Enhancing adaptive capacities of coastal communities, especially women, to cope with climate change induced salinity

Environmental and Social Management Framework

1 September 2017

1

EXECUTIVE SUMMARY

This Environmental and Social Management Framework (EMSF) has been prepared in support of a project proposal on "Enhancing adaptive capacities of coastal communities, especially women, to cope with climate change induced salinity" by the Government of Bangladesh (GoB) to the Green Climate Fund (GCF). As the United Nations Development Programme (UNDP), in its role as a GCF Accredited Entity, supports this project, it has been screened against the UNDP's Social and Environmental Screening Procedure (SESP), and deemed a Moderate Risk (World Bank/International Finance Corporation Category B project. As such, an ESMF has been prepared for the project.

The Ministry of Women and Children's Affairs (MoWCA) is the Implementing Entity for this project, and as such is accountable to UNDP for managing the project, including the monitoring and evaluation of project interventions, achieving project outcomes, and for the effective use of UNDP resources. The Department for Women's Affairs (DWA), the operational wing of the MoWCA, is responsible for programme implementation as per GOB's rules of business, and hence will act as the executing entity of the project, in conjunction with the Department of Public Health Engineering (DPHE) for the water supply component of the project intervention. A Project Management Unit (PMU) will be established for the implementation of the project and compliance with this ESMF. The PMU will be comprised of a National Project Director (NPD), a Project Manager and Technical and Operations Teams. Environmental and Social Safeguards officers will also be assigned to oversee the work of contractors, responsible for compliance with the ESMF.

The primary goal of the project is to enhance the adaptive capacities of extremely poor, coastal communities, especially women, who are most vulnerable to climate change; to cope with the increasing impacts of climate change induced salinity on their freshwater-reliant lives and livelihoods. In order to address this issue, the project will invest in promoting a shift from currently non-adaptive, freshwater-reliant livelihoods of small-scale farmers, fishers, and agro-laborers towards adaptive livelihoods. The project will also support investments in climate-resilient technologies and management capacities, for a shift away from groundwater to surface-water solutions to secure year-round, safe drinking water for coastal communities. Finally, the project strengthens community and institutional capacities for climate-risk informed implementation and adaptive management of livelihoods and drinking water solutions, through investments in knowledge and evidence-based learning, enabling pathways for replication and scale of project impact, across vulnerable districts of the southwest.

Overall, the project will directly benefit 25,425 women to switch or phase in adaptive livelihoods with an associated 500 people benefitting from capacity building and support to value-chain and market actors. The project will also provide potable water through a tiered Rainwater Harvesting (RWH) scheme at the institutional, community and household levels, as well as install additional 'pond based advanced filtration treatment' systems at the community level, benefitting 68,327 women and 67,783 men, improving their health, safety, and resilience and significantly decreasing the unpaid time burden of women in regards to water collection, in order to ensure time available for the diversification into climate-resilient livelihoods.

The water provision component of the project will deliver safe and secure potable water, along with access to a cyclone early warning to protect assets and livelihoods. In designing the climate-resilient livelihoods support component of the project, a range of adaptive livelihoods were chosen based on adaptive capacity, gender-responsiveness, market potential and environmental and social sustainability. This led to a proposed 198 fisheries based and 819 agriculture based livelihood options, comprised of: (i) crab farming and trading; (ii) crab nursery; (iii) aqua-geoponics; (iv) hydroponics; (v) plant nursery; (vi) sesame cultivation; (vii) homestead gardening; and (viii) crab and fish feed processing. Additionally, two crab hatcheries will be established to allow a sustainable development of a currently non-coherent crab value chain.

The project focuses on the gendered dimensions of climate change, and has considered environmental sustainability and sensitivity to marginalized groups in the intervention area in the design of both the water provision and livelihoods components of the projects. The project has significant environmental, social and gender benefits, including improved access to resources for marginalized groups, particularly women, decreased reliance on groundwater resources and improved environmental management of small-scale aquaculture and agriculture. The project also includes support for the introduction of best practice in regards to ecosystem based management of wild stocks and improvements in mangrove conservation and fish/crab feed processing.

The project has the potential to cause moderate environmental and social impacts. The Project's design has avoided high-risk environmental and social impacts, and siting of all project interventions outside environmentally sensitive areas has reduced the potential risk. The cultivation of non-invasive, non-carnivorous local species has been chosen for aquageoponics, only existing shrimp farms in brackish water-inundated tidal zones will be used fro crab farming and organic methods, which avoid the use of pesticides and fertilizers, will be used for all plant cultivation interventions. There is also limited potential for soil, surface water and groundwater impacts; however these can be mitigated through

appropriate management measures. Appropriate and relevant avoidance and mitigation options have been proposed in the ESMF, which if put in place, will significantly reduce the potential impacts of the project to an acceptable level. Actions include the development of site-specific erosion, drainage and sediment control plans that will be developed and implemented as a mitigation measure.

The project does not require any land acquisition and/or resettlement. None of the interventions will require the displacement of people or will be conducted in protected areas or sensitive locations.

The project has developed a gender-sensitive Grievance Redress Mechanism (GRM) to deal with any complaints and/or grievances and issues that may arise as a result of the project. This Grievance Redress Mechanism and has been developed line with UNDP Social and Environmental Standards as well as harmonized with local experience in administering such mechanisms.

Building the resilience and adaptive capacity of vulnerable, extreme poor women and girls, and their communities, in the most climate change affected areas of south-western Bangladesh is an essential investment to support the basic socio-economic human rights of beneficiaries, in regards to a sustainable supply of potable water in the face of rising seal level and increasing salinity. Water provision will have the positive environment benefit of reducing reliance on polluted and increasing saline ground water. Developing women-led water management committees and empowering women to manage their water supply, will also create positive social changes in regards to gender dynamics, social mobility and women's unpaid time burden, which exacerbate vulnerability to climate change in the target districts. Targeted support of climate resilient livelihoods, will not only alleviate climate-induced vulnerability in the coastal communities of Bangladesh but will also further empower women to have greater skills, knowledge, decision-making power and access to assets, contributing to transformative social change. Finally, sustainable development pathways will be strengthened by supporting the GoB in developing Codes of Practice for better management of small-scale aquaculture, regulations of wild fry collection and mangrove conservation, and the reduction the use of by-catch in aquaculture feeds, so that climate-resilient livelihoods adapted to changing conditions can be scaled-up over time.

Budgeting for environmental and social interventions and the application of mitigation measures to enhance positive impacts for the project is an investment in the future, as it will reduce the environmental and social liability at local, regional and national levels.

2 INTRODUCTION

1. This Environmental and Social Management Framework (EMSF) has been prepared in support of a project proposal on "Enhancing adaptive capacities of coastal communities, especially women, to cope with climate change induced salinity" (the project) by the Government of Bangladesh (GoB) to the Green Climate Fund (GCF). As the United Nations Development Programme (UNDP), in its role as a GCF Accredited Entity, supports this project, it has been screened against the UNDP's Social and Environmental Standards Procedure (SESP), and deemed a Moderate Risk (World Bank/International Finance Corporation Category B) project. As such, an ESMF has been prepared for the project.

2.1 BACKGROUND

2. Bangladesh is one of the most disaster-prone countries in the world affected by floods, tropical cyclones, storm surges, and droughts. The exposure of its economy to disaster losses continues to increase, especially in real terms given the multiple and frequent large-scale disastrous hazards, higher economic growth, increases in assets, and population and urbanization.

3. The key climate change risks are from sea level rise (SLR), increased storm surges due to increased intensities of tropical storms and cyclones, and increasing temperatures. All three of these changes in climate act to increase both surface and groundwater salinities; increases in storm surge and SLR increase saltwater intrusion into the coastal region; increasing temperatures leads to greater evaporation, which in the absence of increases in rainfall, leads to greater concentrations of salinity in landlocked water sources. The timing of the dry and wet monsoon season can also increase extreme salinity levels at the end of the dry season when temperatures/evaporative demand is highest and less freshwater is available. Other non-climate stresses, such as reduced freshwater river inflows due to increased abstraction, further act to exacerbate/increase salinity levels. These processes cause increases in the salinity of coastal freshwater sources and land, and affect drinking water availability and agricultural livelihoods.

4. Climate change impacts are not gender-neutral and many of the consequences of climate-induced impacts are more severe for women, and other socio-economically marginalized groups, given their specific livelihood circumstances, their socio-political isolation perpetuated by unequal power dynamics, and related information asymmetry and constraint in decision making processes.[1] In relative terms, women importantly lack access to productive resources, as well as decision-making power, and this has impacts on their health, food security and safety. The constraints in access to natural resources, and additional socio-cultural barriers limiting participation and movement outside the household sphere, is worsened by phenomena such as flooding, drought and erratic rainfall. These constraints cause women to have to work much harder to secure food and water, and generate additional income through livelihoods which, in turn, diminishes their ability to advance out of poverty, particularly when they have, for example, lost their land due to the impacts of flooding during cyclone events.[2]

2.2 OVERVIEW OF THE PROJECT

5. The project will enable the Government of Bangladesh to reduce the vulnerability and build long-term resilience in the most climate change impacted areas in the south-west coastal districts of Satkhira and Khulna in Bangladesh, which are facing increasing impacts of climate change in the form of sea level rise, salinity intrusion and increasing salinization of water and soil, which affect both access to potable water and the viability of coastal livelihoods.

6. Reducing the vulnerability of woman in coastal communities and building the capacity of the Government of Bangladesh in gender transformative climate resilience is recognised in several key national strategies and policies. The Ministry of Woman and Children's Affairs (MoWCA) has led the formulation of this project, with technical on the water provision interventions from the Department of Public Health and Engineering (DPHE), as well as full participation of non-government organisations and community members, including marginalized groups in the intervention areas.

7. The Government of Bangladesh with support from UNDP, is formulating a project on adaptation to climate change impacts, entitled "Enhancing adaptive capacities of coastal communities, especially women, to cope with climate

[1] Alam et al., 2008; Ahmed et al., 2007
[2] Dankelman, 2010

change induced salinity" for submission to the GCF. The project seeks to offer targeted support to women and adolescent girls in two coastal districts in Bangladesh, Khulna and Satkhira, providing skills training and assets for a selection of fisheries and agriculture based climate-resilient livelihoods, and market linkages for these livelihoods options. The project will also provide potable water to a selection of the most salinity-affected wards within the 2 districts, not currently covered by other interventions, through Rainwater Harvesting (RWH) at the institutional, community and household levels and supplementary 'pond based advanced filtration treatment' systems at the community level. Finally, the project provides institutional strengthening, knowledge and learning on the climate-risk informed management of livelihoods and drinking water security. By improving the health, safety, and economic options of women in the target districts, the project aims for gender-transformative results in regards to women's access to resources and decision-making power and supports women in taking the lead in building community climate change resilience.

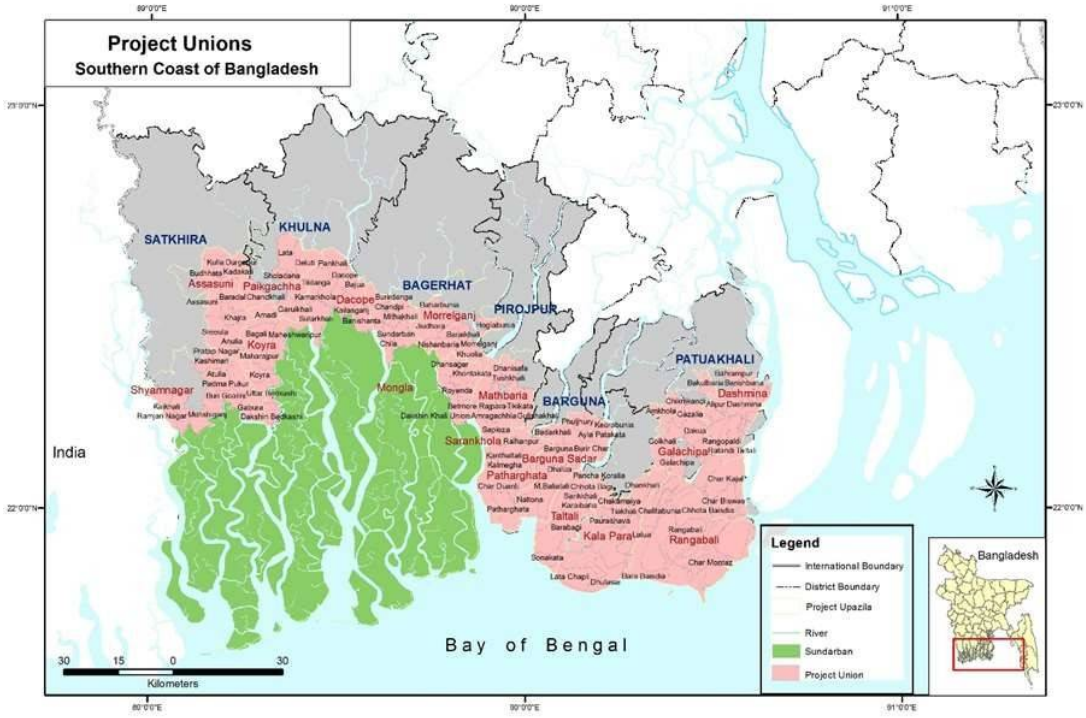


Figure 1 Map of Project Area

2.2.1 Summary of Activities

8. The proposed project will have the following activities:

Output 1: Climate-resilient livelihoods, focusing on women, for enhanced adaptive capacities of coastal agricultural communities

1.1 Enterprise- and community-based implementation of climate-resilient livelihoods for women

1.1.1 Participatory mapping for the portfolio of climate-resilient livelihood options;

1.1.2 Development of livelihood profiles based on the community livelihood risk and adaptation assessment and selection of beneficiaries (Utilize ActionAid resilience index);

1.1.3. Formation and reactivation of 1017 Women Livelihood Groups (WLGs) based on the livelihood profiles (coordinating with Water User Groups – WUGs – under Output 2);

1.1.4. Procurement of inputs, assets and tools for climate-resilient livelihoods for women livelihood groups (for 176 crab farming; 4 crab nurseries; 18 crab feed processing; 61 aqua-geoponics; 189 homestead gardening; 410 hydroponics; 114 Sesame; 45 plant nurseries);

1.1.5 Training of Trainers (ToT) based approach and community sensitization/awareness for WLGs (involving WSCs/LGIs/MoWCA staff in 39 Unions) on skills development on climate resilient technologies, best practices and norms, sustainable management practices, and O&M of resilient livelihoods (in coordination with BFRI for aquaculture interventions);

1.1.6 Training of Trainers (ToT) approach for WLGs to support business skills development resulting in marketing and financing plans for the resilient livelihoods.

1.2 *Strengthened climate-resilient value-chains and markets for alternative, resilient livelihoods*

1.2.1. Participatory, climate-risk informed, value-chain development planning among WLGs, linking with value-chain actors;

1.2.2. Climate-risk informed, value addition investments for resilient livelihoods (upgrading of 2 existing crab hatcheries);

1.2.3. ToT based technical training, incorporating climate risks, for operation and management of value-addition technologies and facilities (hatcheries);

1.2.4 Development of a Codes of Practice for sustainable production and management of small aquaculture as climate change risks evolve;

1.2.5. Establishment and facilitation (through workshops and networking events at union level to form PPIs) of the PPIs at Upazila level to enable replication and scale of resilient livelihoods;

1.2.6. Training of Upazila and District level staff (MoWCA, Department of Agriculture, Department of Fisheries, LGIs) on supporting PPIs to upscale resilient livelihoods;

1.2.7. Capacity building workshops and networking events for WLGs, value-chain actors, and FIs to promote access to finance linkages for sustained resilient livelihood and value-chain investments.

1.3. Community-based monitoring and last-mile dissemination of EWs for climate-risk informed, adaptive management of resilient livelihoods

1.3.1. Awareness and training through 101 workshops for women groups, value-chain actors, and WSC/LGI staff on implementation of climate risk reduction strategies;

1.3.2. Formation of women and girl volunteer groups and (one per ward) and ToT based training on dissemination and delivery of actionable early warnings (in coordination with CPP);

1.3.3 ToT based training, learning exchange, and advocacy for DMC staff, Union level CPP volunteer groups, BRCS, and MoDMOR staff to enable replication of the volunteer mechanisms across other wards and Unions

1.3.4 Development of climate-risk informed social audit protocol and toolkits for participatory monitoring and evaluation of resilient livelihoods;

1.3.5 ToT based training for WLGs and institutional staff (LGIs/DWA) on results monitoring of livelihoods in light of evolving climate risks;

Output 2. Gender-responsive access to year-round, safe and reliable climate-resilient drinking water solutions

2.1 Participatory, site-specific mapping, beneficiary selection, and mobilization of community-based management structures for climate-resilient drinking water solutions

2.1.1 Consultations, in light of the selection criteria, to finalize beneficiaries HHs, raise awareness, and plan for distribution of access to proposed drinking water solution systems in light of climate change risks;

2.1.2 Participatory mapping, vetting, and siting of drinking water supply systems (based on site-specific assessments conducted during design);

2.1.3 Formulation/reactivation/facilitation of WUGs and WMCs (synergizing with WLGs in Output 1);

2.1.4 Detailed assessment including water quality testing at applicable sites to support customized design of the water supply systems.

2.2 Implementation of climate-resilient drinking water solutions (at HH, community, and institutional level)

2.2.1. Customization and detailed design for each of the sites and water supply systems;

2.2.2. Site preparation and construction of 13,323 household RWH systems including storage tanks, roof catchments, and conveyance elements;

2.2.3 Site preparation and construction of 228 community-scale RWH systems including storage tanks, roof catchments, and conveyance elements;

2.2.4 Site preparation and construction of 19 institutional-scale RWH systems including storage tanks, roof catchments, and conveyance elements;

2.2.5 Site preparation and construction of pond embankments and installation of filtrations systems at 42 ponds;

2.2.6. Water quality testing/verification of fresh water sources after installation and prior to commissioning.

2.3 Community-based, climate-risk informed Operation & Maintenance (O&M) and management of the resilient drinking water solutions

2.3.1 Facilitation of WUG and WMC meetings for yearly, adaptive water distribution and management planning in the face of a changing climate;

2.3.2 Awareness raising and capacity building (through workshops) for HHs, water user groups, WMCs on climate change and disaster risk management for water solutions;

2.3.3 Development of fee-based, three-tier O&M plan including identification of O&M needs, financing sources, and technical support;

2.3.4 ToT based technical training, incorporating climate risks, on operations, maintenance and use (including water quality monitoring, system condition assessment, end-point quality control) for HHs, water user groups, WMCs, technicians/caretakers, LGIs/DPHE staff;

2.3.5 Implementation of community-based and three-tier system for water availability and quality monitoring and operations & maintenance (including provision of water quality monitoring tool kits, caretaker costs, and O&M support).

Output 3: Strengthened institutional capacities, knowledge and learning for climate-risk informed planning and management of livelihoods and drinking water security

3.1 Strengthen MoWCA's technical and coordination capacities for design and implementation of gender-responsive, climate-resilient coastal livelihoods

3.1.1. Development of and training (ToT approach) on climate risks and livelihood scenarios for coastal livelihoods;

3.1.2 Development of and training (ToT approach) on tool kit for gender-responsive, climate-resilient livelihoods design and implementation for the Southwest coast;

3.1.3 Development of 'Gender Sensitive Climate Change Adaptation' Training Module and ToT for gender focal persons across key ministries;

3.1.4 Training of MoWCA and DWA staff to integrate gender and climate change across policies (policy forums such as PEC, ECNEC, NDA Advisory Committee) and programs across sectors.

3.2 Strengthen DPHE capacities for climate-risk informed management of drinking water solutions across the Southwest coast

3.2.1. Development of and training (ToT) on climate risks and scenario modelling for drinking water needs across the southwest coast;

3.2.2. Establishment of a regional database for mapping of water supply sources and existing/planned water supply infrastructure;

3.2.3 Technical capacities for R&D wing of DPHE (training and field-based studies) for innovation and design of climate-resilient water solutions across the coast, in coordination with technical institutes.

3.3. Establish knowledge management, learning and M&E mechanisms to promote long-term, adaptive capacities of coastal communities

3.3.1. Codification of knowledge, good practices, tools, and approaches such as climate risk and scenario analyses, tools for climate-resilient livelihood and drinking water solutions, and best practices and lessons

3.3.2 Integration of knowledge and tools into training and informational modules of government and technical institutes;

3.3.3 Establishment of a web-portal, co-hosted by MoWCA, for dissemination of climate and gender related knowledge, tools, and adaptation practices

3.3.4 Design and implementation of 'Adaptive Learning' for young boys and girls through school- and community-based behavioural change communications;

3.3.5 Implementation of monitoring and evaluation framework including: (i) baseline climate risk and vulnerability assessments (Incorporate ActionAid resilience index); and (iii) impact evaluation to quantify project impacts;

3.3.6 Development of a Replication Roadmap for replication and scale or climate-resilient livelihood and drinking water solutions, coordinating with donors, ministries, and multi-laterals.

2.3 Environmental and Social Risk Assessment

9. As this project is supported by UNDP in its role as a GCF Accredited Entity, the project has been screened against UNDP's Social and Environmental Standards Procedure. The Social and Environmental Screening Template was prepared and the project deemed to be a moderate risk (Category B) project. Guidance on the impact assessment is provided in the Social and Environmental Screening Template, which provides the rationale for the project being classified as a moderate risk project. This ESMF provides further discussion on the environmental and social aspects of the project and on the assessment and management of impacts, below.

10. An impact risk assessment was undertaken using the UNDP Social and Environmental Screening Procedure to assess the probability (expected, highly likely, moderately likely, not likely) and the impact of the risk (critical, severe, moderate, minor, negligible). From this, a significance value was attributed to the potential impact (negligible, low, medium, high and extreme).

