CLIMATE RISK ASSESSMENT AND MANAGEMENT REPORT

I. Basic Project Information

Project Title: BAN (51274-001): Emergency Assistance Project

Project Cost (in $ million): $120 million

Location: Coxsbazar District: Ukhia Upazila (subdistrict) (21.22 N, 92.10 E) and Teknaf Upazila (subdistrict) (21.06 N, 92.20 E)

Sector/Subsectors:

- Water and other urban infrastructure and services/Urban flood protection, urban sanitation, urban solid waste management and urban water supply
- Energy/Electricity transmission and distribution
- Transport/Road transport (non-urban)

Theme: Inclusive economic growth; environmentally sustainable growth

Brief Description:

Beginning August 2017, Bangladesh has received over 700,000 displaced persons in Myanmar as a result of events in the neighboring Rahkine State, joining around 400,000 displaced persons who had arrived in waves from Rahkine over the past decades. They are living in 32 camps in the Coxsbazar district, with over 600,000 living in the mega-camp at Kutupalong-Balukhali. The large influx of displaced persons has caused a huge strain on the local people and economy.

The Emergency Assistance Project will support the Government of Bangladesh in addressing the immediate needs of the displaced persons in the Coxsbazar district with the objective to help avert the humanitarian crisis. The project scope includes the improvement of water supply and sanitation, disaster risk management, sustainable energy supply, and access roads.

The south-eastern part of Bangladesh where the project is being proposed is exposed to various types of natural hazards in an extremely fragile environment with cyclone and monsoon seasons, including flooding, landslides, wind storms, lightning, fires, heat waves, and cold spells. Climate change is expected to aggravate the intensity, frequency, and unpredictability of extreme weather events. Much of the land used for the camps is steep or low-lying, prone to flooding, and landslides.

The project impact is accelerated social recovery of displaced persons in the subdistricts of Ukhia and Teknaf. Its outcome will be improved living conditions and resilience of displaced persons.

II. Summary of Climate Risk Screening and Assessment

A. Sensitivity of Project Component(s) to Climate/Weather Conditions and Sea Level

Project components	**Sensitivity to climate/weather conditions**
1. Bathing facilities 2. Mini piped-water supply systems (production and distribution) 3. Waste management 4. Water treatment 5. Multipurpose cyclone shelters with emergency access roads 6. Food distribution centers 7. Hill slope protection/toe walls to resist landslides 8. Storm water drainage networks 9. Standalone solar powered street lights 10. Substations and distribution lines with transformers 11. Access roads and drainage systems	The design of project components need to focus on sensitive weather parameters that are subject to a wide variety of changing climate/weather conditions in the future, such as increased intensity and frequency of precipitation and extreme flooding.

B. Climate Risk Screening – Climate Risk by Sector (see Appendix 5 for details)

	Temperature increase	Precipitation change	Extreme events (heavy rainfall, wind, and storms/cyclones)	Sea level rise and storm surge
1. Access roads	Medium	Medium	High	High
2. Water supply / treatment	High	High	High	High
3. Waste management	High	High	High	High
4. Buildings (Bathing facilities, food distribution center, evacuation)	Medium	Medium	High	High
5. Energy systems				

Production	Medium	Medium	Medium	Medium
Distribution	Medium	Medium	High	High

Climate Risk Classification: ***Medium to High***

C. Climate Risk Assessment

The southeastern part of Bangladesh where Coxsbazar District is located, is exposed to various types of natural hazards in an extremely fragile environment with cyclone and monsoon seasons, including flooding, landslides, wind storms, lightning, droughts, fires, heat waves, and cold spells. Extreme rainfall events, increased flooding, and increased cyclone activity can affect the integrity of the physical infrastructures and people's safety and health. Potential impacts could include:

- Increased water treatment requirements and costs to address lower water quality (e.g., increased algal blooms and bacterial and fungal content in a warmer temperature; increased salinity due to sea level rise);
- During extreme rainfall events, water treatment efficiency may decrease due to rapidly changing water quality;
- Inundation of and damages to all physical facilities (e.g., evacuation shelters, food distribution centers) during storm events;
- Loss of power disrupting treatment operations;
- Damage to power production and distribution networks;
- Inundation of low-lying facilities due to sea level rise;
- Increased salt water intrusion into fresh water aquifers due to sea level rise; and
- Pipe leakage and contamination of water supply due to flooding.

