoples. The situation made them physically and mentally weak (in the context of malnutrition, economic burden, socio-cultural discrimination and stress), economically disempowered and socially excluded. The group discussions emphasized well planned and targeted activities for women's social and economic empowerment and their integration to the socio-political structures. The group discussions remarked job creation for women, especially in animal husbandry, homestead vegetable cultivation, midwifery, small trading etc. as a priority. They suggested legal recognition of women's role as a farmer, so that they could establish their authority on the means of production, also could access to the input services and financial resources. The group discussions urged the local government and NGOs to come forward with interest-free/minimal interest loan schemes for the women. This would help the marginal farmers to come out from the poverty situation and move towards wellbeing and prosperity. Alongside, women's healthcare facilities, especially on reproductive health and hygiene, need to be strengthened. Moreover, quick response and legal support need to be ensured to prevent gender-based violence at home and in the workplace.

The group discussions recognized the differentiated and disproportionate impacts on the plainland Adibasis (indigenous peoples) of the North-west Barind region. Being the minority, they often suffer from economic deprivation as well as socio-cultural domination by the structured power hegemony of the local elite and influential. As the livelihoods of the indigenous peoples are predominantly farming and natural resource-based, hence their struggle for survival could be eased by promoting traditional agricultural practices along with their technological up-scaling as appropriate. They have the cultural barriers to adopting technological solutions, hence the technological solutions need to be appropriate, affordable and accessible for them. The group discussions suggested a localized and context-specific technology needs assessment, especially for women and indigenous peoples, and motivating them towards technological transition along with capacity building and cost-sharing support. This also has been recommended to support the indigenous communities with water infrastructures and facilities for drinking and irrigation use. The group discussions expressed grave concern on the increased conversion of forest and agricultural lands to non-agricultural purposes, especially for small industries, housing and brick manufacturing. They reported many brickfields in and around agricultural lands and urged for strong legal action not to allow brickfields in agricultural lands and keep them away from the habitats. Table 5 presents the adaptation requirements of the North-west Barind Region as suggested in the group discussions.



CHAPTER

1 2 3 4 5 6

CLIMATE CHANGE IMPACTS AND ADAPTATION REQUIREMENTS

SOUTH CENTRAL RIVER BASIN AREAS

The dynamic flows of the world's mighty rivers e.g., Ganges, Brahmaputra, and Meghna (GBM), originating from the upper Himalayas, and their tributaries comprise an ever-changing basin area on their downward flows towards the Bay of Bengal. Though only 7 percent of the GBM river system lies in Bangladesh, its importance and impacts are phenomenal. They together annually carry a huge volume of water along with almost 1 billion tons of organic sediments (silts) (Islam et al., 2017) from the upstream catchment area of 1.7 million sq. km. They have historically and constantly been shaping the country's agrarian economy with rich sedimentation, while also making the country's 18 to 22 percent of the areas highly exposed to monsoon flooding, inundation and river bank erosion (M.N. Akhter, 2013). In every 4–5-year return period, huge monsoon precipitation along with the unpredictable flows of the trans-boundary rivers inundate more than 60 percent of the country's land areas, while also causing massive riverbank erosion concurrently or following the flood.

Bangladesh's 100 out of 489 Upazillas are exposed to monsoon floods, and 35 of them are highly exposed and sensitive to riverbank erosion (Banglapedia, 2021). An analysis of the satellite images of Ganges-Brahmaputra-Meghna rivers between the years of 1982 and 1992 estimated an erosion of approximately 106,300 hectares landmass, conversely forming only 19,300

Lower GBM Basin Areas

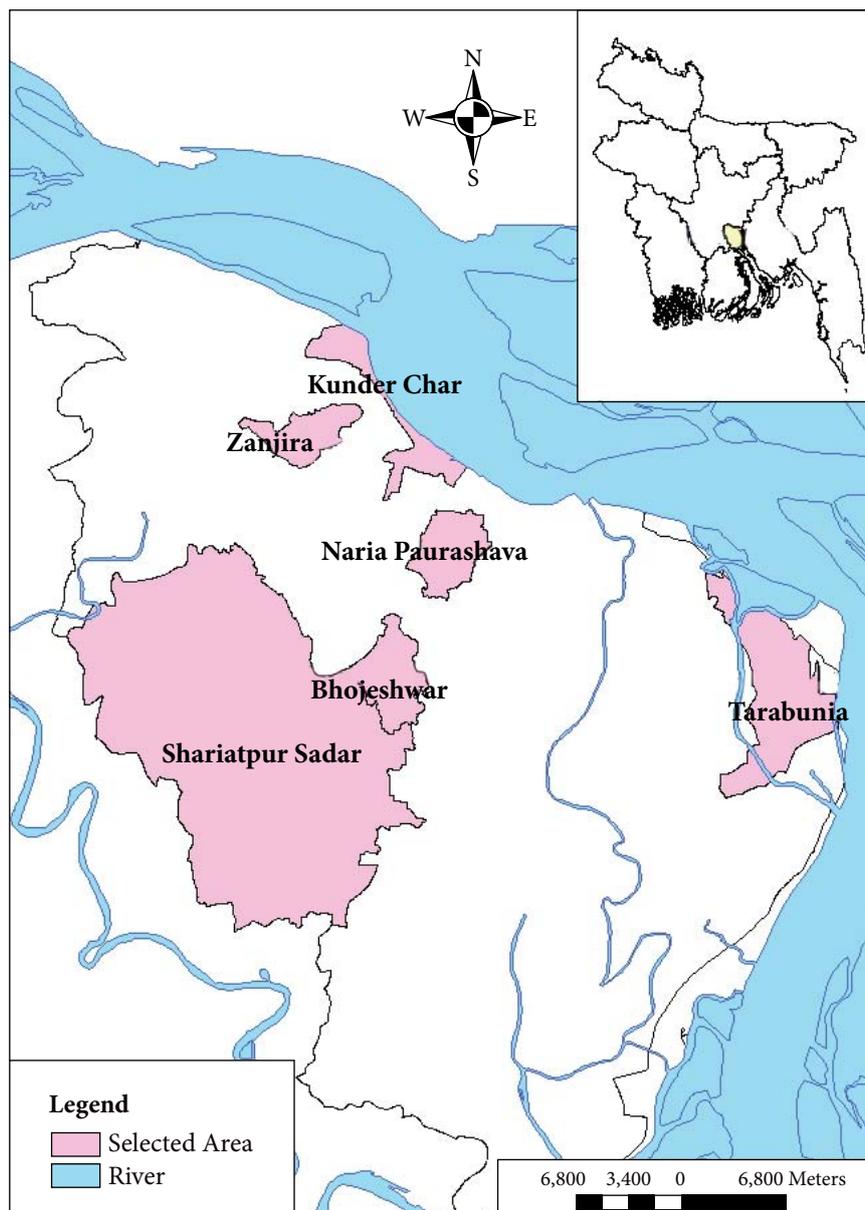


Figure 5 shows the areas (Kunder Char, Zanjira, Naria Pourashava, Bhojeswar, Tarabunia, Shariatpur Sadar) of stakeholders' representation in the local consultations

Major Impacts

- Monsoon flooding, riverbank erosion, water logging and prevalence of waterborne diseases;
- Permanent loss of agricultural lands, habitats, standing crops etc. resulting to further marginalization of the agriculture-dependent families;
- Increased financial insecurity while making the farmers indebted to the local Mahajans (who lends money at unfairly high rates of interest) and NGOs;
- Mass displacement and involuntary migration;
- Increased dropping out from school, child labor and early marriage of the girl child of the displaced families.