Score	Rating
5	Expected
4	Highly Likely
3	Moderately likely
2	Not Likely
1	Slight

Table 1 Rating of Probability of Risk

Score	Rating	Definition
5	Critical	Significant adverse impacts on human populations and/or environment. Adverse impacts high in magnitude and/or spatial extent (e.g. large geographic area, large number of people, transboundary impacts, cumulative impacts) and duration (e.g. long-term, permanent and/or irreversible); areas impacted include areas of high value and sensitivity (e.g. valuable ecosystems, critical habitats); adverse impacts to rights, lands, resources and territories of indigenous peoples; involve significant displacement or resettlement; generates significant quantities of greenhouse gas emissions; impacts may give rise to significant social conflict
4	Severe	Adverse impacts on people and/or environment of medium to large magnitude, spatial extent and duration more limited than critical (e.g. predictable, mostly temporary, reversible). The potential risk impacts of projects that may affect the human rights, lands, natural resources, territories, and traditional livelihoods of indigenous peoples are to be considered at a minimum potentially severe.
3	Moderate	Impacts of low magnitude, limited in scale (site-specific) and duration (temporary), can be avoided, managed and/or mitigated with relatively uncomplicated accepted measures
2	Minor	Very limited impacts in terms of magnitude (e.g. small affected area, very low number of people affected) and duration (short), may be easily avoided, managed, mitigated
1	Negligible	Negligible or no adverse impacts on communities, individuals, and/or environment

Table 2 Rating of Impact of Risk

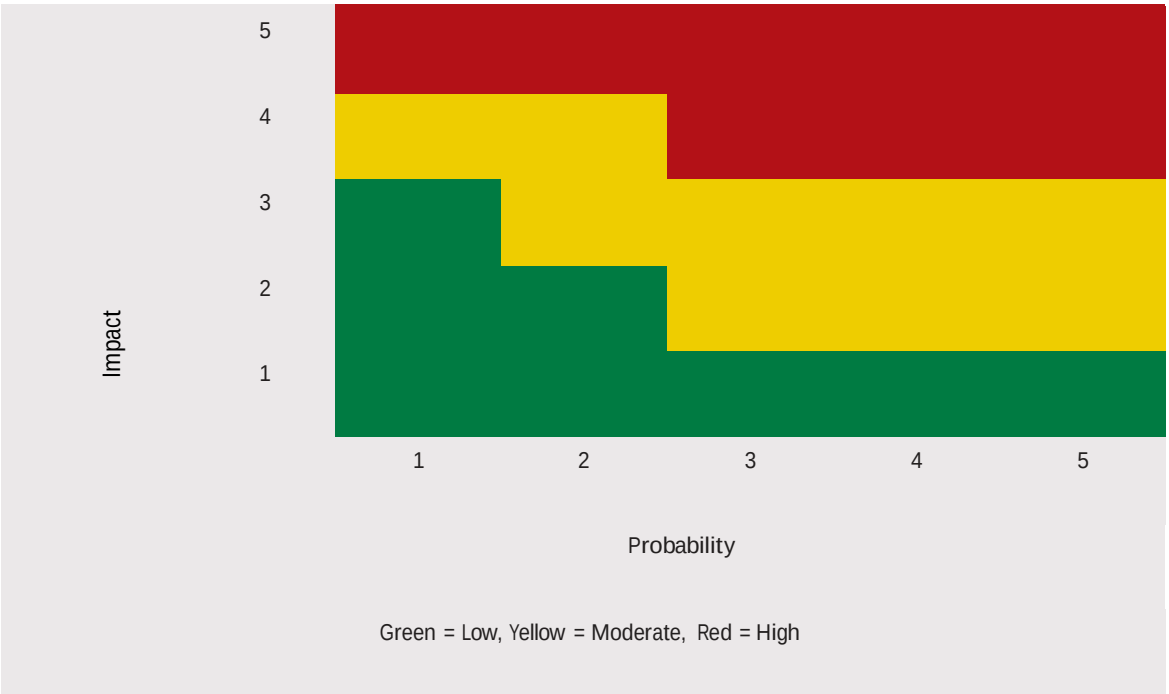


Table 3 UNDP Risk matrix

11. When undertaking the risk assessment, all activities were assessed, including, hard/soft infrastructure and the livelihood interventions. Specific measures for each environmental and social component e.g. water; erosion, biodiversity etc. are discussed along mitigation measures later in this ESMF.

Project Activities with Adverse Impacts	Unmitigated Impacts	Unmitigated Risks	Avoidance and Mitigation Measures	Post mitigation Risk
Output 1: Climate-resilient livelihoods, focusing on women, for enhanced adaptive capacities of coastal agricultural communities				
1.1 Enterprise- and community-based implementation of climate-resilient livelihoods for women Selection of beneficiaries Site-specific, participatory market-mapping and development of livelihood profiles Formation and reactivation of Women Livelihood Groups (WLGs)	The implementation of climate-resilient livelihoods, including beneficiary selection and the investment in assets and tools has a range of environmental and social impacts. Given the number of proposed livelihoods options, the risks associated with each intervention are outlined below. Beneficiary selection, participatory mapping and formation of WLGs have social risks in regards to marginalized groups. Extremely poor religious and indigenous minority groups, who are often discriminated against, inhabit the two target districts, including Hindu households living in the target areas (~30% of population in both Satkhira and Khulna), as well as indigenous (adivasi) families belonging to the Munda ethnic group. These groups may suffer discrimination in regards to participation and site-selection for livelihood interventions. Another social risk of targeting women as primary beneficiaries is that as gender norms are challenged and women gain assets and income, there may be increased incidence of intra-household conflict and Gender Based Violence (GBV).	Impact: 3 Probability: 3 Risk Level: Moderate	The mitigation measures will be tailored to each of the livelihood interventions below A strict and transparent beneficiary selection process will ensure that project benefits are distributed in an equitable manner among the most vulnerable in the target districts, and that the selection is not based on any religious or other discriminatory reason. The selection process will be clearly documented and explained in stakeholder consultations with beneficiary communities. The final beneficiary selection will proportionately reflect the minority population of the district and will also prioritize adivasi households. All community members in the wards targeted by the project will have access to a grievance mechanism. Gender norm transformation and the issue of women's mobility and "appropriate work" will be addressed in community sensitization activities. The GRM will be gender sensitize and project monitoring and evaluation will also track intra-household conflict and GBV.	Impact: 3 Probability: 2 Risk Level: Moderate

Crab Farming (176 small-scale farms) Crab nurseries (4 small-scale nurseries) Aquageoponics (61 systems)	Vulnerability of livelihood options (aqua geoponics, hydroponics, plantations, crab nurseries and farms) to storm surges, extreme winds and cyclones.	Impact: 3 Probability: 3 Risk Level: Moderate	The aquaculture interventions (crab nurseries and farms) will be susceptible to cyclone damage, however beneficiaries can use the early warning systems in the case of an impending extreme weather event, to minimize damage to assets and harvest all stock to minimize losses. To enhance the resilience of the plant cultivation livelihoods, mostly low-growing crops will be promoted and the locations will carefully be selected during the implementation phase of the project to ensure some shelter through existing building, embankments, and vegetation	Impact: 2 Probability: 2 Risk Level: Low
	Exacerbation of soil and water salinity in pond (gher) culture of mud crabs. Since brackish water is used for pond culture, salt content can be exported to neighbouring fields through seepage, pond water discharge and pond sediments	Impact: 3 Probability: 3 Risk Level: Moderate	The siting of crab farms will be strictly regulated by the project team, and in close consultation with government authorities to obtain the necessary licences and permits. Farms will only be allowed at the small scales at low densities, spatially dispersed to minimize cumulative impacts and will make use of existing shrimp ponds, in tidal zones already inundated by brackish water, with a strict prohibition of new ponds on existing agricultural land or expansion of farms. Perimeter ditches will be installed and clay pond lining used to control seepage into surrounding soil and groundwater, if deemed necessary after soil testing. Soil and water salinity will be carefully monitored.	Impact: 2 Probability: 2 Risk Level: Low
	Expansion of crab farming has the potential to increase pressure on already depleted wild stocks of crab fry and create an incentive for communities to enter mangrove areas and	Impact: 4 Probability: 3 Risk Level: High	Crab hatcheries will be built as part of the livelihood component of the project in order to produce crab lets for use in crab farming by target beneficiaries. The project will also support environmental awareness training in communities and a code of	Impact: 3 Probability: 3 Risk Level: Moderate

	the Sundarbans Protected Forest for collection of wild fry, with impacts on biodiversity		practice to ensure that wild fry is not used, and will support enabling policy and regulations at the local government and national levels to promote the switch from reliance on wild stock to hatchery produced stock. The stock produced by the hatcheries will meet the demand created by the creation of crab farms under the project.	
	Improper water management and effluent management of Mud crab farming. The proposed livelihood support for mud crab farming will be done at a small scale at the community level in semi-intensive systems. Regardless, discharge wastewater from ponds into surrounding waterways, pollutes receiving systems and causes detrimental impacts, such as eutrophication, toxicity, and spread of disease. Untreated wastewater laden with uneaten feed and fish feces contributes to nutrient pollution in the receiving esturaries.	Impact: 3 Probability: 3 Risk Level: Moderate	Crab will be cultured according to international best practice to produce limited effluent and rely on a limited amount of external, high-quality feed, which will be produced as part of the project. Farming will be carried out at low stocking densities. Best aquaculture practice will be applied, including minimal use of chemical inputs, antibiotics, drugs, and growth hormones, and supply chain linkages such as harvesting, processing, storage, and transportation will include environmental considerations and will be subject to an ESIA. All farms will be geographically dispersed to avoid cumulative impacts on water quality. Polyculture systems with aquatic weeds with appropriate salinity tolerance will be researched to develop sustainable nutrient recycling systems (bioremediation) and scaled-up based on success. Water quality will be monitored on a regular basis and all aquaculture interventions sites will be subject to an Initial Environmental Examination and located an appropriate distance from environmentally sensitive mangrove areas.	Impact: 3 Probability: 2 Risk Level: Moderate
	Aquaculture disease risk. Crab in nurseries and farms, as well as brackish water fish cultivated in aquageoponics systems are	Impact: 3 Probability: 3	International best practice will be used in mud crab aquaculture and aquageoponics systems to minimize disease risk, including biosafety protocols	Impact: 3 Probability: 2

	susceptible to disease, the incidence of which increases with higher stocking densities and poor water quality.	Risk Level: Moderate	used for the crab farming and crab hatchery facilities. Appropriate training will be given to beneficiaries, low stocking densities will be used in crab farming (no more than 1.5/m2) and water quality, feed consumption and disease incidence will be strictly monitored.	Risk Level: Moderate
	Social risks of the intervention include a lack of gender integration in the aquaculture value chain. Although women are playing an increasingly important role in the aquaculture value chain, due to local norms and beliefs around appropriate work for women, restrictions on movement outside of the household (purdah) and the women's burden of unpaid work, women's participation has been largely limited to seeding and feeding of ponds and attempts to integrate women into other aspects of the aquaculture value chain has had mixed results.	Impact: 4 Probability: 2 Risk Level: Moderate	Lack of participation arises from multiple factors, which will be addressed by the project. Lack of knowledge and technical skills in aquaculture will be addressed through training designed for women beneficiaries, and training will be designed in a gender responsive manner, including use of flexible times, provision of household based trainings when required, and the use of female trainers. Male household members will also be integrated into separate trainings, coupled with norm and behaviours change programs at the community level. The project will ensure proper working conditions for female beneficiaries and will include training in negotiation skills, financial management and access to markets. The project will primarily use pond aquaculture rather than cage culture, which has shown better integration of women. The project will collect gender-disaggregated data on the effectiveness of interventions and apply lessons learned from the project and other interventions in the target districts to refine interventions. Continuous stakeholder consultations with women will ensure that beneficiary concerns and perspectives are incorporated over subsequent years of the project.	Impact: 3 Probability: 1 Risk Level: Low

	Social risks also include the possibility of 'elite capture' of aquaculture interventions and issues with land tenure. In the shrimp aquaculture value chain, it has been observed that due to the demand and profitability of farms, there was an effective privatization of resources which may have previously been under common property regimes for some or all of the year (by intermediaries, local elites and companies), and this led to profits and assets being controlled by powerful actors and local 'elites' rather than poor small-scale farmers.	Impact: 3 Probability: 3 Risk Level: Moderate	The projects will ensure that land tenure arrangements for beneficiaries are secured in the early stages of project implementation, including collective rights to community interventions for women. Project monitoring of possible elite capture will be supported through the project. Stakeholder engagement of communities will ensure knowledge of land tenure security and access to the grievance redress mechanism.	Impact: 3 Probability: 2 Risk Level: Moderate
Crab Feed Processing and Trading (XX groups)	Depletion of fish stocks due to demand as input for feed in crab farming and for the brackish water fish in the aquageoponics systems. Crab/Fish feed processing, currently depends on inputs of small low-value fish and dried fish (sourced from marine fisheries by-catch) and shrimp heads, which can put pressure on wild fish stocks if not sustainably sourced. Shrimp heads are also used locally for human consumption and feed demand may disrupt supply.	Impact: 3 Probability: 3 Risk Level: Moderate	The project will support the research and development of high quality crab/fish feed from plant-based sources that are locally available and do not rely on small fish and fish oils. In the initial phases, a formulation based mostly on locally available agricultural by-products will be used (rice bran, mustard oil cake etc.), with the protein/fat requirement of the feed based on a low fish-processing by-product (10%) and shrimp head formulation (10%), supplemented by vermiculture. This will be optimized over time for crab, reducing the amount of fish/shrimp processing by-products required. The use of any small low-value fish (trash fish and/or tilapia) will be prohibited. A code of practice will also be developed for the GoB to move away from the use of small-fish and by-catch in aquaculture feeds.	Impact: 3 Probability: 2 Risk Level: Moderate

Homestead vegetables 189 home gardens) Hydroponics (410 systems at household/community levels) Sesame growing (114 community level gardens) Plant nurseries (45 community based interventions)	There is a possibility of increased application of pesticides and fertilizers in the target areas due to the expansion of plant cultivation activities. Given that hydroponic systems will be used, there is the potential for eutrophication and public health impacts (from pesticides). .	Impact: 3 Probability: 3 Risk Level: Moderate	The project will train beneficiaries in organic plant cultivation methods. Plant cultivation will be maximized using techniques such as mixed cropping, high quality seeds, raised beds, and organic fertilizer. Pesticide use will be prohibited, and avoided by offering training in Integrated Pest Control methods, such as hand collection, Neem extract application and bagging. Organic fertilizer use will be regulated and Water quality will be monitored in hydroponic and aquageoponics systems	Impact: 3 Probability: 2 Risk Level: Moderate
1.2. Strengthened climate-resilient value-chains and markets for alternative, resilient livelihoods Investment in upgrading of 2 crab hatcheries	The development of value chains has some adverse environmental and social impacts, described below, according to the particular intervention. The project will involve upgrading 2 existing crab hatcheries, including expanding capacity and wastewater treatment. Inadequate biosafety protocols in hatcheries, including introduction of water and airborne pathogens, poor hygiene of staff and equipment, and the introduction of any organisms that are not adequately quarantined before entering the hatchery, can negatively affect crab hatchery stock and introduce a disease risks. A high level of biosecurity is required for high larval survival	Impact: 3 Probability: 3 Risk Level: Moderate	Hatchery facilities will be designed according to international best practice and will ensure that functional areas are separated to minimize spreading of contaminants between areas. Sterilization areas will be kept separate from operations areas, and staff will be trained to maintain proper hygiene and sterilization. The operation schedule of the hatchery will include regular shut down periods for cleaning and disinfection. Inlet and outlet water and wastewater will be thoroughly treated. Training will be given to all crab hatchery staff on best practice in biosecurity	Impact: 3 Probability: 2 Risk Level: Moderate

	and production of cablets for the nursery phase of crab culture and to avoid disease.		and knowledge dissemination, technical exchange and capacity building will be emphasized. The capacity of GoB institutions (BFRI) and the private sector will also be built in biosecurity and disease control.	
1.3. Community-based monitoring and last-mile dissemination of EWs for climate-risk informed, adaptive management of resilient livelihoods	This is a community and institutional level training activity, which is unlikely to have any adverse environmental and social risks, but rather will have environmental and social benefits. Risks associated with social exclusion of marginalized groups from project activities are discussed above as part of Activity 1.1 and below as part of Activity 2.1.	Probability: 1 Impact: 1 Risk Level: Low	No mitigation measures required.	Probability: 1 Impact: 1 Risk Level: Low
Output 2: Gender-responsive access to year-round, safe and reliable climate-resilient drinking water solutions				
2.1 Participatory, site-specific mapping, beneficiary selection, and mobilization of community-based management structures for climate-resilient drinking water solutions	Participatory mapping beneficiary selection, and mobilization of community-based management structures have social risks in regards to marginalized groups. Extremely poor religious and indigenous minority groups, who are often discriminated against, inhabit the two target districts, including Hindu families living in the target areas (~30% of population in both Satkhira and Khulna), as well as indigenous (adivasi) families belonging to the Munda ethnic group. These groups may suffer discrimination in regards	Impact: 3 Probability: 3 Risk Level: Moderate	As for livelihoods support, a strict and transparent beneficiary selection process will ensure that project benefits are distributed in an equitable manner among the most vulnerable in the target districts, and that the selection is not based on any religious or basis. The selection process will be clearly documented and explained in stakeholder consultations with beneficiary communities. Siting of RWH tanks will also account for the preference of ethnic minorities (IPs) to have a separate water access point and the final selection for HH tanks should be proportionate to the population of religious minority households at the district level (~30%). Project evaluations should take a human rights-based and conflict sensitive	Impact: 3 Probability: 2 Risk Level: Moderate

	to participation and site-selection for drinking water solutions		approach and ensure that project benefits are distributed equitably. In case of any conflict or discrimination, minorities groups, along with all other project beneficiaries, can file a complaint using the grievance redress mechanism. The GRM focal point will also be given sensitivity training in regards to social marginalization.	
2.2 Implementation of climate-resilient drinking water solutions (at HH, community, and institutional scales)	Vulnerability of water provision solutions (RWH tanks and 'pond based advanced filtration treatment') to storm surges, extreme winds and cyclones. Cyclones can cause RWH tanks to be moved or dislodged from base causing damage to nearby houses, storm surges can impact the quality of water used for 'pond based advanced filtration treatment'.	Impact: 3 Probability: 2 Risk Level: Medium	The RWH tanks will be secured to cement platforms for minimize the risk of dislodging from the base, and institutional and community level systems have been prioritized to minimize the possibility of damage to beneficiary houses. All roof materials will be checked for structural integrity and guttering secured to ensure that catchment systems are resistant to extreme weather.	Impact: 2 Probability: 2 Risk Level: Low
	Waste generation from installation of Rainwater Tanks. The project will involve the installation 19 institutional level rainwater harvesting, 228 tanks at community sites, and 13,323 smaller tanks at the household level. Pond embankments and filtration systems will also be installed at 42 ponds. There is potential for waste to be generated from extra pipe and guttering that exceeds the needs of the project, although the vast majority of the installation will be prefabricated.	Impact: 2 Probability: 2 Risk Level: Low	Prior to installation, a full site evaluation will be undertaken to assess all sites, with consideration of proximity to water sources, suitability of existing roofing materials and proximity to environmentally sensitive areas. Appropriate measures will be taken to ensure a specific amount of material is procured according to RWH system design, thus, reducing waste.	Impact: 1 Probability: 2 Risk Level: Low
	Sediment movement during installation of rainwater harvesting tanks. During the	Impact: 2 Probability: 2	The installation of the rainwater tanks will be undertaken by experienced international companies who will at the same time, train local staff in the construction of the tanks. Any earthworks should be	Impact: 1 Probability: 2

	necessary to undertake earth works to provide a level platform to construct the tanks. The earth works will move sediment that, if not properly contained, may be removed either as air pollution or through overland flow during a rain event.	Risk Level: Low	undertaken during the dry season and compacted sufficiently to reduce sediment movement. The plan should contain aspects including but not limited to the installation of sediment curtains to reduce sediment movement and the quick placement of footing material. An erosion control and sediment plan has been prepared as part of the ESMF.	Risk Level: Low
	Contamination of existing water. During the installation of the rainwater tanks, it will be necessary to undertake earth works to provide a level platform to construct the tanks. There is the potential for the release of chemicals, nutrients, heavy metals and other material that may be within the existing sediment and for these to enter waterways and groundwater systems during the works. Furthermore, semi-intensive aquaculture systems also risk degrading surface and ground water quality (see Risk 3) if not properly managed.	Impact: 3 Probability: 3 Risk Level: Moderate	As with the above, to ensure contaminants etc. to not enter waterways and groundwater systems, a water-quality monitoring plan and management framework along with a erosion control sediment plan will be developed to ensure sediments are not released. This will involve testing sediment prior to movement and planning so that the works are not undertaken during rain events. Where rainfall is anticipated, appropriate material should be placed under the sediment prior to excavation to ensure there is no seepage into groundwater systems. Environmental management measures, including Water quality monitoring will be applied to all the aquaculture interventions.	Impact: 2 Probability: 2 Risk Level: Low
2.3 Community-based, climate-risk informed Operation & Maintenance (O&M) and management of the resilient drinking water solutions	There is a chance of public health and system sustainability risks from improper maintenance and operation of Rainwater Harvesting Systems. Rainwater Harvesting tanks require relatively simple operation and maintenance, however given that large-scale, high volume tanks are new technology in the target districts, there is some risk that improper operation and maintenance will lead to microbial contamination or that water	Impact: 3 Probability: 3 Risk Level: Moderate	The implementation of a community-based and three-tiered system for water availability and quality monitoring and operations & maintenance (including provision of water quality monitoring tool kits, caretaker costs, and O&M support) is one of the key inputs under this activity. The detailed O&M plan, including participation of Water User Groups (WUGs) at the community level, Water Management Committees (WMCs) at the ward level and the DPHE at the institutional level will ensure that water is free from microbial and other	Impact: 3 Probability: 2 Risk Level: Moderate

	in tanks may become a breeding site for mosquitoes. Sky hydrants filters require technically complicated O&M protocol.		contamination. Technically, RWH systems will be designed to include first flush system to ensure that debris and other contamination from the catchment surface does not enter the tank. All beneficiaries will pay a nominal fee to fund O&M activities and caretaker performance will be monitored. Finally, water will be subject to regular water quality monitoring as per the ESMF.	
Output 3: Strengthened institutional capacities, knowledge and learning for climate-risk informed management of livelihoods and drinking water security				
3.1 Strengthen MoWCA's technical and coordination capacities for design and implementation of gender-responsive, climate-resilient coastal livelihoods 3.2 Strengthen DPHE capacities for climate-risk informed management of drinking water solutions across the Southwest coast 3.3. Establish knowledge management, learning and M&E mechanisms to promote long-term, adaptive capacities of coastal communities	These are institutional planning & coordination, capacity building and knowledge management activities, which is unlikely to have any adverse environmental and social impacts, but rather significant environmental and social benefits.	Impact: 1 Probability: 1 Risk Level: Low	No mitigation measures required.	Impact: 1 Probability: 1 Risk Level: Low

2.3.1 Assumptions Underpinning the Development of the Environmental and Social Management Framework

12. The following assumptions have been made in the preparation of this ESMF:

- None of the interventions will be convert land that can be used for other purposes (agriculture) to an activity that can change the viability of the land,
- Siting of crab farms will be spatially distributed and of small-scale and sited to minimize cumulative impacts of effluent loads on receiving estuaries.
- There will only be limited release of pollution and/or chemicals as a result of the livelihoods components of the project, include strict regulation or organic fertilizer use and where waste is produced, appropriate environmental management measures and biosafety protocols will be put in place. All releases will be mitigated.
- All aquaculture interventions will be semi-intensive systems with low stocking densities and will follow international best practice guidelines for aquaculture.
- No activities will be undertaken within >10km from the boundary of the Sundarbans Protected Area, or within any Ecologically Critical Area (in compliance with the Environmental Conservation Act 1995 and the Official Gazette Notification on 30-08-1999 which declared the 10 km area surrounding the Sundarbans Reserve Forest area as Ecological Critical Area).
- Strict controls will be placed on the use/collection of wild crab fry/crablets from mangrove areas, including, but not limited to the Sundarbans Protected Forest.
- All plant cultivation activities supported by the project will use organic methods, will controlled use of organic fertilizer and prohibition of pesticide use.
- None of the interventions will be conducted in protected areas or sensitive locations.
- The rainwater harvesting tanks will be installed at brownfield locations where vegetation has already been removed and will use existing infrastructure for roof catchments where possible.
- The excavation works will only involve leveling the substrate for the pouring of the rainwater harvesting tank pad. No material will be moved off site.
- The installation of the rainwater harvesting tanks will be undertaken during the dry season to reduce erosional impacts.
- Where possible, materials will be pre-fabricated to reduce waste.
- Acid sulfate soils, commonly occurring in proximity to mangrove areas, will be managed during construction.
- Appropriate erosion, drainage and sediment control will be undertaken during all stages of the projects.
- Appropriate water quality measures will be undertaken during all stages of the project.
- None of the interventions will be in proximity to any archaeological and/or culturally sensitive location.
- None of the interventions will require the displacement of people.
- Beneficiary selection and project monitoring will be conducted with a human rights based approach that ensures that all marginalized populations have equal access to the benefits and grievance mechanism for the project.