D. Climate Risk Screening Tool/Procedure Used (specify)**:**
SARD's climate risk screening framework and tool.

III. Climate Risk Management Response within the Project

- The project team has taken note of potential effects of seasonal weather conditions, including the monsoon season, and expected rainfall to the implementation schedule. Project construction activities will be scheduled in such a way that available working season is efficiently used.
- The project has proactively included the installation of lightning arresters in anticipation of increased storm activity.
- To mitigate flood risks, design measures have to factor in projected rainfall intensity, frequency, and duration estimates.
- Likewise, the design return period for drainage for the access roads has to consider the changed frequency of rainfall intensity and duration. Consider cross-drainages to avoid water logging on the road. In some instances, road level may need to be increased or sited further away from the coast.
- Considering the service life of the physical facilities, regular checkup and maintenance, including costs, have to be planned.
- Geosynthetics for slope stabilization should be considered.

Appendix: Information Used during the Assessment

1. Project Location

Location of Coxsbazar in Bangladesh
Coordinates 21°35'0" N 92°01'0" E

Coxsbazar is located at 21°35′0″N 92°01′0″E and bounded by Bakkhali River on the north and east, Bay of Bengal in the west, and Jhilwanj Union in the south.

The climate of Bangladesh is mostly determined by its location in the tropical monsoon region: high temperature, heavy rainfall, generally excessive humidity, and distinct seasonal variations. The climate of Coxsbazar District is mostly similar to the rest of the country. It is further characterized by the location in the coastal area. The annual average temperature in Coxsbazar is about a maximum of 34.8ºC and a minimum of 16.1ºC. The average annual rainfall is 3,524 mm.

Teknaf is one of eight Upazilas of Coxsbazar District in the Chittagong Division. The area has a warm tropical climate and sufficient rainfall, enabling it to support a wide biological diversity. Important habitats include mangroves, mudflats, beaches and sand dunes, canals and lagoons, and marine habitats. The mangroves support the habitat of about 161 fish species.

The Ukhia Upazila is bounded by Ramu Upazila on the north, Teknaf on the south, Arakan state of Myanmar and Naikhongchhari Upazila on the east, and Bay of Bengal on the west. The main livelihoods are in agriculture (paddy, fruits, sugarcane, vegetables, fishery, livestock and poultry) and commerce/trade.

2. Natural Hazards and Climate Change in Coxsbazar District

The south-eastern part of Bangladesh is exposed to various types of natural hazards in an extremely fragile environment with cyclone and monsoon seasons, including flooding, landslides, wind storms, lightning, fires, heat waves and cold spells. Climate change is expected to aggravate the intensity, frequency, and unpredictability of extreme weather events. Much of the land used for the camps is steep or low-lying, prone to flooding, and landslides. This is further exacerbated by hill cutting and vegetation clearing on the mainly clay hills. The host population of the seven Upazilas comprising Coxsbazar district are considered one of Bangladesh's most vulnerable districts due to a combination of food insecurity, poor health condition, and high poverty rates well above Bangladesh's national average. The congested living conditions and poor sanitation in the camps occupied by the displaced persons create additional health risk, including fires and vector- and water-borne diseases. Women and children, of the displaced persons in Coxsbazar district, are always among the most vulnerable population groups in disaster events.

3. Current Climate Conditions and Other Risk-aggravating Factors

Dry season is in late November to March. In the dry season, shallow wells are not automatically refilled with rainwater. The high number of displaced persons and extra demands on water may therefore drain shallow wells. Fire becomes a more significant hazard, as flames spread more rapidly in a dry environment.

