
Project on Protecting and Restoring Freshwater Ecosystems for Drinking Water for Southern Bangladesh

Project Development Framework

KEITI

July 30, 2025

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This project is at its initial conceptual design stage and extensive effort to turn it into an investable project package is required. Especially, structured endeavors needed, most importantly, on the areas and points as under.

- **Reinforcing Climate Rationale:** Currently formulated Climate Rationale in this document contains basic rationale for the initiative as well as reference information from a previous project funded by GCF(FP069: Enhancing adaptive capacities of coastal communities, especially women, to cope with climate change induced salinity, Bangladesh & United Nations Development Programme, UNDP, 16 March 2018). To clarify the logic for funding for this initiative, the whole Climate Rationale shall be needed to be updated and enhanced to ensure that this project carries its own purpose, goal and component compared to the previous one.
- **Conducting feasibility study and formulating its outcome into Project Description:** Environmental, social, economic and gender-related survey on the circumstances and conditions as they stand now in the target region is needed, producing extensive information on the level and risks of Sea Level Rise, storm-surge, cyclones and their impacts to the environment and affected communities. At the same time, study and analysis of technological feasibility of the intended solutions(nature-based solar-powered purification system) and accompanying component technologies and their expected effect, outcome and cost should be performed to elaborate on justification on the solution intended.
- **Financial structuring and budget planning:** It is needed to assess the whole financial resource needed and specify its composition in terms of financial instruments of grant, loan, equity and guarantee instrumental components and their respective portion. As well, capital cost and operational cost should be measured and be specified to support the whole funding requirement.
- **Project Structure and Logical Framework:** The whole scope of the project needs to be defined of a complete framework of activities, outputs, outcomes and impacts based on GCF's Logical Framework guideline.
- **Theory of Change:** The Theory of Change suggested in this framework document can be a guide to develop a complete and refined ToC structure and related logic.
- **Fulfillment of GCF's Investment Criteria:** To conform to GCF's criteria on investment, specifications on the points such as Impact Potential, Paradigm Shift Potential, Sustainable Development Potential, Needs of the Recipient, Country Ownership and Efficiency and Effectiveness.

PROJECT SUMMARY

This project is to mainly respond to and overcome risks and damages on the water security area for the Southern region of Bangladesh most vulnerable from especially sea water rise and consequent invasion of salt water into fresh water resources and aerial ecosystems.

The nature, purpose, scope and characteristics of this project can be summarized as under.

RESULT AREAS

This project is for adaptation to climate risks in the following areas.

- ☐ Most vulnerable people and communities
- ☐ Health and well-being, and food and water security
- ☐ Ecosystem and ecosystem services

ESTIMATED ADAPTATION IMPACT (NUMBER OF DIRECT BENEFICIARIES AND % OF POPULATION)

(To be defined)

INDICATIVE TOTAL PROJECT COST

(To be defined)

INDICATIVE FUNDING REQUESTED(GCF)

(To be defined)

THE TYPE OF FINANCIAL INSTRUMENT REQUESTED FOR THE GCF FUNDING

Grant

ESTIMATED DURATION OF PROJECT/ PROGRAMME:

7 Months (To be defined)

ESTIMATED PROJECT/ PROGRAMME LIFESPAN

(To be defined)

ESS CATEGORY

C or I-3

PROJECT/PROGRAMME INFORMATION

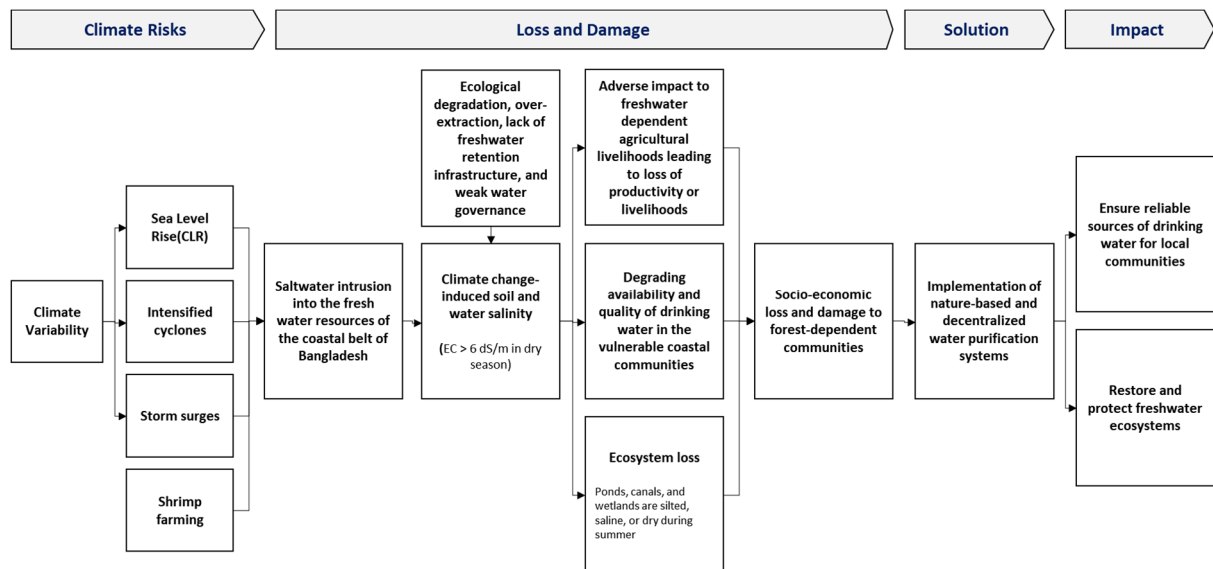
CONTEXT AND BASELINE

Climate Rationale

The southern coastal region of Bangladesh is severely affected by salinity intrusion caused by sea-level rise, tidal surges, shrimp farming, and climate variability. Communities struggle to access safe water year-round. Existing freshwater sources are degraded, and water treatment infrastructure is inadequate or non-existent.

Root causes include ecological degradation, over-extraction, lack of freshwater retention infrastructure, and weak water governance. The problem is further exacerbated for forest-dependent communities, who face both water insecurity and ecosystem loss.

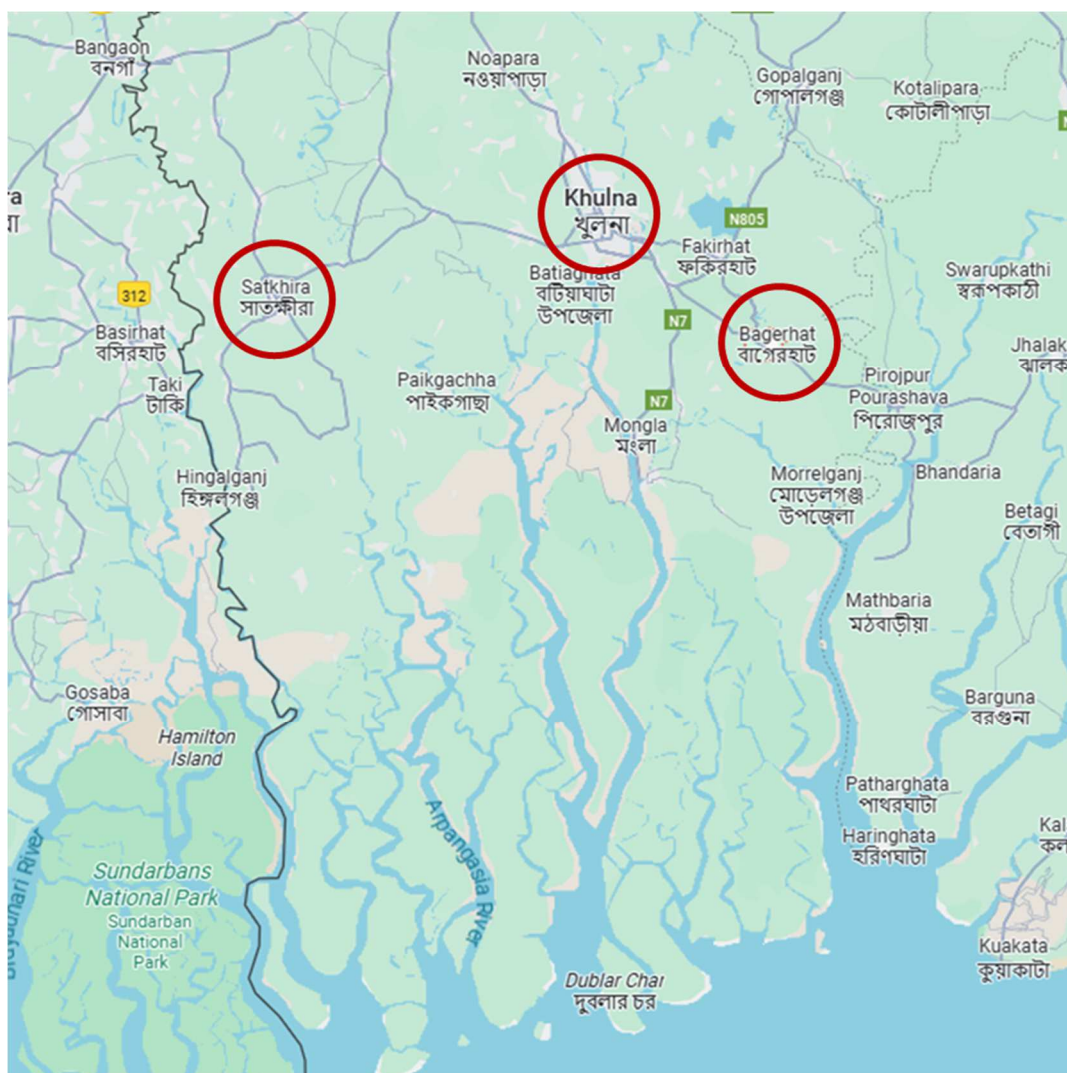
This project is to restore and protect freshwater ecosystems in coastal regions of Bangladesh to ensure reliable sources of drinking water for local communities through nature-based and decentralized water purification systems.



Climate change, manifesting in the form of intensified cyclones, storm surges, and sea-level rise (SLR), is accelerating saltwater intrusion into the fresh water resources of the coastal belt of Bangladesh. Climate change-induced soil and water salinity is projected to adversely impact freshwater dependent agricultural livelihoods (leading to loss of productivity or livelihoods) as well as the availability and quality of drinking water in the vulnerable coastal communities. Furthermore, given the crucial role that women play in water security and household level resilience, and their socio-economic marginalization, the climate change-induced threat to

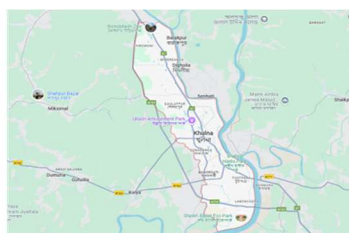
agricultural livelihoods and drinking water security of the affected coastal communities disproportionately affects women and girls.

Therefore, the key objective of the proposed project is to support the Government of Bangladesh (GoB) in strengthening the adaptive capacities of coastal communities to cope with impacts of climate change-induced salinity on their livelihoods and water security. GCF resources will be combined with GoB co-financing to address information, technical, financial and institutional barriers to implementing and managing resilient livelihoods and drinking water solutions for the vulnerable communities in the Southwestern coastal districts of Khulna, Satkhira and Bagerhat. An estimated over 719,229 people (about 245,516 direct and 473,713 indirect; *to be updated to add Bagerhat city*) will benefit from the proposed project interventions.





Satkhira



Khulna



Bagerhat

The proposed project will empower target communities, as 'change-agents' to plan, implement, and manage resilient livelihoods and drinking water solutions. The project will enable those communities to address climate change risks on livelihood and drinking water security to promote synergistic co-benefits. It will enhance the adaptive capacities of these communities in the face of worsening impacts of climate-change induced salinity on their freshwater resources which in turn adversely affect livelihood and drinking water requirements.