2.3.2 Purpose and Objectives of the Environmental and Social Management Framework

13. An ESMF is a management tool used to assist in minimising the impact to the environment and socially; and establish a set of environmental and social objectives. To ensure the environmental and social objectives of the projects are met, project implementers should use this ESMF to structure and control the environmental and social management safeguards that are required to avoid or mitigate adverse effects on the environment and communities. The ESMF does not replace the requirement for an ESIA to be conducted by national authorities responsible for project implementation.

14. The environmental and social objectives of the projects are to:

- Provide the assets and skills required to pursue climate-resilient livelihoods in the most climate-change impacted districts of Bangladesh, while respecting and promoting the integrity of ecosystems, and avoiding maladaptation.
- Provide potable water to the most vulnerable people of two districts in southwestern coastal areas to reduce the impacts on natural systems (ground water aquifers) that are currently stressed.
- Encourage gender-sensitive and climate resilient environmental and social management practices through planning, commitment and continuous improvement of environmental and social practices.
- Minimize and prevent the pollution of land, air and water pollution.
- Protect native flora, fauna and important ecosystems and raise awareness of the environmental sensitivity of the Sundarbans Protected Area, the mangrove ecosystem and the importance of managing wild stocks.
- Comply with applicable laws, regulations and standards for the protection of the environment.
- Adopt the best means available to prevent or minimize environmental impact.
- Describe monitoring procedures required to identify impacts on the environment, and
- Provide capacity building in environmental and social management and best practice to MoWCA (DWA), DPHE, Department of Agriculture, Department of Fisheries, and the Bangladesh Fisheries Research Institute (BFRI) and contractors as required,
- Provide an overview of the obligations of MOWCA, DPHE and UNDP staff and contractors in regard to environmental obligations.

15. The ESMF will be updated from time to time by the implementing Project Management Unit (PMU)/contractor in consultation with the UNDP staff and MOWCA/DPHE to incorporate changes in the detailed design phase of the projects.

2.3.3 Land Issues

16. All proposed livelihoods intervention and water provision solutions are to be constructed on a mix of land currently owned by the Government of Bangladesh, or community and private (beneficiary household) land. As such, there is no requirement for any form of land acquisition or purchase.

17. Given that many project beneficiaries have limited land holdings, or are landless, and the well-documented problem in the project interventions areas with “elite capture” of aquaculture interventions, the project will also secure community land tenure arrangements for beneficiaries (particularly aimed at secure tenure arrangements for women and marginalized group beneficiaries). The project will arrange for land leases for all aquaculture interventions.

18. All livelihoods interventions, including all aquaculture interventions, will be community managed, and implementation and monitoring will ensure that productive assets and revenues will benefit beneficiaries in target communities as opposed to landowners with large tracts of land on which much aquaculture in the project area occurs.

2.3.4 Indigenous Peoples

19. As part of due diligence, an analysis and consultations were undertaken as to the likelihood of any of the project’s activities involving indigenous people and/or ethnic minorities. There are several Indigenous People’s/Ethnic minorities (known locally as ‘adivasi’) in the target districts, with only the Munda ethnic group found in the wards selected for project interventions.

20. Indigenous People in Bangladesh are often marginalized due to a high level of poverty, exclusion from social and political processes, and restricted access to resources. Indigenous people’s in Bangladesh are also more directly dependent on their natural resource base and show different preferences for livelihoods options.

21. In order to account for the unique needs and vulnerabilities of indigenous or ‘adivasi’ minorities in the project intervention area, an Indigenous People’s Planning Framework (IPPF) has been prepared for the project as a separate document (see Annex VI (c) of the GCF Submission).

2.4 Overview of Institutional Arrangements for the Environmental and Social Management Framework Plan

22. The ESMF will be assessed for each sub-activity by the MoWCA and UNDP prior to any works being undertaken. The ESMF identifies potential environment and social risks from all of the activities of the project and outlines strategies for managing those risks and minimising adverse environmental and social impacts. Further, the ESMF provides a Grievance Redress Mechanism (GRM) for beneficiaries and community members in the project intervention area, that may be impacted by the activities of the project, and seek further consultation or the resolution of an issue related to project activities.

23. The MoWCA and the DPHE both will be responsible for the supervision of the ESMF, for the livelihoods and water provision outputs of the project respectively. The UNDP with gain the endorsement of the GoB, and will ensure the ESMF is adequate and followed by all implementing parties. The Project Management Unit (PMU) will ensure the contractor takes timely remedial actions where necessary.

3 LEGAL AND INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL AND SOCIAL MATTERS

3.1 LEGISLATION, POLICIES AND REGULATIONS

24. The legislative and policy basis for environmental and social protection in Bangladesh is controlled by the following:

a. *National Environmental Policy 1992;*

b. *National Environmental Management Action Plan 1995;*

c. *National Conservation Strategy 1992;*

d. *Environment Conservation Act 1995;*

e. *Environment Conservation Rules, 1997 (subsequent amendments in 2002 and 2003)*

f. *National Forest Policy 1994;*

g. *National Water Policy 1999;*

h. *National Fisheries Policy 1998;*

i. *National Land Use Policy 2001;*

j. *Biodiversity Strategy and Action Plan.*

k. *Environmental Standards*

3.1.1 National Environmental Policy, 1992

25. In 1992 the National Environmental Policy (NEP) was drawn up with the aim of providing protection and sustainable management of the environment. The objectives of the Policy include:

a. Maintaining the ecological balance and overall development through protection and improvement of the environment;

b. Identifying and regulate polluting and environmentally degrading activities;

c. Ensuring environmentally sound development;

d. Ensuring sustainable and environmentally sound use of all natural resources;

e. Prevent activities, which are harmful to public health in all spheres, including development;

f. Ensure environmentally sound utilization of all water resources;

g. Keep the rivers, canals, ponds, lakes and all other water bodies and water resources free from pollution

h. Stop shrinkage and depletion of forest land and forest resources;

i. Conserve wildlife and biodiversity;

j. Prevent activities that diminish the wetlands natural habits of fish

k. Actively remain associated with all international environmental initiatives.

3.1.2 National Environmental Management Plan, 1995

26. The National Environmental Management Plan (NEMAP) was developed as the framework of programmes and interventions aimed at implementing NEP. Its activities attempt to lead to better management of scarce resources,

reducing the rate of environmental degradation, improving the natural and manmade environment, conserving habitats and biodiversity, promoting sustainable development and improving quality indicators of human life. NEMAP proposed actions and interventions are for government agencies, NGOs and wider civil society and include activities relating to fisheries and agriculture.

3.1.3 Environmental Conservation Act, 1995

27. The Environmental Conservation Act passed in1995, and the accompanying 1997 Rules, are dedicated to the "conservation, improvement of quality standards, and control through mitigation of pollution of the environment." The 1997 Environment Conservation Rules made in accordance with the 1995 Act provide additional guidance for specific components of the Act, including:

a. Coordinating with other authorities or agencies that have relevance to the objectives of the Act.

b. Adopting safety measures and determining abatement measures to prevent accidents that may cause environmental degradation.

c. Advising persons on environmentally sound use, storage, transportation, import and export of hazardous material or its components.

d. Conducting research and assisting other authorities and agencies in conservation and improvement of the environment.

e. Investigating locations, equipment, manufacture or other processes, ingredients, or materials, to ensure improvement of the environment, and control and mitigation of pollution.

f. Ensuring potable water quality.

28. The *Environmental Impact Assessment Act 2003* requires that all major projects must be supported by an appropriate environmental impact assessment, conducted as required under the Act. In making an assessment with respect to a major project, the Minister (responsible for environment) must have due regard for, *inter alia*, whether any project is likely to:

a. Result in or increase pollution;

b. Result in the occurrence, or increase the chances of occurrence, of natural hazards such as soil erosion, flooding, tidal inundation, or hazardous substances;

c. Result in the introduction of species of types not previously present that might adversely affect the environment and biodiversity;

d. Have features, the environmental effects of which are not certain, and the potential impact of which is such as to warrant further investigation; or

e. Result in the allocation or depletion of any natural and physical resources in a way or at a rate that will prevent the renewal by natural processes of the resources or will not enable an orderly transition to other materials.

29. A major project cannot proceed unless the Minister has approved the Environmental Impact Assessment (EIA).

3.1.4 Protected Areas: Sundarbans Reserve Forest

30. Under the Environment Conservation Act 1995 and the Forest Act 1927 the territory (10km from the boundary of the Reserve Forest) of the Sundarbans has been declared as protected area and hereby been restricted certain activities in and around the Sundarbans. Under the Forest Act, the Sundarbans is declared as Reserve forest where no commercial activities and damage to forest and wildlife resources will be caused.

31. "The Government shall take the following factors into consideration while declaring any area as Ecologically Critical Area under sub-section (1) of section 5:-

a) Human habitat

b) Ancient monument

c) Archeological site

d) Forest sanctuary

e) National park

f) Game reserve

g) Wild animals habitat

h) Wetland

i) Mangrove

j) Forest area

k) Bio-diversity of the relevant area

32. Under this Section 5 (1) of the Environment Conservation Act 1995, the Ministry of Environment and Forest through an Official Gazette Notification on 30-08-1999 declared 10 km area surrounding the Sundarbans Reserve Forest area as an Ecologically Critical Area. Upon declaring an Ecologically Critical Area, all activities except those permitted by the law are prohibited in the specified area. Setting up industries and implementing project activities which cause soil, water, air and noise pollution in the specified area are prohibited activities. The law also prohibits any activities that cause damage/adversely impact on biodiversity, forest resources, wildlife, fisheries and other aquatic resources.

3.1.5 National Water Policy, 1999

33. The National Water Policy provides a comprehensive outlook water resource management in Bangladesh. Section 9.4 of the Policy refers to the importance of water in wildlife and fisheries whereas subsections 12 and 13 respectively focus on the importance of water for the environment and wetlands[3,4]. The water policy aims to provide direction for achievement of objectives that include:

a) Address issues related to the harnessing and development of all forms of surface water and ground water and management of these resources in an efficient and equitable manner;

b) Ensure the availability of water to all elements of society including the poor and underprivileged, and to take into account the particular needs of women and children;

c) Accelerate the development of sustainable public and private water delivery systems with appropriate legal and financial measures and incentives, including delineation of water rights and water pricing[5].

34. The Policy acknowledges that changes are required in the pricing system and other economic incentives affecting water demand and supply. To convey the scarcity value of water, the policy recommends a system of cost recovery, pricing, and economic incentives/disincentives, which is necessary to balance the supply and demand of water. It highlights the importance of public service agencies to be converted into financially autonomous entities, with effective authority to charge and collect fees against services.

3.1.6 National Fisheries Policy, 1998

35. The National Fisheries Policy aims to enhance production of fish from inland marine sources, and to increase foreign currency earnings (Bangladesh is one of the top six aquaculture producing countries in 2016[6]), whilst maintaining environmental balance and biodiversity conservation (objective 5 of the policy). The policy identifies different threats to fisheries, such as (i) population pressure, (ii) construction of infrastructure in the floodplains, (iii) pollution by chemical fertilizers, insecticides and pesticides. It attempts to stem the illegal act of collecting shrimp fry from

3 ClimateChangeinBangladeshpdf pp. 32
4 WARPO 1999
5 WARPO 1999

6 FAO, 2016

the river and by doing so, killing national species and affecting biodiversity and fisheries' livelihoods. It indirectly promotes the production of specific fry for entrepreneurs.

3.1.7 National Land Use Policy, 2001

36. The National Land Use Policy contains components to reduce illegal land use conversion, and to ensure that land use activities are attuned with environmental conservation. The policy advocates for tree plantations in riverine and coastal islands to increase forest cover in the country, which may contribute in protecting people and resources in those areas from climate change induced hazards, particularly cyclone-induced winds and rising storm surges.

3.1.8 National Biodiversity Strategy and Action Plan

37. The National Biodiversity Strategy and Action Plan (NBSAP) provides a framework for conservation, sustainable use and sharing the benefits of biodiversity of the country. A major focus of the NBSAP is the need for cross-sectoral linkages, reflecting the fact that in Bangladesh, biodiversity conservation is closely inter- woven with social and economic development. The strategy acknowledges that the root causes of biodiversity loss ranges from natural processes to man-made interventions like climate change, unsustainable use and over the exploitation of resources. The policy also identifies the main threats to biodiversity in Bangladesh, as being the loss of habitat due largely to deforestation and inappropriate water and agricultural management, over-harvesting of resources, efforts to increase agricultural productivity, and natural disasters (with the underlying causes predominately related to issues of land tenure and users' rights, and institutional capacity constraints.

38. The major objectives of the NBSAP are to:

a) Conserve, and restore the biodiversity of the country for well being of the present and future generations;

b) Ensure that long-term food, water, health and nutritional securities of the people are met through conservation of biological diversity;

c) Maintain and to improve environmental stability for ecosystems;

d) Ensure preservation of the unique biological heritage of the nation for the benefit of the present and future generations;

e) Guarantee the safe passage and conservation of globally endangered migratory species, especially birds and mammals in the country; and

f) Stop the introduction of invasive alien species, genetically modified organisms and living modified organisms.

3.1.9 Environmental Standards

39. Bangladesh has also established a number of Environmental Standards under the *Environment Conservation Rules, 1997*. These include water quality standards including for inland surface water quality and waste from industrial units as examples. Environmental Standards have also been established for ambient noise and gaseous emissions from industry.

40. Given the nature of the livelihood components of the project, the effluent waste from the aquaculture components of the project and the crab hatcheries, as well as the receiving waters in which aquageoponics systems and hydroponics systems are located will have to adhere to all the relevant regulatory requirements, and water quality, as well as biosafety parameters will have to be tested on a regular basis. Project personnel should refer to the Environmental Conservation Rules, Schedule 3: Standards for Water, with attention to (A) Standards for inland surface water and (B) the Standards for drinking water.

41. Additionally, since the project is being undertaken by the UNDP, project activities will not only comply with Bangladesh's national law and standards, but with any obligations imposed and applicable under international law, whichever is the higher standard.

3.2 ENVIRONMENTAL IMPACT ASSESSMENT IN BANGLADESH

42. The Environmental Conservation Rules of 1997 supplemented the Environmental Conservation Act of 1995, as described above. These rules incorporate "inclusion lists" of projects requiring varying degrees of environmental investigation. According to Section 12 of the Environmental Conservation Act 1995 no project will be undertaken without obtaining an Environmental Clearance Certificate from the Department of Environment. Rule 7 of the Environmental Conservation Rules 1997 classifies projects, according to impact on the environment, and in Schedule 1 provides a list of industries for each classification. For industrial units and projects falling in the Orange – A, Orange – B and Red categories, firstly a Location Clearance Certificate and thereafter an Environmental Clearance Certificate is issued.

43. Category C (Orange) projects include processing fish, meat, food as well as animal feed. They also include Engineering works up to 10 hundred thousand Taka capital (item #45). Category D (Red) projects include engineering works: capital above 10 (ten) hundred thousand Taka (item #60) and the construction/reconstruction/expansion of flood control embankment, polder, dike, etc. (item #66).

44. Some of the project's livelihoods components (including individual fish farming in aquageoponic systems, fish/crab feed processing and mud crab nurseries and farms, trigger the rules of a Category C (Orange B) project. Some of the project's components (including the construction/upgrade of crab hatcheries as well as the ensemble of water provision options (RWH and 'pond based advanced filtration treatment', including flood embankments) trigger the roles of a Category D (Red) project.

45. There is no provision for the cumulative impacts that may arise from a number of small-scale aquaculture interventions. However, recognizing the importance of siting to minimize effluent loads in receiving estuaries, the project accounts for incorporation of environmental considerations in the participatory, site-specific mapping of aquaculture farms.

46. In order to obtain Environmental Clearance for Category C (Orange B) projects subject to renewal after each one-year period), the PMU (project management unit) will have to follow the application procedure as outlined:

    a. Provide a feasibility study report with technical specifications and site locations
    b. Provide an IEE (Initial Environmental Examination)
    c. Provide an Environmental Management Plan report
    d. Provide a NOC (No Objection Certificate) from the local authority
    e. Provide a pollution plan

47. In order to In order to obtain Environmental Clearance for Category D (Red) projects subject to renewal after each one-year period), the PMU (project management unit) will have to follow the application procedure as outlined:

    a. Provide a feasibility study report with technical specifications and site locations
    b. Provide an IEE (Initial Environmental Examination) and the Terms of Reference (TOR) for the Environmental Impact Assessment (EIA) of the project and its Process Flow Diagram or an EIA report prepared from a TOR previously approved by the Department of Environment, with a Layout Plan (with location of Effluent Treatment Plant), Process Flow Diagram, design and time schedule of the Effluent Treatment Plant)
    c. Provide an Environmental Management Plan (EMP) and also Process Flow Diagram, Layout Plan and information about the effectiveness of the Effluent Treatment Plan (applicable for existing industrial units, as in the case of crab hatcheries)
    d. Provide a NOC (No Objection Certificate) from the local authority
    e. Emergency plan relating to adverse environmental impacts and plan for the mitigation of the effects of pollution.

4 IMPLEMENTATION AND OPERATION

4.1 GENERAL MANAGEMENT STRUCTURE AND RESPONSIBILITIES

48. The implementation and management arrangement of the project is shown below in Figure . The key roles are also further outlined below.

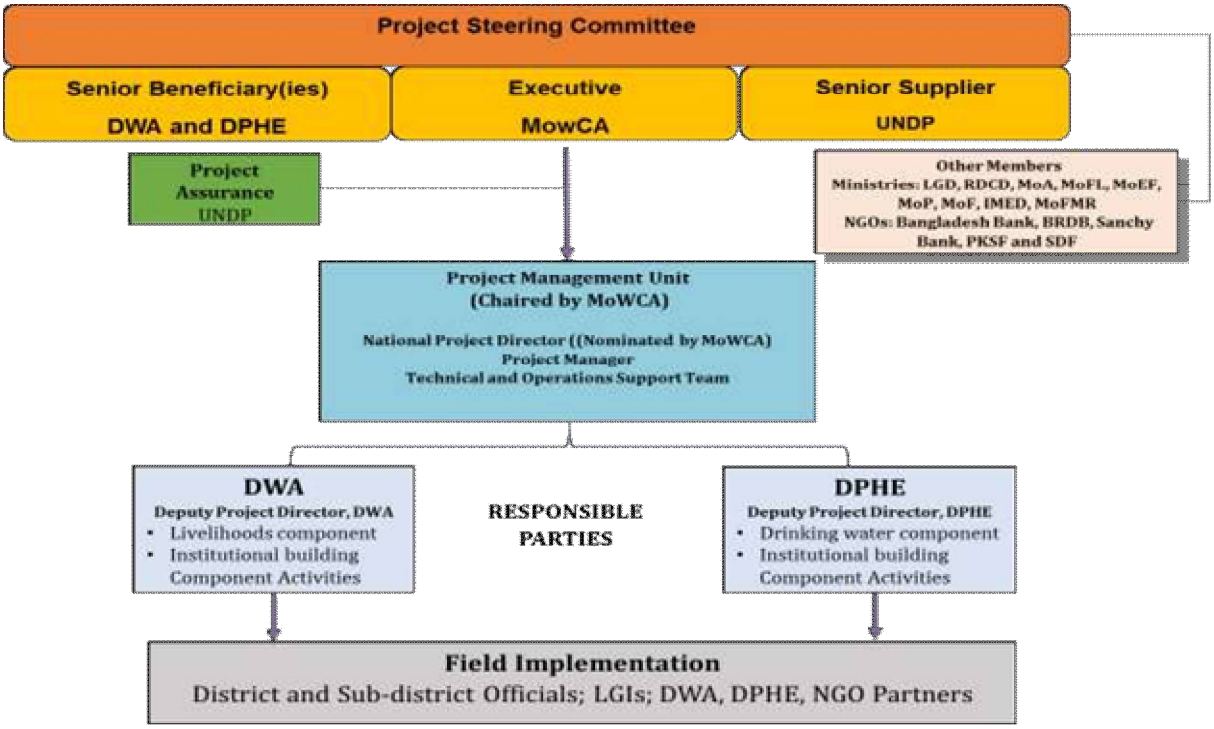


Figure 2 Project organisation structure

4.1.1 Project Steering Committee

49. The project will be governed by a Project Steering Committee (PSC), which will consist of representatives responsible for making consensus-based strategic, policy and management decisions for the project. It will oversee the project implementation, review compliance with GoB, UNDP and GCF requirements and ensure implementation of the management plan for the environmental and social risks identified herein.