Key Adaptation Requirements

- Construction of stronger embankments, riverbank protection systems around the whole erosion prone areas;
- Categorization of lands according to their exposure and sensitivity to a particular risk event and developing/introducing climate resilient cropping system;
- Introducing mobile hospitals (or rotational floating hospitals for the Charlands);
- Providing free education along with the financial incentives to the adolescents of the displaced families to reduce dropping out from school;
- Providing skill-based training to the women and adolescents of the displaced families to enable them to get a dignified job;

hectares (accretion) (Islam & Rashid, 2011). According to FPCO (1995), approximately 9,000 hectares of the mainland and 5,000 hectares of the emerged 'Charland' alongside and beneath the rivers are altered annually due to erosion. Again, in the context of global average temperature rise, the predicted changes in the precipitation and glacier melting of the Himalayan ranges would accelerate flooding and erosion to their worst form. At 2 degree C global mean temperature rise scenario by 2100, the predicted 13 percent and 10.2 percent higher precipitation respectively in the Ganges and Brahmaputra basin areas would increase annual discharge respectively by 21.1 percent and 6.4 percent (Akhter, M.N., 2013). Again, an analysis of Global Climate Models (GCM) estimated an average 13 percent and 18 percent increase in erosion along the three major rivers, the Ganges, the Jamuna and the Padma by 2050 and 2100 respectively (ibid).

The lower GBM basin areas, Shariatpur district in particular, have been the worst sufferers of riverbank erosion in the last few decades. According to Bangladesh Water Development Board (BWDB), during 2010 to 2017, the Padma devoured 13 sq. km area of Naria in Shariatpur District, with an accelerated rate of annually 1.33 sq. km since 2016 (Startfund, Bangladesh, 2018). However, the erosion took its worst form in 2018, eroding 2 sq km of land within a two months time (ibid).

While riverbank erosion and accretion (emerging/forming of new lands on the other side of river bank or in distant places) is a natural move of a riverine ecosystem, however, they cause everlasting miseries on people's life and livelihoods. The river's

play of erosion and accretion recurrently alters the landscape (Islam & Rashid, 2011), devours homestead and agricultural lands, destroys assets and infrastructures, makes people homeless and assetless and causes permanent displacement of thousands of people annually.

The group discussions in the GBM basin areas (in Shariatpur district) also confirmed an increase in rainfall and relatively stronger river run-off and recurrent erosion along the Padma. The erosion in 2018 caused unprecedented damage to agricultural lands, homesteads, public infrastructures, including roads, educational institutions, religious establishments, hospitals, residences etc. and displaced 4,200 to 5,000 people (Startfund, Bangladesh, 2018).

Alongside of the flooding and erosion, the group discussions also confirmed an accelerated rate of riverbank erosion that recently been aggravated by the erratic rainfall, floods and turbidity at the lower GMB basin areas. The discussions also remarked on the increase of salinity front and dryness (particularly in Gosairhat, Bhedargonj) especially in the winter. CEGIS (2011) termed these areas as a rainfall-stressed and exposed to salinity ingress. The basin areas receive merely less than 380 millimeter of rainfall during the dry season (Nov-May) while 1 ppt (parts per thousand) salinity front has already invaded 15 percent (3736 sq. km) of the land areas. The saline zone and the salinity level are expected to rise to 5ppt (parts per thousand), affecting 13.5 million people by 2050 (ibid).

The salinization of the riverine ecosystem is gradually destroying habitat of the freshwater fisheries. Many fish species that were abundant even



Consultation in the lower GBM basin areas

Table 6: Climate change impacts as perceived by the people of the South-central (GBM) river basin areas.

Sectors/Issues	Impacts/Concerns	
Water Resource and Infrastructure	<ul style="list-style-type: none"> • Monsoon flood, riverbank erosion, water logging and increased prevalence of waterborne diseases; • Complete loss of physical infrastructures e.g., roads, culverts, schools, hospitals, markets, riverbank protection systems etc.; • Erratic rainfall (heavy downpour within a short period of time), causing loss of cash crops like onion, watermelon, pumpkin etc.; • Depletion of ground water level and increase of Arsenic prevalence; • Increased salinity front and dryness in some areas; 	
Agriculture and Human Habitat	<p>Riverbank erosion</p> <ul style="list-style-type: none"> • Permanent loss of agricultural lands, habitats, standing crops etc., resulting to further marginalization of the agriculture-dependent families; • Mass displacement and involuntary migration; • Increase of poverty and inequality; 	<p>Fog</p> <ul style="list-style-type: none"> • Damage of <i>Robi</i> crops leading to production failure; • Increased infestation of pests and insects resulting in poor production; • Degradation of seed quality;
Agriculture and Human Habitat	<p>Floods</p> <ul style="list-style-type: none"> • Loss of household-based assets and properties; • Damage of seedbed and seedlings, leading to production failure in the following year; • Loss of standing crops, resulting in food shortage of the subsistence farmers; • Increased financial insecurity while making marginal farmers indebted to the local Mahajans and NGOs; 	<p>Heavy rainfall, drought and salinity</p> <ul style="list-style-type: none"> • Loss of seasonal crop production and seed preservation; • Increased risk of waterlogging and production failure; • Disruption in cropping cycle; • Salinization of the riverine ecosystem and destruction of the habitats of freshwater fisheries;
Health	<ul style="list-style-type: none"> • Increase of pneumonia (children), dermatitis, diarrhoea, dengue etc.; • Trauma and psychological disorder (due to riverbank erosion); • Increased social and economic stress on the women of the river-eroded displaced families; • Indiscriminate use of pesticides, herbicides and chemical fertilizers and their persistent impact on human health; 	
Women & Children	<ul style="list-style-type: none"> • Increased exposure to sexual harassment and trafficking of women and adolescent girls of the displaced families; • Increased dropping out from the schools, child labor and early marriage of the girl child of the displaced families (marrying of girl child is considered as an option of transferring risk); • Increased gender-based violence at home and in the workplace; • Increased work load, oppression and wage discrimination in the work places; • High risk of venomous snake bites; 	

a few years ago seem to have disappeared by now. The distribution and abundance of *Hilsa* fish have also been changed. The frequent and excessive use of pesticides, herbicides and chemical fertilizers, especially in vegetable production, and their runoff to the adjacent waterbodies are also affecting fisheries resources.

