# CLIMATE CHANGE: PROJECT ADAPTATION ACTION REPORT

Part 1: Climate Change Adaptation[1]

<table>
<tr><th colspan="4">BASIC PROJECT INFORMATION</th></tr>
<tr><td colspan="4">Project Title: P47101 IND: Assam Power Sector Investment Program<br>Sector: Energy</td></tr>
<tr><td colspan="2">Location:<br>LKHP (Dam site): Latitude 25° 39’ 57.39” N, Longitude 92º 46’ 53.62” E<br>LGP: Latitude: 26° 59’ 07” N, and Longitude: 94° 55’ 52” E</td><td colspan="2">Estimated ADB Financing: $300 million</td></tr>
<tr><td colspan="2">Brief Description:</td><td colspan="2">Implementation Period: Sep 2014 - Dec 2023</td></tr>
<tr><td colspan="4">Two projects – (i) 120 megawatt (MW) Lower Kopili Hydropower Project (LKHP) constructed by 2023; and (ii) replacement of 70 MW Lakwa Gas Plant (LGP). The 120 MW run-of-the-river Lower Kopili hydropower project is located on River Kopili near Longku village of Lanka Taluk of Karbi Anglong district of Assam. Kopili river is a tributary of the mighty Brahmaputra River in the northeastern part of India falling into Bay of Bengal. The proposed project has two upstream hydropower projects- 3x25 MW Kandong hydropower and the other is 4x50 MW Kopili hydropower projects. LKHP will have two 55 MW units in the Main Power House and an additional 10 MW unit in the Auxiliary Power House located at the toe of the dam. The project is expected to run at its full capacity during monsoon season and a supplementary station to offset the peak load requirements during the non-monsoon season. The average net head is determined to be 108 meters at the Main Power House and 47.3 meters at the Auxiliary Power House. The drainage area up to the project site is 2,076.62 km$^2$ and is a predominantly reserved forest area. The reservoir is being proposed with a 70.13 meter high concrete gravity dam with a capacity of 106.29 Mm3 at FRL of 226.0 m above MSL. This gives a live storage of 77.29 Mm$^3$.<br><br>The second component includes replacement of existing 4 x 15 MW (60 MW) Gas Turbine Units with 70 MW capacity of Gas Engines and replacement of existing 3 Gas Compressor Units at LGP. The plant will be situated within the 7 acres designated area inside the premises of the Lakwa Thermal Power Plant (LTPS) plant. Water requirement has been assessed as 0.9 m3/hour (21.6 m³/day) for Gas engine based power plant. This water shall be drawn from the water clarifier inside the plant.</td></tr>
<tr><td colspan="4">Climate Change Classification: (ADB PCS: Mitigation or Adaptation Classification) – Medium</td></tr>
<tr><th colspan="4">SUMMARY of CLIMATE RISK SCREENING<br>(Screening will be done using GIS and Remote Sensing techniques built through three sets of databases: Geological, Climate and Knowledge base. Other climate change assessment reports or databases can be used provided they are from reputable sources and appropriate scope.)</th></tr>
<tr><td colspan="4">A. Projected changes under A2 scenario (by 2050)</td></tr>
<tr><td>Temperature rise ($^0$C)<br>~ 2.2$^0$C (annual mean)</td><td>Precipitation rise (mm)<br>~ 120 mm (Annual) or 5%)</td><td>Sea Level Rise (masl):<br>N/A</td><td>Others:</td></tr>
<tr><td colspan="4">B. Climate Risks</td></tr>
<tr><td>1. Flood;<br>2. Glacial outburst lake floods (GLOF);<br>3. Avalanche; and<br>4. Sedimentation.</td><td colspan="3">Description of the risks:<br>1. Flood -The stream flow is likely to increase in volume as a result of increased precipitation. The loss through aggravated evapotranspiration is likely to increase.<br>2. GLOF- Since there are no glacial lakes, the risk is not there.<br>3. Avalanche – There are no snow covered areas in the upstream of the LKHP site as well as the LGP sites. Both LKHP and LGP are not likely to have any avalanches.</td></tr>
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[1] This report is prepared for hydropower only. Gas plant, transmission and other components are not required to assess for CC.

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| | 4. Sedimentation – Erosion of river banks is likely to worsen due to projected increase in river flow and flooding in parts of the river. Sediment loads is likely to increase and more frequent flushing may be required. |
| *C. Recommendations* | |
| 1. Conduct assessment on the runoff characteristics of the Kopili River under the current climate and future scenarios taking extreme events of precipitation.<br>2. Based on the assessments, devise an early warning system to prevent dams overflow.<br>3. Conduct soil erosion and sedimentation modeling. Propose a sediment flushing scheme taking into account of future climate scenarios, and propose measures to curb soil erosion and erosion of embankments.<br>4. Project design by taking into account of the threat of earthquakes as well as of landslides. In addition, dam safety due to induced seismicity as a result of the formation of the reservoir must also be considered during detailed design. | Specific requirements for TORs for Lower Kopili Hydropower project:<br>I. A climate change specialist is required to undertake the following tasks:<br>(i). Study sediment generation within each sub-basin of the reservoir by employing appropriate models and taking into account climate scenarios. Models must be validated using observations from various gauging stations;<br>(ii). Estimate quantity and timing of effluents of coal mines within each sub-basin; assess the extent of damage to hydropower generation equipment by acidification of effluents;<br>(iii). Based on sediment generation modeling, recommend an efficient sediment flushing mechanism (i.e. timing and number of times);<br>(iv). Recommend counter-measures for reducing equipment corrosion by acidification;<br>(v). Formulate and recommend a set of best management practices for sustainable watershed management to reduce soil erosion and to restore watershed ecosystem resilience.<br>II. Risk of earthquake is high – the TOR of geotechnical/earthquake scientist and structural engineer for:<br>(i) Conducting dam break analysis,<br>(ii) All physical structures at LKHP must be constructed to withstand shockwaves of an MMI[2] 9 event,<br>(iii) Adaptation of site including flood control (embankments, dams, dikes, reservoirs, location of flood defense barriers, and higher channel capacity.<br>III. Conduct of Catchment Area Treatment study must:<br>(i) Control measures for soil erosion which is likely to pose a serious problem to the sediment flushing schedules due to increased precipitation and storminess.<br>(ii) A detailed study on the sediment generation and load within each sub-basin needs to be conducted.<br>(iii) Plan for sustainable watershed management including the restoration of ecosystems within the watershed. |
| Risk Classification: (*Low, Medium and High Risk*) - Medium | |
| **DUE DILIGENCE**<br>*(Enumerate the type of analytical or fact finding activities conducted during project preparation)* | |
| 1. Conducted environmental and social survey, and site specific consultations;<br>2. Reviews of desk studies of the latest project-related reports and existing secondary data;<br>3. Discussions with AGPCL and Government of Assam regarding gas availability, hydropower development policy, water resources, and river basin development reports and policies;<br>4. Discussions on the environmental management plan or alter project design to suit high acidity of | |

[2] MMI – Modified Mercali Intensity.

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| river water; and resettlement/displacement of affected persons. |
| **PROJECT DESIGN CHANGE OR ADAPTATION RESPONSE**<br>*(Describe key action items and budgetary allocations, and other response measures relevant to the project)* |
| Allocation of resources and budgetary provision will be made as appropriate during the feasibility studies to consider the climate related risks such as high precipitation, dam break analysis for earthquake, landslide, flood, and GLOF that are identified as medium in the project climate screening report. |