50. The Committee will be comprised of:

a. An Executive (role represented by National Implementing Partner) that holds the project ownership and chairs the Board (designated as Chief Accounts Officer of MoWCA);

b. A Senior Supplier representative providing guidance on the technical feasibility of the project, compliance with donor requirements, and rules pertaining to use of project resources (fulfilled by UNDP in its capacity as GCF AE);

c. Senior Beneficiary representatives from DWA (the operational arm of the MoWCA) and the Department of Public Health Engineering (DPHE) who will ensure the realization of project benefits; and

d. The National Project Director, nominated by MoWCA, responsible for overall direction, strategic guidance, and timely delivery of project outputs.

e. Other representatives will include Local Government Division, Rural Development and Cooperatives Division, Ministry of Agricultural, Ministry of Fisheries and Livestock, Ministry of Environment and Forests, Ministry of

Planning, Ministry of Finance, Implementation Monitoring and Evaluation Division, Ministry of Disaster Management and Relief, Bangladesh Bank, National Designated Authority, BRDB, Sanchy Bank and SDF.

4.1.2 Project Management Unit

51. The Project Management Unit (PMU) will support the PSC, and will be responsible for preparing work plans and progress reports, and will supervise the overall project implementation and day-to-day management of the project. The National Project Director (NPD), who will be a senior official from MoWCA, will chair the PMU.

52. The NPD will provide up to 50% of his/her time, and be responsible for the overall direction, strategic guidance, and timely delivery of project outputs. The major roles of the NPD will be the following to 1) Coordinate the additional NPDs at DWA and DPHE to ensure that the objectives of the programme are met 2) Coordination of project components and calling meetings of the PSC and PMU 3) Translating project outputs to policy recommendations 4) Submission of mid-term and final evaluations to the PSC 5) Coordination with other development partners 6) Supervising the work of the Project Manager and other PMU staff.

53. The Project Manager will manage the implementation of the project under the direct supervision of NPD and will be accountable to UNDP. UNDP, on behalf of the MoWCA, DPHE and DWA, will recruit all staff of the PMU responsible for day-to-day operations and the management.

54. The PMU, comprised of the technical and operational support teams, will be responsible for development and implementation of all programme component of the project. The Technical Team will work on (i) development of programme standards, (ii) provide technical guidance to implementation team at the field level and contractors and NGOs, (iii) implement policy research, dialogue and advocacy component of the project, (iv) guide implementation of and monitor social, gender, and environmental safeguards plans, (v) implement knowledge management and communications activities; and (vi) monitor project progress and support project monitoring and evaluation. The Operations Team will manage finance, general administration, internal auditing and risk management functions of the project.

4.1.3 Project Assurance

55. The 'project assurance' function of UNDP is to support the Project Steering Committee by carrying out objective and independent project oversight and monitoring functions. This role ensures appropriate project management milestones are managed and completed. Project assurance has to be independent of the Project Manager; therefore, the Project Steering Committee cannot delegate any of its assurance responsibilities to the Project Manager. Furthermore, as the Senior Supplier, UNDP provides quality assurance for the project; ensures adherence to the NIM guidelines and ensures compliance with GCF and UNDP policies and procedures.

56. A UNDP Programme Officer, or Monitoring and Evaluation Officer, typically holds the Project Assurance role on behalf of UNDP.

4.2 Project Delivery and Administration

4.2.1 Project Delivery

57. The MoWCA will enter into a specific "letter of agreement" with relevant agencies for the implementation of the project. The MoWCA will deliver reporting, auditing and M&E requirements of the government to UNDP, in line with UNDP requirements.

58. The DWA and DPHE will nominate part time Deputy and Assistant NPDs from its Senior Officials to assist the NPD in the implementation. These directors will be accountable to the Secretary of their respective ministries and the NPD.

59. At the district and sub-district level, the officials of the DWA and DPHE will supervise the day-to-day implementation of the project activities supported by project staff. The project will enter into partnership agreements with competent contractors and NGOs selected through a Call for Proposal mechanism approved by the Board. Implementation will be done in close collaboration with the local government and district and sub-district level Women Committees.

60. At the field level, a project implementation committee will be set up for community and institution based drinking water installations and other community level infrastructure. The implementing contractors and NGOs will work under the supervision of the committee and with technical monitoring by the staff of DPHE, DWA and PMU. Once constructions are done, the infrastructures will be handed over to the Water User Committee or other relevant committees as per the guidelines of the project. The household level water installation will be directly handed over in the name of women of the selected households.

4.2.2 Administration of Environmental and Social Management Framework

61. As the implementing agency, MOWCA will be responsible for the implementation of the ESMF via the delivery organisations, with oversight from the Technical Team of the PMU.

62. The ESMF will be part of any tender documentation. The MOWCA will be responsible for the revision or updates of this document during the course of work. It is the responsibility of the person to whom the document is issued to ensure it is the most up to date version.

63. The UNDP and MoWCA are accountable for the provision of specialist advice on environmental and social issues to the delivery organisations (e.g. contractors and/or NGOs) and for environmental and social monitoring and reporting. The MoWCA or its delegate will assess the environmental and social performance of the delivery organisations (e.g. contractors and/or NGOs) in charge of delivering each component throughout the project and ensure compliance with the ESMF. During operations the delivery organisations will be accountable for implementation of the ESMF. Personnel working on the projects have accountability for preventing or minimising environmental and social impacts.

64. The Site Supervisors will be responsible for daily environmental inspections of the project/construction site. The MoWCA or its delegates will cross check these inspections by undertaking monthly audits.

65. The delivery organisations e.g. the individual contractors will maintain and keep all administrative and environmental records, which would include a log of complaints and/or grievances together with records of any measures taken to mitigate the cause of the complaints and/or grievances.

66. The delivery organisations will be responsible for the day-to-day compliance of the ESMF.

4.2.3 Environmental procedures, site and activity-specific work plans/instructions

67. Environmental procedures provide a written method describing how the management objectives for a particular environmental element are to be obtained. They contain the necessary detail to be site or activity-specific and are required procedure for all construction works. Site and activity-specific work plans and instructions are to be issued and will follow the previously successful work undertaking similar projects by the UNDP, Asian Development Bank, World Bank and EU as examples.

4.2.4 Environmental incident reporting

68. Any incidents, including non-conformances to the procedures of the ESMF are to be recorded using an Incident Record and the details entered into a register. For any incident that causes or has the potential to cause material or serious environmental harm, the field officers shall notify the Project Manager as soon as possible. The delivery organisation/contractor must cease work until remediation has been completed as per the approval of MoWCA.

4.2.5 Daily and weekly environmental inspection checklists

69. A daily environmental checklist is to be completed at each work site by the relevant Site Supervisor and maintained within a register. The completed checklist is forwarded to MoWCA for review and follow-up if any issues are identified. A weekly environmental checklist is to be completed and will include reference to any issues identified in the daily checklists completed by the Site Supervisors.

4.2.6 Corrective Actions

70. Any non-conformances to the ESMF are to be noted in weekly environmental inspections and logged into the register. Depending on the severity of the non- conformance, the Site Supervisor may specify a corrective action on the weekly site inspection report. The progress of all corrective actions will be tracked using the register. Any non-conformances and the issue of corrective actions are to be advised to MoWCA.

4.2.7 Review and auditing

71. The ESMF and its procedures are to be reviewed at least every two months by UNDP staff and MoWCA. The objective of the review is to update the document to reflect knowledge gained during the course of project delivery/construction and to reflect new knowledge and changed community standards (values).

72. The ESMF will be reviewed and amendments made if:

a. There are relevant changes to environmental conditions or generally accepted environmental practices or
b. New or previously unidentified environmental risks are identified or
c. Information from the project monitoring and surveillance methods indicate that current control measures require amendment to be effective or
d. There are changes to environmental legislation that are relevant to the project or
e. There is a request made by a relevant regulatory authority or
f. Any changes are to be developed and implemented in consultation with UNDP Staff and MoWCA. When an update is made, all site personnel are to be made aware of the revision as soon as possible e.g. through a toolbox meeting or written notification.

4.3 TRAINING

73. Delivery organisations have the responsibility for ensuring systems are in place so that relevant employees, contractors and other workers are aware of the environmental and social requirements for construction, including the ESMF.

74. All project personnel will attend an induction that covers health, safety, environment and cultural requirements.

75. All workers engaged in any activity with the potential to cause serious environmental harm (e.g. handling of hazardous materials) would receive task specific environmental training.

5 COMMUNICATION

5.1 PUBLIC CONSULTATION AND ENVIRONMENTAL AND SOCIAL DISCLOSURE

76. The preparation of the ESMF included public consultation as part of the stakeholder engagement plan. The full Stakeholder Engagement Plan is appended as part of the proposal in Annex XIII (e) Stakeholder Engagement Plan, which includes the full list of stakeholders consulted, and a summary of the consultations. The project was discussed with a wide range of stakeholders including relevant government departments, industry groups, NGOs, and individual community members (including marginalized groups) and approved by the Government of Bangladesh. These extensive on-the-ground consultations undertaken during the design of the project (as well as during the earlier interventions that this project complements and up-scales) closely informed overall project design and the ESMF, and it is expected that consultations with affected communities and beneficiaries will continue. It is anticipated that based on the communities' needs, the projects will be fully accepted.

77. The UNDP and MoWCA will develop and release updates on the project on a regular basis to provide interested stakeholders with information on project status. Updates may be via a range of media e.g. print, radio, social media or formal reports. A publicized telephone number will be maintained throughout the project to serve as a point of contact for enquiries, concerns, complaints and/or grievances. All enquiries, concerns, complaints and/or grievances will be recorded on a register and the appropriate manager will be informed. All material must be published in English and Bengali (Bangla) as appropriate.

78. Where there is a community issue raised, the following information will be recorded:

a. Time, date and nature of enquiry, concerns, complaints and/or grievances
b. Type of communication (e.g. telephone, letter, personal contact)
c. Name, contact address and contact number
d. Response and investigation undertaken as a result of the enquiry, concerns, complaints and/or grievances, and
e. Actions taken and name of the person taking action.

79. Some enquiries, concerns, complaints and/or grievances may require an extended period to address. The complainant(s) will be kept informed of progress towards rectifying the concern. All enquiries, concerns, complaints and/or grievances will be investigated and a response given to the complainant in a timely manner. A grievance redress mechanism has been included in the ESMF to address any complaints and/or grievances that may not be able to be resolved quickly.

80. Nominated PMU/contractor staff will be responsible for undertaking a review of all enquiries, concerns, complaints and/or grievances and ensuring progress toward resolution of each matter.

5.2 COMPLAINTS REGISTER AND GRIEVANCE REDRESS MECHANISM

81. During the construction and implementation phases of any project, a person or group of people can be adversely affected, directly or indirectly due to the project activities. The grievances that may arise can be related to social issues such as eligibility criteria and entitlements of selected beneficiaries, gender norm changes, access to project benefits by marginalized groups, disruption of services, temporary or permanent loss of livelihoods and other social and cultural issues. Grievances may also be related to environmental issues such as impacts on water quality, damage to infrastructure due to construction or transportation of raw material, noise, decrease in quality or quantity of private/ public surface/ ground or surface water resources during implementation of livelihoods assets or water provision, damage to home gardens and agricultural lands etc.

82. Should such a situation arise, there must be a mechanism through which affected parties can resolve such issues in a cordial manner with the project personnel in an efficient, unbiased, transparent, timely and cost-effective manner. To achieve this objective, a grievance redress mechanism has been included in ESMF for this project.

83. The project allows those that have a complaint and/or grievance to be able to communicate their concerns and/or grievances through an appropriate process. The Complaints Register and Grievance Redress Mechanism set out in this ESMF are to be used as part of the project and will provide an accessible, rapid, fair and effective response to concerned stakeholders, especially any vulnerable group who often lack access to formal legal regimes.

84. While recognising that many complaints and/or grievances may be resolved immediately, the Complaints Register and Grievance Redress Mechanism set out in this ESMF encourages mutually acceptable resolution of issues as they arise. The Complaints Register and Grievance Redress Mechanism set out in this ESMF has been designed to:

a. Be a legitimate process that allows for trust to be built between stakeholder groups and assures stakeholders that their concerns will be assessed in a fair and transparent manner

b. Allow simple and streamlined access to the Complaints Register and Grievance Redress Mechanism for all stakeholders and provide adequate assistance for those that may have faced barriers in the past to be able to raise their concerns

c. Provide clear and known procedures for each stage of the Grievance Redress Mechanism process, and provides clarity on the types of outcomes available to individuals and groups

d. Ensure equitable treatment to all concerned and aggrieved individuals and groups through a consistent, formal approach that, is fair, informed and respectful to a concern, complaint and/or grievance

e. To provide a transparent approach, by keeping any aggrieved individual/group informed of the progress of their complaint and/or grievance, the information that was used when assessing their complaint and/or grievance and information about the mechanisms that will be used to address it, and

f. Enable continuous learning and improvements to the Grievance Redress Mechanism. Through continued assessment, the knowledge generated through the process may reduce potential future complaints and grievances.

85. Eligibility criteria for the Grievance Redress Mechanism include:

g. Perceived negative economic, social or environmental impact on an individual and/or group, or concern about the potential to cause an impact

h. Clearly specified kind of impact that has occurred or has the potential to occur; and explanation of how the project caused or may cause such impact, and

i. Individual and/or group filing of a complaint and/or grievance is impacted, or at risk of being impacted; or the individual and/or group filing a complaint and/or grievance demonstrates that it has authority from an individual and or group that have been or may potentially be impacted on to represent their interest.

86. Local communities and other interested stakeholders may raise a complaint and/or grievance at all times to the MoWCA. Affected local communities should be informed about the ESMF provisions, including its grievance mechanism and how to make a complaint and/or grievance.

5.2.1 Complaints Register

87. Where there is a community issue raised, the following information will be recorded:

88. A complaints register will be established as part of the project to record any concerns raised by the community during construction. Any complaint and/or grievance will be advised to the UNDP and MoWCA within 24 hours of receiving the complaint and/or grievance. The complaint and/or grievance will be screened. Following the screening, complaints and/or grievances regarding corrupt practices will be referred to the UNDP for commentary and/or advice along with the MoWCA.

89. Wherever possible, the project team will seek to resolve the complaint and/or grievance as soon as possible, and thus avoid escalation of issues. However, where a complaint and/or grievance cannot be readily resolved, then it must be escalated.

90. A summary list of complaints and/or grievances received and their disposition must be published in a report produced every six months.

5.2.2 Grievance Redress Mechanism

91. The Grievance Redress Mechanism has been designed to be problem-solving mechanism with voluntary good-faith efforts. The Grievance Redress Mechanism is not a substitute for the legal process. The Grievance Redress Mechanism will as far as practicable, try to resolve complaints and/or grievances on terms that are mutually acceptable to all parties. When making a complaint and/or grievance, all parties must act at all times, in good faith and should not attempt to delay and or hinder any mutually acceptable resolution.

92. In order to ensure smooth implementation of the Project and timely and effectively addressing of problems that may be encountered during implementation, a robust Grievance Redress Mechanism, which will enable to the Project Authorities to address the grievances of the stakeholders of the Project has been established.

93. All complaints regarding social and environmental issues can be received either orally (to the field staff and/or MoWCA), by phone, in the complaints box or in writing to the UNDP, PMU or the contractors/ NGOs responsible for implementation of project components. A key part of the grievance redress mechanism is the requirement for the PMU and contractors/ NGOs to maintain a register of complaints received at the respective project site offices. All complainants shall be treated respectfully, politely and with sensitivity. Every possible effort should be made by the PMU and contractors/ NGOs to resolve the issues referred to in the complaint within their purview. However, there may be certain problems that are more complex and cannot be solved through project-level mechanisms. Such grievances will be referred to the Grievance Redress Committee.

94. The Grievance Redress Mechanism has been designed to ensure that an individual and/or group are not financially impacted by the process of making a complaints and/or grievances. The Grievance Redress Mechanism will cover any reasonable costs in engaging a suitably qualified person to assist in the preparation of a legitimate complaint and/or grievance. Where a complaint and/or grievance is considered ineligible, the Grievance Redress Mechanism will not cover these costs.

95. Information about the Grievance Redress Mechanism and how to make a complaint and/or grievance must be placed at prominent places for the information of the key stakeholders.

96. The Safeguards Officer in the PMU will be designated as the key officer in charge of the Grievance Redress Mechanism. The Terms of Reference for these positions (as amended from time to time) will have the following key responsibilities:

a. Coordinate formation of Grievance Redress Committees before the commencement of construction/implementation to resolve issues
b. Act as the focal point at the PMU on Grievance Redress issues and facilitate the resolution of issues within the PMU
c. Create awareness of the Grievance Redress Mechanism amongst all the stakeholders through public awareness campaigns
d. Assist in redress of all grievances by coordinating with the concerned parties
e. Maintain information on grievances and redress
f. Monitor the activities of MoWCA on grievances issues, and
g. Prepare the progress for monthly/quarterly reports.

97. A two-tier Grievance Redress Mechanism structure has been developed to address all complaints and/or grievances in the project. The first trier redress mechanism involves the receipt of a complaint and/or grievance at the Union/Upazila and/or Ward level. The stakeholders are informed of various points of making complaints and/or grievances (if any) and the Union/Upazila/Ward Officer, the Safeguards Officer from the PMU or the ESS/Gender focal points collect the complaints and/or grievances from these points on a regular basis and record them, followed by coordinating with the concerned parties to redress the grievances. The Safeguards Officer of the PMU will coordinate the activities at the district level to address the grievances and would act as the focal point in this regard. The ESS and Gender focal points or any other officers (Site Supervisors) given the responsibility to receive and record grievances/complaints, will coordinate with the Safeguards Officer and MoWCA in redressing the grievances. The designated officers of the Local Authorities will also be provided with sufficient training in the procedure of redress

to continue such systems in future, and the systems will draw on lessons learnt in a recent review of national GRMs systems carried out by the UNDP Bangladesh Country Office.

98. The grievance must be made orally (to the field staff) in writing to the UNDP, Safeguards Officer, MoWCA or the contractors/ NGOs. Complainants may specifically contact the Safeguards Officer, ESS or Gender focal points and request confidentiality if they have concerns about retaliation. In cases where confidentiality is requested (i.e. not revealing the complainant's identity to UNDP, MoWCA and/or the contractors/ NGOs). In these cases, the Safeguards Officer will review the grievances, discuss it with the complainant, and determine how best to engage project-executing entities while preserving confidentiality for the complainant.

99. As soon as a complaint and/or grievance is received, the Safeguards Officer would issue an acknowledgement. The focal point receiving the complaint and/or grievance should try to obtain relevant basic information regarding the grievance and the complainant and will immediately inform the Safeguards Officer in the PMU.

100. The PMU will maintain a Complaint/Grievance Redress register at the Ward Level (with the relevant information at the Union/Upazila level recorded). Keeping records collected from relevant bodies is the responsibility of PMU.

101. After registering the complaint and/or grievance, the Safeguards Officer will study the complaint and/or grievance made in detail and forward the complaint and/or grievance to the concerned officer with specific dates for replying and redressing the same. The Safeguards Officer will hold meetings with the affected persons / complainant and then attempt to find a solution to the complaint and/or grievance received. If necessary, meetings will be held with the concerned affected persons / complainant and the concerned officer to find a solution to the problem and develop plans to redress the grievance. The deliberations of the meetings and decisions taken are recorded. All meetings in connection with the Grievance Redress Mechanism, including the meetings of the Grievance Redress Committee, must be recorded. The Safeguards Officer for the Grievances Redress Mechanism will be actively involved in all activities.

102. The first-tier Grievances Redress Committee would be formed to oversee all the grievances EXCEPT for grievances related to:

    a. Compensation for acquired land
    b. Issues related to engineering/technical aspects and
    c. Cases pending in court.

103. Given the marginalization of certain minorities groups among project beneficiaries (including Hindu religious minority households and the Munda ethnic group households) that risk facing discrimination in regards to access to project interventions and the GRM, social inclusion/ conflict-sensitivity training will be provided to the Safeguards Officer of the PMU.

104. Given the Gender focus of the project and potential around conflict arising from changing gender norms, the Safeguards Officer, as well as the ESS and Gender focal points will also be given gender sensitivity training. The project will also ensure that female Gender focal points are available to receive complaints and record grievances from women, given that women beneficiaries may hesitate to report certain grievances, particularly those related to GBV, to male focal points.

105. The resolution at the first tier will be normally be completed within 15 working days and the complaint and/or grievance will be notified of the proposed response through a disclosure form. The resolution process should comply with the requirements of the Grievance Redress Mechanism in that it should, as far as practicable, be informal with all parties acting in good faith. Further, the Grievance Redress Mechanism should, as far as practicable, achieve mutually acceptable outcomes for all parties.

106. Should the grievance be not resolved within this period to the satisfaction of the complainant, the grievance will be referred to the next level of Grievance Redress Mechanism. If the Safeguards Officer and ESS/gender focal point feels that adequate solutions can be established within the next five working days, the officer can decide on retaining the issue at the first level by informing the complainant accordingly. However, if the complainant requests for an immediate transfer to the next level, the matter must be referred to the next tier. In any case, where the issue is not addressed within 20 working days, the matter is referred to the next level.