People's means of livings in the GBM areas are dependent on agriculture and fisheries, both of which are highly sensitive to weather variability and climate change. While the extended rainless days or heavy rainfall in a short time spell are damaging the standing crop either by contracting or inundating the agricultural lands, the prolonged water-logged condition in some areas (due to receding in flood water discharge) is limiting the scopes of agricultural production.

The farmers, as many of them are smallholders, are forced to take loans from the local Mahajans (a person who lends money at unfairly high rates of interest) and NGOs to recover from the sudden loss and revive agricultural activities. Very often they fail to recover from the consecutive disaster losses and are forced to sell agricultural land to repay loans. This is how the smallholders fell into the vicious cycle of poverty and indebtedness. Ultimately, they become landless, forced to migrate or take shelter in the newly formed Char lands which even are more exposed to the risk.

The group discussions have identified increase of water-borne diseases, especially diarrhoea, during and in the aftermath of the flood. The discussions also identified an increase of venomous snakes, snake-bites and fatalities, especially in the monsoon. The recent media reports confirmed presence of one of the world's most lethal snakes, Russell Viper (*Daboia russelii*), in Shariatpur and adjacent Chandpur district, that is suspected to have travelled down from the north through the monsoon flows of the Meghna River. Already there are several deaths from snake bites, as reported. People face snake attacks mostly when they are displaced shift their belongings to a new place, allowing snakes to take shelter inside the vacant containers (e.g., earthen jar, commonly used for seed preservation).

The social dimension of climate change impacts in the GBM areas is linked to mass displacement resulting from riverbank erosion. Erosion makes people homeless, assetless, increases dropping out from schools, and they together instigate child marriage. A recent study (Sharmin, R. et al, 2020) with 200 displaced families in Shariatpur district confirmed disproportionate burden and sufferings on women and adolescent girls. Among the study

respondents, 36 percent admitted their harassment by the local youth, including teasing, taunting, name-calling, or verbal abuse. 18 percent faced domestic violence, 65 percent faced low wage rate, 75 percent got employed in undignified jobs, especially as housemaid and in the brickfields, 11 percent were at the risk of being divorced/ or being abandoned. The study also identified differentiated vulnerabilities to the girl child, which include dropping out from the schools and increase of early marriage. 75 percent respondents confirmed increased dropping out of the girl child from primary and secondary level education, 68 percent respondents confirmed increase of child labor, especially in the risky jobs in the Brickfields and household works, 11 percent respondent sconfirmed increase of child marriage with the evident cases.

In general, the displaced families consider their adolescent girls as 'risk' as they could be the primary targets of harassment, abuse, sexual exploitation and trafficking. On the other hand, displaced families are unsure of finding out suitable grooms for their adolescent girls as they said, "no man would show interest in marrying a girl whose family has lost everything." Given the context, marrying off adolescent girls at an early age is considered 'transferring of risk' or being 'risk free'.

Adaptation Recommendations for the Lower GBM Basin Areas

The lower GBM basin areas are predominantly exposed to monsoon flooding and sensitive to massive riverbank erosion, however, currently are also experiencing some other unusual and localized climate change impacts, including drought, waterlogging and salinity intrusion. While the riverbank erosion has been a key concern for mass displacement and involuntary migration, the other concerns are the increase of food, water and health insecurity.

The group discussions identified inappropriate and inadequate physical protection to the riverbank erosion. Though some of the erosion-prone areas have been provided with concrete blocks and geobags, most of the areas are unprotected. The group discussions demanded stronger embankments around the whole erosion-prone areas and erosion preventive plantation in the inner and outer slopes.

The group discussions narrated the combined effects of riverbank erosion, drought and salinity on the agricultural production. They are on the edges of a sharp knife; on one side, riverbank erosion is engulfing a vast swath of agricultural

Table 7: Adaptation requirements of the lower GBM Basin areas as suggested in the group discussions

Sectors/Issues	Adaptation Requirements
Water Resource and Infrastructure	<ul style="list-style-type: none"> • Stronger embankments, riverbank protection systems around the whole erosion prone areas; • Regular maintenance of the new and existing embankments; • Early warning on flood and riverbank erosion; • Conservation and management of surface water systems; • Planting erosion preventive local trees on the bank of rivers /canals; • Stopping/preventing excessive use of groundwater; • Excavation in rivers and canals to keep them live and flowing;
Agriculture	<ul style="list-style-type: none"> • Categorization of lands based on their exposure and sensitivity to a particular risk and developing/introducing climate resilient cropping system (considering crop variety and crop cycle etc.); • Introduction of salinity and drought-tolerant crop varieties as per crop zoning; • Building skills and technological capacities of farmers and farmers' organizations on the climate-resilient cropping systems; • Promoting organic farming practices along with the integrated pest management system to reduce dependency on chemical fertilizers and pesticides; • Promoting cooperative farming practices to facilitate farmer's involvement in supply and value chain; • Establishing community seed banks to address seed/seedlings crisis in the aftermath of disasters e.g., flooding; • Raising awareness on the negative consequences of ground water extraction; • Facilitating farmers' access to the government's services like loans, seeds and other inputs;
Health	<ul style="list-style-type: none"> • Introducing mobile hospitals (or rotational floating hospitals for the Charlands) by the government's health department/NGOs; • Providing free/subsidized health facilities, advice and medicines in the remote Charlands; • Raising mass awareness on the negative consequences of pesticides; • Ensuring availability of anti-venoms in all the health centers to minimize the number of deaths from snake bites;
Women & Children	<ul style="list-style-type: none"> • Raising awareness and social movement on the prevention of gender-based violence, abuse, harassment and trafficking; • Women's economic empowerment through creating farm-based and off-farm employment opportunities; • Providing free education along with financial incentives to the adolescents of the displaced families to reduce drop-out from school; • Providing skill-based training to the women and adolescents of the displaced families to ensure scopes of dignified jobs for them; • Ensuring basic services like water, sanitation, education etc. to the displaced families; • Expanding social safety net coverage for the displaced families; • Facilitating access of the homeless people to the government's Khas land.

land annually, on the other side the irreversible impacts of waterlogging, salinity and desertification are affecting crop and fisheries production. The group discussions demanded categorization of lands according to their exposure and sensitivity to a particular risk event and develop/introduce risk-resilient cropping system (considering risk sensitivity, resilience capacity etc. of a particular crop variety). They also demanded skill development and technological capacity building of farmers and farmers' organizations on the climate-resilient cropping systems. They suggested a stronger role by local government authorities and local administration for disseminating pre-disaster warnings, especially on flood and riverbank erosion.

Furthermore, the group discussions underscored launching of massive awareness-raising programs on the negative consequences of pesticide and herbicide use. They proposed introducing Integrated Pest Management (IPM) and organic farming practices while ensuring seeds and other inputs for climate-resilient cropping (as required by the modified cropping system) by the government's agriculture extension department.