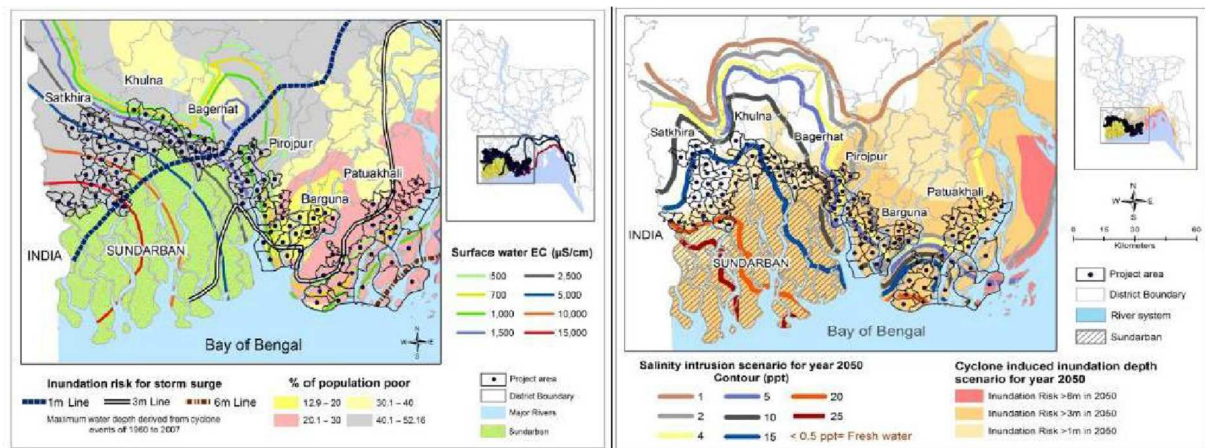
GCF resources will be invested in promoting a diversification from currently non-adaptive, freshwater-reliant livelihoods of small-scale farmers, fishers, and agro-labourers towards climate-resilient agricultural livelihoods. GoB co-financing is leveraged to support adoption and scale of these alternative, climate-resilient agricultural livelihoods through strengthened value-chains and market linkages for their long-term viability in the face of increasing salinity and extreme weather. The project also utilizes GCF and GoB resources to support investments in and management of climate-resilient drinking water solutions to secure year-round, safe drinking water supplies for the targeted communities. Access to reliable, safe drinking water enables the communities, especially women and girls in targeted households, to invest the resulting time and cost savings and health co-benefits in enhanced livelihoods and income generating and/or educational opportunities. In turn, the enhanced incomes and livelihoods will enable the communities to sustain the investments in the drinking water supply solutions in the long-term. Finally, through investments in institutional capacities, knowledge dissemination and evidence-based learning, the project will enable pathways for replication and scale of project impact to secure livelihoods and drinking water across the vulnerable districts of the southwest coast of Bangladesh. The project yields significant environmental, social (including gender), and economic co-benefits including enhanced integrity of coastal ecosystems and freshwater resources; improved gender norms and women empowerment; and increased income and health benefits, estimated at USD15 million and USD4 million respectively over the project lifetime.

Baseline Situation

- Coastal districts(e.g. Khulna, Satkhira, Bagerhat) face increasing salinity levels($EC > 6$ dS/m in dry season).
- Ponds, canals, and wetlands are silted, saline, or dry during summer.
- Inadequate investment in sustainable freshwater restoration or purification solutions.

- Forest Department lacks structured freshwater ecosystem program but manages key forest zones.

A total of six districts (namely Satkhira, Khulna, Bagerhat, Pirojpur, Barguna and Patuakhali) across the Southwest Coast show most significant exposure to climate induced salinity and disasters. The districts of Satkhira, Khulna, and Bagerhat face higher observed surface water salinities, highlighting that districts to the west are currently the most vulnerable to salinity risks.



In view of site-specific assessments and data required to target and plan for climate-resilient livelihoods and drinking water solutions, GoB aims to adopt a phased approach to supporting adaptation investments for the coastal resilience of the six high-priority vulnerable districts. Therefore, for Phase I (for which this proposal seeks funding), Khulna and Satkhira have been prioritized, given their salinity exposures are the highest among the priority districts.

Relevance to NDCs

The project aligns with Bangladesh's NDC commitments to enhance climate resilience through nature-based solutions, including integrated water resource management and ecosystem-based adaptation. It contributes directly to the National Adaptation Plan and the Bangladesh Delta Plan 2100's goals to secure freshwater in coastal zones. The project contributes towards GoB's achievement of priorities outlined in the Nationally Determined Contributions (NDC) and its climate change strategies. The project objective speaks to the top five key near-term areas of intervention identified by the INDC to address adverse impacts of climate change¹ including: 1) Food security, livelihood and health protection (incl. water security); 2) Comprehensive disaster management, 3) Coastal Zone Management, including Salinity Intrusion control, 4) Flood Control and Erosion protection, 5) Building Climate Resilient Infrastructure. Directly aligned to six of the fourteen² broad adaptation actions prioritized by INDC, the project is implementing improved EWS, supporting climate resilient infrastructure, Tropical cyclones and storm surge protection, stress-tolerant variety improvement and cultivation, and Capacity Building at Individual and institutional level to plan and implement adaptation programmes and projects.

Target Beneficiaries

- Forest-adjacent forest-dependent communities
- Women and children vulnerable to waterborne diseases
- Local government bodies and forest user groups

Target beneficiaries were identified based on current livelihood practices, water supply availability, poverty levels, location of housing and coordination (based on coverage gaps) with on-going or future efforts by other government or donor projects taken into account i.e. avoiding those already covered by existing projects. The selection of the direct beneficiaries of the livelihood interventions was based on a Participatory Rapid Appraisal (PRA) process during which households, women and indigenous people engaged in non- and/or maladaptive livelihoods, that require support to shift towards climate-resilient livelihoods, were identified. Targeted beneficiaries for water, within the climate change impacted wards, were identified based on assessing the demand and supply gap (for year- round access to safe water, accounting for baseline coverage), water source mapping and availability, and consideration of other water supply investments in the targeted areas (especially the USAID funded, World Vision supported 'Nobo Jatra' and the 'O'Harizan' programmes).

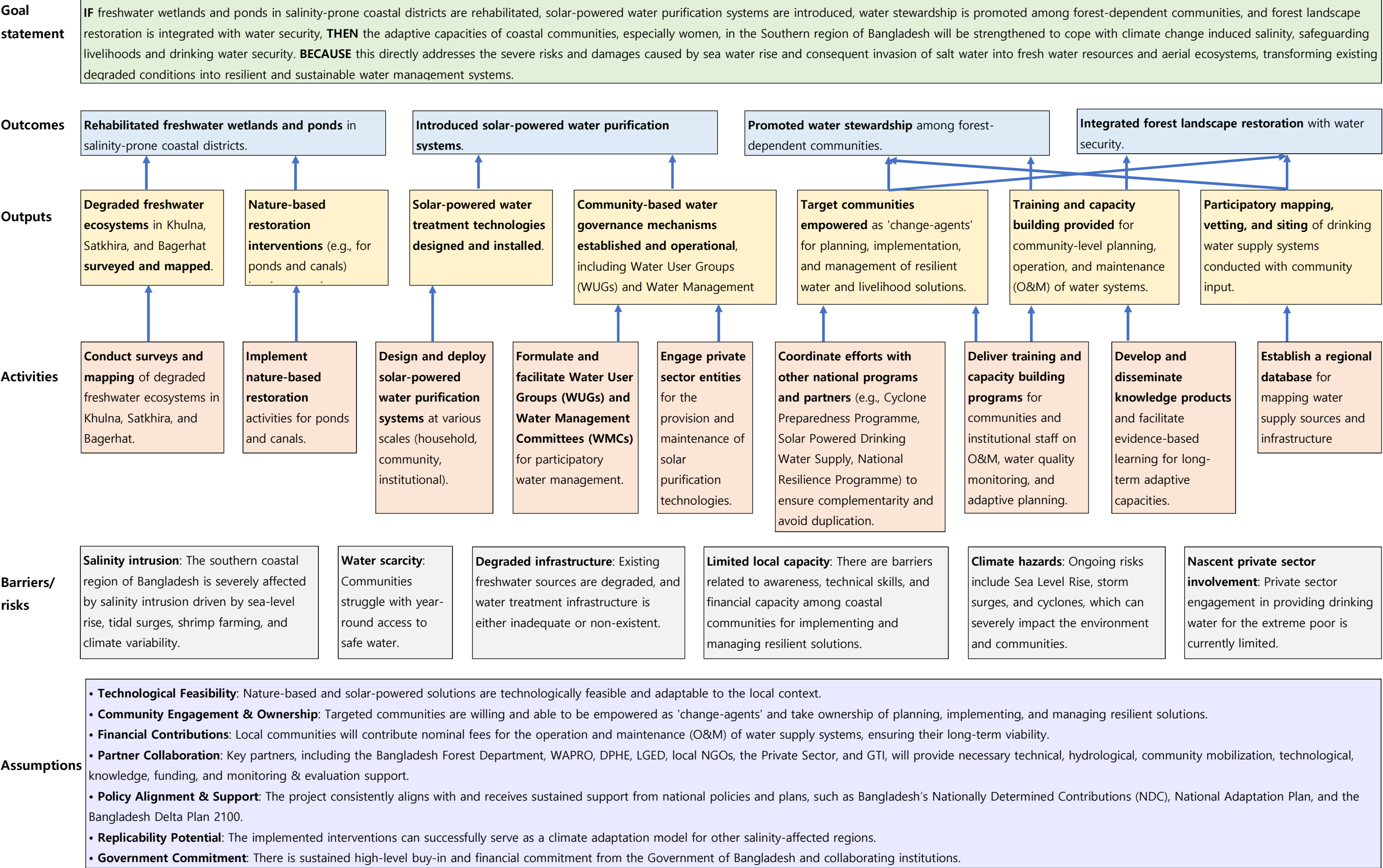
Alignment with SDGs

- **SDG 6:** Clean Water and Sanitation
- **SDG 13:** Climate Action
- **SDG 15:** Life on Land
- **SDG 11:** Sustainable Cities and Communities

PROJECT/PROGRAMME DESCRIPTION

This project is focused on restoring and protecting freshwater ecosystems in forested and salinity-prone regions through eco-hydrological interventions. It included nature-based restoration (ponds, canals), water treatment using solar-powered technology, and community-based water governance.

Theory of Change



The objective of the proposed project is to support the Government of Bangladesh (GoB) in strengthening the adaptive capacities of coastal communities, especially women, to cope with impacts of climate change- induced salinity on their livelihoods and water security. The Fund level impacts of the project are increased resilience and enhanced livelihoods of the most vulnerable communities and increased resilience of health and well- being, and food and water security of the coastal communities, especially women, in Bangladesh. The GCF Results Framework outcome that this project fits under is strengthened adaptive capacity and reduced exposure to climate risks of the vulnerable communities, especially women, of the southwest coast of Bangladesh. Recognizing the crucial role that women play in water security and household level resilience, and the layered socio-economic marginalization that leads to their increased vulnerability, the proposed solution will empower target communities, especially women, as 'change-agents' to plan, implement, and manage resilient drinking water solutions and livelihoods in the face of worsening impacts on their freshwater resources. The paradigm shift is to move away from a focus on short-term responses and technology-led interventions towards community-centric solutions that build ownership and capacities across the system to design, implement, manage, and evolve adaptive responses to safeguard livelihoods and drinking water security.

Goals

- Rehabilitate freshwater wetlands and ponds in salinity-prone coastal districts
- Introduce solar-powered water purification systems
- Promote water stewardship among forest-dependent communities
- Integrate forest landscape restoration with water security

Project Activities

- Survey and map degraded freshwater ecosystem in Khulna, Satkhira, and Barunga.
- Restore dredge community ponds and establish protective vegetative buffers.
- Install decentralized, solar-powered purification systems(UV/RO-based).
- Build capacity among community forest groups to manage and monitor freshwater sources.
- Develop a participatory freshwater ecosystem monitoring platform.

No.	Implementing Activities	Timeframe (in Months)
1	Freshwater mapping and hydrological assessment	1-2
2	Community mobilization and ecosystem restoration	2-5
3	Installation of solar purification systems	3-6
4	Monitoring, capacity building, and scale-up road map	5-7

PROJECT GOVERNANCE AND IMPLEMENTATION STRUCTURE

ROLES AND LINKAGES OF KEY STAKEHOLDERS:

- **Green Climate Fund (GCF):**

- **Role:** The primary funding source for the project, providing crucial grant financing. The GCF establishes a Funded Activity Agreement (FAA) with its Accredited Entity.

- **Linkage:** Provides financial resources to the Accredited Entity (AE) under the FAA.

