Rural Electricity Transmission and Distribution Project

Environmental and Social Assessment

Environmental and Social Management Framework (ESMF)

Volume I: Main Report

Final Report

February 2014

Power Cell, Power Division
Ministry of Power, Energy and Mineral Resources
Government of the People's Republic of Bangladesh
The Environmental and Social Management Framework (ESMF) has been prepared by the Bureau of Research, Testing and Consultation (BRTC), Bangladesh University of Engineering and Technology (BUET), Dhaka.

The ESMF has been prepared based on an overall environmental and social assessment, which included (i) assessment of baseline condition of project areas, (ii) evaluation of potential environmental and social impacts of different project components and subcomponents on baseline environment, and (iii) assessment of environmental practices in different ongoing and completed projects of similar nature.

The ESMF provides guidelines for carrying out environmental and social screening, analysis of alternatives, and detail Environmental and Social Impact Assessment (ESIA), including preparing of Environmental Management Plans, Resettlement Action Plans and Tribal Peoples Plans, of subprojects to be implemented under the proposed “rural electricity transmission and distribution project”.

The ESMF report is presented in following two volumes:  
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Volume 2: Appendices
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<th>Abbreviation</th>
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<td>ABC</td>
<td>Axially Bundled Cables</td>
</tr>
<tr>
<td>AIS</td>
<td>Air Insulated Switchgear</td>
</tr>
<tr>
<td>BDT</td>
<td>Bangladesh Taka</td>
</tr>
<tr>
<td>BMD</td>
<td>Bangladesh Meteorological Department</td>
</tr>
<tr>
<td>BNBC</td>
<td>Bangladesh National Building Code</td>
</tr>
<tr>
<td>BODS</td>
<td>5-day Biochemical Oxygen Demand</td>
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<td>BRTC</td>
<td>Bureau of Research Testing and Consultation</td>
</tr>
<tr>
<td>BUET</td>
<td>Bangladesh University of Engineering and Technology</td>
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<tr>
<td>COD</td>
<td>Chemical Oxygen Demand</td>
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<tr>
<td>DG</td>
<td>Director General</td>
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<td>DoE</td>
<td>Department of Environment</td>
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<tr>
<td>EA</td>
<td>Environmental Assessment</td>
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<tr>
<td>ECA</td>
<td>Ecologically Critical Area</td>
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<tr>
<td>ECoP</td>
<td>Environmental Code of Practice</td>
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<tr>
<td>ECR</td>
<td>Environment Conservation Rules</td>
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<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>EMF</td>
<td>Environmental Management Framework</td>
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<td>EMP</td>
<td>Environmental Management Plan</td>
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<td>ESA</td>
<td>Environmental and Social Assessment</td>
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<td>ESIA</td>
<td>Environmental and Social Impact Assessment</td>
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<td>ESMF</td>
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<tr>
<td>ESU</td>
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<tr>
<td>FGD</td>
<td>Focus Group Discussion</td>
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<tr>
<td>GIS</td>
<td>Gas Insulated Switchgear</td>
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<td>GAAP</td>
<td>Governance and Accountability Action Plan</td>
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<tr>
<td>GoB</td>
<td>Government of Bangladesh</td>
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<tr>
<td>GRC</td>
<td>Grievance Redress Committee</td>
</tr>
<tr>
<td>IDA</td>
<td>International Development Association</td>
</tr>
<tr>
<td>IEE</td>
<td>Initial Environmental Examination</td>
</tr>
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<td>IEF</td>
<td>Important Environmental Features</td>
</tr>
<tr>
<td>MoEF</td>
<td>Ministry of Environment and Forests</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Government Organization</td>
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<tr>
<td>OHS</td>
<td>Occupational Health and Safety</td>
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<tr>
<td>OP</td>
<td>Operational Policy</td>
</tr>
<tr>
<td>PAP</td>
<td>Project Affected Person</td>
</tr>
<tr>
<td>PBS</td>
<td>Palli Biddyut Shamiti</td>
</tr>
<tr>
<td>PCAIP</td>
<td>Public Consultation and Access to information Plan</td>
</tr>
<tr>
<td>PD</td>
<td>Project Director</td>
</tr>
<tr>
<td>PGCB</td>
<td>Power Generation Company of Bangladesh</td>
</tr>
<tr>
<td>PM</td>
<td>Particulate Matter</td>
</tr>
<tr>
<td>PM2.5</td>
<td>Particulate Matter with aerodynamic diameter $\leq 2.5$ micrometers</td>
</tr>
<tr>
<td>PM10</td>
<td>Particulate Matter with aerodynamic diameter $\leq 10$ micrometers</td>
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<td>PMO</td>
<td>Project Management Office</td>
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<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>RCC</td>
<td>Reinforced Cement Concrete</td>
</tr>
<tr>
<td>BREB</td>
<td>Bangladesh Rural Electrification Board</td>
</tr>
<tr>
<td>RoW</td>
<td>Right of Way</td>
</tr>
<tr>
<td>SECs</td>
<td>Special Environmental Clauses</td>
</tr>
<tr>
<td>SIA</td>
<td>Social Impact Assessment</td>
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<tr>
<td>SMF</td>
<td>Social Management Framework</td>
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<tr>
<td>SMP</td>
<td>Social Management Plan</td>
</tr>
<tr>
<td>SPM</td>
<td>Suspended Particulate Matter</td>
</tr>
<tr>
<td>TDS</td>
<td>Total Dissolved Solids</td>
</tr>
<tr>
<td>TL</td>
<td>Transmission Line</td>
</tr>
<tr>
<td>TPP</td>
<td>Tribal People Plan</td>
</tr>
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<td>ToR</td>
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EXECUTIVE SUMMARY