The natural and man-made hazards e.g., surface water pollution, use of pesticides etc. have had several health effects mostly on women's hygiene and reproductive health. Furthermore, many remote areas, including the isolated Chars, are not

supported with the necessary healthcare centers and services. The discussions demanded introducing mobile hospitals (or rotational floating hospitals for the Charlands) by the government's health department/NGOs, supported with free/subsidized facilities of health advice and medicines. Youths in the remote areas could be trained on basic health care and with first aid facilities. The group discussions also suggested making anti-venoms available in all the health centers to minimize the risk of death from snake biting.

On addressing social dimension of climate change impacts (e.g., dropping out from schools, child marriage, harassment, abuse, gender-based violence, increase of child labor etc.), the group discussions suggested an effective role of the local government authorities and administration in terms of raising awareness and supporting the displaced families with financial and other means. Skill-based training and creating farm-based or off-farm employment scopes for displaced women could help their economic empowerment and social integration. Local NGOs and the private sector could come up with such capacity building initiatives. The group discussions also recommended free education facilities and financial incentives to the adolescents/families to reduce dropping out from school. Table 7 presents the adaptation requirements of the lower GBM Basin areas as suggested in the group discussions.





KEY MESSAGES TO THE POLICY MAKERS

Mr Saber Hossain Chowdhury, MP
Chairman, Parliamentary Standing Committee, MoEFCC

- 1** | Corruption and governance failure have been identified as the major challenges/ barriers in the implementation of adaptations projects, especially construction and maintenance of coastal infrastructures e.g., embankments, polders, sluice gates etc., Corruption in adaptation activities/projects would multiply the risks in two ways; first, ineffective and unaccountable utilization of adaptation finance might limit Bangladesh's access to global adaptation finances; second, poorly designed and implemented projects might not provide/ensure targeted adaptation benefits, hence would increase risk exposure instead of risk reduction. The NAP process could recommend establishing 'NAP Implementation Unit' preferably under the Prime Minister's office to ensure effective, transparent and accountable utilization of adaptation resources.
- 2** | The discussions demanded a stand-alone climate resilient cropping and land-use planning for each of the agro-ecological zones and ensuring their effective implementation. Such a plan would inform the farmers of the exposure and sensitivity of a particular crop to a particular disaster event (both slow and sudden onset disasters).
- 3** | There is a strong demand for socially just adaptation actions ensuring both procedural justice (empowering communities to overcome institutional barriers and build social capital to effectively engage in the decision-making processes) and distributive justice (distribution of income, assets and opportunity). The NAP process should provide the scope of developing a model of 'socially just adaptation' with the provisions of providing preferential access for the marginalized/excluded communities to the rights (e.g., Khas land), resources (e.g., public commons) and services (e.g., social safety nets, finance, health schemes, insurance etc.).
- 4** | Women and the indigenous peoples are disproportionately burdened as they already are economically, socially and culturally excluded and highly dependent on the climate sensitive sectors. Indigenous women of the North-west Barind region are even more vulnerable due to collapse of their natural resources and agriculture-based livelihoods. The NAP process should capture the differentiated vulnerabilities of the indigenous communities, women in particular, and should include measures for their economic empowerment and socio-cultural integration.



Sharing locally-led findings with the national stakeholders

CHAPTER

1 2 3 4 5 6

DISCUSSION & RECOMMENDATIONS

Bangladesh is often referred to as the ‘Global Adaptation Capital’, but in practice, its adaptation measures are still around reducing the risks (e.g., the primary impacts) of the known/usual extreme weather events. The adaptation measures rather are extended endeavors of DRR (Disaster Risk Reduction), mostly on building project-specific infrastructure-based protections system that the country has been practicing since years to ensure safe shelters for the disaster risk exposed communities and to reduce disaster losses. The consistent innovation and effort in such DRR measures, for instance, building coastal embankments and cyclone shelters, protecting river bank with boulders, concrete blocks etc. have contributed to significant reduction of human casualties. However, the country, as well as its DRR practices, has not been progressed much (in terms of policies, plans and programs) in addressing climate change induced unusual and localized extreme and slow onset disasters, which reportedly have increased in all the three areas of locally-led process.

For instance, the South-west coastal areas which are predominantly exposed to tropical cyclones are now experiencing regular tidal surge, flooding and drought-like condition. These areas are also bearing the brunt of the slow onset-events like sea level rise, salinity intrusion, prolonged waterlogged situation etc. The North-west Barind region, usually prone to drought, is now being affected by late monsoon flood. Likewise, the active floodplains of the lower Ganges-Brahmaputra-Meghna (GBM) river basin areas, usually and

historically prone to monsoon flood and riverbank erosion, are now being affected by drought, salinity and water logging. Fog, a common and usual weather event especially in the winter, has now turned into a disaster event as the density and the extended foggy days are causing harm to agricultural seedbed and seedlings production.

While impacts of the extreme weather events, for instance, crop loss by early flash flood or cyclone etc. could be minimized/avoided through enhanced adaptation actions (e.g., developing short maturing rice varieties, changing cropping pattern etc.), impacts of the slow onset events such as sea-level rise, salinization of agricultural lands, desertification, pest and disease outbreak etc., cannot be avoided by the adaptation actions. Even, the adaptation options to those slow-onset events do not exist yet- the situation which has been defined as the hard limits of adaptation (Klein et al., 2014).

Evidently, the slow onset events (also termed as climate processes) and the residual impacts of the extreme events are exacerbating the consequences by extending the impact chain to the secondary and tertiary risk levels. The secondary risks include food and water insecurity, spread of certain diseases associated with temperature and precipitation changes, loss of biodiversity, loss of ecosystem services, forced displacement and involuntary migration, loss of cultural goods (such as cult and burial sites that cannot be relocated for religious reasons) etc. The tertiary risks include regression in growth and development, widening inequality, competition and conflict in resource use, domestic and international tensions on displacement and migration etc.

Essentially, climate change and its interconnected impact chain demand a human dimension in adaptation actions, which is enhancing the 'ability' and/or 'capacity' of social, economic and environmental systems, those in turn would enable people to cope with a hazardous event or trend or disturbance. This refers maintaining the capacity of a system to bounce back and transform to a new system to deal with adverse changes and shocks. It's about building people's ability to resist, recover from, or adapt to the effects of a shock or a change. The concept entails a progression in a dynamic pathway of resisting, recovering, adapting and evolving.

While the theoretical debate on the characteristic of adaptation has evolved persistently with a comprehensive and encompassing understanding, yet there have been simultaneous critics on the limitations of identifying appropriate adaptation actions and measures. Fundamentally, an adaptation plan should be built on a comprehensive vulnerability analysis that comprises of three components e.g., exposure, fragility (sensitivity) and adaptive capacity. Literally, vulnerability of a community depends on the exposure of that community or people (and their assets) to the climate change induced hazard(s), the fragility to those hazards, and their capabilities and resources to recover and bounce back with the full potentials to the state of origin.