- **AE:**

- **Role:** The AE is responsible for GCF-specific oversight and quality assurance, ensuring project activities align with GCF standards and policies. It manages the GCF funds, disbursing them quarterly in advance to the Executing Entity. The AE also provides implementation support, including recruiting Project Management Unit (PMU) staff and ensuring compliance with both GCF and the AE's rules and procedures. The AE guides the Project Steering Committee (PSC) on technical feasibility and compliance requirements.

- **Linkage:** Receives funds from GCF, and enters into a Letter of Agreement (LoA) with Ministry of Environment, Forest and Climate Change for fund disbursement and implementation support. Is a key member of the PSC.

- **Ministry of Environment, Forest and Climate Change (MEFCC):**

- **Role:** The **Executing Entity (EE)** and national Implementing Partner for the project. MEFCC is accountable to UNDP for managing the project, achieving outcomes, and effectively using UNDP resources. It provides overall strategic direction and guidance to the project, chairs the Project Steering Committee (PSC), and hosts the Project Management Unit (PMU).

- **Linkage:** Receives funds from UNDP, is directly responsible for project implementation, and oversees its Responsible Parties (DWA and DPHE). Holds project ownership and chairs the PSC.

- **Bangladesh Forest Department:**

- **Role:** This department is specifically identified as the Lead Partner for this project and will act as the project execution agency on behalf of the MEFCC. The Forest Department is responsible for coordinating restoration activities and involving communities in planning, operation, and maintenance. This role also supports the Forest Policy 2023, the Bangladesh Delta Plan 2100, and the department's landscape-level ecosystem restoration agenda.

- **Project Steering Committee (PSC):**

- **Role:** The PSC is the governing body of the project, responsible for making consensus-based strategic, policy, and management decisions. It oversees project implementation, reviews compliance with Government of Bangladesh, AE, and GCF requirements, and approves the Annual Work Plan (AWP) and budget.

- **Composition:** Comprised of key representatives including the MEFCC's Chief Accounts Officer (Executive), AE, BFD and DPHE (Senior Beneficiaries), and the National Project Director (NPD). It meets every six months or as needed.

- **Linkage:** Provides high-level strategic guidance and oversight to the PMU and ensures coordination among key ministries and partners.

- **National Project Director (NPD):**

- **Role:** Nominated by MEFCC, the NPD is responsible for the overall direction, strategic guidance, and timely delivery of project outputs. The NPD leads the Project Management Unit (PMU).

- **Linkage:** Leads the PMU and reports to the PSC, providing day-to-day supervision of the PMU staff.

- **Project Management Unit (PMU):**

- **Role:** The operational core of the project, led by the NPD. The PMU is responsible for day-to-day project management, including preparing work plans and progress reports, supervising overall implementation, guiding the implementation of social, gender, and environmental safeguards plans, and managing knowledge and communications activities. It comprises both technical and operational support teams.

- **Linkage:** Recruited by the AE, the PMU provides technical and operational support to the and monitors the work of contractors and NGOs.

- **Implementation Support Agencies:**

- **DPHE** has a significant role in rural water supply and sanitation in Bangladesh, having implemented numerous development projects. It maintains a presence with offices and technical staff at various levels, including Upazila (sub-districts) and Union. In other projects, DPHE is responsible for the installation and operation & maintenance (O&M) of drinking water solutions.

- **LGED** is the technical arm of the Ministry of Local Government, Rural Development and Cooperatives, mandated with planning and implementing local-level rural and urban physical infrastructure, including small-scale water resources. LGED is also involved in mainstreaming climate resilience into infrastructure planning and has a decentralized workforce across the country.

- The project also aims to coordinate with the **Water Resources Planning Organization (WARPO)** on hydrological assessments.

- **Procured Service Providers (Engineering Companies, NGOs, Private Sector):**

- **Role:** These entities are engaged through contractual agreements to execute specific project activities, such as construction and commissioning of water supply systems and implementing livelihood projects. These include the following:

- **Private Sector:** Private sector entities will function as solar purification technology providers. This is essential for the project's goal of introducing solar-powered water purification systems (UV/RO-based) as part of its nature-based and decentralized water purification solutions.

- **Green Transition Initiative (GTI):** This entity will serve as a partner providing knowledge, funding, and Monitoring and Evaluation (M&E) support for the project.

- **Linkage:** Work under the supervision of community committees (Water Management Committees) and with technical monitoring by DPHE and PMU staff.

- **Local Government Institutions (LGIs) / Union Parishads (UPs):**

- **Role:** Play a crucial role in co-management and oversight of project interventions at the local level. They are involved in the selection of beneficiary areas and will own community- pond-based systems, providing communities with established access rights to water and land.

- **Linkage:** Work closely with implementation support agencies, supporting day-to-day implementation and monitoring of activities.

- **Communities / Beneficiaries (including Water User Groups, Water Management Committees):**

- **Role:** The ultimate recipients of the project interventions. They are empowered as 'change-agents' to plan, implement, and manage resilient drinking water solutions and livelihoods. They also contribute nominal fees for the O&M of water supply systems.

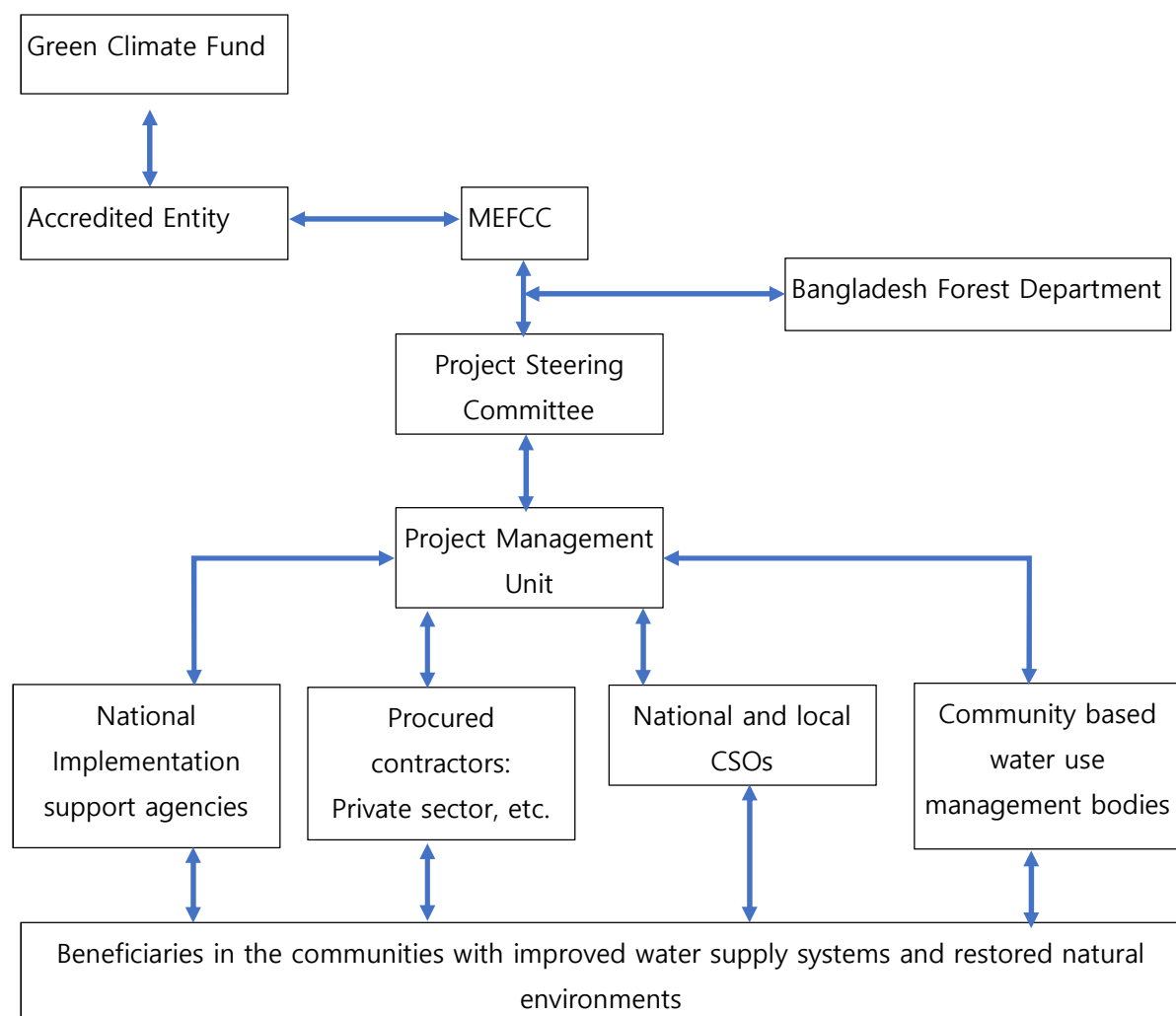
- **Key Groups:**

- **Water User Groups (WUGs) and Water Management Committees (WMCs):** Established at the ward level to support participatory water management, O&M, and adaptive planning for water access and distribution.

- **Linkage:** Directly engaged in participatory planning, implementation, and O&M of interventions. WLGs are linked with financial intermediaries (FIs) and Micro Finance Institutions (MFIs) through Public-Private Initiative platforms (PPIs) to access credit and ensure the sustainability and scale of resilient livelihoods.

The project's design emphasizes moving away from short-term, technology-led interventions towards **community-centric solutions that build ownership and capacities** across multiple stakeholders to sustain and scale adaptive responses, safeguarding livelihoods and water security in the face of worsening climate change impacts. It also coordinates with other ongoing national programs to ensure complementarity and avoid duplication.

IMPLEMENTATION ARRANGEMENT:



Requested Support

- Technical assistance for ecological restoration and purification systems
- Financial support for pilot and scale-up
- Policy and institutional strengthening for freshwater ecosystem management

EXPECTED PROJECT RESULTS ALIGNED WITH THE GCF INVESTMENT CRITERIA

- 100,000 people gain access to safe drinking water.
- Salinity-free freshwater ecosystems restored across 500 hectares.
- Improved water governance and community-based water conservation.
- Enhanced ecosystem services and biodiversity in forest-water landscapes.

ENGAGEMENT AMONG THE NDA, AE, AND/OR OTHER RELEVANT STAKEHOLDERS IN THE COUNTRY

The Forest Department will coordinate restoration activities while involving communities in planning, operation, and maintenance. The project will serve as a climate adaptation model for other salinity-affected regions.

Legal and Regulatory Alignment:

Supports the Forest Policy 2023, Bangladesh Delta Plan 2100, and NDC adaptation goals. Aligns with the Forest Department's landscape-level ecosystem restoration agenda.

Key Partners

- **Bangladesh Forest Department**(Lead)
- **WARPO, DPHE, LGED**: Technical and hydrological support
- **Local NGOs**(e.g. : Shushilan, BRAC): Community mobilization
- **Private Sector**: Solar purification tech providers
- **GTI**: Knowledge, funding, and M & E partners

LINKAGE WITH OTHER NATIONAL PROGRAMS

In addition to building on these past and on-going efforts, the project has been designed in coordination with and to complement the following ongoing and planned initiatives:

- The Cyclone Preparedness Programme (CPP), jointly managed by Ministry of Disaster Management and Relief (MoDMR) and the Bangladesh Red Crescent Society (BDRCS) and various NGOs, has been engaged in large-scale public awareness and capacity development activities for pre-disaster preparedness at the household and community levels. The CPP disseminates cyclone early warning messages through its extensive radio network (130 stations) to districts along the

coastal belt. The official mandate of the BDRCS as stated in the Standing Orders on Disaster (SOD) is to complement the government's efforts in case of emergency response, emphasizing the development of disaster preparedness related plans and programs. The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2009 also emphasize the role of BDRCS to enhance the cyclone preparedness programme. The CPP covers 37 Upazilas of 13 districts in the coastal areas. The success of the CPP is largely attributed to the robustness of the Early Warning System (EWS), the issuance of warnings through a unified signalling system, and the dissemination of information through approximately 62,000 volunteer groups. Volunteers have been trained to play a crucial role in the dissemination of cyclone warnings, evacuation, rescue, first aid emergency relief and in the usage of radio communication equipment. The CPP relies on technical skills and volunteers' commitment to ensure that potential victims of an approaching cyclone are given sufficient warning, enabling them to move to safe sites. CPP receives the meteorological data and cyclone early warnings from the Bangladesh Meteorological Department (BMD), which issues regular bulletins that are transmitted to the six zonal offices and the 32 upazila (sub-district) offices over high frequency (HF) radio. The upazila office in turn, passes it to unions (village level) through very high frequency (VHF) radios. The unit team spreads out in villages and issues cyclone warnings. Volunteers deliver the messages to most at risk villages and assist especially the weakest members of communities to seek refuge in cyclone shelters. Cyclone Preparedness Volunteers also get involved in Rescue, First Aid activities and the distribution of relief items. Outside the 4 months cyclone season they run public awareness activities such as staging educational dramas and simulation exercises. The proposed project will coordinate with the CPP to equip and train women and girl volunteers from targeted households to support gender-responsive dissemination and use of EWSs for safer lives and livelihoods.