107. Any grievance related to corruption or any unethical practice should be referred immediately to the Cabinet Division of the Government of Bangladesh (or other designated national authority for grievance mechanisms) and the Office of Audit and Investigation within the UNDP in New York.

108. The Grievance Redress Committee formed at the district level would address the grievance in the second tier. A Grievance Redress Committee would be comprised of the following:

a. Upazila Nirbahai Officer – Chairman
b. Chairman of the concerned Union Parishad (ibid)
c. Representative of the non-government organization/civil society organization working in the area as nominated by the District Women Affairs Officer
d. District Head of MoWCA
e. Vice Chairman (Female) of the Upazila Parishad
f. Upazila Social Welfare Officer, and
g. The Safeguards Officer.

109. The Safeguard Officer from the PMU will coordinate with the respective Local Government authorities in setting up the committees for each district, and ensure that the necessary circulars and notifications are issued in this regard so that they can be convened whenever required.

110. The Terms of Reference and responsibilities for the Grievance Redress Committee are:

a. Providing support to the affected persons in solving their problems
b. Prioritize grievances and resolve them at the earliest
c. Provide information to the PMU and MoWCA on serious cases at the earliest opportunity
d. Coordinate with the aggrieved person/group and obtain proper and timely information on the solution worked out for his/her grievance, and
e. Study the normally occurring grievances and advise PMU, Project Steering Committee on remedial actions to avoid further occurrences.

111. The Grievance Redress Committee will hold the necessary meetings with the aggrieved party/complainant and the concerned officer and attempt to find a solution acceptable at all levels. The Safeguards Officer and/or a delegate would record the minutes of the Grievance Redress Committee meeting.

112. Grievance Redress Committee through the Safeguards Officer and/or a delegate will communicate proposed responses to the complainant formally. If the proposed response satisfies the complainant, the response will be implemented and the complaint and/or grievance closed. In cases where a proposed response is unsatisfactory to the complainant, the Grievance Redress Committee may choose to revise the proposed response to meet the complainant's remaining concerns, or to indicate to the complainant that no other response appears feasible to the Grievance Redress Committee. The complainant may decide to take a legal or any other recourse if s/he is not satisfied with the resolutions due to the deliberations of the three tiers of the grievance redress mechanism.

113. In addition to the project-level and national grievance redress mechanisms, complainants have the option to access UNDP's Accountability Mechanism, with both compliance and grievance functions. The Social and Environmental Compliance Unit investigates allegations that UNDP's Standards, screening procedure or other UNDP social and environmental commitments are not being implemented adequately, and that harm may result to people or the environment. The Social and Environmental Compliance Unit is housed in the Office of Audit and Investigations, and managed by a Lead Compliance Officer. A compliance review is available to any community or individual with concerns about the impacts of a UNDP programme or project. The Social and Environmental Compliance Unit is mandated to independently and impartially investigate valid requests from locally impacted people, and to report its findings and recommendations publicly.

114. The Stakeholder Response Mechanism offers locally affected people an opportunity to work with other stakeholders to resolve concerns about the social and environmental impacts of a UNDP project. Stakeholder Response

Mechanism is intended to supplement the proactive stakeholder engagement that is required of UNDP and its Implementing Partners throughout the project cycle. Communities and individuals may request a Stakeholder Response Mechanism process when they have used standard channels for project management and quality assurance, and are not satisfied with the response (in this case the project level grievance redress mechanism). When a valid Stakeholder Response Mechanism request is submitted, UNDP focal points at country, regional and headquarters levels will work with concerned stakeholders and Implementing Partners to address and resolve the concerns. Visit www.undp.org/secu-srm for more details. The relevant form is attached at the end of the ESMF.

115. The Safeguards Officer of the PMU will initially brief all the staff of PMU, the ESS and Gender focal points, and the implementing entities (contractors/NGOs) on the Grievance Redress Mechanism of the Project and explain them the procedures and formats to be used including the reporting procedures. The Safeguards Officer will further brief the concerned Local Authorities on the Grievance Redress Mechanism of the Project and explain to them the procedures and formats to be used including the reporting procedures.

116. The Safeguards Officer of the PMU will prepare a report on the Grievance Redress issues of the Project for addition into the quarterly report.

6 KEY ENVIRONMENTAL AND SOCIAL INDICATORS

117. This section identifies the key environmental and social indicators identified for the project and outlines respective management objectives, potential impacts, control activities and the environmental performance criteria against which these indicators will be judged (e.g. audited).

118. This section further addresses the need for monitoring and reporting of environmental performance with the aim of communicating the success and failures of control procedures, distinguish issues that require rectification and identify measures that will allow continuous improvement in the processes by which the projects are managed.

6.1 GEOGRAPHY

119. Bangladesh is also one of the most disaster-prone countries in the world affected by floods, tropical cyclones, storm surges, and droughts. The hydro-geophysical features of the country significantly contribute to its high vulnerabilities to natural disasters and climate change.

120. Based on three hydro-morphological characteristics[7], the coastal zone can be delineated into three regions: (i) The Ganges Tidal Plain or the Western Coastal Region, (ii) The Meghna Deltaic Plain or the Central Coastal Region and (iii) The Chittagong Coastal Plain or the Eastern Coastal Region[8]. The coastal zone is quite distinct and is characterized by a wide network of rivers and channels, high discharge of water with large amounts of sediments, many islands, the Swatch of No Ground (underwater canyon located 45 km south of the Sundarbans in Bangladesh), as well as the shallow northern Bay of Bengal, which exerts a strong tidal influence.

121. About 88 per cent of the landmass of Bangladesh consists of a flood plain that sits in the world's largest delta, Bengal Delta, which forms part of the greater Ganges-Brahmaputra-Meghna river basin system which spans across five countries in Asia including India (62.9 per cent), China (19.1 per cent), Nepal (8 per cent), Bangladesh (7.4 per cent) and Bhutan (2.6 per cent).

122. The geographic location is such that it is heavily influenced by monsoon rains and, whilst the landmass consists of only 7 per cent of the combined catchment areas of three great rivers, the Ganges, the Brahmaputra and the Meghna, this region must drain over 92 per cent of rainfall runoff generated in the combined Ganges-Brahmaputra-Meghna catchment, within a period of four and a half months (June to mid-October)[9]. The monsoon season is followed by a prolonged dry season, where lack of appreciable rainfall and almost continuous evaporation from the topsoil give rise to aridity and subsequent (phonological) moisture stress[10].

123. Neap tides during the peak of the monsoon are high enough to penetrate coastal plains, which may be protected by embankments, leaving entire areas under such embankments inundated with saline water[11]. Owing to an inverted funnel-shaped shoreline and being located on the path of cyclonic storms and associated surges occurring in the northern Indian Ocean, the country remains highly vulnerable to cyclonic disasters[12].

124. Bangladesh is predominantly flat and low-lying.[13] Apart from hilly regions in the northeast and southeast corners of Bangladesh, most of the country is less than 10m above sea level (ASL). Additionally, most of the southwest coastal belt is less than 2m ASL with a significant area less than 1m ASL. The average elevation of the southwest coastal zone ranges from 1-2 m and in the southeast coastal zone 4-5 m ASL). The low-lying flat topography and dynamic morphology of the zone significantly contribute to its vulnerability to sea level rise (SLR).

125. Target project areas are mostly located in the Western Coastal Region or the Ganges Tidal Plain and are all < 7m ASL with those in the western regions < 4m ASL. The Ganges Tidal Plain is largely covered by the Sundarbans mangrove

7 Characteristics include: level of tidal fluctuations, salinity condition (both surface and ground water), and risks of cyclone, storm surge and tidal influence.
8 Islam, 2001
9 Ahmad, 1994
10 Ahmed, AU 2006.
11 Ibid.
12 Ali, 1999
13 UNFCCC, 2012

forests, which acts as a natural barrier against cyclones, storm surges, and soil erosion and provides some stability to the zone. Swamps, tidal floodplain and natural levees with numerous tidal creeks are also present in the area. Being a semi-active delta, the soils are composed mostly of silty loams, or alluvium washed down from the Himalayas.[14] The Ganges tidal zone is also considered the most salinity-prone region of the coast, with the western part remaining more saline than the eastern part.

6.2 CLIMATE

126. Located within the south Asian monsoon region, Bangladesh enjoys a warm, humid and tropical climate, influenced primarily by monsoon and partly by pre-monsoon and post-monsoon circulations. With the Bay of Bengal and the Indian Ocean to the south and large mountain ranges— Himalayan Mountains and Arakan Ranges to the north and east respectively—the country receives very high annual precipitation, most of which is concentrated during the monsoon season. There are four prominent climatic seasons in Bangladesh - winter (December-February), pre-monsoon (March-May), monsoon (June-September) and post-monsoon (October-November). Although the onset of the monsoon tends to vary from year to year, it starts during the first week of June on average and withdraws by the first week of October. Intense heat and consequent low-pressure systems draw in moisture-laden southwest trades to the Indian sub-continent, starting the main rainy period in Bangladesh. Besides monsoon, easterly trade winds are also active in the country, providing warm and relatively drier circulation.

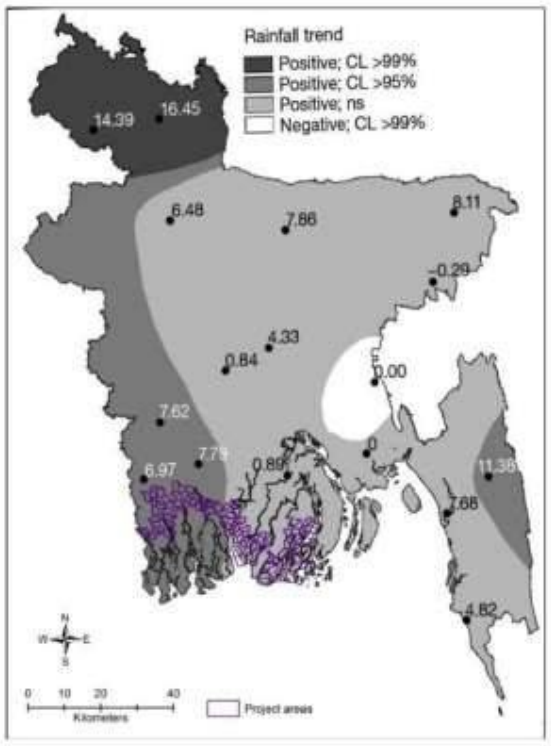
127. Rainfall in the project area is highly seasonal, with almost 80% rainfall occuring in monsoon and a negligible amount in winter. The rainfall is initially stored in the ditches, agricultural lands, shrimp farms and other low lying areas, finally discharging into multiple creeks joining the areas river systems.

128. Countrywide annual normal rainfall over a period of 30 years (1980-2009) is found to be 2,306 mm. Precipitation during 1960-1989 and 1970-1999 were 2,298 and 2,314 mm, respectively. The southwest (Jessore-Khulna-Satkhira) regions have exhibited increases in annual rainfall at 90 per cent level of confidence according to Shahid (2010)[15]

129. Seasonal rainfall trends when compared for three periods—1960-1980, 1970-1999 and 1980-2009 have also revealed that pre-monsoon and post-monsoon precipitations have increased whereas the monsoonal rainfall has decreased[16]. Shahid (2010)[17] also found an increasing trend in pre-monsoon rainfall. Stronger and more continuous winds from the Bay of Bengal during pre-monsoon months in recent years, because of increased sea surface temperatures[18], are postulated to be the cause of increased pre-monsoon rainfall in Bangladesh.

130. Mondal et al.[19] observed non-significant increases in precipitation in March and October, and decreases in June and August. The study further found that the number of rainy days and consecutive rainy days has been increasing in Khulna and Satkhira.

14 Islam, 2001
15 Shahid, 2010
16 ibid.
17 Shahid, 2010
18 Khan, 2000
19 Mondal et al, 2013



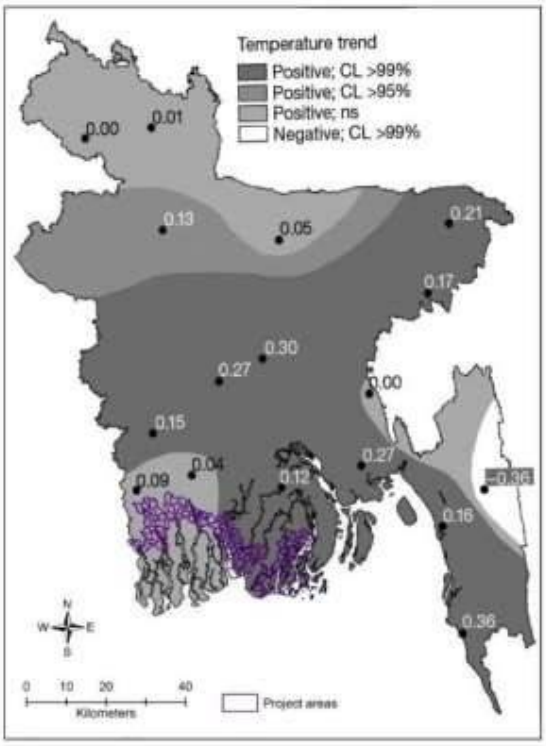


Figure 3 (a) Annual rainfall trends (mm/yr.) (b) Temperature trends (°C/decade) in Bangladesh, 1958–2007. White numbers: significant (see legend for level of statistical significance). CL: confidence - not significant.

131. According to a study conducted by CDMP in 2013[20], Bangladesh has been exhibiting increasing trends in mean annual temperatures. Data from all 34 stations in Bangladesh suggests that the trend is 1.2°C. This is in-line with the results obtained by Shahid[21] who analysed temperature from 17 stations over the period of 1958-2007 and observed an increase of mean temperature by 0.097°C per decade.

132. Data from all 34 stations demonstrates a trend for increasing temperature rates for the period 1980-2010 compared to 1948-2010, for example, it is getting warmer quicker. It was evident that the annual trend in mean temperatures during the 1980-2010 period at 2.4°C, was nearly twice the value computed using the data for the entire period (1948•2010). The CDMP study[22] further noted that corresponding winter (December-February), pre-monsoon (March-May), monsoon (June-September) and post-monsoon (October-November) trends have been 1.2, 0.7, 1.2 and 2.0°C respectively.

133. Shahid[23] observed that, except the northern areas, there has been a significant increase in mean temperature in most parts of the country. The highest increase was observed in November at a rate of 0.3°C per decade[24]. Seasonal analysis of temperature shows that the temperature is increasing significantly, but only in winter. Mean temperature has been increasing in the potential project areas. The mean temperature increase observed, although not statistically significant, is 0.09°C and 0.04°C per decade for Satkhira and Khulna stations, respectively[25].

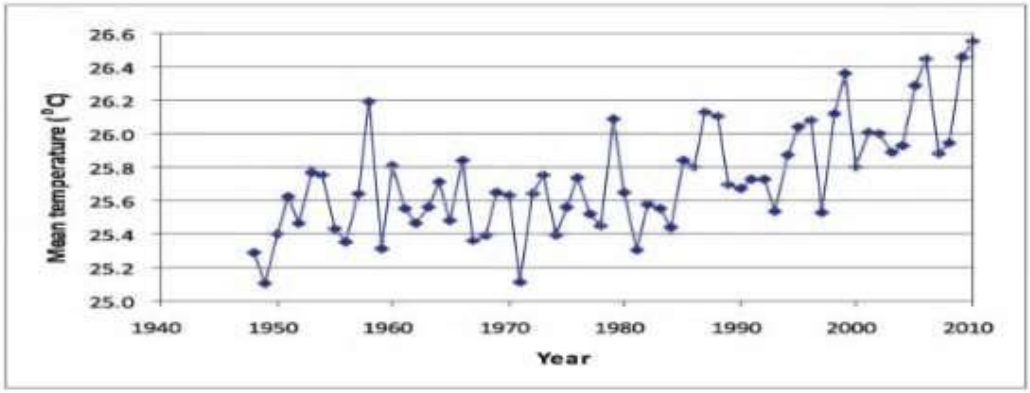


Figure 4 Time series of all-Bangladesh annual mean temperature (data period: 1948-2010)

20 CDMP, 2013
21 Shahid, 2010
22 CDMP, 2013
23 Shahid, 2010
24 Ibid.
25 Ibid.

6.3 ECOLOGY

6.3.1 Background

134. Three types of ecosystems exist in the project area, including terrestrial, aquatic and mangrove (brackish water) ecosystems. In general, brackish water ecosystem characteristics dominate in the project areas, though wards/villages with slightly higher elevations, low tidal flushing and lower salinity show brackish to fresh water ecosystems. Bio-ecological zones of importance within these ecosystems include 1) the Saline tidal floodplain where most fisheries occur and 2) the Sundarbans mangrove forest (which is a protected area).[26]

135. Mangrove wetlands act as a barrier against cyclones, avoid coastal erosion and provide nursery grounds for a number of commercially important fish, prawns and crabs and some of these mangrove wetlands play an important role in enhancing the fishery production of the adjacent waters by exporting organic and inorganic nutrients.[27]

136. Brackish water tidal flushing is dominant within a large portion of the target districts, with varied depth due to the connectivity of the internal canals and with the river systems through several tidal inlets. [28]

6.3.2 Protected Areas

137. The Sundarbans in southwestern Bangladesh is the largest mangrove forest in the world. It covers an area of about one million hectares, of which 60% is located in Bangladesh and the remaining western portion within India. Mangrove ecosystems are of great ecological significance in the tropical and sub-tropical coast, protecting the coast from heavy wind, tidal waves, and coastal erosion and seawater intrusion, generating substantial quantities of fishery resources and providing many useful forestry products.[29]

138. The Sundarbans ecosystem supports rich fisheries diversity. This ecosystem support 27 families and 53 species of pelagic fish, 49 families 124 species of demersal fish, five families and 24 species of shrimps, three families and seven species of crabs, and eight species of lobster. [30]

139. The Sundarbans also contains a total 334 plants, 165 algal species, 13 special orchids, 17 ferns, 87 monocotyledon and 230 dicotyledon, belonging to 245 genera and 75 families are found in the areas. The principal tree species is Sundry, which covers about 73% to total landmass and the second species is Gewa, which covers about 16% of total forest area. Of the 50 true mangrove plant species recorded throughout the globe, the Sundarbans alone contain 35 species.

140. The Sundarbans acts as a critical habitat for a range of important fauna, including the Royal Bengal Tiger and other jungle cats (including the fishing cat and civet), Spotted deer, barking deer, wild boars, monkey, Bengal fox, jackle, water monitor, monitor lizard and snakes.

141. Bird species, many of which are of significant conservation importance within the Sundarbans includes the purple heron, pond heron, cattle egret, little egret, open billed stork, smaller adjutant stork, and Brahmini kite. Other abundant bird species include the spotted dove, rose ringed parakeet, crow pheasant, woodpecker, bee eater, drongo, pide myna, jungle myna, bulbul, and tailor bird.

142. The area has two species of amphibians, 14 species of reptiles, 25 species of birds and five species of mammals that are considered as endangered species.

26 CEGIS, 2013
[27] Alongi, 1992
[28] CEGIS, 2013
[29] Rahman, 2010
[30] ibid.

6.3.3 Fisheries Diversity

143. The fisheries resources of the study area are rich in diversity, with mainly brackish water to minor fresh water fish habitats. The project area has a close connection with mangrove forest providing support to a number of marine and fresh water fishes. The network of river systems of this region connects the fresh water fish habitats with the brackish water habitats and maintains biological balance of the major fish groups.[31]

144. With increasing salinity intrusion, aquatic diversity of the project area is rapidly changing, however species composition of fishes within the waterways of the intervention area is still rich in its diversity and is believed to have about 120 species. The brackish water fishes that most common in the project area include: Hilsa, Parsha, Tapashi, Bhetki, and Tulardandi. Exotic carp species and Tilapia (including the Nilotica and Mossambicus) are also cultured in the study area and have been introduced over the last 30 years.

145. It has been reported by local fishermen, and is evident from fish catches and recent assessments that aquatic biodiversity is declining. A range of factors affect the species diversity, including changing salinity, over fishing pressure, collection of shrimp and prawn post larvae (wild fry) that results high mortality of other aquatic fauna, obstruction in fish migration routes, changes the geo-morphological processes of rivers and their connectivity, rapid siltation of fish habitats, squeezing of spawning and feeding grounds and the rapid, unplanned expansion of culture fishery. Few ecosystems assessments exist to determine the impacts of invasive species such as tilapia on local fish diversity.

146. Crab is an increasing becoming an important species in the project area for its market demand worldwide, and natural harvesting and cultivation (crab fattening) of crab species (mainly Scylla Serrata) is a growing practice in southwestern part of Bangladesh. Currently the traditional culture of mangrove mud crab, Scylla Serrata, and harvesting of crabs from nature is practiced in both Satkhira and Khulna. The natural crabs are collected from inter-tidal creeks, khals, mangrove area and rivers using local traps and crab fattening is already being practiced along with the shrimp farms.

147. In the southern region of Bangladesh, as well as in the project interventions area, the collection of wild fry for shrimp, prawn and crab (post larvae stage) is the most common practice for inputs to aquaculture. Men, women and children are all involved in collection of shrimp fry, with much collection coming from poor and extreme households and often dominated by women, adolescent girls and children. The collection of wild fry has significant environmental issue, with stocks in the project intervention area severely depleted. Most significantly, in the collection of 1 wild fry, it is estimated that 100 other types of aquatic species are destroyed, resulting in the rapid loss of fisheries biodiversity in the region[32].

6.3.4 Performance Criteria

148. The following performance criteria are set for the construction of the projects:

a. No project activities will occur within a 10km buffer of the Sundarbans Protected Area,
b. No introduction of invasive or carnivorous fish species for aquaculture,
c. No collection of wild fry for use in crab nurseries and crab farming,
d. No conversion of agricultural land for pond aquaculture,
e. No siting of aquaculture interventions outside of the brackish water inundated intertidal zone,
f. No clearance of vegetation outside of the designated clearing boundaries,
g. No death to native terrestrial and marine fauna as a result of clearing activities,
h. No deleterious impacts on aquatic environments and terrestrial habitats,
i. No introduction of new species of flora or fauna as a result of project activities, or as part of livelihood interventions,

[31] ibid.
32 ibid.

j. No increase in existing weed proliferation within or outside of any project footprint as a result of construction activities.