The degree of fragility would vary from community to community, also from household to household even in the same community. This is due to diverse and dissimilar socio-economic conditions, which are the determinants of adaptive capacity. For instance, a salinity affected community in the South-west coastal areas, depending solely on rain water harvesting, is much more sensitive to the risk of sea-level rise (and water insecurity and conflicts as the secondary risk) than a community in the South-central coastal areas that have community ponds to supply filtered water along with the options of rain water harvesting. Typically, a contemporary adaptation planning often perceives vulnerability as the degree of exposure of a system or a community to a climatic hazard and very often ignores the 'degree of sensitivity (fragility)' and 'adaptive capacity' of that system or community. Instead of a site-specific vulnerability analysis, the planning process rather follows sporadic and structured consultations with



Sharing locally-led findings with the national stakeholders

the preferred stakeholders/ groups (allowing knowledge hegemony and preference of the interest groups). Hence, it fails to accommodate the 'adaptive preference' (Teschl and Comim, 2005) and structurally bypass politically sensitive issues (Coaffee & Lee, 2016; Welsh, 2014) e.g., corruption and governance failure etc. in adaptation planning and its implementation. Many theorists (Chu et. al., 2017; Ernstson et. al., 2010) argued that the ultimate objective of adaptation and resilience building i.e., ensuring 'social equity' and 'distributive justice' cannot be achieved by keeping the sensitive, yet significant, issues aside and unaddressed. Instead of building adaptive capacities, they even could increase vulnerability of the already marginalized groups e.g., women, indigenous community, adolescents, fishers, forest-dependent people etc., putting them under more fragile conditions. This also would cause another state of isolation by limiting the scopes of developing a human-centric and rights-based adaptation plan.

Given the context, NAP provides a broad-based scope to develop an inclusive plan followed by a methodical vulnerability analysis. As decided at COP 16 in 2010, NAP would follow a country-driven process in terms of identifying medium and long-term climate change adaptation needs. This would follow a gender-sensitive, participatory and fully transparent process in a continuous, progressive and interactive endeavor. Unlike the National Adaptation Programme of Action (NAPA), which was rather a list of several adaptation projects, NAP is said to be mainstreamed to the country's overall development planning.

Bangladesh's NAP Roadmap also emphasized to follow participatory and gender sensitive approaches, recommended locally-led, stand-alone planning at least in two risk-exposed Upazilas. The idea was to introduce site-specific adaptation plan along with the institutional arrangements for their implementation. Such a planning would create spaces for the local institutions (e.g., local government authorities, local administration, CSOs etc.) to effectively engage in localized vulnerability analysis, identifying and prioritizing adaptation activities and mobilizing resources from the local, national and international sources.

In doing so, Bangladesh, compared to the other LDCs, is in advantageous position with its strong policy orientation, institutional setting and experiences in community-based DRR practices. Bangladesh, being one of the first LDCs to complete its NAPA, listing "urgent and immediate" adaptation needs, developed a more comprehensive plan 'Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2008, revised in 2009, with its own financial and intellectual resources. It also established two separate funds: the Bangladesh Climate Change Trust Fund (BCCTF) resourced entirely from the government's own budget and the Bangladesh Climate Change Resilience Fund (BCCRF) consisting of funds pledged and provided by the developed countries or groups.

This locally-led process underscores Bangladesh's high exposure to the diversified impacts of climate change, it's sincere aspiration of pioneering adaptation actions, and rich experiences in up-scaling community-based DRR practices. The

process also highlights the importance of locally-led planning followed by an inclusive and site-specific vulnerability analysis and, thereby, puts forward several recommendations for consideration in Bangladesh's NAP process.

Consistent Endeavor in Up-scaling Adaptation Technologies

The climate change impacts are context and location-specific, so are the adaptation requirements. They both are non-identical as they vary according to the social and ecological context of a given area. Adaptation requirements are time-specific too. A set of adaptation actions relevant today may not be sufficient or relevant even within a decade as the vulnerability (function of exposure, sensitivity and adaptive capacity) may change over time. For instance, floating gardening, which is considered a celebrity adaptation technology of Bangladesh, seems an inappropriate intervention in the coastal areas. Though this has been a widely cited adaptation technology, particularly in the water-logged areas, no further innovation and evaluation of this technology might limit its replication to other similar ecological settings (CCDB, 2017). In contrast to this, crab fattening in the sub-merged bamboo cages and in the earthen ponds in the coastal areas has been found a befitting adaptation technology. Hence, it is essential to keep on innovating new adaptation technologies and continue up-scaling the existing ones as per requirements of the local context. Though technology could play an important role in resilience building, technology-based adaptation actions might benefit only the well-off who could afford them. Hence it is crucial to develop low-cost technological options and keep them affordable by the poor and by the less privileged women farmers.

The site-specific vulnerability context should also be considered in upscaling and disseminating adaptation technologies. It demands a periodic vulnerability analysis at different climate hot-spots at 3-5-year interval. NAP should continually upscale the adaptation measures considering the changing dynamics of the site-specific vulnerability context.

Climate Resilient Cropping and Climate Sensitive Land Use Planning

The locally-led discussions demanded a stand-alone climate resilient cropping and climate sensitive land-use planning for each of the agro-ecological zones and ensuring their effective implementation. The group discussions identified conversion of agricultural land to shrimp farm in the South-west coastal areas, and mango farm in the North-west Barind region. In both the areas, the corporate (Big Farm) farms are grabbing the means of livings of the subsistence farmers and forcing them to involuntary migration. The situation is also accelerating climate change impacts by piping/channeling saline water in the non-saline areas and waterbodies for expanding shrimp cultivation. The NAP process should include a scope of a country-wide climate resilient cropping and climate sensitive land-use planning. Such a plan would inform the farmers of the exposure and sensitivity of a particular crop to a particular disaster event (both slow and sudden onset disasters).

Combatting Corruption and Governance Failure

The group discussions identified corruption as one of the major challenges/barriers to local resilience building. This has been a critical concern in regards to construction and maintenance of the coastal infrastructures e.g., embankments, polders, sluice gates etc., that are supposed to protect coastal habitats, agricultural lands, infrastructures from inundation by cyclones and tidal surges. Reportedly, the whole process of such infrastructure development (e.g., site selection, prioritization and resource allocation, tendering for work, procurements of construction materials, monitoring of standard and quality, and so on) are highly

politically dominated though the degree of political influence is context specific. The high degree of political domination/preferences often subside the voices of the socio-politically marginalized and excluded people in the decision-making process, which also is an approach of masking the politically sensitive issues. The situation increases the chances of 'organized corruption' of certain interest groups. Eventually, corruption in adaptation activities/projects would multiply the risks in two ways: a) ineffective and unaccountable utilization of adaptation finance might limit access to the global adaptation finances, and b) poor adaptation projects might not provide/ensure targeted adaptation benefits, hence would increase risk exposure instead of reducing the risks.

