# Project Climate Risk Assessment and Management Report

## I. Basic Project Information

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| **Project Title:** Power System Expansion and Efficiency Improvement Program – Tranche 3 |
| **Project Budget:** $530 million |
| **Location:** Dhaka, Chittagong, Bangladesh |
| **Sector:** Energy |
| **Subsector:** Electricity transmission and distribution, energy efficiency and conservation |
| **Brief Description:**<br>Tranche 3 will cover investments in generation system expansion and efficiency improvement, transmission system enhancement, and demand side energy efficiency improvement. |

## II. Summary of Climate Risk Screening and Assessment

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

| *Project component* | *Sensitivity to climate/weather conditions and sea level* |
|---|---|
| 1. **Output 1: Power generation system expanded and upgraded**<br>Output 1 comprises replacement of aging steam and gas turbine power plants of equivalent capacity of 220 MW with a more efficient 400 MW gas-fired CCPP at Ashuganj Power Station complex.<br>2. **Output 2: Transmission system expanded and upgraded**<br>Output 2 comprises:<br>(i) upgrading of 65 kilometer (km) of 132 kV double circuit Comilla (South)-Chandpur transmission line with advanced low loss conductors;<br>(ii) construction of 7 km of 132 kV double circuit Madunaghat-Kalurghat underground transmission line;<br>(iii) construction of 132/33 kV air-insulated substation (AIS) at Kachua (Chandpur) and 132/33 kV gas-insulated substation (GIS) at Kalurghat (Chittagong); and<br>(iv) upgrading of existing 132/33 kV substation at Madunaghat (Chittagong) and 132/33 kV substation at Comilla (South) from AIS to GIS.<br>**3. Output 3: Demand side energy efficiency improved**<br>Output 3 comprises replacement of existing analog meters with 700,000 pre-payment meters in Dhaka Division. | 1. Temperature rise causes increased power demand and lower transmission efficiency. The effect of increased ambient temperature on power transmission lines is increased resistance and reduced conductivity. In addition, high ambient temperature can cause lines to sag, de-rating of transformers, lowering of the thermal limits of transmission lines and circuit breakers.<br>2. Increased precipitation is likely to lead to river flooding and flash flooding. Flooding can affect the location and integrity of the power plant and sub-station, and the integrity of transmission towers. Flooding can cause severe damage to power plant and substation equipment and may lead to interruptions in service continuity and widespread outages. Large amounts of water, rust and mud left trapped behind a flood in a substation can make repair of the equipment a sizable and lengthy restoration task.<br>*3.* Strong wind from cyclones and tornadoes can cause tower and conductor damage.<br>*4.* Lightning is one of the most serious causes of over-voltage. Lightning can result in strokes to a Phase-conductor and towers with no earth wire, and over-voltages. Transients or surges on the power system may originate from switching and from other causes but the most important and dangerous surges are those caused by lightning. The lightning surges may cause serious damages to the expensive equipment in the power system (e.g., generators, transformers, etc.) either by direct strokes on the equipment or by strokes on the transmission lines that reach the equipment as traveling waves. Additionally, lightning-originated surges can also damage, depending on their amplitude and energy content, the power components connected to these networks as well as the relevant electronic devices. |

### B. Climate Risk Screening

| Risk topic | Description of the risk |
|---|---|
| 1. Rising temperatures<br>2. Increased precipitation | 1. Annual mean temperature within the project area is projected to increase by 2.5° Celsius against the baseline period (1960–1990). The highest temperature rise is projected to occur in the month of January (>2.76°C), and the lowest rise is projected for the month of July (<2.15°C).<br>2. Annual precipitation is projected to increase by 131 mm or 6.1% over the baseline period. The increase is projected to occur mainly during the monsoon season from May to October. |

Climate Risk Classification *[Low, Medium and High]* **Medium**

### C. Climate risk assessment

1). The main climate impact on the project is increasing risks of hydro-meteorological hazards. The project area is

prone to flooding, lightning, hailstorms, cyclones, and tornadoes. Flooding affects many aspects of the power system, but is a major concern to substations as well as power stations. The risks of both river flooding and flash flooding are projected to increase in the future. Transmission lines are particularly vulnerable to strong winds of cyclones and tornadoes. Projections indicate that both of these natural hazards may become more violent in the future. Lightning surges may cause serious damages to the expensive equipment in the power system either by direct strokes on the equipment or by strokes on the transmission lines that reach the equipment as traveling waves.

2). Rise in the ambient temperature can impact electricity transmission and distribution. Higher temperatures cause thermal expansion of power lines which results in line sag, de-rating of transformers, increased resistance of transmission and decreased amount of power that can be securely transported, and increased demand puts extra electricity flowing through the lines thereby generating extra heat.

**III. Climate Risk Management Response within the Project**

1. Project will help better cope with climate variability and change through specifically identifying and locating substation and transmission towers in suitable locations.
2. Flood risks must also be taken into account for the design of both the power plant and substations. Design flood should be at least of 1–in–100 year return period.
3. Transmission lines should be able to withstand strong winds from cyclones and tornadoes. Due to projected increases in cyclone wind intensity, it would be necessary to uprate designs and to consider shifting more resources to emergency planning and restoration.
4. Specifications of transmission line conductors are expected to withstand the projected increase in ambient temperature to reduce sag.
5. Lightning surges may cause serious damages to the expensive equipment in the power system. Lightning protection must be implemented as well.
6. Specify more effective cooling for substations and transformers.
7. The project area falls within a medium to high seismic risk zone, all physical structures must be designed to withstand the shockwaves of a MMI 9 event.