6.3.5 Monitoring

149. A flora and fauna-monitoring program will be implemented (Table 4).

150. Weed monitoring will be undertaken and appropriate action taken in the event of alien or noxious species being identified.

151. The delivery organisation will when undertaking works, compile a weekly report to MoWCA outlining:

a. Any non-conformances to this ESMF,

b. The areas that have been rehabilitated during the preceding week, and

c. Details of the corrective action undertaken.

6.3.6 Reporting

152. All flora and fauna monitoring results and/or incidents will be tabulated and reported as outlined in the ESMF. The MoWCA must be notified in the event of any suspected instances of death to native fauna and where vegetation if detrimentally impacted.

Table 4 Flora and Fauna Management Measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
FF1. Habitat loss and disturbance of fauna	FF1.1 Limit vegetation clearing and minimise habitat disturbance through adequate protection and management of retained vegetation.	During construction	Field officer	Daily and maintain records
	FF1.2: Minimise noise levels and lighting intrusion throughout construction in the vicinity of any sensitive locations.	During construction	Field officer	Daily and maintain records
	FF1.3: Ensure that all site personnel are made aware of sensitive fauna/habitat areas and the requirements for the protection of these areas.	During construction	Contractor	Daily and maintain records
	FF1.4 Minimise disturbance to on-site fauna and recover and rescue any injured or orphaned fauna during construction.	During construction	Contractor	Daily and maintain records, report
	FF1.5 Where necessary and practicable, relocate native fauna where works are being undertaken to the closest protected area	During construction	Contractor	Daily and maintain records, report
	FF1.6 Where earthworks are undertaken, rehabilitate the site with local provenance vegetation that provides habitat for fauna	During and post construction	Contractor	Daily and maintain records, report
FF2. Introduced flora and weed species	FF2.1: Implement an EDSCP to reduce the spread of weeds through erosion and sediment entering any waterways and therefore spreading.	Pre and during construction	Contractor	Maintain records
	FF2.2: Revegetate disturbed areas using native and locally endemic species that have high habitat value.	During construction	Field officer	As required and maintain records
	FF2.3: Minimise disturbance to mature remnant vegetation, particularly canopy trees and mangroves.	During construction	Field officer	Daily and maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
FF2. Introduced flora and weed species	FF2.5: Small trees and shrubs shall be removed in preference to large trees.	During construction	Site Supervisor	Daily and maintain records
	FF2.6: Environmental weeds and noxious weeds within the project footprints shall be controlled.	During and post construction	Field officer	Weekly and maintain records
	FF2.7: Vegetation to be removed shall be clearly marked using paint or flagging tape.	During construction	Site Supervisor	Daily and maintain records

6.4 GROUNDWATER

6.4.1 Background

153. The total available water resources in Bangladesh have been estimated to be 1,211 billion cubic metres (bcm) of which 21.1 bcm are groundwater resources. Groundwater is the main source of domestic, irrigation and industrial water supply in the project area, with many households using groundwater to fulfill their daily requirements. Hand tube wells are used in households for domestic water supply and other industries, as well as some households in the study area use Deep Tube-Wells (DTW) for water supply. The agriculture sector accounts for 90 per cent of all water use, 80 per cent of which is covered by groundwater resources and groundwater is the source of nearly 88 per cent (28 bcm) of the total volume withdrawn for irrigation[33].

154. During the monsoon season, aquifers are flushed and recharged bringing fresh subsurface water, however recharge is highly variable, owing to the presence of intermittent and thick deposits of clays[34]. Additionally, secure water supply options are very limited in some coastal areas as there are no rivers in the surrounding areas or freshwater aquifers at reasonable depths are not available[35].

155. Aquifer-aquitard alteration is highly variable even within a short distance. In many places, three to four aquifer units are encountered separated by aquitards. On a regional basis, a 1982 report described three aquifers. In coastal area these three aquifers are classified as; the shallow (50 150 meters) below a considerably thick upper clay and silt unit. The aquifer sediments are composed of fine sand with lenses of clay. The second aquifer zone extends down to 250-350 meters and is generally underlain and overlain by silty clay bed, and composed mainly of fine to very fine sand, occasionally inter-bedded with clay lenses. Both these aquifers have been significantly impacted by saline intrusion, making them unsuitable for drinking except through reverse osmosis.

156. The groundwater is generally the Na–Cl type and the Na-Ca-Mg–HCO_3 type. The major ion trends of the Na–Cl type are $Na^+ > Ca^{2+} > Mg^{2+} > K^+$ and $Cl^- > HCO_3^- > SO_4^{2-}$. Potential salinization sources are generally diverse, including natural

    saline groundwater, halite dissolution, presence of paleo-brackish water, seawater intrusion, and domestic and agricultural effluents etc. Among these sources, seawater intrusion is the most common and widespread phenomena in coastal areas. The present fresh water-saline water interface is the limit of potable water from the deep aquifer and is fairly well defined. Fresh/saline water interface lies about 50 to 75 km inland. The occurrence of brackish and saline water in the coastal aquifers of Bangladesh does not follow any regular pattern spatially or vertically. All the different depth levels of aquifer units down to the investigated depths of 350 meters have been affected by salinity in many areas.

157. In the upper aquifers, to depths of 150 meters, the salinity is extremely variable overlain by very shallow fresh water pockets recharged from recent precipitation and changes rapidly over short distances. The salinity appears to be closely related to the relative amounts of saline and fresh water flooding from estuarine tidal effects. The shallow groundwater is generally too saline for domestic or irrigation use due either to connate salts or estuarine flooding. However, sufficient flushing of saline water has taken place in isolated pockets to enable a limited domestic use of fresh water in the shallow aquifer. In the deep aquifer the pattern of salinity distribution is more uniform on a regional basis, as is the continuity of the aquifer. The change from potable water to very saline water is sharp and occurs over a relatively short distance. Groundwater salinity for upper shallow aquifer varies from 1000 mg/l to 15000 mg/l

158. Contamination of groundwater resources in southwest coastal Bangladesh is common, with shallow aquifers frequently contaminated with salinity and arsenic. Salinity contamination is partly due to both incremental SLR and the impacts of storm surge by cyclones and tropical storms. Storm surge due to cyclones contaminates already scarce, freshwater sources in coastal areas with the GoB reporting that Cyclone Sidr in 2006 damaged a total of 11,612 hand tube wells and 7,155 ponds in 12 highly affected districts[36].

33 FAO 2013
34 Ravenscroft 2003
35 Kamruzzaman and Ahmed, 2006; Islam et al., 2010; Islam et al., 2013
36 Ministry of Food and Disaster Management 2008

5.3.1 Performance Criteria

159. The following performance criteria are set for the project:

a. No significant decrease in the quality and quantity of groundwater as a result of construction and operational activities in proximity to the projects,

b. No extraction of groundwater for use in project interventions,

c. Effective implementation of site-specific EDSCPs and other measures to protect groundwater.

160. By following the management measures set out in the ESMF the project will not have a significant impact on groundwater quality across the broader area.

6.4.2 Monitoring

161. Refer to Table 5 for the monitoring requirements for groundwater.

162. During the project groundwater quality should be assessed initially and then at least every two months. Initial assessment should cover a wide range of parameters (e.g. depth to water, pH, DO, conductivity, nitrates, phosphates, faecal coliforms, heavy metals, turbidity, hydrocarbons) to provide a baseline and to confirm suitability for intended use. Subsequent monitoring parameters will be determined on need.

6.4.3 Reporting

163. All groundwater quality monitoring results and/or incidents will be tabulated and reported as outlined in the ESMF. The MoWCA must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to water quality is exceeded.

Table 5 Groundwater management measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
GW 1: Increase of gross pollutants, hydrocarbons, metals and other chemical pollutants into the groundwater environment.	GW1.1: Conduct regular surface and groundwater quality monitoring in location where the groundwater is likely to be impacted, including assessing the changes to groundwater quality.	Construction and operation phase	Field officer	Weekly and as required with reporting to MoWCA and UNDP
	GW1.2: Prevent contaminated surface water from entering aquifers via seepage through aquaculture ponds – line ponds with clay as required.	All phases	All Personnel	Weekly
	GW1.3: Designated areas for storage of fuels, oils, chemicals or other hazardous liquids should have compacted impermeable bases and be surrounded by a bund to contain any spillage. Refuelling to be undertaken in areas away from water systems.	Entire construction and operation phase	All Personnel	Weekly with reporting to MoWCA and UNDP
	GW1.4: Check all vehicles, equipment and material storage areas daily for possible fuel, oil and chemical leaks. Undertake refuelling at designated places away from water systems.	All phases	All Personnel	Daily and maintain records
	GW 1.5: Prohibit the use of herbicides, pesticides and other chemicals and use only biodegradable herbicides that have minimal impact on water quality and fauna. Use only as per directions	All phases	All Personnel	Weekly reporting to MoWCA and UNDP

6.5 SURFACE WATER

6.5.1 Background

164. The total available water resources in Bangladesh have been estimated to be 1,211 billion cubic metres (bcm) of which 1,189.5 bcm are surface water resources. There are several major rivers in the project districts including the Passur, Maidara-Ochamoti and Kholpetua River systems.

165. Tides in Bangladesh coast originate in the Indian Ocean. It enters the Bay of Bengal through the two submarine canyons, the 'Swatch of No Ground' and the 'Burma Trench'. Tide arrives with semi diurnal features all over the coastal zone of Bangladesh. The periods of oscillations are 12 hours 25 minutes or 12 hours respectively.

166. The coastal area of Bangladesh has three tidal zones. These are: a) Western zone: consists of the Malancha and Raimongal River system; b) Central Zone: consists of the Passur-Sibsha system; and c) Eastern zone: the Meghna estuary. The project area is located in the southwestern region of Bangladesh and is characterized by the large estuaries of the Passur, Sibsha, Malancha and Raimangal interlinked by numerous smaller creeks and are maintained by tidal spill, and fresh water flows. Differences in the time of tidal propagation cause a net flow from one estuary to another. [37]

167. The western part of the area is saline even during the monsoon season, whereas the central part (the Passur-Sibsha Rivers) is fresh during monsoon and gradually increasing of salinity during rest of the year. The intrusion of salinity is controlled by the upland flow coming down the rivers. During wet season, the salinity front recedes towards the sea and migrates upstream in the dry season.

168. Two tides (e.g. flood and ebb) are regularly observed in the river systems of the project area. Tidal water intrudes during high tide, and land is flooded twice a day and discharged with the creeks during low tide. The average height of flood tides rises during spring tide and declines during neap tide.

169. The project area is dominated by seasonal shrimp cultivation and agricultural practices, both of which significantly impact surface water quality. Shrimp farms where there is river water intrusion through tidal creeks, are regulated by indigenous wooden water control structures.

170. Water quality within the two districts has been also been significantly affected by salinity ingress and the release of acid sulfates from within the soil through excavation.

171. The two districts where the rainwater harvesting tanks will be installed currently rely on a number of sources of water for drinking. These include pond sand filters, which have been significantly impacted by pollution and salinity, small rainwater tanks (>2,000 liters) and groundwater extraction.

6.5.2 Performance Criteria

172. The following performance criteria are set for the construction of the projects:

a. No significant decrease in water quality of the coastal and/estuarine environments;

b. No offsite impact in the event of a release;

c. Water quality shall conform to any approval conditions stipulated by UNDP, MoWCA and/or other government departments, or in the absence of such conditions follow a 'no worsening' methodology; and

d. Effective implementation of site-specific EDSCPs.

37 CEGIS, 2013

6.5.3 Monitoring

173. A standardised water-quality monitoring program has been developed for the projects and will apply to surface water impacted by the livelihoods interventions of the project (crab hatchery effluents, crab nurseries and farms and water used for aquageoponics and hydroponics).

174. A separate water quality-monitoring program has been developed for the water provision interventions (including the water stored in RWH tanks and filtered through 'pond based advanced filtration treatment' systems) as part of the O&M plan.

175. The Program is subject to review and update at least every two months from the date of issue. The site supervisor will be required to conduct a daily visual inspection for hydrocarbons and turbidity within or adjacent to their work area as a part of the daily site inspection checklist.

176. Table 6 outlines the monitoring required.

6.5.4 Reporting

177. All water-quality monitoring results and/or incidents will be tabulated and reported as outlined in the ESMF. The MoWCA must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to water quality is exceeded.

Table 6 Water Quality Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
W1: Elevated suspended solids and other contaminants into the freshwater, estuarine and coastal environments.	W1.1: Develop and implement a site specific Erosion, Drainage and Sediment Control Plan (EDSCP) to address drainage control, sediment and erosion controls and stockpiling of materials including soil during construction of all components of the projects. EDSCP measures to be inspected regularly to ensure all devices are functioning effectively.	Pre Earthworks	Field officer	Initial set up and then as required with reporting to MoWCA and UNDP
	W1.2: Designated areas for storage of fuels, oils, chemicals or other hazardous liquids should have compacted impermeable bases and be surrounded by a bund to contain any spillage. Refuelling to be undertaken in areas away from water systems.	Entire construction and operation phase	All Personnel	Weekly with reporting to MoWCA and UNDP
	W1.3: Conduct regular surface water quality monitoring in location where the water quality is likely to be impacted.	Entire construction and operation phase	Field officer	Weekly and as required with reporting to MoWCA and UNDP
	W1.4: Schedule works in stages to ensure that disturbed areas are revegetated and stabilised progressively and as soon as practicable after completion of works.	Avoid undertaking bulk earthworks during wet season	Field officer and MoWCA	Maintain records
	W1.5: Construction materials will not be stockpiled in proximity to aquatic environment that may allow for release into the environment. Construction equipment will be removed from in proximity to the aquatic environment at the end of each working day or if heavy rainfall is predicted	Entire construction and operation phase	Field officer	Maintain daily records
W2: Eutrophication of water bodies from elevated nutrient levels.	W2.1 Minimise the release of clays and very fine silts into the coastal and/or estuarine environments through the installation of sediment basins, rock checks and sediment fences in appropriate places as outlined in the EDSCPs.	Entire construction phase	All Personnel	Weekly with reporting to MoWCA and UNDP

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
W2: Eutrophication of water bodies from elevated nutrient levels.	W2.2 Manage the application of fertilizers (and only allow use of organic fertilizers) to ensure that over application does not occur.	Operation phase	Site Supervisor	Maintain records
	W2.3 Manage the application of fish and crab feed in aquaculture interventions to ensure that over application does not occur	Operation phase	All Personnel	Daily and maintain records
	W2.4 Manage the elevated nutrient levels in water using bioremediation with native aquatic plants	Operation phase	Field Officer and MoWCA	Initial set up and then as required with reporting to MoWCA and UNDP
W3: Increase of gross pollutants, hydrocarbons, metals and other chemical pollutants	W3.1: Reuse suitable water runoff from site to supplement construction water supply.	Entire construction phase	All Personnel	Weekly with reporting to MoWCA and UNDP
into the coastal environment.	W3.2: Check all vehicles, equipment and material storage areas daily for possible fuel, oil and chemical leaks.	Entire construction phase	All Personnel	Daily and maintain records
	W3.3: Rubbish and waste materials to be placed in suitable facilities to ensure that they do not enter the coastal and/or estuarine environments. Ensure all absorbent material is placed in contaminant bags.	Entire construction phase	All Personnel	Weekly reporting to MoWCA and UNDP
	W3.4: Minimise the use of herbicides and use only biodegradable herbicides that have minimal impact on water quality and fauna.	Pre and Post Construction	All personnel	Maintain records
	W3.5 Prohibit the application of pesticides in all plant cultivation components of the project (aquageoponics, hydroponics, sesame cultivation and homestead gardens)	Operation Phase	All personnel	Weekly with reporting to MoWCA and UNDP

W4. Flood impacts from the Project.	W4.1: Where practicable, construct detention ponds to mitigate flows where adverse impacts are otherwise unavoidable to the coastal and/or estuarine environments.	Entire Project Construction Phase	All personnel	Maintain records

6.6 AIR QUALITY

6.6.1 Background

178. The project intervention areas are largely non-urbanized, rural village households within the districts of Satkhira and Khulna, with air pollution sources in and around the project area mostly comprised of cement industries, road dust, vehicle emissions, windblown dust from agricultural land and exposed earth, and domestic cooking emissions.

179. A proposed 1320 MW Coal-fired power station in Khulna (Bagerghat district) adjacent to the project area, and located within 14 Km of the Sundarbans, is likely to have significant impacts on air quality in the surrounding area.[38]

180. The proposed project interventions do not involve high emission activities and so impacts on air quality would generally be low. None the less, there is potential for some impacts, and in particular odour impacts, to occur as a result of some of the activities (from feed processing and aquaculture interventions).

181. All construction activities have the potential to cause air quality nuisance.

182. Contractors involved in construction and operation activities should be familiar with methods minimizing the impacts of deleterious air quality and alternative construction procedures as contained in Bangladesh legislation.

6.6.2 Performance Criteria

183. The following performance criteria are set for the construction of the projects:

a. Release of dust/particle matter must not cause an environmental nuisance;
b. Undertake measures at all times to assist in minimising the air quality impacts associated with construction and operation activities; and
c. Corrective action to respond to complaint and/or grievances is to occur within 48 hours.

6.6.3 Monitoring

184. A standardised air monitoring program has been developed for the projects (Table 7). The program is subject to review and update at least every two months from the date of issue. Importantly:

a. The requirement for dust suppression will be visually observed by site personnel daily and by MoWCA and UNDP staff when undertaking routine site inspections; and
b. Vehicles and machinery emissions – visual monitoring and measured when deemed excessive.

6.6.4 Reporting

185. All air quality monitoring results and/or incidents will be tabulated and reported as outlined in the ESMF. The MoWCA must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to air quality is exceeded.

[38] UNESCO, 2016

Table 7 Air Quality Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
A.1 Increase in dust levels at sensitive receptors	A1.1: Implement effective dust management measures in all areas during design, construction and operation.	Pre and during construction	All Personnel	Daily and maintain records
	A1.2: Restrict speeds on roads and access tracks.	During construction	Field officer	Daily and maintain records
	A1.3: Manage dust/particulate matter generating activities to ensure that emissions do not cause an environmental nuisance at any sensitive locations	During construction	Field officer	Daily and maintain records
	A1.4: Construction activities should minimise risks associated with climatic events (check forecasts).	During construction	Field officer	Daily and maintain records
	A1.5: Implement scheduling/staging of proposed works to ensure major vegetation disturbance and earthworks are minimised.	Entire construction	Contractor	Daily and maintain records
	A1.6: Locate material stockpile areas as far as practicable from sensitive receptors. Cover if appropriate.	During construction	Field officer	Daily and maintain records
	A1.7: Source sufficient water of a suitable quality for dust suppression activities complying with any water restrictions.	During construction	Field officer	Daily and maintain records
	A1.8: Schedule revegetation activities to ensure optimum survival of vegetation species.	During construction	Field officer	Maintain records
	A1.9: Rubbish receptacles should be covered and located as far as practicable from sensitive locations	During construction	Field officer	Maintain records

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
A2. Increase in vehicle / machinery emissions	A2.1 Ensure vehicles/machines are switched off when not in use.	During construction	Field officer	Daily and maintain records
	A2.2 Ensure only vehicles required to undertake works are operated onsite.	During construction	Field officer	Daily and maintain records
	A2.3 Ensure all construction vehicles, plant and machinery are maintained and operated in accordance with design standards and specifications.	During construction	Field officer	Daily and maintain records
	A2.4 Develop and implement an induction program for all site personnel, which includes as a minimum an outline of the minimum requirements for environmental management relating to the site.	Pre and during construction	Contractor	Daily and maintain records
	A2.5 Locate construction vehicle/plant/equipment storage areas as far as practicable from sensitive locations.	During construction	Field officer	Daily and maintain records
	A2.6 Direct exhaust emissions of mobile plant away from the ground.	During construction	Field officer	Daily and maintain records

6.7 NOISE AND VIBRATION

6.7.1 Background

186. All construction and operation activities have the potential to cause noise nuisance. Vibration disturbance to nearby residents and sensitive habitats is likely to be caused through the use of vibrating equipment (rollers, graders) and construction traffic. Blasting is not required as part of this project.

187. The use of machinery or introduction of noise generating facilities could have an adverse effect on the environment and residents if not appropriately managed.

188. Contractors involved in construction activities should be familiar with methods of controlling noisy machines and alternative construction procedures as contained within specific Bangladeshi legislation or in its absence, the Australian Standard AS2436 – 1981, *Guide to Noise Control on Construction, Maintenance and Demolition Sites* may be used if the legislation has not been enacted.

189. The detail, typical equipment sound power levels, provides advice on project supervision and gives guidance noise reduction. Potential noise sources during construction may include:

a. Excavation equipment for the installation of rainwater harvesting systems;
b. Pumps;
c. Power tools and compressors; and
d. Delivery vehicles;

6.7.2 Performance Criteria

190. The following performance criteria are set for the construction of the projects:

a. Noise from construction and operational activities must not cause an environmental nuisance at any noise sensitive place;
b. Undertake measures at all times to assist in minimising the noise associated with construction activities;
c. No damage to off-site property caused by vibration from construction and operation activities; and
d. Corrective action to respond to complaints and/or grievances is to occur within 48 hours.

6.7.3 Monitoring

191. A standardised noise monitoring program has been developed for the projects (Table 8). The program is subject to review and update at least every two months from the date of issue. Importantly, the site supervisor will:

a. Ensure equipment and machinery is regularly maintained and appropriately operated; and
b. Carry out potentially noisy construction activities during 'daytime' hours only.