The other concern is governance failure, which has been evident in the country's Cyclone SIDR and Cyclone Aila affected areas. Delayed measures in draining out of saline water trapped inside the embankments lasted the waterlogged situation, causing acute drinking water crisis; the situation forced thousands of the displaced people to migrate (Shamsuddoha et. al. 2013). Another example of governance failure has been evident in the South-west coastal areas where the power and influence of the shrimp Gher owners changed functions of the water regulators e.g., embankments and sluice gates. They are supposed to protect coastal areas from tidal/saline water influx, but ironically now they are being used for channeling saline water to the agricultural lands for horizontal expansion of the shrimp farms. Though the availability of saline water has boosted shrimp aquaculture, it has put a high cost on agricultural production, animal husbandry and on the local ecology and ecosystem

services. Shrinkage of the agricultural activities already are affecting livelihoods of the subsistence farmers and agricultural labourers. As the number of shrimp farms have gone up, the number of unemployed people has risen subsequently as the shrimp farms require seasonal and comparatively less labor than for rice cultivation.

This situation has been aggravated further by the chronic residual impacts of Cyclone SIDR and Cyclone Aila that contaminated almost every fresh water source and ruined farm-based income opportunities. Therefore, increased climate vulnerability of the South-west coastal areas in some ways is related to corruption and governance failure.

Like the other development plans, the NAP process and its implementation is not politically neutral and adaption to the impacts of climate change is a political commitment of the government of Bangladesh. Hence, NAP demands a strong political commitment to involve a 'whole of government approach' in its development and implementation. The NAP process could suggest establishing 'NAP Implementation Unit' preferably under the Prime Minister's office to ensure effective, transparent and accountable utilization of adaptation resources.

Facilitating a Progressive Path towards Resilience and Wellbeing

As stated earlier, many of the ongoing adaptation practices are 'business as usual', which are developed based on the past experiences and learnings of DRR projects. Most of them are reactive solutions to certain stresses. Such an approach, to some extent,



undermines the notion of socially just adaptation that encompasses both of procedural justice (empowering communities to overcome institutional barriers and build social capital to effectively engage in the decision-making processes) and distributive justice (distribution of income, assets and opportunity). NAP should include the scope of developing a model of 'socially just adaptation', with the provisions of providing preferential access of the marginalized/excluded communities to the rights (e.g., Khas land), resources (e.g. public commons) and services (e.g., social safety nets, finances, health schemes, insurance etc.). NAP should not follow the 'business as usual' practices only, rather should facilitate a progressive path towards resilience and wellbeing.

Climate Adaptive Governance and Service Delivery

As discussed, the impacts of climate change are context-specific and non-identical, so are the adaptation activities. For instance, while the South-west coastal areas suffer from fresh/drinking water scarcity, the lower GBM basin areas suffer from flooding and recurrent riverbank erosion. On the contrary, the North-west Barind region suffers from acute water crisis round the year. Such diversified impacts in different climate hotspots have constantly been altering agricultural practices and livelihoods preferences. For instance, people in the South-central coastal areas are gradually inclining towards sunflower, maize and soybean cultivation as they are resulting in good yield even in the moderately salinized soils. On the other hand, people in the South-west coastal areas are increasingly practicing crab fattening, floating agriculture, tower-type vegetable gardening and salinity tolerant short-maturing rice variety etc.; pumpkins, nuts, pulses, watermelon etc. are also resulting in plentiful production in the river basin areas.

Such locally-led innovations in the adaptation practices should be supported by the government's service delivery agencies. They should come out from their centrally designed and uniform (e.g., one size fits all types of services) practices of knowledge dissemination and input support provisions. For instance, the Department of Public Health and Engineering (DPHE) of the government of Bangladesh is mandated for ensuring water supply by installing hand-pumped tube wells. In the context of diverse/localized climate change impacts, DPHE should redesign its services both for the South-west coastal areas and North-



স্থানীয় পর্যায়ে জলবায়ু পরিবর্তনের বিপদাপন্নতা এবং
 অভিযোজনের প্রয়োজনীয়তা শীর্ষক কর্মশালা
 Consultation Meeting on Local Level Climate Vulnerability and
 Adaptation Requirements

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Consultation in the lower GBM basin area

west Barind region. DPHE's hand-pumped tube wells are no more useful as the water table has gone down in the Barind region and the tube wells pump-out saline water in the coastal areas. DPHE rather should ensure conservation and management of common waterbodies (e.g., ponds, canals etc.) to make surface water available for drinking and irrigation use. In addition, this also should require changes/redistributions in the 'rules of businesses' of the relevant ministries, for instance, Ministry of Land that holds the authority on lands and land-based resources.

Similarly, the Department of Agricultural Extension (DAE) should develop context specific, decentralized support services (e.g., inputs, advice and technologies) as per the local adaptation requirements. DAE should also increase its efforts in agricultural technology innovation, demonstration and dissemination of agricultural technologies, while providing particular attention to their affordability, accessibility and appropriateness for the women farm-holders. NAP should highlight the importance of decentralized service delivery mechanism to make adaptation and resilience practices locally appropriate and sustainable.

Strengthening Local Institutions for Socially Just Adaptation

One of the major challenges of locally-led, organically developed practices is the absence of an in-built knowledge generation and management system. Ideally, the locally-led adaptation practices

could be enhanced by strengthening community-based institutions (e.g., farmer's cooperatives, trade unions, clubs, business associations etc.) and the local government authorities (e.g., Union Parishad) in regards to climate vulnerability analysis, project/program identification and prioritization, resource mobilization and distribution, project implementation and monitoring etc.

NAP could include a pilot project in a few areas so that local institutions (e.g. the Union Parishad) could play a pivotal role in knowledge generation, participatory decision making, while establishing a co-management system in project implementation and monitoring.

Such pilot initiatives could also strengthen governance of the UPs to function in a transparent and accountable manner, while avoiding power domination and preferences of the local interest groups.

Making NAP Gender-inclusive and Gender-responsive:

The locally-led discussions remarked that the women and the indigenous peoples are disproportionately burdened with the impacts of climate change as they predominantly are economically, socially and culturally excluded; yet they play a critical role in resilience building with their multiple roles as food producers and providers, guardians, healthcare givers, and economic actors. It has been discussed that the primary impacts of an extreme weather event (e.g.,

cyclone, flood, riverbank erosion etc.) and the aftermath residual/secondary impacts put women in more fragile situation, making their role harder. Evidently, women's work load has increased in the water-scarce regions as they need to travel far away from home to fetch drinking water. There are many evidences of miscarriage (loss of pregnancies) and reproductive health disorder as women are forced to use saline water for every-day use, and for drinking as often.

Women of the indigenous communities in the North-west Barind region are even more vulnerable due to collapse of the natural resource and agriculture-based livelihoods opportunities where most of the indigenous women are employed in. The discussions identified massive 'routine economic migration' of the indigenous community people to the urban areas and employed there in risky as well as in the undignified occupations. The discussions also identified an increased level of social insecurity and a sense of disempowerment among the indigenous women as their role and dominance in the agricultural practices have gradually been declining.