- O'Harijan drinking water project (implemented by LEDARS) has initiated two projects to enhance adaptive livelihood capacity and income of target beneficiaries. To reduce climate induced migration, the project is introducing integrated water resource management models through excavated mini ponds and canals in paddy land, establishing deep tube-wells, and supporting households to preserve the daily use of waste water for dry season cropping. The project also increases awareness of the beneficiaries on how to maximise use of their conserved rainwater, what varieties are growing in less water, which varieties can grow in brackish water, introduce tools and techniques for adaptive agriculture. USAID's Nobo Jatra project works in 40 Unions including in Kaliganj in Satkhira District and Dacope in Khulna District³⁷. The project is designed to reduce food insecurity and vulnerability for 856,116 households in 4 Unions and includes activities related to Installation of water systems and to promote livelihoods of the poor. It will establish Climate Smart Agriculture plots and engage with local producer groups. It will activate or reactivate Water, Hygiene, and Sanitation (WASH) Committees and community support groups and engage in behavioural change communication activities. The

project will install 1-2 water options and 23-25 sanitation options per village. Water interventions mainly focus at the community-level whilst sanitation more at the household level. The proposed project is coordinating with both these initiatives on targeting and coverage to address supply gaps (see Section C.3 on 'Targeting'). The project also aims to coordinate with these efforts during implementation on institutional capacity building efforts to support systematic, climate-risk informed planning and implementation of these solutions.

- GoB started implementation of the Local Government Initiative on Climate Change (LoGIC) with support from EU-SIDA-UNCDF-UNDP. The project will be implemented in seven districts of which 5 districts (Khulna, Bagerhat, Patuakhali, Bagruna and Bhola) are in the coastal area and it will support climate and disaster proofing rural infrastructure and household based adaptation and Disaster Risk Reduction (DRR) measures. The project will invest around USD1.5 million in the Khulna District to climate-proof small-scale rural infrastructure and households. The project will build on the experience of LoGIC in strengthening vulnerable communities' capacities, local government institutions and civil society organizations for planning. Therefore, the actions at various levels will bring about climate change adaptation by scaling up through local government institutions incorporating high quality accountability and participation of the most vulnerable people.
- GLZ's planned "Solar Powered Drinking Water Supply in Selected Coastal Areas of Bangladesh" is conceptualized as a GCF project to support GoB in addressing the high demand and insufficient supply of drinking water. The project would include technologies such as PSF, RO, and Managed Aquifer Recharge (MAR) and is expected to meet the water demand of approximately 0.16 million households. Discussions with GCF have led to identifying potential complementarities (in technologies and target areas) that will also be taken into account as both projects advance.
- The National Resilience Programme (NRP) is a joint programme implemented by the Ministry of Disaster Management and Relief (MoDMR), Ministry of Women and Children Affairs (MoWCA), Local Government Engineering Department (LGED) and the Programming Division of the Planning Commission. Considering growing government annual development budgets, its extensive portfolio of social safety nets and the likelihood of declining international aid, the NRP does not just aim to implement local risk reduction activities at scale but will provide strategic support to enhance government capacity to do so through its own structures and programmes. Among its key focus areas is enhancing women's leadership in disaster management and developing capacity for gender-responsive disaster risk reduction. This will include capacity development of Disaster Management Committee Members and women volunteers in particularly vulnerable areas to act as local change agents for gender equality and responsiveness in disaster response, early warning, preparedness and recovery initiatives. The NRP will also include activities building up the resilience skills and providing livelihood support of women in climate hotspots, and work with MoWCA to use the learning from these activities to build MoWCA capacity for adaptive social

safety programming and skills development programmes. The proposed GCF project will coordinate with NRP on EWs and policy and coordination capacity building activities for MoWCA.

INDICATIVE FINANCING/COST INFORMATION

FINANCING BY COMPONENTS

(To be defined)

Component/Output	Indicative cost (USD)	GCF financing		Co-financing		
		Amount (USD)	Financial Instrument	Amount (USD)	Financial Instrument	Name of Institutions
Indicative total cost (USD)						

JUSTIFICATION OF GCF FUNDING REQUEST

Over a period of 15 years (2001-2015), USD3.4 billion was spent on development projects in the two targeted districts of Khulna and Satkhira. Additionally, USD513 million has been spent to address salinity, waterlogging, and coastal inundation in these districts over the last 15 years. The majority of the spending came from the Bangladesh Water Development Board (BWDB) (for water and irrigation infrastructure), the Local Government Engineering Departments (LEGD, on cyclone centres, rural roads, culverts, irrigations, and market development), the Department of Disaster Management (DDM) (for safety net programmes, disaster risk reduction, and cyclone centres), the DPHE (for drinking water and sanitation infrastructure), the Department of Agriculture Extension (DAE) (for crop extension), and the Department of Fisheries (DoF) (for extension work on fisheries). In addition, the GoB is developing a Delta Plan 2100 for the coastal areas including support to ensure safety from floods and climate change related disasters; water security and efficiency of water usage; sustainable and integrated river systems and estuaries management; preservation of wetlands and ecosystems and promotion of their wise use; and integrated use of land and water resources. The priority activities include the Construction of the Ganges Barrage, the Coastal Embankment Improvement Programme, and the Tidal River Management Programme for the southwest region. The estimated cost of these three investments is USD4 billion.

GoB is undertaking many initiatives, with support from donors, multi-lateral partners and NGOs, related to infrastructure, disaster preparedness and response, water and sanitation, agriculture,

and social protection. The Coastal Embankment Improvement Project (2002-2013, USD400 million) supported agricultural production by reducing saltwater intrusion into polders; the Southwest Area Integrated Water Resources Planning and Management (ADB, USD32.5 million) project supports flood control, drainage, and irrigation schemes; the Emergency 2007 Cyclone Recovery and Restoration Project (2013-present, USD140 million) aims to support restoration and recovery from the damage to infrastructure and livelihoods caused by Cyclone Sidr; the Humanitarian Preparedness and Response, a USD25 million DFID-funded programme, aims to save lives and reduce risk amongst people affected by disasters; the Comprehensive Disaster Management Programme (CDMP) (USD76 million) has introduced adaptation interventions and early warning community management; the Rural Water Supply and Sanitation Project (World Bank funded, USD75 million) aims to provide safe drinking water and sanitation for areas near contaminated shallow aquifers; the Blue Gold Programme (EUR 57.5 million) supports participatory water management and farmer field schools; the UNICEF supported Rural Water Supply, Sanitation and Hygiene in Difficult and Hard-to- Reach Areas of Bangladesh project focuses on addressing arsenic contamination of water supply; the USAID funded Nobo Jatra, a Food for Peace program in Khulna and Satkhira districts and the European Union (EU) supported DIPECHO projects focus on resilient agricultural production practices as part of disaster preparedness efforts in the south-east region; the Creating Opportunities for the Poor and Excluded in Bangladesh (COPE) (UK-DFID funded) programme supports the poorest communities through advocacy, assets, and economic opportunities; and the Empowerment and Livelihood Improvement project, Ultra-Poor (DFID funded) project, the Stimulating Household Improvements Resulting in Economic Empowerment (DFID funded) project, and the SHOUHARDO (CARE implemented) project support livelihoods for the poor. Refer to Section 3.1 Feasibility Study for detailed list of investments.

Despite these considerable investments, especially in the past decade, there has been limited explicit consideration of climate change related impacts, and the related vulnerabilities on women and girls, in their design and implementation. Climate change has also served to undermine many of the development investments, and is increasing the burden on GoB, as development gains are repeatedly jeopardized by sudden-onset events, such as cyclones, as well as the slow erosion of environmental productivity through salinity increases. In turn, these impacts further exacerbate the vulnerabilities of the poor and extreme poor populations, the very target of the government and donor support. The GoB has also invested in building climate change resilience through support from projects such as the Bangladesh Pilot Programme for Climate Resilience (PPCR) to support climate-smart technologies, climate-proofing of infrastructure, and improving coastal connectivity; the Coastal Climate Resilient Infrastructure Project (USD150 million) for investments in roads, bridges, shelters, and markets; the Climate Resilient Agriculture and Food Security project (IFC, USD344 million); the Livelihood Adaptation to Climate Change (LACC) (FAO supported) for farmers' resilience; the "Jolobayoo-O-Jibon" (UK funded, USD15 million) project for climate risk reduction and adaptation; and the Climate-Resilient Ecosystems and Livelihoods (CREL) project (USAID, USD32.6 million) to support diversified, resilient livelihoods.

Whilst the majority of projects aimed at addressing climate change, address development challenges to build resilience to climate change, only a few focuses on specifically addressing climate change induced risks, both observed and projected, to support incremental or full adaptation solutions. Furthermore, there has been no systematic assessment of cyclone and SLR risks leading to the saltwater intrusion crisis that has disrupted freshwater resource dependent lives and livelihoods in the coastal zones. While there have been a number of localized interventions, coordinated solutions that address community and system capacities (particularly governing bodies, civil society, and the private sector) for gender-targeted, adaptive responses to salinity, at the required scale, are still limited.

The project will empower communities, especially women, as 'change-agents' to plan, implement, and manage resilient livelihoods and drinking water solutions in the face of worsening climate change impacts on their freshwater resources. The paradigm shift is to move away from focus on short-term responses and technology-led interventions towards community-centric solutions that build ownership and capacities across multiple stakeholders to sustain and scale up adaptive responses to safeguard livelihoods and water security. Community-centric awareness, skills building, value-chain and market linkages support can promote a transformational switch from current, non-adaptive livelihoods to climate-resilient livelihoods that can, in turn, reduce the vulnerabilities of the extreme poor against future climate change risks. Climate-resilient water technologies, such as rainwater harvesting and pond water systems, provide the communities with a means to shift away from their dependence on ground- water to surface water systems that can address seasonal variability and cope with slow- and sudden-onset changes. Within the same communities, the benefits of the livelihoods and water security are synergistic and can mutually reinforce the resilience of the populations in coping with climate change-induced salinity impacts on their freshwater resources. Strengthened capacities across the government, Non-Governmental Organisations (NGOs), and private sector to incorporate climate change risks into implementation and management of livelihood and drinking water solutions are critical support long-term adaptive capacities of the coastal communities. Strengthening

MoWCA's capacity to integrate gender and climate change into policies and programs particularly improves social targeting and climate-risk informed development across other sectors. Engaging national, sub-national, and local institutional structures in provision of these solutions creates an enabling environment for communities, particularly, women as 'change-agents' to adapt to climate change.

SUSTAINABILITY AND REPLICABILITY OF THE PROJECT (EXIT STRATEGY)

- Enterprise- and community-based climate-resilient livelihoods and value-chains: Through the investments in assets, tools, knowledge and skills development, awareness of climate-risks and capacities to continuously monitor and adapt livelihoods, the project enables ownership, co-investment, enhanced income generation, and social empowerment of the

vulnerable women and marginalized households. Moreover, the group-based livelihood and value-chain development support (through WLGs) promotes a peer-to-peer support system and cost-effective investments resulting from the economies of scale. Capacity building in understanding and assessing climate risks and undertaking social auditing of the livelihood interventions empower women to assess the results of the interventions and adapt their livelihoods. Supported by the institutional capacities (of WSCs, staff of LGIs, DWA, MoWCA) strengthened under each of the Outputs; and, particularly, the institutional framework for planning and coordination promoted under Output 3, these measures ensure long-term capacities among the beneficiaries for adaptive livelihood planning beyond the project lifetime.