6.7.4 Reporting

192. All noise monitoring results and/or incidents will be tabulated and reported as outlined in the ESMF. The MoWCA must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to noise is exceeded

Table 8 Noise and Vibration Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
N1: Increased noise levels	N1.1: Select plant and equipment and specific design work practices to ensure that noise emissions are minimised during construction and operation including all pumping equipment.	All phases	Contractor	Maintain records
	N1.2: Specific noise reduction devices such as silencers and mufflers shall be installed as appropriate to site plant and equipment.	Pre and during construction	Contractor	Maintain records
	N1.3 Minimise the need for and limit the emissions as far as practicable if noise generating construction works are to be carried out outside of the hours: 7am-5.30pm	Construction phase	All Personnel	Daily and maintain records
	N1.4: Consultation with nearby residents in advance of construction activities particularly if noise generating construction activities are to be carried out outside of 'daytime' hours: 7am-5.30pm.	Construction phase	All Personnel	Daily and maintain records
	N1.5 The use of substitution control strategies shall be implemented, whereby excessive noise generating equipment items onsite are replaced with other alternatives.	Construction phase	All Personnel	Daily and maintain records
	N1.6 Provide temporary construction noise barriers in the form of solid hoardings where there may be an impact on specific residents.	Construction phase	Field officer	Daily and maintain records
	N1.7 All incidents complaints and non-compliances related to noise shall be reported in accordance with the site incident reporting procedures and summarised in the register.	Construction phase	Field officer	Maintain records
	N1.8 The contractor should conduct employee and operator training to improve awareness of the need to minimise excessive noise in work practices through implementation of measures.	Pre and during construction	Contractor	Maintain records

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
N2. Vibration due to construction	N2.1: Identify properties, structures and habitat locations that will be sensitive to vibration impacts resulting from construction and operation of the project.	Pre and during construction	Contractor	Maintain records
	N2.2: Design to give due regard to temporary and permanent mitigation measures for noise and vibration from construction and operational vibration impacts.	Pre-construction	Contractor	Maintain records
	N2.3: All incidents, complaints and non-compliances related to vibration shall be reported in accordance with the site incident reporting procedures and summarised in the register.	Construction phase	Field officer	Maintain records
	N2.4: During construction, standard measure shall be taken to locate and protect underground services from construction and operational vibration impacts.	Construction phase	Field officer	Maintain records

6.8 EROSION, DRAINAGE AND SEDIMENT CONTROL

6.8.1 Topography, Geology and Soils

193. About 80% of the land in Bangladesh is flat, intersected by numerous rivers and their tributaries. The flat deltaic coastal areas are interlaced by an intricate river and tidal channel system, which cuts the land into numerous areas. The landmasses are generally at an elevation slightly above sea level but are subject to inundation at the higher portions of the tidal cycle. Ground level varies from below sea level to 6 meter or more above sea level. In many areas, the maximum level does not exceed 3 meters.

194. In Khulna district, the land is exceptionally flat and includes numerous low-lying areas called "Beels". The area in this district is separated from Bay of Bengal by mangrove swamp forests, (the Sundarbans), which form a protective belt from 15 to 25 km wide along the southern part of the district. The flatness of the land allows significant coastal inundation, which can result in erosion.

195. Poor management of soils can lead to erosion and subsequent loss of soils and the habitats and livelihoods that it supports. Activities that will be undertaken by the project have the potential to cause erosion, changes in drainage patterns and subsequent sedimentation.

196. It is important to understand the difference between drainage, erosion and sediment controls to determine the right control technique to use in each situation.

    a. Erosion controls prevent or reduce soil erosion caused by raindrop impact (see photograph below) and sheet flow (downslope movement of water taking the form of a thin, continuous film over relatively smooth soil or rock surfaces).

    b. Drainage controls prevent or reduce soil erosion caused by concentrated flow by managing the movement of "clean" and "dirty" water through the site.

    c. Sediment controls trap and retain sediment either moving along the land surface or contained within flowing water (suspended sediment).

197. Soil erosion depends on several parameters such as type of soil, slope, vegetation, the nature of topography and rainfall intensity. The loss of soil stability and soil erosion can take place due to the removal of vegetation cover, and numerous construction activities. It can cause the loss of soil fertility and induce slope instability. Land preparation for the project may result in blockage or alteration of natural flow paths causing changes in the drainage patterns in the area. Effective and efficient mitigation measures, including minimization of vegetation removal and the siting of aqauculture interventions in existing shrimp ghers, can not only reduce, but could improve the conditions over the existing conditions.

198. As no geotechnical surveys have been undertaken, the author assumes there is the potential for acid sulfate soils (ASS) and/or potential acid sulfate soils (PASS) to occur as would normally be observed in areas of mangrove. Deposits of ASS are commonly found less than five meters ASL, particularly in low-lying coastal areas, which is where all project interventions will occur. Mangroves, salt marshes, floodplains, swamps, wetlands, estuaries, and brackish or tidal lakes are ideal areas for ASS formation and therefore there is the potential for it to be observed.

6.8.2 Acid Sulfate Soils

199. Deposits of Acid Sulfate Soils (ASS) are commonly found less than five metres Above Sea Level (ASL), particularly in low-lying coastal areas, which is where a number of the project's activities will occur. Mangroves, salt marshes, floodplains, swamps, wetlands, estuaries and brackish or tidal lakes are ideal areas for ASS formation. Any sediment movement may also expose ASS.

200. About 71, 000 hectares of ASS have been identified as problem soils in the coastal zone of Bangladesh. They have been grouped into ASS, Potential Acid Sulfate Soils (PASS) and Buried Acid Sulfate Soils. The soils are very poor to

poorly drained with color ranging from dark grey to grey. The texture is silty clay loam to clay and the soil pH is less than 4. PASS have no jarosite minerals, and ASS and BASS have jarosite minerals within the profile at different depths. Most of the ASS in Bangladesh are, at present, lying fallow, with the exception of some areas being used for single or double cropping of rice and production of shrimp and salt alternatively, depending on topography of the land, flooding irrigation facilities, drainage salinity, and acidity of the soils. Rice and shrimp yields are commonly as low as 0.5 to 0.75 to 1.0 t/ha respectively.

201. Mitigative controls will potentially be required for the management of ASS and/or PASS during any excavation works due to their locations close to coastal areas. The presence of ASS may not be obvious on the soil surface as they are often buried beneath layers of more recently deposited soils and sediments of alluvial or aeolian origin. These soils contain iron sulfide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, ASS are benign. However if the soils are drained, excavated or exposed to air by a lowering of the water table, the sulfides react with oxygen to form sulfuric acid. The release of this sulfuric acid from the soil can in turn release iron, aluminum and other heavy metals (particularly arsenic) within the soil. Once mobilised, the acid and metals can create a variety of adverse impacts including killing vegetation, seeping into and acidifying groundwater and water bodies, killing fish and other aquatic organisms and degrading concrete and steel structures to the point of failure.

202. Prior to any excavation, sediments should be tested for their presence of ASS or PASS. Sampling should be undertaken consistent with that proposed by the Queensland Acid Sulfate Soils Investigation Team as described in Ahern *et al* (2014) and laboratory analysis consistent with Ahern *et al* (2004). If the analysis proves positive, the sediment can be treated by a range of techniques including but not limited to liming the sediment. The contractor should refer to management measures provided by for example by Dear *et al* (2002) to mitigate the impacts. Of critical importance for ground water quality especially as this is the source of potable water in many areas, one of the most significant impacts is via infiltration into the water table from an ASS stockpiling/treatment area. To reduce this impact, a compacted clay liner should be developed including where possible limed clay although this may reduce the efficiency of compaction and hence increase the permeability of the liner. Every effort should be made to ensure there is no direct or residual impact following treatment.

203. Activities that have the potential to cause erosion should be undertaken with the likely weather conditions in mind.

6.8.3 Performance Criteria

204. The following performance criteria are set for the projects:

a. No build-up of sediment in the aquatic environments and/or surface and/or groundwater as a result of construction and operation activities,

b. No degradation of water quality on or off site of all projects,

c. All water exiting the project site and/or into groundwater systems is to have passed through best practice erosion, drainage and sediment controls,

d. Preferably no disturbance of ASS or PASS, however if there is disturbance, compliance with the management measures discussed above, and

e. Effective implementation of site-specific Erosion Drainage and Sediment Control Plan (EDSCP).

205. By following the management measures set out in the ESMF, construction and operation activities of the projects will not have a significant impact as a result of sedimentation across the broader area.

6.8.4 Monitoring

206. A standardised sediment control monitoring program has been developed for the projects (Table 9). The program is subject to review at least every two months from the date of issue, and update as necessary. The Field officer will be required to:

a. Conduct site inspections on a weekly basis or after rainfall events exceeding 20mm in a 24 hour period;

b. Develop a site-specific checklist to document non-conformances to this ESMF or any applicable EDSCPs; and

c. Communicate the results of inspections and/or water quality testing and ensure that any issues associated with control failures are rapidly rectified and processes are put in place to ensure that similar failures are not repeated.

6.8.5 Reporting

207. All sediment and erosion control monitoring results and/or incidents will be tabulated and reported as outlined in the ESMF. The MoWCA must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to erosion and sediment control is exceeded.

Table 9 Erosion, Drainage and Sediment Control Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
E1: Loss of soil material and sedimentation to the surface and/or groundwater systems from site due to earthwork activities	E1.1: Develop and implement an EDSCP for any surface works, embankments and excavation work, near estuarine/marine environments, water crossings and stormwater pathways.	Construction phase	All Personnel	Maintain records
	E1.2: Ensure that erosion and sediment control devices are installed, inspected and maintained as required.	Construction phase	All Personnel	Maintain records
	E1.3: Schedule/stage works to minimise cleared areas and exposed soils at all times.	Pre and during construction	Field officer	Maintain records
	E1.4: Incorporate the design and location of temporary and permanent EDSC measures for all exposed areas and drainage lines. These shall be implemented prior to pre-construction activities and shall remain onsite during work	Pre and during construction	Field officer	Maintain records
	E1.5: Schedule/stage proposed works to ensure that major vegetation disturbance and earthworks are carried out during periods of lower rainfall and wind speeds.	Pre and during construction	Field officer	Maintain records
	E1.6: Strip and stockpile topsoil for use during revegetation and/or place removed soils back on to agricultural lands.	Pre and during construction	Field officer	Maintain records
	E1.7: Schedule/stage works to minimise the duration of stockpiling topsoil material. Vegetate stockpiles if storage required for long periods.	During construction	All Personnel	Maintain records
	E1.8: Locate stockpile areas away from drainage pathways, waterways and sensitive locations.	Pre and during construction	Field officer	Maintain records
	E1.9: Design stormwater management measures to reduce flow velocities and avoid concentrating runoff.	Pre and during construction	Field officer	Maintain records
Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting

E1: Loss of soil material and sedimentation to the surface and/or groundwater systems from site due to earthwork activities	E1.10: Include check dams in drainage lines where necessary to reduce flow velocities and provide some filtration of sediment. Regularly inspect and maintain check dams.	Pre and during construction	Field officer	Maintain records
	E1.11: Mulching shall be used as a form of erosion and sediment control and where used on any slopes (dependent on site selection), include extra sediment fencing during high rainfall.	During construction	All Personnel	Maintain records
	E1.12: Bunding shall be used either within watercourses or around sensitive/dangerous goods as necessary.	During construction	All Personnel	Maintain records
	E1.13: Grassed buffer strips shall be incorporated where necessary during construction to reduce water velocity.	During construction	Field officer	Maintain records
	E1.14: Silt fences or similar structures to be installed to protect from increased sediment loads.	During construction	Contractors	Maintain records
	E1.15: Excess sediment in all erosion and sediment control structures (e.g. sediment basins, check dams) shall be removed when necessary to allow for adequate holding capacity.	During construction	Contractors	Maintain records
E2: Soil Contamination	E2.1: If contamination is uncovered or suspected (outside of the project footprints), undertake a Stage 1 preliminary site contamination investigation. The contractor should cease work if previously unidentified contamination is encountered and activate management procedures and obtain advice/permits/approval (as required).	Construction phase	All Personnel	Daily and maintain records

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting

E2: Soil Contamination	E2.2: Adherence to best practice for the removal and disposal of contaminated soil/ material from site (if required), including contaminated soil within the project footprints.	Construction phase	All Personnel	Daily and maintain records
	E2.3: Drainage control measures to ensure runoff does not contact contaminated areas (including contaminated material within the project footprints) and is directed/diverted to stable areas for release.	Construction phase	All Personnel	Daily and maintain records
	E2.4: Avoid importing fill that may result in site contamination and lacks accompanying certification/documentation. Where fill is not available through on site cut, it must be tested in accordance with geotechnical specifications.	Construction phase	All Personnel	Daily and maintain records
	E2.5: Ensure no impact of ASS/PASS on water quality and groundwater systems. Where observed, ensure compliance with best practice for the sampling, analysis and handing of all ASS/PASS.	Entire construction phase	All Personnel	Daily and maintain records
E3: Disposal of excess soil/silt	E3.4: Silt removed from dams/canals/weirs during rehabilitation / maintenance is to be beneficially reused eg composted, returned to farm land, brick making etc. Silt should be tested to confirm suitability for proposed use	Construction and operation phases	MOWCA	Maintain records

6.9 WASTE MANAGEMENT

6.9.1 Background

208. As the implementing agencies, the DWA and the DPHE, as well as MoWCA, advocate good waste management practices. The preferred waste management hierarchy and principles for achieving good waste management is as follows

a. Waste avoidance (avoid using unnecessary material on the projects),

b. Waste re-use (re-use material and reduce disposing),

c. Waste recycling (recycle material such as cans, bottles, etc.), and

d. Waste disposal (all petruscible and/or contaminated waste to be dumped at approved landfills).

209. The key waste streams generated during construction are likely to include the removal of any existing material located in the project footprints. This will include, but not limited to, shrubs/trees, dirt, waste concrete, etc. The wastes to be generated will mostly be vegetation-based and also include:

a. The excavation wastes unsuitable for reuse during earthworks,

b. Wastes from construction equipment maintenance. Various heavy vehicles and construction equipment will be utilized for the duration of the construction. Liquid hazardous wastes from cleaning, repairing and maintenance of this equipment may be generated. Likewise leakage or spillage of fuels/oils within the site needs to be managed and disposed of appropriately,

c. Non-hazardous liquid wastes will be generated through the use of workers' facilities such as toilets, and

d. General wastes including scrap materials and biodegradable wastes.

210. Operational wastes will include:

a. Fish/Crab processing waste (which can be used within project interventions as additional feed stock for producing fish/crab meal for aquaculture)

b. Agricultural waste

211. Contractors involved in construction and operational activities should be familiar with methods minimizing the impacts of clearing vegetation to minimize the footprint to that essential for the works and rehabilitate disturbed areas. By following these methods, the projects should minimize the impact of waste generated by the project.

6.9.2 Performance Criteria

212. The following performance criteria are set for the construction of the projects:

a. Waste generation is minimized through the implementation of the waste hierarchy (avoidance, reduce, reuse, recycle),

b. No litter will be observed within the project area or surrounds as a result of activities by site personnel,

c. No complaints received regarding waste generation and management,

d. Any waste from on-site portable sanitary facilities will be sent off site for disposal by a waste licensed contractor, and

e. Waste oils will be collected and disposed or recycled off-site, local oil companies or shipped for recycling.

6.9.3 Monitoring

213. A Waste-monitoring program has been developed for the projects (Table 10). The program is subject to review and update at least every two months from the date of issue.

6.9.4 Reporting

214. The MoWCA as implementing agency must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to waste is exceeded.

Table 10 Waste Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
WT1: Production of wastes and excessive use of resources	WT1.1: Preference shall be given to materials that can be used to construct the project that would reduce the direct and indirect waste generated.	Pre and during construction	Contractor	Maintain records
	WT1.2: Daily waste practices shall be carried out unless these are delegated to the activities of external waste management bodies.	During construction	Field officer	Daily and maintain records
	WT1.3: The use of construction materials shall be optimised and where possible a recycling policy adopted.	During construction	Field officer	Weekly and maintain records
	WT1.4: Separate waste streams shall be maintained at all times i.e. general domestic waste, construction and contaminated waste. Specific areas on site shall be designated for the temporary management of the various waste streams.	During construction	Field officer	Weekly and maintain records
	WT1.5: Any contaminated waste shall be disposed of at an approved facility.	During construction	Field officer	Weekly and maintain records
	WT1.6: Recyclable waste (including oil and some construction waste) shall be collected separately and disposed of correctly.	During construction	Field officer	Weekly and maintain records
	WT1.7: Waste sites shall be sufficiently covered to ensure that wildlife does not have access.	During construction	Field officer	Daily
	WT1.8: Disposal of waste shall be carried out in accordance with the Government of Bangladesh's requirements.	During construction	Field officer	Weekly and maintain records
	WT1.9: Fuel and lubricant leakages from vehicles and plant shall be immediately rectified.	During construction	Field officer	Daily and maintain records
	WT1.10: Major maintenance and repairs shall be carried out off-site whenever practicable.	During construction	Field officer	Weekly and maintain records

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting

WT1: Production of wastes and excessive use of resources	WT1.11: Where possible, fuel and chemical storage and handling shall be undertaken at central fuel and chemical storage facilities, such as petrol stations.	During Construction	Field officer	Daily and maintain records
	WT1.12: On-site storage of fuel and chemicals shall be kept to a minimum.	During Construction	Contractor	Daily, maintain records and report any incidents
	WT1.13: Any waste oils and lubricants are to be collected and transported to recyclers or designated disposal sites as soon as possible.	During Construction	Field officer	Daily and maintain records
	WT1.14: Any dangerous goods stored on site shall be stored in accordance with Bangladeshi regulations.	During Construction	Contractor	Daily and maintain records

6.10 Social Management

6.10.1 Background

215. Based on World Bank data, the average population density for Bangladesh is 1,237 people per sq. kilometre[39] with a growth trend. The average population density in the coastal belt ranges from 369 people per sq. kilometre in Bagerhat to 823 people per sq. kilometre in Barisal, where the uninhabited Sundarbans (mangrove forest) is located. Within the seventh cycle of the Five Year Plan period (2016-2020), the population is projected to increase to 172 million[40] and Bangladesh is expected to become a middle-income country by 2021. The Household Income and Expenditure Survey (HIES) of 2010[41] estimated that poverty incidence is 31.5 per cent at the national level, 35.2 per cent in rural area and 21.3 per cent in urban area. The average monthly income per household in 2010, was BDT 11,479 (US$ 148.13), in comparison with 2005, where the average monthly income was estimated at only BDT 7,203 (US$ 92.95). Income per capita in the same year was BDT 2,553 (US$ 32.94)[42].

216. According to the World Bank, the GDP of Bangladesh in 2015 was US$ 195.079 billion, and the GDP per capita US$ 1,211.7. In 2010, 31.5 per cent of the population lived under the national poverty line, 18.52 per cent of the population lived with less than US$ 1.9 per day and 56.8 per cent with less than US$ 3.10 per day. Official poverty indicators show a slightly higher percentage of the population living below the absolute poverty line in the coastal zone compared to the country as a whole (52 per cent versus 49 per cent), while GDP per capita and the annual GDP growth rates in the coastal zone are similar to national averages.[43]

217. The southwest of Bangladesh is amongst the poorer regions of the country. About 16-35 per cent of people living in Khulna are extremely poor. In Barisal, the percentage of extreme poor ranges from 6 per cent in the southern most districts, and more than 35 per cent in the city. Through good macroeconomic policies and a vigorous private sector, the country is maintaining a GDP growth rate of 6 per cent annually with a total GDP in 2013 of approximately BDT 10,380 billion. With increased life expectancy, a reduced mortality rate and improvements in nutrition, an increasing population will remain a challenge.

218. According to the Labour Force Survey[44], the economically active population stands at 56.7 million, with regional and gender-based differences a concern. Certain groups of people such as women, children, elderly, the disabled and remote rural dwellers are more prone to suffering from poverty, malnutrition and food insecurity, with almost 40 per cent of the rural population in Bangladesh live on less than US$ 1.25 per day, and 60 per cent of that income is spent on food[45].

219. At present, nearly 40 million live in the coastal areas of Bangladesh which depending on population growth, by 2080 may vary between 51 to 97 million. The Intergovernmental Panel on Climate Change (IPCC) reports that by the year 2050 approximately 27 million people in the coastal areas of Bangladesh will be at risk due to sea level rise[46]. Pender et al.[47] further projected that by the year 2080, assuming a sea level rise of 62 cm, up to 17 million, 12 million and 14 million people are expected to be at low, medium and high risk, respectively.

220. The southern coastal districts not only house a higher percentage of poorer people than the rest of the country, but they are also those most likely to suffer a wider range of and intensification of impacts from climate change. Impacts in the coastal region include SLR and increased storm surges from cyclones and tropical storms, in addition to the increases in temperature, which will be experienced over the whole country. All three of these impacts work to increase the salinity of land and freshwater sources, through increased inundation of seawater and evaporation of fresh water. In turn, this places further stress on populations who rely on both surface and groundwater for drinking

39 World Bank, 2015
40 MOEF-GOB, 2012
41 BBS, 2010
42 BBS, 2011
43 World Bank, 2017
44 BBS, 2010
44 ibid
45 IPCC 2016
47 Pender, 2008.

and agricultural/farming activities, causing people (often women) to have to travel further to source safe and potable drinking water, and for agriculture to shift to more saline resilient activities.

221. The populations of Khulna and Satkhira Districts have experienced a series of extreme weather events, including Cyclone Aila, that have made them even more vulnerable to further climate induced risks, deepening impoverishment and exacerbating food and insecurity. Many households in the project intervention area have entirely or partially lost their housing and productive assets of higher monetary value in the past.

222. The major livelihood for most people in the project area is farming and fishing. Prior to Cyclone Aila, much of the population was self-sufficient, cultivating vegetables and fruits around their homestead and *ghers*[48]. Following the Cyclone, most agricultural land in the affected area was damaged and the lands were inundated with saline water. Major crops destroyed included *Aus* rice (wet-season rice), jute and vegetables.