Yet, men of the same families/communities are not aware, and do not acknowledge such differentiated risk and vulnerabilities that the women are facing currently and are being exposed to increasingly. Eventually, the adaptation requirements and priorities of women and adolescent girls are ignored in the families, also in the national plans and policies. The NAP process should capture the differentiated vulnerabilities of women, especially of the indigenous communities, and should also include measures for their economic empowerment and socio-cultural integration.

Indigenous women, who prefer traditional medication instead of state supported essential healthcare and hygiene facilities, are suffering from reproductive and maternal health problems. NAP should include a special health package, including raising awareness on maternal and reproductive health, for the indigenous women.



REFERENCES

- Ahmeduzzaman, M., Kar, S., & Asad, A. (2012). A study on ground water fluctuation at Barind Area, Rajshahi. *International Journal of Engineering Research and Applications (IJERA)* ISSN, 2248-9622.
- Alam, K., Shamsuddoha, M., Tanner, T., Sultana, M., Huq, M. J. & Kabir, S. S. (2011). Understanding the Political Economy of Low Carbon and Climate Resilient Development: Planning exceptionalism? *Political Economy of Climate Resilient Development in Bangladesh*. Institute for Development Studies, IDS Bulletin. Volume 42, Number 3. May 2011.
- Alamgir, M., Mohsenipour, M., Homsy, R., Wang, X., Shahid, S., Shiru, M. S., ... & Yuzir, A. (2019). Parametric assessment of seasonal drought risk to crop production in Bangladesh. *Sustainability*, 11(5), 1442.
- Ali, S., Ghosh, B. C., Osmani, A. G., Hossain, E., & Fogarassy, C. (2021). Farmers' Climate Change Adaptation Strategies for Reducing the Risk of Rice Production: Evidence from Rajshahi District in Bangladesh. *Agronomy*, 11(3), 600. <https://www.mdpi.com/2073-4395/11/3/600/htm>
- Aktar, M. N. (2013). Impact Of Climate Change On Riverbank Erosion. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, 7(1), 36-42. Retrieved from <https://gssrr.org/index.php/JournalOfBasicAndApplied/article/view/1255>
- Anik, A. R., Rahman, S., Sarker, J. R., & Al Hasan, M. (2021). Farmers' adaptation strategies to combat climate change in drought prone areas in Bangladesh. *International Journal of Disaster Risk Reduction*, 65, 102562.
- Banglapedia (2021). Riverbank Erosion. Retrieved from https://en.banglapedia.org/index.php?title=Riverbank_Erosion.
- Bangladesh Bureau of Statistics (BBS) (2005). *Population Census-2001, Community Series, Zila: Rajshahi*. Dhaka, Bangladesh, Planning Division, Ministry of Planning, Government of the People's Republic of Bangladesh.
- BBS (Bangladesh Bureau of Statistics) (2014). *Statistical Yearbook of Bangladesh*. Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh
- CEGIS (2011). *Final Report on Programmes Containing Measures to Facilitate Adaptation to Climate Change of the Second National Communication Project of Bangladesh, 2011*, CEGIS and CGC
- Chu, E., Anguelovski, I., & Roberts, D. (2017). Climate adaptation as strategic urbanism: assessing opportunities and uncertainties for equity and inclusive development in cities. *Cities*, 60, 378–387. <https://doi.org/10.1016/j.cities.2016.10.016>
- Clemett, A., Amin, M. M., Ara, S., & Akan, M. M. R. (2006). *Background Information for Rajshahi City, Bangladesh*. WASPA Asia Project Report, 2, 1-29.
- Coaffee, J., & Lee, P. (2016). *Urban Resilience: Planning for Risk, Crisis and Uncertainty*. London: Palgrave Macmillan.
- CPRD (2012). *Coastal Fishers' Livelihood in Peril: Sea Surface Temperature and Tropical Cyclones in Bangladesh*, CPRD, Dhaka, Bangladesh. 54 pp. Available at: <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.454.6542&rep=rep1&type=pdf>
- CPRD (2015): *Climate-Induced Displacement and Migration: Policy Gaps and Policy Alternative*. Available on: https://unfccc.int/files/adaptation/groups_committees/loss_and_damage_executive_committee/application/pdf/briefing_paper_climate_induced_displacement_and_migration.pdf
- CPRD (2018): *Troubled Journey towards Climate Justice: Tackling manifest climate injustice in the Loss and Damage negotiations*; <https://cprdbd.org/wp-content/uploads/2021/05/Troubled-Journey-towards-Climate-Justice.pdf>
- DoE. (2020). *Impacts of Projected Sea Level Rise on Water, Agriculture and Infrastructure Sectors of the Coastal Region*. Draft Final Report
- Ernstson, H., Leeuw, S. E., Redman, C. L., Meffert, D. J., Davis, G., Alfsen, C., Elmqvist, T. (2010). Urban Transitions: On Urban Resilience and Human Dominated Ecosystems. *Ambio*, 39(8), 531–545. <https://doi.org/10.1007/s13280-010-0081-9>
- Flood Plan Coordination Organization (FPCO) (1995). *Bangladesh Water and Flood Management Strategy*. Ministry of Water Resources, Dhaka
- Goosen, H., Hasan, T., Saha, S. K., Rezwana, N., Rahman, R., Assaduzzaman, M., & Terwisscha van Scheltinga, C. (2018). *Nationwide climate vulnerability assessment in Bangladesh*. Ministry of Environment, Forest and Climate Change, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh
- Hossain M.K. (2009). 'A Birth of a Climate Change Policy and Related Debates: Analyzing the Case of Bangladesh', paper presented at Environmental Policy: A Multinational Conference on Policy Analysis a Detaching Methods, June 2009, Seoul, South Korea, www.welfareacademy.org/pubs/international/
- Hossain, M. N., Chowdhury, S., & Paul, S. K. (2016). Farmer-level adaptation to climate change and agricultural drought: empirical evidences from the Barind region of Bangladesh. *Natural Hazards*, 83(2), 1007-1026.
- International Institute for Environment and Development (2009). *Climate change and the urban poor: risk and resilience in 15 of the world's most vulnerable cities*. https://pubs.iied.org/g02597?gclid=Cj0KCQiAmpyRBhCARIsABs2EAqzysuROZttv11yn3Fj4l55TFGJXD8JOjsivNzXscrDZxsA-OQxZ-saAsxHEALw_wcB
- Islam, M. A., Islam, S. L., & Hassan, A. (2017). *Impact of Climate Change on Water with Reference to the Ganges-*