- Participatory approaches and co-management of drinking water supply investments: The project proposes the formulation of WUGs and WMCs to support participatory, adaptive planning for water access and distribution and O&M support that can be managed at the community level, backstopped by O&M support by DPHE. Participatory mapping, vetting, and siting of drinking water supply systems in consultation with the communities will promote buy-in, building on site-specific consultations undertaken during project design. Households will also contribute a nominal fee to ensure access to water and minor upkeep and maintenance of the water systems. WUGs, with support from WMCs, will be able to identify O&M and financing needs and plan for them for sustained operation of the systems. WUGs will be trained in water quality monitoring, simple O&M skills, and measures for end-point storage and quality control along with awareness of climate risks and climate and disaster risk reduction strategies so that the benefits from safe and reliable water supply are evident and incentivize long-term community commitments in the face of climate change.
- GoB co-financing leveraged for ownership and sustained impact: The project has leveraged USD8 million in cash co-financing from GoB to support investments in technologies and capacities for communities and institutions to safeguard livelihoods and water security of the targeted coastal communities. GoB resources will support skills transfer including business skills development, value-chain development and market linkages, and access to finance for the resilient livelihoods promote by the project. They will also support continued monitoring and implementation of adaptive livelihood strategies through participatory social auditing for the livelihoods. GoB co-financing will support implementation of resilient drinking water solutions, especially shouldering the cost of project and post-project O&M (USD4million commitment for post-project O&M), with contributions from the communities (see paragraph below). GoB co-financing, including USD1 million in kind, is also leveraged to support technical and coordination capacities of local, sub-national, and national level government institutions to ensure that project impact is sustained during and beyond the project lifetime (see Section B.1 for details on the activities co-financed by GoB resources).

- Project and post-project operations and maintenance. O&M of the project established infrastructure will be undertaken through a community-centric tiered support system, with backstopping by GoB. In case of O&M of livelihood assets, beneficiaries will be fully responsible for maintaining tools and equipment provided by the project, with technical assistance from local support staff and BFRI (for aquaculture). Beneficiary investments are facilitated by enhanced income generation supported by the interventions as well as the support for access to finance. For the water supply infrastructure, the project establishes a three-tiered O&M system (see Activity 2.3) that involves a fee-contribution and training for WUGs on upkeep and maintenance and GoB co-financing for both the minor repairs through staffed technicians in each WMC and for major repairs/part or full system replacements during the project. Community and GoB financing will be fully responsible for post-project O&M, as also indicated in the O&M Commitment Letter issued by DPHE (see Annex IVb). This model of O&M and co- ownership and management will maximize the likelihood of continued operational and financial viability of project investments beyond the project implementation period. In addition, as GoB's main technical agency dealing with rural water supply and sanitation, DPHE has the mandate to provide DPHE has demonstrated a strong track record in working with several development partners to install rural water technologies having implemented around 1300 development projects since its inception and currently implementing several relevant drinking water and sanitation projects in rural Bangladesh. DPHE's presence (offices and technical staff) in each Upazila (sub- districts) and districts in Bangladesh including outreach staff at Union Level and the project support to further strengthen its capacities in addressing climate change-induced salinity impacts on drinking water supply for the coastal communities will enable sustained impact post-project.
- Sub-national and national Institutional capacity building for climate-risk informed implementation and management of livelihoods and water security: Technical knowledge and capacities for implementation support among the local support staff (WSCs/WMCs/LGIs) are strengthened through training, along with communities, in Outputs 1 and 3 to ensure long-term viability of planned interventions. In addition, Output 3 of the project creates an enabling environment to sustain the community-centric, gender-responsive investments during the project and enable replication and scale of the impact beyond the project period. By building technical capacities of MoWCA on climate risks and livelihood scenarios and climate-risk informed implementation of livelihoods, the project ensures adaptive management of the project interventions for livelihoods. DPHE's capacity to innovate and implement resilient drinking water solutions and livelihoods, helps safeguard the project investments as climate risks evolve. This ensures that the project interventions do not remain short-term responses rather can be sustained and scaled beyond the project lifetime. ToT approaches to technical training further institutionalize these skills so as to build long-term, continued capacities across the

agencies. Moreover, broadening the capacity building to include sub-national and national level government staff as well as partner NGOs creates synergistic approaches to support for coastal communities that can also ensure that impacts last beyond the project.

- **Incentivizing private sector engagement:** The proposed project catalyses private sector engagement in the adoption and up-scaling of climate-resilient livelihoods and value-chains. Output 1 support to enterprise- and community-based livelihoods through initial upfront investments into assets and tools to switch to resilient livelihoods and skills development for financing and marketing facilitates economies of scale to attract private sector investment. Value-addition and value-chain linkages will crowd-in upstream and downstream value-chain and market actors (including for further investments in crab hatcheries, production and processing). Project facilitates public-private platforms (PPIs) at the Upazila level to broaden the market access and create linkages across value-chain actors to support the financial viability and sustained scale of alternative climate-resilient livelihoods. The collateral expansion of the WLGs, business skills, and value-chain development will also enable access to finance. The proposed project will also build awareness of the FIs in understanding climate risks and financing resilient livelihoods for long-term financial viability of project interventions. Private sector engagement is nascent in the provision of drinking water for the extreme poor communities. With the institution of a fee-based model and co-management of water supply systems, there is a potential to create community-based enterprises that would co-invest in capital costs and distribute water at a cost.

RISK MANAGEMENT

- **Land tenure disputes:** Resolve through stakeholder mapping and consultation
- **High systems maintenance:** Develop user-pay co-financing model
- **Lack of coordination:** Establish a project steering committee with all actors.
- **Climate risks:** Addressed through climate-resilient ponds and wetland design
- **Community non-involvement:** Mitigated via participatory water user committees
- **O & M purification systems:** Addressed through training and partnerships with local governments and NGOs.

SUPPORT DOCUMENTS SUBMITTED

- Map indicating the location of the project/programme
- Diagram of the theory of change
- Economic and finance model with key assumptions and potential stressed scenarios
- Pre-feasibility study
- Evaluation report of previous relevant projects
- Results of environmental and social risk screening

LINKAGE WITH THE PRECEDING PROJECT

The followings are linkage points with the preceding, FP069: Enhancing adaptive capacities of coastal communities, especially women, to cope with climate change induced salinity, Bangladesh & United Nations Development Programme, UNDP, 16 March 2018. Information herein can be incorporated through enhancement to enrich the goals and solutions intended for this new project further.

Climate vulnerability baseline(p.11 - 24)

14. Given its location, dependence on monsoon systems, transboundary rivers, and the low coping capacity of its population, Bangladesh is vulnerable to the impacts of climate change. In particular, an increase in the intensity of cyclones and storm surges, as well as ongoing SLR and temperature increases, are increasingly affecting low-lying coastal communities and ecosystems. Saltwater intrusion into fresh water resources, induced by SLR, storm surge and cyclones, is a major risk affecting the lives and livelihoods of coastal communities, disrupting agricultural productivity and drinking water security.

Key climate change hazards driving salinity

15. (i) Storm surges and cyclones: Between 1961 and 2013, a total of 61 cyclones hit Bangladesh, with the south-western zone affected by 28 per cent of these cyclones¹². Storm surge flooding due to cyclones penetrates deeper inland, and causes extensive damage, especially when a cyclone makes landfall during high tide. Historically, cyclones have had associated storm surges ranging from 1.5 to 10.0m¹³. Under climate change projected increases in surface sea temperatures are expected to increase the intensity of tropical cyclones resulting in higher wind speeds and storm surge. According to the IPCC, tropical cyclone frequency in Bangladesh is likely to decrease or remain the same, but the number of intense cyclones will likely increase. Dynamic and regional climate models ¹⁴ project increased intensities of tropical storms by 2100 for the North Indian Ocean and increased frequencies of highest storm surges across the Bay of Bengal. Combined with SLR, the country is expected to face increasing tidal surge and inundation of coastal areas. By 2050, an additional 15 per cent of the coastal area of Bangladesh is projected to be inundated with storm surges during cyclones. Storm surge from a 10-year return period cyclone (such as Sidr) would inundate an area 80 per cent greater than the present flooded areas, with a total of 9.7 million people (compared to 3.5 million in the no climate change scenario) are expected to be exposed to severe inundation (>3m)¹⁵.

16. (ii) Sea Level Rise: Observations along the coast of Bangladesh (1980-2012) demonstrate SLR increases of 6-21 mm/ year¹⁶. The water level in the Ganges tidal floodplain was found to have risen by 7-8 mm/yr, in the Meghna Estuary by 6-10 mm/ year and in the Chittagong coastal plain areas by 11-21 mm/ year (Figure 1). These observed SLR trends are much higher than the global mean/average of <4 mm/yr¹⁷. Under climate change the country is expected to experience further SLR of 14cm, 32 cm, and 88cm by the year 2030, 2050, and 2100 respectively¹⁸, assuming only small contributions from melting ice sheets (implying these estimates are conservative). Critically, both the historical increases noted above and the projected increases due to climate change are expected to raise the salinity of freshwater sources¹⁹.

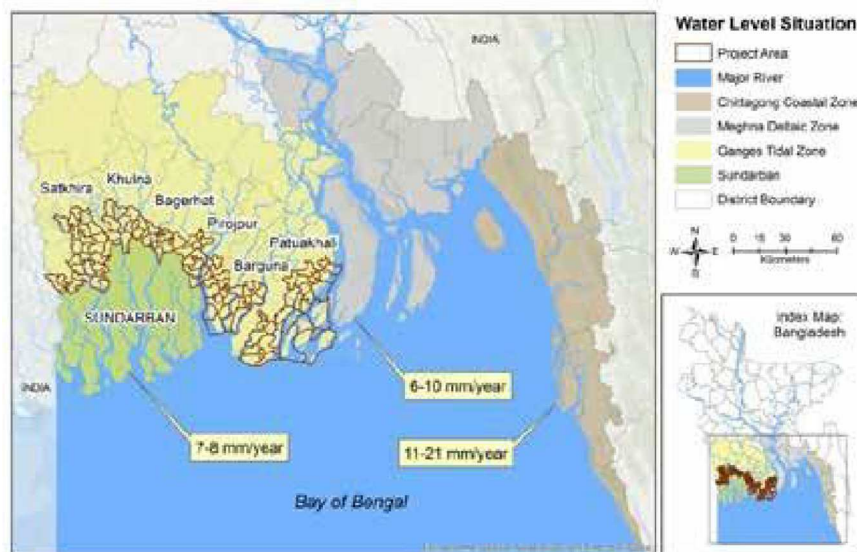


Figure 1. Water level trends for the coastal sub zone of Bangladesh based on the data of the last 30 years²⁰

17. iii) Rainfall and temperature: Mean annual temperatures have been increasing in Bangladesh²¹, and several studies have noted increases in surface temperatures, with higher trends during drier periods²². Climate models simulate that this trend will continue to accelerate²³. Furthermore, future simulations of the climate suggest higher than average monsoon rainfall in the future²⁴, with winter months becoming warmer and drier while monsoon months become warmer and wetter. Increased monsoon rainfall may lead to frequent occurrence of high intensity floods over the floodplains²⁵ and prolonged monsoon flood duration will lead to an increased extent and depth of the inundation²⁶. However, warmer and drier winter months will lead to more intense dry seasons, placing further pressure on surface freshwater sources of water and increasing the intrusion of salinity from saltwater (see below).

18. For further details on climate change risks (observed and projected) refer to Chapter 1, Section 1.2 of the Feasibility Study (Annex IIa).

Cyclone and SLR induced saltwater intrusion into fresh water resources

19. A major concern resulting from intensified cyclones, higher storm surge, and rising sea levels is saltwater intrusion into the freshwater resources of the coastal belt of Bangladesh, affecting drinking water resources and agricultural livelihoods. Salinity intrusion varies by season, with more salinity observed during the dry season owing to reduced freshwater flows.