223. In the project area, there is extreme polarization of land ownership, with most large tracts of land being owned by a few landowners, and as well as dominated by those with control over shrimp farming land. The number of landless households in the project area is growing rapidly. Furthermore, there have been well-documented cases of land rights violations in connection with the shrimp industry, including illegal land occupations, forced construction of shrimp polders, non-payment of leases and elite capture of productive assets.[49]

224. Bangladesh's population is mostly made up of Muslim (91%), Bengali speakers (99%). However, Bangladesh also has a variety of other ethnic groups. Bangladesh is rich in cultural diversity due to presence of more than 45 distinct indigenous groups (about 2.5 million people). These groups are diverse in their culture, language, religion, traditions and patterns of social, economic and cultural life. In the recent, *Khudro Nrigoshthi Shanskritik Protisthan Bill* (2010), the Government of Bangladesh defined the indigenous peoples as "Khudro Nrigosthi" or "Small Ethnic Communities". Bangladesh's indigenous groups prefer to be known as "Indigenous People" in English or *"adivasi"* in Bangla. For a more detailed discussion of Indigenous People in the project area, please refer to Annex VI (c) Indigenous People's Planning Framework.

225. Bangladesh has a high level of gender inequality, particularly prevalent in rural areas, which importantly hinders overall development. The life of a woman in Bangladesh is shaped by the patriarchal, patrilineal and patrilocal nature of the social system, with heavily gendered power structures greatly limiting women's roles in the social, political and economic spheres. Although Bangladesh has made significant progress in poverty, human development and gender equality indicators over the last few decades[50], poverty and inequality remains prevalent, and the social status of Bangladeshi women remains very low, especially in rural areas[51].

226. Central to the issue of gendered inequality, is that Bangladeshi women suffer under a particularly high burden of unpaid work, responsible for a range of essential household functions such as collecting water, providing childcare, and producing half of the food at the household level, yet making up only a quarter of the industrial workforce[52]. The severity of gender disparity in Bangladesh persists despite a moderate level of policy formulation and integration of gender issues in social protection measures nationally. Women are disproportionately represented amongst the poor, have considerably less access to formal employment and earn less when employed, while continuing to face high levels of gender-based violence (GBV). For a more detailed discussion of Gender Inequality in the project area, please refer to Annex XIII Gender Assessment and Action Plan.

227. Both districts of Satkhira and Khulna have a majority Muslim population, with Hindu minority populations in both districts significantly higher than the national average (~30%). The Hindu minority population is subject to marginalization from economic and socio-political processes and at times severe discrimination and violence. Reported incidents against religious minorities include land grabs, killings, rape, torture, occupation of places of worship, destruction of homes, forced evictions, and desecration of items of worship.[53]

48 Shrimp-culturing embankments
49 Alam, 2012
50 ADB, 2010
51 Ferdushi, 2011
52 Kabeer, 2011
53 US Department of State, 2010

228. Communal violence in the target districts against religious and ethnic minorities, and particularly the Hindu minority, has been particularly intense during election periods, with reports of assaults, torture, threats, rape, and displacement. More broadly, marginalization of religious minorities has taken the form of restricted access to education, health services, and employment, as well as forced expropriation, with recent reports finding that minority Hindus represents the most vulnerable section of the population in southwest Bangladesh[54].

229. The project has been designed with the assistance of a broad range of stakeholders, including special consultations focused on women and indigenous groups, and care has been taken to design project interventions and safeguards to ensure that the projects provides benefits to the broader community, including all marginalized groups. Notwithstanding, as with any project that involves construction, and the provision of assets, some dissatisfaction can occur and conflicts may arise. It is important that potential areas of tension are recognised early and appropriate actions taken to avoid or minimise conflict.

230. The project and its sub-projects do not require involuntary resettlement or acquisition of land although they may impact on land during construction activities, which will be temporary in nature.

6.10.2 Performance Criteria

231. The following performance criteria are set for the project:

a. The community has been consulted and project elements have been designed with their informed consultation and participation throughout the project,
b. All stakeholders are appropriately represented and the beneficiary selection process is strict, transparent and represents all marginalized groups,
c. Avoid adverse impacts to local community during construction and operations and where not possible, minimise, restore or compensate for these impacts,
d. Cultural heritage is not adversely impacted,
e. Community health and safety is protected and overall well-being benefits derived from the project,
f. Complaint and grievance redress mechanisms are put in place and proactively managed, and have been designed to be gender sensitive,
g. Long-term social benefits are achieved.

232. Local stakeholders and community members have a key role to play in the implementation and monitoring of the project.

233. Consultation with stakeholders will continue. This will help ensure that stakeholders continue to be aware of the project, its progress and any changes in the project. It will also assist in identifying any issues as they arise.

234. MoWCA will be responsible for advisory support and extensions services to local beneficiaries along with being responsible for distributing material inputs and providing technical training and backstopping in the implementation of programme activities.

6.10.3 Reporting

235. Records of all consultations are to be kept and reported on monthly basis.

236. The MoWCA must be notified in the event of any individual or community complaint and/or grievance or dissatisfaction and ensure the Grievance Redress Mechanism is complied with.

54 Rahman, 2014

Table 11: Social Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
SM1: Long term conflict related to areas not having interventions	SM 1.1: Carry out community consultation on the purpose and benefits of making changes to land use	Pre-construction	MoWCA	Maintain records
	SM 1.2: Get community buy-in on any change of land use	Pre-construction	MoWCA	Maintain records
	SM 1.3: Ensure compliance with the Grievance Redress Mechanism process	Entire construction and operation phase	MoWCA	Maintain records
SM2: Public nuisance caused by construction/operation activities (eg noise, dust etc)	SM 2.1: Carry out community consultation prior to undertaking activities	Pre-construction	MoWCA	Maintain records
	SM 2.2: Implement appropriate management plans (refer to Noise, Air, ESCP, and Waste sections of the ESMF)	Construction and operation	Site supervisor and MoWCA	Daily and maintain records
	SM 2.3: Ensure compliance with the Grievance Redress Mechanism process	All phases	MoWCA	Maintain records

6.11 Archaeological and Cultural Heritage

6.11.1 Background

237. The maintenance and study of cultural history, folklore, assets and places is essential for the preservation of national heritage and for future planning. Cultural heritage sites, areas, places and practices should be protected and celebrated via planning tools, as an important feature of local identity and sense of place.

238. While no cultural heritage sites, buildings and monuments are known to exist in areas where the project will be undertaken, further investigation of places and practices of cultural and historic heritage significance would be undertaken when activities are to be undertaken in or near known areas of historic value.

239. There are no known Archaeological and Cultural Heritage sites within any of the project areas.

6.11.2 Performance Criteria

240. The following performance criteria are set for cultural heritage issues related to the project:

a. There will be no impact on any important Archaeological, Indigenous and/or Cultural Heritage sites;

b. Manage any specific sites of important Archaeological, Indigenous and/or Cultural significance (significant sites); and

c. Allow the participation of locals who are familiar with the history of the area during the construction phase of the project.

6.11.3 Monitoring

241. Local stakeholders and community members have a key role to play in the implementation and monitoring of the project.

242. Consultation with stakeholders will continue. This will help ensure that stakeholders continue to be aware of the project, its progress and any changes in the project. It will also assist in identifying any issues as they arise.

243. MoWCA will be responsible for advisory support and extensions services to local beneficiaries along with being responsible for distributing material inputs and providing technical training and backstopping in the implementation of programme activities.

244. An important Archaeological, Indigenous and Cultural Heritage monitoring program has been developed for the projects. The program is subject to review and update at least every two months from the date of issue. Importantly, the plan should:

a. Provide cultural heritage awareness training to all construction site personnel (including contractors),

b. Identify and collect any cultural heritage items worthy of protection,

c. Consult with the relevant Museums about any important Archaeological, Indigenous and/or Cultural Heritage material discovered during construction, and

d. Cease work in the area where any human remains are discovered and consult with MoWCA and UNDP.

6.11.4 Reporting

245. The UNDP and MoWCA must be notified immediately in the event of any suspected find related to important Archaeological, Indigenous and/or Cultural Heritage.

246. Records of all consultations are to be kept and reported on monthly basis.

Table 12: Archaeological and Cultural Heritage

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
CH1: Damage or disturbance to significant important Archaeological, Indigenous and/or Cultural Heritage during the earth disturbances and land clearing activities	CH1.1: Should any important Archaeological, Indigenous and/or Cultural Heritage sites, immediately cease work within the area that the site has been observed and consult with the Ministry of Cultural Affairs, UNDP, MoWCA and archaeologist available for implementation during construction.	Pre and during construction	Contractor	Daily, maintain records and immediately notify Ministry of Cultural Affairs, UNDP and MoWCA of any find

6.12 Emergency Management Measures

247. In the event of actions occurring, which may result in serious health, safety and environmental (catastrophic) damage, emergency response or contingency actions will be implemented as soon as possible to limit the extent of environmental damage.

248. The delivery organisation will need to incorporate emergency responses into the project complying with the requirements under the Occupational, Health and Safety Policy of the delivery organisation and the relevant Bangladeshi legislation.

6.12.1 Performance Criteria

249. The following performance criteria are set for the construction of the projects:

a. No incident of fire outbreak,
b. No failure of water retaining structures,
c. No major chemical or fuel spills,
d. No preventable industrial or work related accidents,
e. Provide an immediate and effective response to incidents that represent a risk to public health, safety or the environment, and
f. Minimise environmental harm due to unforeseen incidents.

6.12.2 Monitoring

250. An emergency-response monitoring program has been developed for the projects (Table 13). The program is subject to review and update at least every two months from the date of issue. Importantly, the field officer will conduct visual inspections daily, with reporting to MoWCA and UNDP staff on a weekly basis (minimum) noting any non-conformances to this ESMF.

6.12.3 Reporting

251. The MoWCA and UNDP staff must be notified immediately in the event of any emergency, including fire or health related matter including those that have resulted in serious environmental harm.

Table 13 Emergency Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
E1. Fire and Emergency management and prevention strategies implemented	E1.1: Flammable and combustible liquids bunding/storage areas to be designed in accordance with appropriate international standards	Pre and during construction	Contractor	Daily and maintain records
	E1.2: Fire extinguishers are to be available on site	During construction	Contractor	Daily and maintain records
	E1.3: No open fires are permitted within the project area	During construction	Field officer	Daily and maintain records
	E1.4: Communication equipment and emergency protocols to be established prior to commencement of construction activities.	During construction	Field officer	Daily and maintain records
	E1.5: Train all staff in emergency preparedness and response (cover health and safety at the work site). Coordinate with NEMO.	During construction	Field officer	Daily and maintain records
	E1.6: Check and replenish First Aid Kits	During construction	Field officer	Daily and maintain records
	E1.7: Use of Personal Protection Equipment	During construction	All Personnel	Daily and maintain records

7 BUDGET FOR ESMF IMPLEMENTATION

252. A budget has been prepared for the implementation of the ESMF as follows:

Cost component	Cost
ESIA for baseline, detailed design and siting of crab hatcheries, nurseries and farms	$150,000
Effluent management for crab farms and nurseries (timed release, aeration, halophyte biofiltration, retrofitting shrimp ghers with dykes, clay lining etc.)	$150,000
Soil Quality Monitoring (250 sites - two assessments/year over 5 years)	$150,000
Water Quality Monitoring (300 sites, including nurseries, farms, hydroponics)	$200,000
Water and Soil Quality Sample Laboratory Analysis	$75,000
Erosion, Drainage and Sediment Control	$100,000
Sediment Sample Field Testing	$75,000
Sediment Sample Laboratory Analysis	$75,000
Regulatory Support for Environmental Management of Small-Scale Aquaculture and Mangrove Conservation	$50,000
Regulatory Support on prohibition of wild fry collection and use of hatchery stock	$50,000
Regulatory Support on decreasing use of by-catch for fish feed	$50,000
Research support for developing low fish meal content, locally-sourced plant-based feed for crab	$50,000
Workshops on Integrated Pest Management and Organic Agriculture Techniques	$50,000
Grievance Redress Mechanism	$50,000
Total	$1,275,000

8 REFERENCES

Acid Sulfate Soils (ASS) in Queensland QASSIT, Department of Natural Resources, Resource Sciences Centre, Indooroopilly

Ahern, C.R., McElnea, A.E. and Sullivan, L.A. (2004) Acid Sulfate Soils Laboratory Methods Guidelines, In Queensland Acid Sulfate Soils Manual, Department of Natural Resources, Mines and Energy, Indooroopilly, Queensland, Australia

Ahmad, (1994) Ahmad, & Rasheed, 1994, 'Resources, Environment and Development in Bangladesh with Particular Reference to the Ganges, Brahmaputra and Meghna Basins', Academic Publishers, Dhaka.

Ahmed, AU (2006a). Ahmed, 2006. Bangladesh: Climate Change Impacts and Vulnerability a Synthesis. Climate Change Cell, Department of Environment, Component 4b, Comprehensive Disaster Management Programme, Bangladesh.

Ahmed, A. K., & Chowdhury, E. H. (2006b). Study on livelihood systems assessment, vulnerable groups profiling and livelihood adaptation to climate hazard and long term climate change in drought prone areas of NW Bangladesh. FAO, CEGIS.

Ahmed, A. U. (2006a). Bangladesh: Climate Change Impacts and Vulnerability a Synthesis. Climate Change Cell, Department of Environment, Component 4b, Comprehensive Disaster Management Programme, Bangladesh.

Alam, K., Fatema, N., & Ahmed, W. B. (2008). Gender, climate change and human security in Bangladesh. Dhaka.

Alam T. (2012) IEconomic Prospects as well as Human Rights Violations at Shrimp Farming: A study based in south west coastal region of Bangladesh. IOSR Journal of Humanities and Social Science (IOSRJHSS) ISSN: 2279-0845 Volume 1, Issue 1 (July-August 2012), PP 45-49

BBS, (2011a). Bangladesh Bureau of Statistics, 2011. Household Income and Expenditure Survey (HIES) of 2010

BBS, (2011b). Bangladesh Bureau of Statistics, 2011. Population and housing census report 2011. Bangladesh Bureau of Statistics, Ministry of Planning, Dhaka.

BBS, (2010). Labour Force Survey, 2010, Bangladesh Bureau of Statistics. Statistics Division. Ministry of Planning Government of the People's Republic of Bangladesh.

CDMP (2013). Local Level Hazard Maps for FLOOD, STORM SURGE & SALINITY. STUDY REPORT. Comprehensive Disaster Management Programme (CDMP II). Ministry of Disaster Management and Relief

CEGIS (2013) Final Report on Environmental Impact Assessment of 2X (500-660)MW Coal Based Thermal Power Plant to be Constructed at the Location of Khulna.

Dear, S.E., Moore, N.G., Dobos, S.K., Watling, K.M. and Ahern, C.R. (2002) Soil Management Guidelines, In Queensland Acid Sulfate Soil Technical Manual, Department of Natural Resources and Mines, Indooroopilly, Queensland, Australia.

FAO 2016 FAO Aquaculture Newsletter (FAN) March 2016. #54 Retrieved from: http://www.fao.org/3/a-bc866e.pdf

Islam, M. S., (2001) Sea-level changes in Bangladesh: The last ten thousand years, Asiatic Society of Bangladesh.

Khan, T.A., (2000) "Water Based Disasters in Bangladesh", in Q.K. Ahmad (ed.) Bangladesh Water Vision 2025: Towards a Sustainable Water World, Bangladesh Water Partnership (BWP), Dhaka, pp. 54-62

Mondal M. S., Islam A.K.M. S., Madhu M. K. (2013) Development of Four Decade Long Climate Scenario & Trend: TEMPERATURE, RAINFALL, SUNSHINE & HUMIDITY. Institute of Water and Flood Management Bangladesh University of Engineering & Technology. Comprehensive Disaster Management Programme (CDMP II). Ministry of Disaster Management and Relief

Pender, J.S. 2008. What Is Climate Change? And How It Will Affect Bangladesh. Briefing Paper. (Final Draft). Dhaka, Bangladesh : Church of Bangladesh Social Development Programme

Rahman (2010). Ecology of Sundarban, Bangladesh J. Sci. Foundation, 8(1&2): 35-47, June-December 2010 ISSN 1728-7855

Shahid S. (2010) Recent trends in the climate of Bangladesh. CLIMATE RESEARCH. Vol. 42: 185–193. doi: 10.3354/cr00889

UNFCCC, (2012). Second National Communication of Bangladesh to the United Nations Framework Convention on Climate Change 2012; Retrieved from http://unfccc.int/resource/docs/natc/bgdnc2.pdf

US Department of State(2010). Diplomacy in Action Bangladesh BUREAU OF DEMOCRACY, HUMAN RIGHTS, AND LABOR July-December, 2010 International Religious Freedom Report (http://www.state.gov/j/drl/rls/irf/2010_5/index.htm) Report

World Bank, (2015). The World Bank DataBank. Retrieved from http://data.worldbank.org/indicator/EN.POP.DNST

World Bank (2017). Development Indicators for Bangladesh. Online Resource available at: http://data.worldbank.org/country/bangladesh (Accessed April 2017)

Annexure Two Guidance for Submitting a Request to the Social and Environmental Compliance Unit and/or the Stakeholder Response Mechanism

Guidance for Submitting a Request to the Social and Environmental Compliance Unit (SECU) and/or the Stakeholder Response Mechanism (SRM)

Purpose of this form

- If you use this form, please put your answers in bold writing to distinguish text
- The use of this form is recommended, but not required. It can also serve as a guide when drafting a request.

This form is intended to assist in:

(1) Submitting a request when you believe UNDP is not complying with its social or environmental policies or commitments and you are believe you are being harmed as a result. This request could initiate a 'compliance review', which is an independent investigation conducted by the Social and Environmental Compliance Unit (SECU), within UNDP's Office of Audit and Investigations, to determine if UNDP policies or commitments have been violated and to identify measures to address these violations. SECU would interact with you during the compliance review to determine the facts of the situation. You would be kept informed about the results of the compliance review.

and/or

(2) Submitting a request for UNDP "Stakeholder Response" when you believe a UNDP project is having or may have an adverse social or environmental impact on you and you would like to initiate a process that brings together affected communities and other stakeholders (e.g., government representatives, UNDP, etc.) to jointly address your concerns. This Stakeholder Response process would be led by the UNDP Country Office or facilitated through UNDP headquarters. UNDP staff would communicate and interact with you as part of the response, both for fact-finding and for developing solutions. Other project stakeholders may also be involved if needed.

Please note that if you have not already made an effort to resolve your concern by communicating directly with the government representatives and UNDP staff responsible for this project, you should do so before making a request to UNDP's Stakeholder Response Mechanism.

Confidentiality If you choose the Compliance Review process, you may keep your identity confidential (known only to the Compliance Review team). If you choose the Stakeholder Response Mechanism, you can choose to keep your identity confidential during the initial eligibility screening and assessment of your case. If your request is eligible and the assessment indicates that a response is appropriate, UNDP staff will discuss the proposed response with you, and will also discuss whether and how to maintain confidentiality of your identity.

Guidance

When submitting a request please provide as much information as possible. If you accidentally email an incomplete form, or have additional information you would like to provide, simply send a follow-up email explaining any changes.

Information about You

Are you:

1. A person affected by a UNDP-supported project?

Mark "X" next to the answer that applies to you: Yes: No:

2. An authorized representative of an affected person or group?

Mark "X" next to the answer that applies to you: Yes: No:

If you are an authorized representative, please provide the names of all the people whom you are representing, and documentation of their authorization for you to act on their behalf, by attaching one or more files to this form.

3. First name:
4. Last name:
5. Any other identifying information:
6. Mailing address:
7. Email address:
8. Telephone Number (with country code):
9. Your address/location:
10. Nearest city or town:
11. Any additional instructions on how to contact you:
12. Country:

What you are seeking from UNDP: Compliance Review and/or Stakeholder Response

You have four options:

- Submit a request for a Compliance Review;
- Submit a request for a Stakeholder Response;
- Submit a request for both a Compliance Review and a Stakeholder Response;
- State that you are unsure whether you would like Compliance Review or Stakeholder Response and that you desire both entities to review your case.

13. Are you concerned that UNDP's failure to meet a UNDP social and/or environmental policy or commitment is harming, or could harm, you or your community? Mark "X" next to the answer that applies to you: Yes: No:

14. Would you like your name(s) to remain confidential throughout the Compliance Review process?

Mark "X" next to the answer that applies to you: Yes: No:

If confidentiality is requested, please state why:

15. Would you like to work with other stakeholders, e.g., the government, UNDP, etc. to jointly resolve a concern about social or environmental impacts or risks you believe you are experiencing because of a UNDP project?

Mark "X" next to the answer that applies to you: Yes: No:

16. Would you like your name(s) to remain confidential during the initial assessment of your request for a response?

Mark "X" next to the answer that applies to you: Yes: No:

If confidentiality is requested, please state why:

17. Requests for Stakeholder Response will be handled through UNDP Country Offices unless you indicate that you would like your request to be handled through UNDP Headquarters. Would you like UNDP Headquarters to handle your request?

Mark "X" next to the answer that applies to you: Yes: No:

If you have indicated yes, please indicate why your request should be handled through UNDP Headquarters:

18. Are you seeking both Compliance Review and Stakeholder Response?

Mark "X" next to the answer that applies to you: Yes: No:

19. Are you unsure whether you would like to request a Compliance Review or a Stakeholder Response? Mark "X" next to the answer that applies to you: Yes: No:

Information about the UNDP Project you are concerned about, and the nature of your concern:

20. Which UNDP-supported project are you concerned about? (if known):

21. Project name (if known):

22. Please provide a short description of your concerns about the project. If you have concerns about UNDP's failure to comply with its social or environmental policies and commitments, and can identify these policies and commitments, please do (not required). Please describe, as well, the types of environmental and social impacts that may occur, or have occurred, as a result. If more space is required, please attach any documents. You may write in any language you choose

-
-
-
-

23. Have you discussed your concerns with the government representatives and UNDP staff responsible for this project? Non-governmental organisations?

Mark "X" next to the answer that applies to you: Yes: No:

If you answered yes, please provide the name(s) of those you have discussed your concerns with

Name of Officials You have Already Contacted Regarding this Issue:

First Name	Last Name	Title/Affiliation	Estimated Date of Contact	Response from the Individual

24. Are there other individuals or groups that are adversely affected by the project?

Mark "X" next to the answer that applies to you: Yes: No:

25. Please provide the names and/or description of other individuals or groups that support the request:

First Name	Last Name	Title/Affiliation	Contact Information

Please attach to your email any documents you wish to send to SECU and/or the SRM. If all of your attachments do not fit in one email, please feel free to send multiple emails.

Submission and Support

To submit your request, or if you need assistance please email: project.concerns@undp.org