Background

To meet the growing electricity demand and to meet the goal of universal access by 2020, the GoB has taken a plan to add more than 11,500MWs electricity to the national grid by the year 2015. To evacuate the additional power, enhancements and extensions are needed in the transmission network of the Power Grid Company of Bangladesh (PGCB) and in the rural distribution network of the Palli Biddiyut Samities (PBSs) under Bangladesh Rural Electrification Board (BBREB). The proposed “rural electricity transmission and distribution project” involves rehabilitation and augmentation needs of the 33/11 kV network operated by the PBSs under the BBREB, transmission enhancement needs of the PGCB, and capacity building of BREB, PBSs and PGCB as well as implementation of the reform action plan for BREB/PBSs with the support of World Bank.

The proposed project requires carrying out an Environmental and Social Assessment in accordance with the Environment Conservation Act 1995 (Amended in 2000, 2002 and 2010), the Environment Conservation Rules 1997, and the World Bank Safeguard Policies. However, the exact routes of transmission/distribution lines and substation locations, to be implemented under the proposed project, are not identified at this stage. Therefore, a framework approach has been adopted for environmental and social assessment (ESA) of the proposed project. This volume (Volume I) presents the “Main Report” of the Environmental and Social Management Framework (ESMF); Volume II presents the Appendices.

Policy and legal Framework and Applicability to Project Components

Bangladesh has an environmental legal framework that is conducive to both environmental protection and natural resources conservation. In addition, a wide range of laws and regulations related to environmental and social issues are in place in Bangladesh. Many of these are cross-sectoral and partially related to environmental issues. The ESMF report presents an overview of the major national laws and regulations that are relevant and may apply to activities supported by the project, institutional arrangement at national and sub-national level. The report also discusses the relevant World Bank safeguard policies and their applicability to the proposed project.

Sub-project Categories

The sub-projects to be implemented under the proposed rural electricity transmission and distribution project do not appear to pose risk of significant adverse environmental impacts. Accordingly, the overall project could be classified as a “Category B” project, according to WB project classification (OP 4.01). In the ECR 1997, certain sub-projects are categorized (e.g., construction/upgradation of power distribution lines) and the EIA requirements of these projects are also clearly spelled out in the ECR 1997. Sub-projects category according to ECR 1997 is shown in the Table E-1. However, environmental/social screening of all sub-projects will be carried out first (see Section 4.6), based on which the ESIA requirements will be determined. In general, the environmental/social screening process identifies what impacts will be generated and what type of mitigation measures will be required for the sub-projects.
### Table E-1: Classification of sub-projects according to ECR 1997 (GoB, 1997)

<table>
<thead>
<tr>
<th>Project Component/Sub-projects</th>
<th>Project/Sub-project Category according to ECR 1997</th>
<th>Likely Project/Sub-project Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of 33 kV new power distribution line</td>
<td>Red</td>
<td>--</td>
</tr>
<tr>
<td>Upgradation of 33 kV power distribution line</td>
<td>Red</td>
<td>May be classified as “Orange A” or “Orange B” depending on assessment of potential impact</td>
</tr>
<tr>
<td>Construction of 11 kV new power distribution line</td>
<td>Red</td>
<td>--</td>
</tr>
<tr>
<td>Construction of 132 kV new power transmission line</td>
<td>Not specifically listed</td>
<td>Red</td>
</tr>
<tr>
<td>Re-conductoring/Upgradation of 132 kV lines</td>
<td>Not specifically listed</td>
<td>May be classified as “Orange A” or “Orange B” depending on assessment of potential impact</td>
</tr>
<tr>
<td>Construction of 33/11 kV substation on privately owned land</td>
<td>Not specifically listed</td>
<td>Red</td>
</tr>
<tr>
<td>Construction of 132/33 kV substation on privately owned land</td>
<td>Not specifically listed</td>
<td>Red</td>
</tr>
<tr>
<td>Construction of 33/11 kV substation on Government owned land</td>
<td>Not specifically listed</td>
<td>May be classified as “Orange A” or “Orange B” depending on assessment of potential impact</td>
</tr>
<tr>
<td>Construction of 132/33 kV substation on Government owned land</td>
<td>Not specifically listed</td>
<td>May be classified as “Orange B” or “Red” depending on assessment of potential impact</td>
</tr>
</tbody>
</table>

**Notes:**
1. According to ECR 1997, “power distribution line laying/relaying/extension” projects fall under “Red” category; i.e. Category is designated based on the nature of project not the anticipated impact.
2. Proposed rural electricity transmission and distribution project could be classified as “Category B” on the expected impact according to WB OP4.01.