20. *Upstream river flows (non-climate change factor) and salinity:* While transboundary flows and land use changes have an impact on fresh water availability, climate change risks such as sea level rise, storm surges and tidal flooding have increased salinity levels in water and soils, with saltwater intrusions extending further inland. The contribution of reduced upstream freshwater flows to salinity increases has stabilised since 1996, due to the Ganges Treaty, wherein agreement with India guaranteed stable freshwater flows. However, since then salinity levels have continued to increase due to other climate change related factors mentioned above. The saline area in 10 of the most vulnerable coastal districts of the country has increased by 27 per cent between 1973 and 2009²⁷. Furthermore, extensive modelling of most climate change related factors (SLR, rainfall, temperature, altered river flows from the Himalayas, land subsidence and upstream abstraction), though not including storm surge related inundation, has shown that by 2050 there will be a probable reduction in slightly saline (<1dS/m, from 22% to 13%) and slight to moderately saline (1–5dS/m, from 35% to 21%) river areas, whereas there will be an increase in moderate to high saline (5–10dS/m, from 8% to 27%) and highly saline (> 10dS/m, from 35% to 40%) river areas. In particular, freshwater river areas (0–1ppt) decrease from 40.8% to 17.1% and river areas suitable for agricultural irrigation (with salinity less than 2ppt) decrease by 29.7 percent²⁸.

21. Further studies show that highly saline areas are extending inland and that soil salinity, along with surface and coastal river water salinity is gradually increasing²⁹. The present dry season saline front (2 ppt) is projected to move 30 km to 70 km north, affecting most of Khulna, Jessore, Barisal, Patuakhali, and Noakhali (greater) districts by 2050³⁰ (see Figure 2). In particular, with a 1m SLR, the saline front is projected to move much further north in districts further east. Any increases in storm surge and related inundation will further increase these surface water salinity estimates. Currently, nearly 6 million people are exposed to high salinity surface waters (>5 ppt) and climate change is expected to increase this number to 13.6 million in 2050 and 14.8 million in 2080, most directly affecting the coastal district populations in Khulna, Satkhira, and Bagerhat³¹. Refer to Section 1.3.1 of the Feasibility Study (Annex IIa) for further discussions on observed and projected soil and water salinities in Southwest Bangladesh.

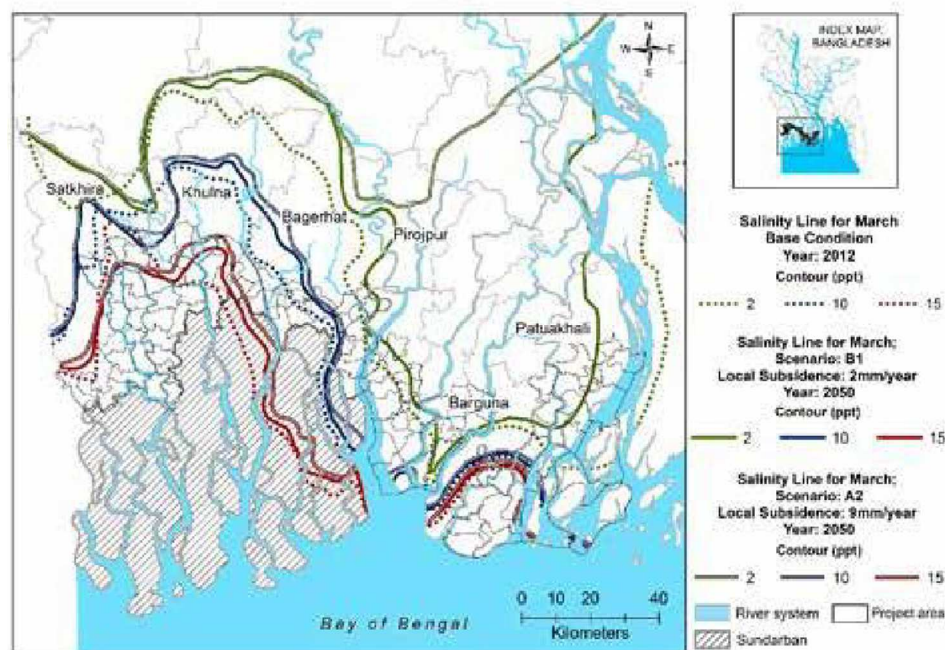


Figure 2: Projected river salinities in 2050 under two different climate change scenarios (A2 and B1)
Key Impacts of CC induced salinity – disruption to agricultural livelihoods and drinking water security
Salinity impacts on agricultural livelihoods:

22. Local communities are already experiencing direct damages to crops, decreasing fresh water fish stocks, and income loss, leading to increased vulnerability. Over 1 million hectares of cultivable land are already affected by salinity intrusion caused by slow- and rapid-onset events³² e.g. the net cultivated area in Satkhira decreased by 7 per cent from 1996 to 2008³³. Crop losses due to SLR-induced salinity intrusion have been estimated as 200,000 metric tonnes³⁴, with salinity (+5 ppt) of irrigation water expected to further reduce farm productivity by up to 50 per cent³⁵. Storm surge inundation under climate change is estimated to cause an additional loss of 422,642 tons of *Aman* rice, 156,928 tons of *Aus* rice, and 116,060 tons of *Boro* rice, which will have profound impacts on both the country's economy and the food security of its citizens³⁶.

23. Salinity intrusion and tidal flooding have already prevented the expansion of agriculture in the coastal region, with land used for agriculture gradually decreasing between 1980 and 2010. The Livelihoods Assessment Report (Annex IIb) presents GIS maps on land use patterns in the targeted project Unions for the years 1995, 2005, and 2015 (see Section 6 of the Livelihoods Assessment Report (Annex IIb) for further discussion). These demonstrate that the targeted districts of Khulna and Satkhira have experienced a shift from agricultural land to aqua-cultural land (mainly shrimp farms), partly related to increasing soil salinity levels due to inundation after cyclones Sidr in 2007 and Aila in 2009. Shrimp farming, widely adopted as a way to deal with the increasing salinity of soil and water,

has had significant negative impacts on salinity levels of surrounding lands, as well as on the livelihoods of vulnerable households. Furthermore, weak governance and land-tenure arrangements, as well as value chain structures, has created a situation where expanded shrimp farming has primarily benefited middle-class and wealthy landowners and large-scale enterprises, affecting the labour and income opportunities of the poor, especially for women.

24. Increasing climate-induced salinities will also adversely impact small-scale fishers. The reproductive cycle and capacity, spawning area and feeding, breeding and longitudinal migration of many fish species have been impacted and a combination of anthropogenic and climate factors have led to dramatic declines in fish biodiversity³⁷; fresh water species decreased by 59 per cent in the highly saline Paikgacha Sub-District within a 30-year period. This dramatic loss in biodiversity is a serious threat to the local ecosystem and the national food supply. Climate change scenarios used to extrapolate salinity trends in coastal rivers between 2012 and 2050 projected losses across 83 different fish species which are integral to the current nutrition and livelihoods of local, poor communities in the coastal districts³⁸.

Salinity impacts on drinking water:

25. Despite Bangladesh's abundant supply of water resources, drinking water quality is greatly affected by monsoon patterns and salinity. While the monsoon is expected to bring fresh subsurface water, groundwater recharge is variable, and water supply options are very limited in many coastal areas as freshwater aquifers at reasonable depths are not available³⁹. Climate change induced salinities (associated with changes in precipitation patterns and inundation) compound dry season water scarcity and deteriorated water quality due to over extraction, salinization, arsenic and other contamination, which compels people to avail themselves of multiple drinking water sources to meet basic personal needs⁴⁰.

26. Tubewells that access groundwater are the main source of drinking water for 73 per cent of the population living in the rural areas of Bangladesh⁴¹. On the coast, most of the groundwater is pumped from above 150 m below the surface, but much of this water is saline⁴² due to salt water intrusion from the Bay of Bengal, which has accelerated due to sea level rise and percolation of saline surface water resulting from storm surge and unsustainable land use practices. These shallow coastal aquifers are highly saline and as such water supply wells must penetrate 250 metres or more to find water of acceptable quality⁴³. Data from Bangladesh Water Development Board (BWDB)⁴⁴ indicates that the groundwater salinity in several key coastal districts is already beyond the limit for potable and irrigation use (>2500 uS/cm) and that surface water is beyond this acceptable limit in Satkhira district and parts of Khulna district⁴⁵. Due to the high salinity of groundwater a substantial number of coastal people also rely on pond water⁴⁶ and the collection of rainwater is often the primary source of drinking water in many communities⁴⁷. With an additional 15 per cent of the coastal area of Bangladesh projected to be inundated by 2050, the quality of water resources in this area is expected to further deteriorate. Cyclones also damage water supply infrastructure –

tubewells and ponds – with many ponds becoming saline subsequent to inundation. Saltwater intrusion due to high tidal surges during Cyclone Aila, for instance, affected surface water sources such as ponds further intensifying the freshwater crisis. A district-wise assessment of water infrastructure damage by Cyclone Aila (conducted by DPHE) indicated that Khulna and Satkhira were the worst affected, including damage to 278 pond sand filters.

27. The availability of fresh water is also projected to decrease due to changing rainfall patterns which affect the regular recharge of groundwater sources. This will increase drinking water insecurity during the dry season, which is expected to be prolonged under projected climate change scenarios. Compounded by water infrastructure damage due to cyclones and storm surges, year-round access to safe drinking water will be further diminished, increasing the recurrent costs of water supply as well as associated health costs. The situation is all the more pressing, given that Bangladesh's annual water demand is expected to increase by 200 per cent by 2050 from current levels. These climate change induced impacts on drinking water sources will impact the entire population of the coastal districts, but will be particularly severe for socio-economically marginalized groups, such as women, adolescent girls, children, the elderly, and ethnic and religious minorities. For further details on salinity impacts on drinking water, refer to Section 1.3.4, of the Feasibility Study (Annex IIa).

Disproportionate impacts of salinity induced loss of agricultural livelihoods and reduced water security on women

28. ActionAid in collaboration with the Australian Government and The Economist Intelligence Unit, conducted comprehensive studies on gender-specific vulnerabilities associated with climate-change, and have developed the South Asia Women's Resilience Index to quantify the relative resilience of women. The index demonstrates that countries across South Asia fare poorly in supporting women's resilience to disasters and in Bangladesh there are significant economic and social barriers to women's empowerment that increase their vulnerability during disasters. Gender inequality in Bangladesh arises from societal and cultural norms that impact woman's daily activities, as well as their overall adaptive capacity to climate change. Participation of women in agriculture has declined between 2001 and 2011⁴⁸, partly due to increasing disruption to agricultural production from cyclones and salinity that renders agricultural production more difficult, and compels women to take on other domestic burdens, such as walking increasing distances to fetch viable water for domestic use. The shift to shrimp farming has also impacted the economic opportunities available to women, as it requires less labour than traditional rice paddy farming.

29. Climate change exposure, sensitivity and adaptive capacity of women and girls were also examined in a report by UN Women and were shown to be certain of exposure to salinity in all areas of their lives, and high sensitivity. Women's livelihoods were deemed vulnerable due to a lack of diversity of livelihoods; reduced options for on-farm livelihoods; cultural barriers in employment in the industry sector; limited SMEs to absorb women labourers; poor capacity to enter into skilled service sectors; domestic responsibility; lack of incentives for skilled jobs; and sole responsibility of child care. Drinking water related vulnerability was reported to be due to a limited number of safe and salinity free water-points in public and private spheres; lack of available water sources; lack of economic ability for poor women and women headed households to install salinity free water sources; long hours to collect water from distant sources; and threat of sexual harassment during long walkway to collect water from distant sources. Focus group discussions during the proposed project development yielded findings related to gender relationships at the household and community level. These are presented in Chapter 1, Feasibility Study, Annex IIa.

30. Land use changes due to salinity significantly impact women's livelihood options due to fewer on-farm and post-harvest employment opportunities. The overall reduction in livelihood options in coastal regions has also led to the increased migration of men to find work, and this also greatly increases women's burden of unpaid and undervalued household work. Climate-change induced migration has also meant that income from women's productive labour becomes critical for families' survival, and also creates a situation where women are often forced to provide labour at any cost to supplement household income, sometimes earning only USD0.91 a day. This is equally true for adolescent girls, forced to marry early and discontinue their education in order to supplement household income. Women and married adolescent girls who are left behind face exploitation and become even more exposed to unsafe and unjust workplace conditions and gender-based violence⁵⁰. Furthermore, increasing salinity has also led to a decline in the production of assets under their control, such as cattle and paddy. These assets are rapidly being replaced by economic activities such as shrimp, prawn, and fish aquaculture value chains, and rents from leasing out land, all of which tend to be dominated by men.

