Project Climate Risk Assessment and Management

I. Basic Project Information

Project Title: Southwest Area Integrated Water Resources Planning and Management Project – Additional Financing
Project Budget: $ 63.7 million
Location: Southwest region of Bangladesh
Sector: Agriculture, Natural Resources and Rural Development
Theme: Integrated Water Resources Management
Brief Description *(particularly highlighting aspects of the project that could be affected by weather/climate conditions)***:** The project aims to renovate the existing flood control and drainage/irrigation (FCD/I) schemes in the southwest region of Bangladesh, so as to achieve their maximum development potentials in terms of agricultural and fishery production, and incomes of beneficiaries in a sustainable manner. The project is expected to ensure sustainability of the FCD/I schemes through high beneficiary participation. The outcome will increase productivity and sustainability of nine subprojects. The project has three major components: (i) renovation and construction of water resources management structures in the existing FCD/I schemes that cannot function fully due to inadequate maintenance; (ii) formulation and capacity development of beneficiary water management organizations (WMOs) to plan and manage water resources, and operate and maintain water management infrastructures; and (iii) national-level institutional capacity strengthening for registering, monitoring including auditing, and managing WMOs.

II. Summary of Climate Risk Screening and Assessment

(Initial climate risk screening can be carried out using AWARE for Projects. Upon the completion of this initial screening, a report will be generated with risks ranked for different climate hazards and advice for possible next steps provided. Mission leaders for projects ranked at medium or high risk could arrange for more detailed climate risk assessments, to further identify the nature, level of risks, and more critically, options to manage such risks within the context of the proposed project.)

A. Sensitivity of project component(s) to climate/weather conditions and sea level

Project component:	Sensitivity to climate/weather conditions and sea level:
1. Revival of drainage systems with repair and construction of gated structures (regulators) and re-excavation of the khals (canals) 2. Repair(re-sectioning) of flood embankment	1. Temperature increase and change in rainfall pattern 2. Increased intensity of rainfall and associated flood impacts 3. Increase intensity of wind velocity (10% increase over every cyclone) and cyclone weather conditions 4. Sea level rise in downstream areas resulting in prolonged flood events

B. Climate Risk Screening

Risk topic:	Description of the risk
1. Increased flood intensity 2. Prolonged drought conditions and increased water temperatures 3. Increased cyclone conditions with higher wind velocities 4. Sea level rise in downstream areas	1. Flood embankment heights and drains capacity calculated with climate statistics of the last about 10 years may be insufficient to manage future increased flood events. 2. Disturbed rainfall distribution, reduced rainfall and temperature increase may result in imbalanced irrigation water demand and water availability. This may lead to reduced irrigated area and/or crop production or greater dependence on the ground water for irrigation. 3. Increased wind velocities and incidences including cyclonic weather conditions may result in greater damages to crops reducing the yields and productivities unless the cultivated crops are changed to wind resistant high yielding shorter term varieties. 4. The overall effects of climate change on freshwater systems will likely be increased water temperatures, decreased dissolved oxygen levels, and increased toxicity of pollutants that may directly affect the fisheries in both capture and natural systems. The ecosystem approaches to fisheries and ecosystem approaches to aquaculture should be adopted to reduce the vulnerability of capture fisheries that will be established for promoting fisheries that will improve food security and protein supply to aquatic resource dependent communities. 5. Downstream sea level rise and storm surges during monsoon may reduce the slope of the water surface, which may cause higher flood water levels and longer flooding periods due to lower drainage discharges. Flood embankment heights calculated with current climate statistics may be

	insufficient to retain increase in flood intensities.

Climate Risk Classification: Medium

C. Climate risk assessment

Assessments:

This climate change assessment is based on several studies carried out on Bangladesh and specifically on South West region and more recent scientific knowledge as published by FAO:

(i) Climate Observations and Projections for Bangladesh by the UK Met Office Hadley Centre 2011.
(ii) Coastal Embankment Improvement Project Phase I implemented by BWDB and World Bank 2012.
(iii) Various other studies including the ADB TA7417 India Support to the National Action Plan for Climate Change 2011 were used as supporting reference material as the river catchments are in India.
(iv) Bangladesh Climate Change Strategy and Action Plan 2009.
(v) Climate change implications for fisheries and aquaculture: Overview of current scientific knowledge (ISSN 2070-7010: FAO Fisheries and Aquaculture Technical Paper 530.

The Hadley Center of UK, study report for Bangladesh assessed that temperature increases over Bangladesh are in the region of 3 to 3.5°C by 2100 and precipitation is projected to increase in Bangladesh with increases of 5-10% in south west area.

Studies by the Hadley Centre indicate an increase in mean and extreme precipitation over Bangladesh. This confirms conclusions from the IPCC AR4, however large uncertainties remain, particularly with respect to how the large-scale monsoon system might respond to climate change and changes in precipitation associated with tropical cyclones and storm surges. Studies carried out by the Institute of Water Modeling (IWM)[1] which included simulation modelling of rainfall intensities, recommended to increase the drainage design in the Muhuri project area in Bangladesh to a 1:25 year return flood.

The Southwest Area Integrated Water Resources Planning and Management Project – Additional Financing plans to excavate 420 kilometers (km) of drains (Khal) and improvements of 52 regulators. These will help to meet the potential increase flood levels due to rainfall intensity projected under climate change.