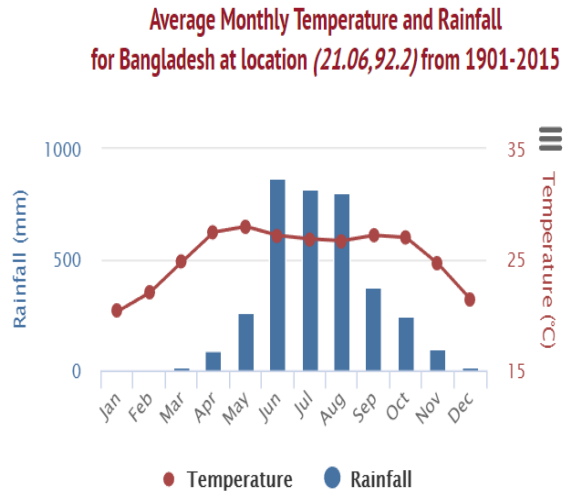
Cyclone season: Two cyclone seasons are distinguished. The post-monsoon cyclone season is October–November, and the pre-monsoon cyclone season occurs April–June. In the past 3 years, Coxsbazar has been hit by one cyclone annually (Cyclone Mora – May 2017, Cyclone Roanu – May 2016, Cyclone Komen – July 2015). Cyclone Mora in May 2017 killed at least six people and injured 218, damaged at least 70% of shelters in makeshift settlements, and around 70–80% of latrines. Cyclones increase the risk of floods and landslides, and building on hilly areas leaves people highly vulnerable to landslides (ISCG 14/11/2017; WFP 06/2017).

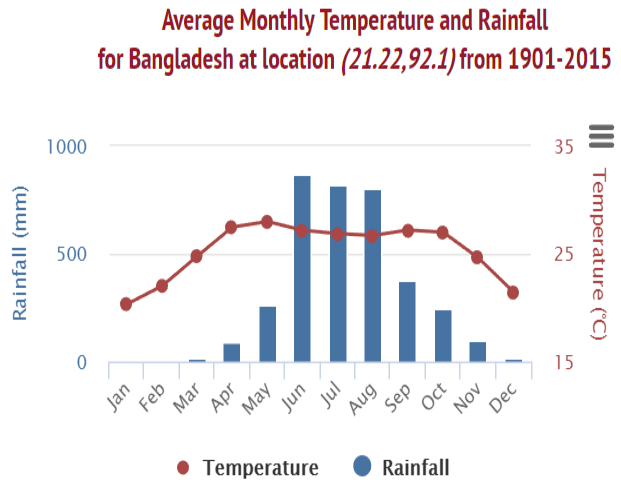
The displaced persons are familiar with cyclones, as Rakhine state in Myanmar is also cyclone-prone. They have indicated that their response to cyclones was to shelter in the largest house in the village. Although the displaced persons would want to do the same in the settlements, this is impossible as large structures are non-existent or not able to withstand a cyclone. Cyclone preparedness will be key, as panic may spread when a cyclone alert is raised (Translators Without Borders 11/2017).

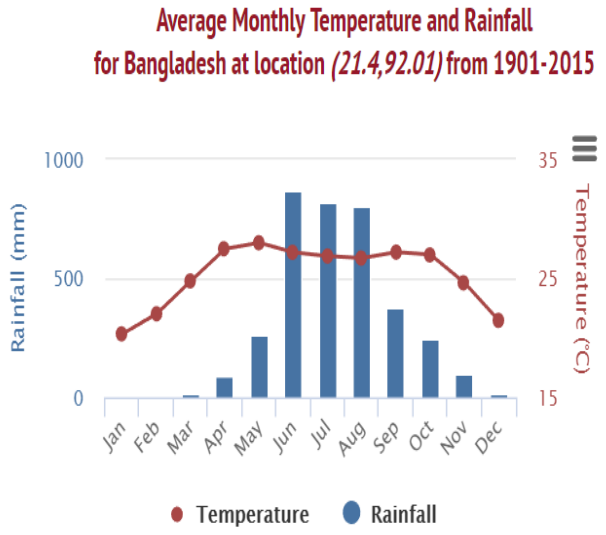
Monsoon season is at its peak June–September. Heavy rainfall will complicate access to the camps. Muddy pathways in the settlements will become even more difficult to navigate. Waste from latrines built upon hilly terrain will flow down with rainwater, heightening the risk of disease outbreak.

Deforestation affects wildlife in the area. It may also exacerbate the effects of flooding and cyclone, as low-lying land will become more exposed (RFA 30/10/2017).