31. Climate change pressures on drinking water security, both current and projected also has a disproportionately negative impact on women and girls. A recent Gender Water Alliance study for the Bagerhat district, reveals how salinity-induced water stress in the region impacts the lives of women. The study details how the burden of collecting safe drinking water primarily falls on women and girls, and how declining access to suitable water compels them to walk long distances to secure water for the household, additionally jeopardizing their safety. Moreover, it is estimated that, in the most affected coastal areas of Bangladesh, women and girls spend an average of 2.5 hours to collect water, adding to their unpaid burden of work and monopolizing time that could otherwise be used for income generating activities⁵¹.

32. Poor water quality also directly affects the health of women and adolescent girls, in specific ways. In south-western coastal Bangladesh, the average intake of sodium far exceeds the World

Health Organization (WHO) limits⁵². Although high levels of sodium intake affect the health of the entire population, a survey in 2008 found that pregnant women living in this coastal area had much higher rates of pre-eclampsia and gestational hypertension than pregnant women living in non-coastal areas⁵³, likely due to the high sodium intake. Given that women and girls are not prioritized in terms of family health expenditures, and that this also has implications for maternal mortality, and the survival rate of infants at birth, this salinity exposure had multiplier effects on the health of women and their families. These secondary impacts of climate-induced salinity further reduce women's adaptive capacity. For further details on salinity impacts on women and children, refer to Section 1.3.5 of the Feasibility Study (Annex IIa).

Baseline efforts and investments

33. Over a period of 15 years (2001-2015), USD3.4 billion was spent on development projects in the two targeted districts of Khulna and Satkhira. Additionally, USD513 million has been spent to address salinity, waterlogging, and coastal inundation in these districts over the last 15 years. The majority of the spending came from the Bangladesh Water Development Board (BWDB) (for water and irrigation infrastructure), the Local Government Engineering Departments (LEGD, on cyclone centres, rural roads, culverts, irrigations, and market development), the Department of Disaster Management (DDM) (for safety net programmes, disaster risk reduction, and cyclone centres), the DPHE (for drinking water and sanitation infrastructure), the Department of Agriculture Extension (DAE) (for crop extension), and the Department of Fisheries (DoF) (for extension work on fisheries). In addition, the GoB is developing a Delta Plan 2100 for the coastal areas including support to ensure safety from floods and climate change related disasters; water security and efficiency of water usage; sustainable and integrated river systems and estuaries management; preservation of wetlands and ecosystems and promotion of their wise use; and integrated use of land and water resources. The priority activities include the Construction of the Ganges Barrage, the Coastal Embankment Improvement Programme, and the Tidal River Management Programme for the southwest region. The estimated cost of these three investments is USD4 billion.

34. GoB is undertaking many initiatives, with support from donors, multi-lateral partners and NGOs, related to infrastructure, disaster preparedness and response, water and sanitation, agriculture, and social protection. The Coastal Embankment Improvement Project (2002-2013, USD400 million) supported agricultural production by reducing saltwater intrusion into polders; the Southwest Area Integrated Water Resources Planning and Management (ADB, USD32.5 million) project supports flood control, drainage, and irrigation schemes; the Emergency 2007 Cyclone Recovery and Restoration Project (2013-present, USD140 million) aims to support restoration and recovery from the damage to infrastructure and livelihoods caused by Cyclone Sidr; the Humanitarian Preparedness and Response, a USD25 million DFID-funded programme, aims to save lives and reduce risk amongst people affected by disasters; the Comprehensive Disaster Management Programme (CDMP) (USD76 million) has

introduced adaptation interventions and early warning community management; the Rural Water Supply and Sanitation Project (World Bank funded, USD75 million) aims to provide safe drinking water and sanitation for areas near contaminated shallow aquifers; the Blue Gold Programme (EUR 57.5 million) supports participatory water management and farmer field schools; the UNICEF supported Rural Water Supply, Sanitation and Hygiene in Difficult and Hard-to-Reach Areas of Bangladesh project focuses on addressing arsenic contamination of water supply; the USAID funded Nobo Jatra, a Food for Peace program in Khulna and Satkhira districts and the European Union (EU) supported DIPECHO projects focus on resilient agricultural production practices as part of disaster preparedness efforts in the south-east region; the Creating Opportunities for the Poor and Excluded in Bangladesh (COPE) (UK-DFID funded) programme supports the poorest communities through advocacy, assets, and economic opportunities; and the Empowerment and Livelihood Improvement project, Ultra-Poor (DFID funded) project, the Stimulating Household Improvements Resulting in Economic Empowerment (DFID funded) project, and the SHOUHARDO (CARE implemented) project support livelihoods for the poor. Refer to Section 3.1 Feasibility Study (see Annex IIa) for detailed list of investments.

35. Despite these considerable investments, especially in the past decade, there has been limited explicit consideration of climate change related impacts, and the related vulnerabilities on women and

girls, in their design and implementation. Climate change has also served to undermine many of the development investments, and is increasing the burden on GoB, as development gains are repeatedly jeopardized by sudden-onset events, such as cyclones, as well as the slow erosion of environmental productivity through salinity increases. In turn, these impacts further exacerbate the vulnerabilities of the poor and extreme poor populations, the very target of the government and donor support. The GoB has also invested in building climate change resilience through support from projects such as the Bangladesh Pilot Programme for Climate Resilience (PPCR) to support climate-smart technologies, climate-proofing of infrastructure, and improving coastal connectivity; the Coastal Climate Resilient Infrastructure Project (USD150 million) for investments in roads, bridges, shelters, and markets; the Climate Resilient Agriculture and Food Security project (IFC, USD344 million); the Livelihood Adaptation to Climate Change (LACC) (FAO supported) for farmers' resilience; the "Jolobayoo-O-Jibon" (UK funded, USD15 million) project for climate risk reduction and adaptation; and the Climate-Resilient Ecosystems and Livelihoods (CREL) project (USAID, USD32.6 million) to support diversified, resilient livelihoods.

36. Whilst the majority of projects aimed at addressing climate change, address development challenges to build resilience to climate change, only a few focuses on specifically addressing climate change induced risks, both observed and projected, to support incremental or full adaptation solutions. Furthermore, there has been no systematic assessment of cyclone and SLR risks leading to the saltwater intrusion crisis that has disrupted freshwater resource dependent lives and livelihoods in the coastal zones. While there have been a number of localized interventions, coordinated solutions that address community and system capacities (particularly governing bodies, civil society, and the private sector) for gender-targeted, adaptive responses to salinity, at the required scale, are still limited. For further details on projects addressing the salinity impacts on drinking water, refer to Chapter 3, Feasibility Study (Annex IIa) for further discussion.

Adaptation Solution

37. The project will empower communities, especially women, as 'change-agents' to plan, implement, and manage resilient livelihoods and drinking water solutions in the face of worsening climate change impacts on their freshwater resources. The **paradigm shift** is to move away from focus on short-term responses and technology-led interventions towards community-centric solutions that build ownership and capacities across multiple stakeholders to sustain and scale up adaptive responses to safeguard livelihoods and water security. Community-centric awareness, skills building, value-chain and market linkages support can promote a transformational switch from current, non-adaptive livelihoods to climate-resilient livelihoods that can, in turn, reduce the vulnerabilities of the extreme poor against future climate change risks. Climate-resilient water technologies, such as rainwater harvesting and pond water systems, provide the communities with a means to shift away from their dependence on ground- water to surface water systems that can address seasonal variability and cope with slow- and sudden-onset changes. Within the same communities, the benefits of the livelihoods and water security are synergistic and can mutually reinforce the resilience of the populations in coping with climate change-induced salinity impacts on their freshwater resources. Strengthened capacities across the government, Non-Governmental Organisations (NGOs), and private sector to incorporate climate change risks into implementation and management of livelihood and drinking water solutions are critical support long-term adaptive capacities of the coastal communities. Strengthening

MoWCA's capacity to integrate gender and climate change into policies and programs particularly improves social targeting and climate-risk informed development across other sectors. Engaging national, sub-national, and local institutional structures in provision of these solutions creates an enabling environment for communities, particularly, women as 'change-agents' to adapt to climate change.

Gaps and Key barriers

Limited awareness, technical, and financial capacity among coastal communities, especially women, to diversify to climate-resilient livelihoods:

38. Lack of awareness and access to tools to practice resilient agriculture-based livelihoods: A large share of the poor and extreme poor communities in Bangladesh's coastal areas have been

experiencing disruptive impacts of climate change on their economic activities and livelihoods, particularly through increasing salinization of soil and freshwater bodies eroding farming and fishing productivity. However, while communities are aware of the salinity-induced disruption to their livelihoods, there is limited understanding of the evolving risks and worsening impacts due to climate change and how to respond to these risks to safeguard their livelihoods. Climate change affects the environmental conditions (such as salinity and temperature) under which agricultural livelihoods are practiced. Traditional farming practices will only provide a reliable source of income for a limited time, depending on shifting climate influenced variables (rainfall, temperature, evaporation, soil salinity, water salinity/availability) and management options (irrigation)⁵⁴. Progressive farming techniques involve using short cycle crops and shifting away from low salinity tolerant crops such as Boro rice, to those vegetable crops which are less affected by salinity and have a higher market price. However, there is a limited knowledge of, and access to those crop varieties, particularly among women, climate-resilient practices and livelihoods that could reduce communities' vulnerability to the evolving risks. Reliable information on climate resilient practices is generally not available, preventing farmers from switching to resilient agriculture inputs, approaches and techniques (crop diversification, saline/drought/submergence tolerant crop varieties or early maturing varieties etc.) or resilient livelihoods away from fresh-water dependent agriculture, given the projected increases in salinity. Many of the recent livelihood changes (within the last 5-10 years), such as shifting to shrimp farming (which lead to further salinization) or cultivating highly freshwater dependent watermelons, have been maladaptive. These have exacerbated vulnerabilities indicating that there is a limited awareness and knowledge of how to respond to climate change impacts among local households, particularly women (see Livelihoods Assessment Report, Annex IIb, section 5.1).

39. Gender-specific constraints: This knowledge gap and lack of agricultural extension support services is particularly acute among women, with many extension services and training being geared towards men. This is compounded by the fact that women's participation in activities such as trainings can be greatly limited, both due to norms and attitudes about the abilities of women, what is considered appropriate work, and due to restrictions on movement and time. Training and extension services are often not designed in a manner that will allow women's full participation (e.g. mixed groups, male trainers, far from homestead) and can be compounded by the fact that many women in the coastal districts of south-western Bangladesh have limited literacy. When labour opportunities are created, women are often involved in work with lower pay, and limited from positions that require more technical skills or leadership and their bargaining power is limited in regards to negotiating fair working conditions⁵⁵.

40. Limited technical and financial capacities to switch to climate-resilient livelihoods: Closely linked to the lack of awareness, are a range of constraints, both technical and financial, to diversify the portfolio of livelihood options and adopt climate-resilient livelihoods. Diversification to climate-resilient agricultural practices (e.g. adapting saline tolerant crop varieties), technologies (e.g. drip irrigation, hydroponics, aqua-geoponics), and livelihoods (such as crab farming) requires specific knowledge, skills, and technology transfer that is limited, as communities lack the technical assistance and support owing to limited capacities among peers and local extension staff. Extremely poor households are often unable to invest in risk management strategies, given that they are continuously coping with new shocks and stresses and have limited space and ability to think about and act on choices that will make a positive difference in their future (relative to households that are relatively more resource endowed). Lack of collateral constrains the capacity of many agricultural based households to access finance and invest in the necessary switch to resilient livelihoods, but also their marginal asset base and financial resources are continually undermined by repeated saltwater inundations and cyclone impacts, which lead to significant crop and asset losses.

The livelihoods support and assistance provided by the GoB as part of 'business-as-usual' development does not incorporate current and projected climate risks to enable transformation to resilient livelihood and market systems. Any development gains through existing governmental support programs, particularly for women, are jeopardized by these climate change-induced losses. Thus, GoB's own limited financial resources are also further stressed as they cope with sudden onset changes. Furthermore, there is limited capacity within the government to incorporate the evolving climate-risks, which undermines the effectiveness of support to enable the poor to deal with worsening climate change impacts, including slow-onset changes in salinity.