Studies indicate that there are many uncertainties in predicting water stress but from the few regional assessments available it is suggested that:

(i) Bangladesh could be exposed to moderate to high water stress with climate change. However, further research is required to quantify the potential magnitude of any change.
(ii) A study by the Bangladesh University of Engineering and Technology (BUET) and the South Asian Association of Regional Cooperation (SAARC) Meteorological Research Centre used the 'CERES-Rice' model; a computer model that evaluates the effect of land use and environmental changes on rice production, predicted a decline in yields of more than 20% by 2050 and 50% by 2070 due to temperature increase and drought conditions.[2]
(iii) Simulations by the Hadley Centre using the AVOID programme broadly agree with the global simulations, and project an increase in water stress for Bangladesh as a whole with climate change. However, the uncertainty in the projected changes is large. Monsoon variations and increased chance of periods of drought even during the monsoon will be reduced by provision of access to irrigation supply throughout the year.
(iv) FAO technical report on Climate Change Strategy and Action Plan (2009) indicated that Bangladesh population is one of the highest risk communities among four Asia nations identified as having the highest vulnerability due to climate impact on fisheries and aqua culture.

Structural design under the feasibility studies for seven subprojects have not considered the potential climate change impacts, but the planning under the studies have assumed that rehabilitation and improvement of regulators and excavation and re-sectioning embankments could deal with potential future changes in impacts. The assumptions had been based on historic data that these structures had been able to contain floods and drain the area as required during their operational phases.

However there is a necessity to check the crest heights and strengths of these embankments to meet the resiliencies of climate changes. It is important to note that flows will be also affected by upstream abstractions in India and the

[1] Government of Bangladesh, Bangladesh Water Development Board/World Bank. 2012. *IWM Studies on Drainage in Polders in the Southwest of Bangladesh using the data from Coastal Embankment Improvement Project (CEIP) Phase 1*. Dhaka.

[2] Rajib Kamal, Sarfaraz Alam and M.A. Matin. 2013. *Modelling Monsoon flood flows of lower Meghna River Due to Climate change and Sea level Rise,* Proceedings of International Conference on Climate Change Impact and Adaptation (ICCIA-2013),14 16 November 2013, BUET, Dhaka.

proposed Ganges Barrage in Bangladesh, slower flow of flood waters during storm surges, over-exploitation of the groundwater, and possibly climate change. Modeling of future flows has not been attempted possibly due to the poor quality flow data, and the difficulties of assessing current and future abstractions from the upstream catchments in India and also due to the time limitations.

The research and introduction of climate change impact resistant crop varieties for cultivation and adaptive fish species in aquaculture that will help to meet protein demands of the community need to be seriously pursued in Bangladesh.

III. Climate Risk Management Response within the Project

(Describe project activities, outputs, indicators and/or targets aimed to address identified climate risks and budgetary allocations, and other adaptive measures to be included/considered in the project design to address climate risks identified).

1. The proposed project will strengthen the embankment and flood control infrastructure in the area thus reducing the vulnerability of flood damages to their crops and livelihood activities. (Measures include: 45 regulators will be rehabilitated; 7 new regulators will be constructed; existing flood embankment systems with a total length of 250 km of embankment will be strengthened by re-sectioning of 73 km of deteriorated portions and re-construction of1.5 km of a washed-away portion; 3 riverbank erosion protection works of total 1.04 km will be provided with a total budget of $12.89 million. Where feasible the proposed re-sectioning of the embankments will consider floods with 25-year of return period, instead of 10-year floods to ensure rising flood levels can be coped up.)
2. The proposed action to deepen and better manage remaining natural water bodies as refuge for the wildlife and natural fishes in the project area will help reduce the vulnerability of the natural ecosystems that support associating wildlife and biota. (Measures include: 420 km of Khal will be excavated with a total budget of $ 6.97 million).
3. The establishment and improving the management capacity and increased technical support to WMOs will help better manage the flood control infrastructure to cope with increase flood intensity and drought conditions.(Measures include: Establishment and development of 150 water management groups (WMGs) and 22 water management associations (WMAs), O&M planning and training is an important part of the WMO capacity building program, funds for O&M will be collected from the members amongst others through development of income generating activities and value chain development. A budget of $ 6.55 million for social mobilization is provided.)
4. The project will support establishment of capture fisheries which will be carried out with the technical guidance and assistance of fisheries authorities that will help the project to adopt the ecosystem approaches to fisheries and ecosystem approaches to aquaculture reducing the vulnerability of the community protein sources to the local communities. (Measures include: WMOs will receive training and guidance on fisheries development with assistance of the Department of Fisheries (DOF). DOF is an active member of the Technical Coordination Committee at National Level. DOF amongst others will advise on best practices and sustainable fisheries. A budget of $4.50 million for training and capacity strengthening for WMOs has been provided. This budget covers agriculture, fisheries and livelihood support activities.)
5. It is recommended that cultivation practices and crop varieties to be selected are chosen from known climate impact adaptable (resistant) varieties suitable for Bangladesh.(Measures include: WMOs will receive training and guidance on agricultural development with assistance of the Department of Agriculture Extension (DAE). DAE is an active member of the Technical Coordination. Committee at National Level, amongst other they will advise on suitable cropping patterns.) A budget of $4.50 million for training and capacity strengthening for WMOs has been provided. This budget covers agriculture, fisheries and livelihood support activities.)
6. Increased water management efficiency will help reduced vulnerability to climate change impacts such as droughts and wind damages.(Measures include: WMO training and capability strengthening on O&M)