4. Current Climate



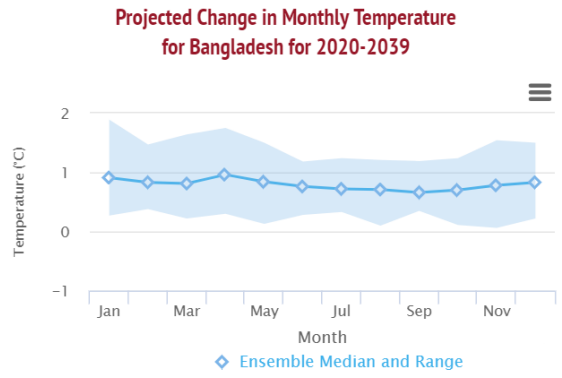


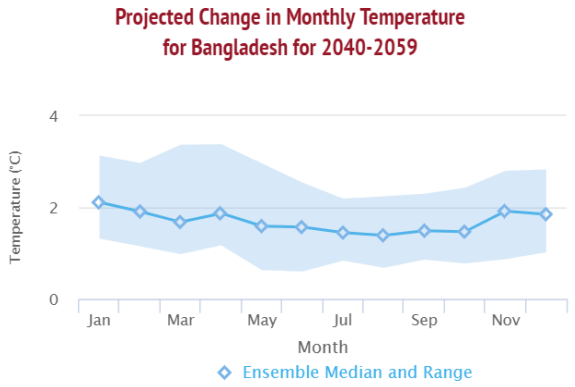


In Coxsbazar (21.4 N, 92.01 E)

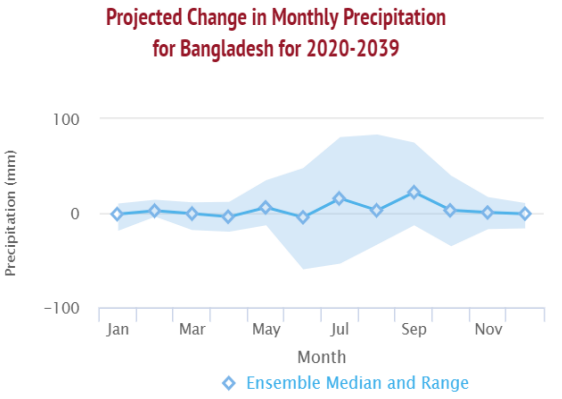
	Mean temperature (°C)	Mean Precipitation (mm)
Jan	20.33	–
Feb	22.02	–
Mar	24.78	17.8
Apr	27.48	92.18
May	27.99	259.56
Jun	27.18	872.81
Jul	26.87	817.48
Aug	26.70	799.78
Sep	27.20	377.11
Oct	27.00	245.90
Nov	24.62	96.2
Dec	21.46	–

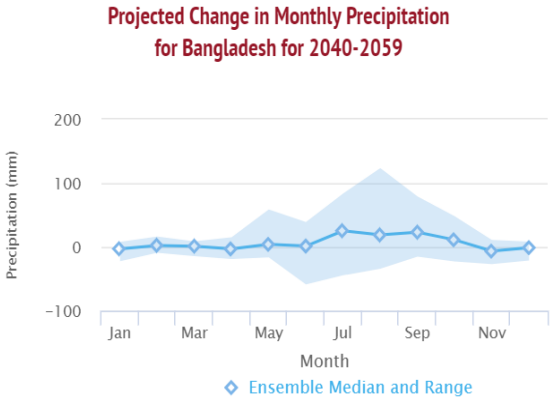
5. Climate Projections for Bangladesh





a. Zero value indicates there is no change in projected monthly temperature compared to historical mean. In the time slice 2020 to 2039, temperature increase ranges from 0.66ºC to 0.96ºC; in time slice 2040 to 2059, 1.39ºC to 2.11ºC.[1]





b. In general, the value of monthly precipitation change varies between -100 mm and +200 mm. Mean or change in monthly precipitation compared to the reference period.[2]

c. The frequency of tropical cyclones in the Bay of Bengal may increase with peak intensity by 5% to 10% and precipitation rates may increase by 20% to 30%. Cyclone-induced storm surges are likely to be exacerbated by a potential rise in sea level of over 27 cm by 2050.[3]

d. Runoff (precipitation minus evapo-transpiration), a measure of water availability, is projected to increase. The time between rainy days is expected to increase. Peak 5-day rainfall intensity (a proxy for an extreme storm event) is projected to increase.[4]

[1] Source: http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_future_climate&ThisRegion=Asia&ThisCcode=BGD.
[2] Source: http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_future_climate&ThisRegion=Asia&ThisCcode=BGD.
[3] GoB – MEF. 2012. Second National Communications of Bangladesh to the United Nations Convention on Climate Change. Dhaka.
[4] GoB – MEF. 2012. Second National Communications of Bangladesh to the United Nations Convention on Climate Change. Dhaka.