41. Gender specific constraint: Extremely poor women, and girls, in the target unions are even more vulnerable to climate shocks and stresses, and are often unable to meet their basic requirements

(nutrition, health, education, and shelter) due to their socio-economic marginalization. The impact of climate change combined with specific vulnerabilities experienced by women, such as restricted technical/financial knowledge, limited or no access to resources and assets, markets and services puts women at even greater risk. Furthermore, as they have limited decision-making power and little control or household assets, they are unable to engage in capital and asset accumulation or other forms of risk mitigation. Other factors may also limit their adoption of climate resilient livelihoods, including adoption of technologies that may present physical constraints (type of aquaculture with heavy cages that are difficult to move, or require women entering deep water) and promoting livelihood activities that add to women's work burden without addressing their heavy burden of unpaid household responsibilities (water collection, cooking, child rearing etc.). See Section 4.2, in the Feasibility Study for further detail.

42. Limited capacities to invest in value-chains associated with climate-resilient livelihoods: Since a switch to alternative, climate-resilient livelihoods is necessary to cope with climate-change induced salinity, full adaptation solutions require that associated value-chains are created or enhanced to ensure long-term viability of the introduced resilient livelihoods. The existing value chain structures are not usable due to changes in livelihood patterns caused by climate change-induced salinity and new value chains are necessitated for the alternative, resilient agriculture and aquaculture options. However, given the constrained financial and technical capacities, among both communities and the government, the value-chain development required for newer, climate-resilient practices and technologies is limited, which suppresses opportunities for enhanced incomes and scale-up of these resilient livelihoods. Several climate-resilient agricultural and aquaculture production options such as, crab farming and vegetables grown in hydroponics systems, show great promise in providing opportunities for enhanced incomes, but comprehensive value-chain development is required to scale-up access to the associated inputs, create high value products, and to spur incentives and market linkages for a vibrant adaptive market place. Increased scale, coupled with rising demands can then attract further investments, leading to improved value-chains, creating more competitive prices for goods and services related to alternative, resilient livelihoods.

43. Gender-specific constraint: Compounding the existing lack of market linkages are the currently limited capacities and skills of women in Bangladesh to incubate, manage, and grow their businesses and leverage market linkages. Given that women are often constrained by religious and social beliefs to household tasks, and may face restricted access to markets, the gendered division of labour and constraints in controlling financial assets, they often lack knowledge and skills related to marketing, sales, income/expenditure, and accounting, all of which further contributes to their vulnerability.

Limited access to freshwater sources and technical capacity and means for communities to plan for, implement, and manage resilient drinking water solutions in the light of a changing climate:

44. Limited access to freshwater sources and limited capacities for planning and implementing drinking water solutions in the light of climate-induced salinity: Given the deterioration of surface and ground water sources due to climate change-induced salinity, access to fresh water sources for drinking is becoming increasingly constrained. The technological means to capture and store freshwater entail prohibitive costs for the poor, vulnerable communities and requires awareness, skills, capacities, and behavioural change. Coastal households, currently, also have a limited planning horizon to adequately consider incremental climate change impacts on fresh-water resources and identify resilient solutions for year-round, safe drinking water supply. This can be related to a limited understanding of climate change induced salinization processes and an inadequate exposure to adaptive technological solutions to follow best practices. Adaptive technologies, such as rainwater harvesting at different scales, collection of pond water, and Reverse Osmosis (RO) require technical skills, and an understanding of hydrological characteristics of flow regimes, climate variability (including changes in monsoon patterns and intensity), and water treatment options. Options such as RO also have significant environmental impacts and financial costs, constraining adoption by the coastal poor. Provision of water to households is fairly decentralized and where access to piped water is unavailable, communities, local authorities, and NGOs often apply disparate approaches, as there is limited common understanding and technical skills to plan and implement drinking water provision with climate risks incorporated.

45. Gender-specific constraint: Water scarcity and lack of access to clean water is disproportionately borne by women in these communities. Men are generally unwilling to collect water and the issue of drinking water security is not given the importance that it warrants. This has become a gender stereotype and as this is not men's problem therefore, the importance is less from the powerful cohorts of the society. Access to information, skills, and technical capacity is extremely limited among extremely poor women, preventing investment in and adoption of climate-resilient technologies. The consequence of exclusion from water distribution and planning processes is that women are further marginalized.

46. Limited additional financial means to expand water solutions in increasingly cyclone and salinity-stressed areas: Government and donor investments in drinking water supply have been repeatedly eroded by asset destruction due to cyclones and increasing salinity, which has rendered ground water unsafe to drink. Compounded by an inadequate understanding of and planning for these climate risks, these investments are further inhibited in the most vulnerable areas, as extreme poor are unable to pay for costs of expansion, new technologies, or treatment options. The abundance of rainwater is the most dependable source of drinking water in the salinity affected coastal rural areas, but affordability for low-income groups is a major concern, given the capital cost of available rainwater tanks in the market is often beyond their reach. In addition, there is no specific yearly budget allocation for water supply from the government to support people living in water scarce areas. In some unions, a few households from higher income brackets have been able to adopt climate resilient water technologies including RO. However, income divisions create an enormous barrier for the poor and extreme poor households to follow suit, given their economic means in the face of the high capital and operating costs of such technologies. The current price of clean water in saline-prone areas restricts access to safe, year-round supplies of drinking water for households, particularly those living under the poverty line.

47. Gender-specific constraint: Not only do women have less income overall, female-headed households are also consistently poorer, and hence less able to invest in clean water. By not having the financial means to access safe water, year-round, women are further marginalized. Drinking unsafe water also has adverse health impacts, which can further undermine their income generating capacities.

48. Limited technical, financial and organizational capacities for sustained O&M of the drinking water technologies: Where government or other donor investments have been made to secure water for the poor, the lack of capacities among beneficiaries to operate and maintain these technologies in the face of climate-change impacts, has rendered many such investments non-functional. In many instances, technologies are designed without climate change risks taken into consideration. For instance, shallow tube wells are subject to saline intrusion and Pond Sand Filter (PSF) technology alleviates water scarcity by securing surface water in ponds, but without raising the level of the pond embankments, cyclone inundation can render ponds unfit for use due to increased salinity. Furthermore, the sustainable operation and maintenance of water technologies in coastal districts in southwest Bangladesh have also proved to be difficult. Adaptive technologies required to deal with increased salinization of water sources, such as rain water harvesting, PSF, ponds with filtration treatment and RO, require technical skills for both operations and maintenance (including knowledge of basic carpentry and plumbing), as well as an understanding of evolving climate risks, including changes in precipitation, salinity, and intensification of cyclone events. However, often there is a lack of capacity in these technical skills at the local level, including among community members, local staff, and NGOs in regard to sustained operation and maintenance in light of evolving climate risks. An inadequate level of training and capacity building, and a general lack of awareness on the long-term benefits of freshwater storage or treatment technologies, results in limited technical knowledge and neglect among local users. Finally, community involvement in design and water management has been sporadic and limited. A major constraint is the lack of consultation with and involvement of the marginalized and poor, leading to a reduced sense of ownership, which in turn limits the willingness and interest of beneficiaries to participate in required O&M activities.

49. Gender specific constraint: The collection of water for drinking and other household purposes (including cooking, cleaning, bathing and household gardening) are primarily a women's responsibility, are a major contribution to women's unpaid burden of work. Community consultations

revealed that women spend on average 2.5 hours collecting water for household use, having to walk long distances. Rooftop and local rainwater harvesting systems would reduce this burden on women by being able to store water at or near their houses. Screening of common practices showed that water management committees, and women involvement within them, exists on a conceptual level, but that their functionality, consistency of meetings, and transparent decision-making processes are questionable. This stems from unequal power dynamics on the local level and weak organizational structures to empower women and other marginalized community members. This constraint leads to a reduced sense of ownership, which, consequently, can limit the sustainability of the interventions. Mechanisms to strengthen the position of the local communities and women in design processes for drinking-water supply and livelihood planning are needed. That is, it is imperative that women participate in the design and sustainability of solutions, including location, access protocols and maintenance, as they are the main-user group of the system. Women should be included during the project design phase and any system should provide easy access to the water collection point for women, and other marginalized groups (people with disabilities, ethnic and religious minorities) who may face additional constraints in water access. See Chapter 4, Feasibility Study (Annex IIa) for further details.

Limited institutional capacities, coordination, and knowledge and learning mechanisms for climate-risk informed planning and implementation of resilient livelihoods and drinking water solutions

50. Low technical skills, knowledge, and capacities to innovate, plan for, and implement resilient solutions to cope with rising salinity impacts on drinking water and livelihoods: Despite the prioritization of climate change issues and relevant strategies and plans to support climate action at the national level, evidence-based design and the implementation of solutions that target climate-induced salinity impacts on coastal freshwater resources is limited. The burden of maintaining research capacity, knowledge sharing, and technical skills with regard to climate risks, is very high for national, sub-national and local government institutions that are already fiscally constrained, as well as for partners' institutions such as NGOs and the private sector. For example, the technical knowledge and capacities to design and implement resilient technologies to support diversification of agricultural livelihoods is not yet systematized, nor positioned to evolve as climate risks evolve. Similarly, understanding of salinity risks, consequent projected changes to the ground and surface water profiles, changes in precipitation patterns, as well as the technical capacities to innovate and evolve drinking water solutions to cope with these projected risks is limited. This is partly due to limited knowledge and technology transfer, but also due to financial constraints to build these incremental costs of climate change responses into development planning, which limits the design of public good solutions targeted to support vulnerable coastal communities. Thus, while considerable investments are being made in climate-smart agriculture, resilient livelihoods, water supply solutions, and coastal development, the practices, efforts, and approaches are not institutionalized to promote technical capacities among the relevant ministries. There is limited knowledge exchange and evidence-based learning to support upscale of resilient livelihoods and drinking water solutions to cope with climate change induced salinity and extreme weather events.

51. Gender specific constraint: Given the multiple intersections between building community resilience in the face of shifting livelihoods and water scarcity, and the need for gender responsive solutions to these challenges, it is imperative to strengthen the long-term capacity of MoWCA, along with DPHE and LGIs, and relevant technical and civil society organizations to incorporate climate change risks into the planning and implementation of gender empowerment strategies national and locally.

52. Weak coordination across agencies and sectors to support coastal communities in coping with evolving climate risks and impacts on drinking water and livelihoods: The GoB recognizes the lack of coordination among sectors and ministries as one of the major limitations of the current institutional set up to address climate change issues⁵⁶. Limited vertical and horizontal coordination is a barrier for addressing climate change risks such as slow-onset salinization, as it requires an integrated, evidence-based approach to planning and supporting resilient interventions to address cross-sectoral impacts of deterioration of freshwater resources. When these impacts are especially devastating for women and girls' lives and livelihoods and collectively affect a community's adaptive capacity, coordination is critical to ensure long-term, gender responsive, integrated solutions. Climate-risk reduction of coastal communities is a complex process demanding a systemic approach and a

multitude of expertise. The communal and household level acceptance of empowering women in pursuing new livelihoods and managing climate-smart water solutions requires comprehensive support from government institutions with mandates and capacity to coordinate across interventions and actors. Furthermore, the interventions themselves require coordination across technical domains, gender-responsiveness and support that takes women specific climate vulnerabilities into account. Currently, such coordination is weak and can lead to planning failures and short-lived support, without resulting in transformational changes to improve the climate-resiliency of water security and livelihoods of coastal people. The designation of climate change focal points in each ministry and relevant agencies and training by the Ministry of Environment and Forests (MOEF) to better integrate climate change into activities is a step in this direction. However, the human resource capacity is still being built and the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) has duly highlighted capacity building as a fundamental requirement towards addressing climate change nationally⁵⁷.

53. Gender-specific constraint: Many projects implemented by GoB agencies do not have any theoretical construct to address gender sensitivity in the project design. The MoWCA, under the Bangladesh Climate Change Trust Fund (BCCTF), has helped other ministries to integrate gender considerations, whilst NGOs have similarly taken initiatives to train gender focal points to include gender sensitivity in project design and monitoring. Even so, progress has been slow and gender is often a neglected aspect in many projects. Weak institutional capacities and coordination can further marginalize women as the opportunities for women to address the impacts of salinity on freshwater resource-based livelihoods might be lost in design of primarily technical, sectoral solutions. Institutional mandates define the processes and rules that govern and regulate access and entitlement to assets and this can inadvertently create winners and losers if the marginalized and the vulnerable, including women and children, are not targeted in a coordinated manner.