- Brahmaputra–Meghna River Basin. In *Chemistry and Water* (pp. 121-160). Elsevier.
- Islam, M. R., & Shamsuddoha, M. (2017). Socioeconomic consequences of climate induced human displacement and migration in Bangladesh. *International Sociology*, 32(3), 277-298
- Islam, M. T., & Nursey-Bray, M. (2017). Adaptation to climate change in agriculture in Bangladesh: The role of formal institutions. *Journal of environmental management*, 200, 347-358.
- Klein, R. J. T., Nicholls, R. J. & Thomalla, F. (2003). 'Resilience to natural hazards: How useful is this concept?' *Environmental Hazards*, 5, 35-45
- Mitchell, T. & Harris, K. (2012). Resilience, a Risk Management Approach, Background note, London: Overseas Development Institute; www.dochas.ie/Shared/Files/4/Resilience_a_risk_management_approach.pdf
- MoEF (2015). Roadmap for Developing a National Adaptation Plan for Bangladesh. Dhaka: Ministry of Environment, Forest, Government of the People's Republic of Bangladesh.
- Mojid, M. A. (2020). Climate change-induced challenges to sustainable development in Bangladesh. In IOP Conference Series: Earth and Environmental Science (Vol. 423, No. 1, p. 012001). IOP Publishing.
- Muntarin, Z. M. R., Roquia, S., Abbasi, B. M., & Towfiqul, I. A. R. M. (2020). Appraising drought hazard during Boro rice growing period in western Bangladesh. *International Journal of Biometeorology*, 64(10), 1687-1697.
- Murad, H., & Islam, A. K. M. S. (2011, January). Drought assessment using remote sensing and GIS in north-west region of Bangladesh. In *Proceedings of the 3rd International Conference on Water & Flood Management* (pp. 797-804).
- Pal, S., & Talukdar, S. (2018). Drivers of vulnerability to wetlands in Punarbhaba river basin of India-Bangladesh. *Ecological Indicators*, 93, 612-626.
- Rahman, A. S., Kamruzzama, M., Jahan, C. S., & Mazumder, Q. H. (2016). Long-term trend analysis of water table using 'MAKESENS' model and sustainability of groundwater resources in drought prone Barind area, NW Bangladesh. *Journal of the Geological Society of India*, 87(2), 179-193. <https://doi.org/10.1016/j.wace.2014.07.004>
- Raihan, M.; Huq, J.; Alsted, G. and Andreassen, H. (2010). *Understanding Climate Change From Below, Addressing Barriers from Above*, Dhaka: ActionAid Bangladesh
- Rashid, M. B., Islam, M. B., & Sultan-Ul-Islam, M. (2013). Causes of acute water scarcity in the Barind Tract, Bangladesh. *Int. J. Econ. Environ. Geol.*, 4(1), 5-14.
- Rasid, H., & Mallik, A. (1995). Flood adaptations in Bangladesh: is the compartmentalisation scheme compatible with indigenous adjustments of rice cropping to flood regimes? *Applied Geography*, 15(1), 3-17.
- Roy, M. K., Datta, D. K., Adhikari, D. K., Chowdhury, B. K., & Roy, P. J. (2005). Geology of the Khulna city corporation. *J Life Earth Sci*, 1, 57-63
- Sarker, M. H., & Ahmed, F. (2015). Climate Change Vulnerability of Drinking Water Supply in coastal areas of Bangladesh. <https://www.iucn.org/content/climate-change-vulnerability-drinking-water-supply-infrastructure-coastal-areas-bangladesh>
- Shamsuddoha, M., Khan, S.M.M.H., Hossain, T., and Raihan S. (2013). *Displacement and migration from the climate hot-spots: Causes and Consequences*, Center for Participatory Research and Development and ActionAid Bangladesh, Dhaka
- Shamuddoha, M. and Bijoy, M.R. (2015): *Step towards Local Adaptation Planning: Climate Change Vulnerability Assessment of Mongla Upazilla*. Network on Climate Change, Bangladesh (NCC' B), Dhaka, 2015.
- Sharmin, R., Sharmin, S., Iqbal, S. M. S, Shamsuddoha, M. (2020). Climate-Induced Migration and Displacement in Bangladesh: A Case Study of Riverbank Erosion from Naria Upazila, Shariatpur. <https://cansouthasia.net/climate-induced-migration-and-displacement-in-bangladesh/>
- Setu, N. N., Hossain, S., Saha, R., & Rahman, M. (2014, February). Natural disasters impact on the water cycle, resources, quality and human health. In *Proceedings of the 2nd International Conference on Civil Engineering for Sustainable Development (ICCESD)* (pp. 14-16).
- SRDI (2010). *Saline Soils of Bangladesh*. Soil Resource Development Institute, Farmgate, Dhaka-1215. 55p
- Teschl M. and Comim, F. (2005) Adaptive Preferences and Capabilities: Some Preliminary Conceptual Explorations, *Review of Social Economy*, 63.2: 229-247
- Start Fund Bangladesh (2018): Naria, Shariatpur Riverbank Erosion; Briefing note 17 September 2018; <https://reliefweb.int/sites/reliefweb.int/files/resources/180917%20Start%20Fund%20Bangladesh%20Briefing%20Note%20Riverbank%20Erosion%20Naria%20Shariatpur.pdf>
- Sridevi, et. al. (2021). Role of river discharge and warming on ocean acidification and pCO₂ levels in the Bay of Bengal. *Tellus B: Chemical and Physical Meteorology*. <https://doi.org/10.1080/16000889.2021.1971924>
- Welsh, M. (2014). Resilience and responsibility: governing uncertainty in a complex world. *The Geographical Journal*, 180(1), 15–26. <https://doi.org/10.1111/geoj.12012>

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Declaration

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Let the VOICES of the climate VICTIMS be heard in Bangladesh's NAP process

EDITOR'S PICK

Climate change impacts are context and location-specific, they are non-identical as they vary according to the social and ecological context of a given area. While climate change has instigated the frequency and intensity of known disasters e.g., tropical cyclones, monsoon flood, riverbank erosion etc., this has also instigated prevalence of unusual and localized disasters, including drought, waterlogging, salinity intrusion etc.,. Evidently, the long-term residual impacts of the extreme weather events and the irreversible impacts of the slow onset events (also termed as climate processes) are outspreading the impact chain to their secondary and tertiary risk levels. They are understood as the 'human dimension' of climate change impacts, which are causing regression in growth and development, widening inequality, competition and conflict in resource use, mass displacement and involuntary migration etc.

Hence, adaptation to the impacts of climate change should not only be based on the perceived vulnerability situation (e.g., considering only the exposure) and with some engineering solutions to the risks (e.g., cyclone shelter and flood preventive infrastructures), it rather should also consider a human dimension in planning and deciding actions. And, the adaptation planning should follow a comprehensive, site-specific, bottom-up vulnerability analysis, while also providing due attention to the existing fault lines of inequality and social exclusion such as gender discrimination, ethnicity, and socio-economic deprivations.

Instead of a centralized planning, the NAP process should follow a locally-led (bottom-up) process, while allowing participation of a broad-based stakeholders, including the climate-vulnerable people, in the context-specific vulnerability analysis and prioritizing adaptation actions. Let the Voices of the Climate Victims be heard in Bangladesh's NAP Process.