### Environmental Considerations in Project Formulation

By considering certain issues during project formulation, it is often possible to reduce or eliminate some of the possible adverse environmental impacts during both construction and operational phases of a project. Table E-2 identifies a number of such issues to be considered for substation and power line sub-projects.

### Table E-2: Environmental and social considerations to be included in design to reduce/eliminate the impacts for some major sub-projects

<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Issues to be Considered at Project Formulation Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substation</td>
<td>• Use of government-owned land or vacant/fallow (non-productive) land for construction of substation, where possible</td>
</tr>
<tr>
<td></td>
<td>• Use of land located at close proximity to existing power lines/load centers, and road network (for easier transportation of material and equipment), where available</td>
</tr>
<tr>
<td></td>
<td>• Avoiding lands that are susceptible to inundation/storm surge¹</td>
</tr>
<tr>
<td></td>
<td>• Avoiding ecologically and socially critical areas while selecting land for substations</td>
</tr>
<tr>
<td></td>
<td>• Use of Gas Insulated Switchgear (GIS) instead of Air Insulated Switchgear (AIS), in order to reduce land requirement for substation and avoid possible generation of toxic fumes in control building due to flashover inside AIS (especially under high...</td>
</tr>
</tbody>
</table>
### Sub-project: Power Line

<table>
<thead>
<tr>
<th>Issues to be Considered at Project Formulation Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ensuring not to purchase and installation of transformers containing PCB</td>
</tr>
<tr>
<td>• Treating PCB contained in old transformers using available technologies; namely, super critical oxidation, electro-chemical oxidation, solvated electron technology, chemical reduction method, dehalogenation process, and thermal desorption using pyrolysis, catalyzed dehalogenation and vitrification before disposal</td>
</tr>
<tr>
<td>• Designing substations considering maximum flood level, and considering wind speed and earthquake load suggested in the Bangladesh National Building Code (BNBC)</td>
</tr>
</tbody>
</table>

- Avoiding homestead areas, forest, protected areas, game reserve, national park, ECAs (as much as possible) while selecting routes of the power line
- Avoiding crossing of rivers/hills/bamboo groves/cash-in trees, as much as possible, while selecting routes of power line
- Use of “guard cable” for saving cash-in trees
- Maintenance of adequate clearance for right of way (RoW)
- Use of Axially Bundled Cables (ABC) or insulated cables, instead of conventional separate cables, in order to prevent possible pilferage of power through illegal connection and provide added security against accident
- Keeping layout of power line tower/pole such that they do not interfere with movement of traffic/pedestrian
- Designing power lines considering wind speed suggested in the Bangladesh National Building Code (BNBC)
- Checking structural adequacy of existing power line towers/poles (to accommodate new cables) for sub-projects involving power line re-conductoring/rehabilitation
- Selecting alignment of transmission line avoiding routes of migratory birds, nesting sites, significant bird habitat, and take off/landing routes of aircrafts
- Safety features in towers constructed over rivers against damage due to collision with water vessels
- In order to avoid fire hazards, using technology in power line (and also substations) which trips the line in fraction of seconds

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1 Usually, control room buildings are built to a height of 1.5 storey to avoid storm surge (BPDB, 2008)

### Environmental/Social Screening

All project components or sub-projects to be implemented under the proposed project will be subject to an environmental/social screening in order to prevent execution of projects with significant negative environmental impacts. The environmental/social screening would involve: (i) reconnaissance of the sub-project areas/routes and their surroundings; (ii) identification of the major sub-project activities; and (iii) preliminary assessment of the impacts of these activities on the ecological, physicochemical and socio-economic environment of the sub-project surrounding areas. Environmental and Social Screening forms for substation and power line are presented in Appendix B (Form 2a and 2b). Guidelines for carrying out environmental screening are presented in Chapter 4 (Section 4.6), while guideline for carrying out social screening is presented in Chapter 5 (Section 5.4.2).

To ensure that the sub-projects meet the main objectives of the project, legal requirements and safeguards, a set of exclusion criteria will be applied during social screening including the following:

- Subprojects requiring land acquisition or population displacement that cannot be compensated for or resettled;
• Subproject affecting mosques, temples, graveyards and cremation grounds, and other places/objects of religious, cultural and historical significance;
• Subprojects threatening cultural tradition and way of life of tribal peoples; severely restrict their access to common property resources and livelihood activities;
• Subproject interventions with objections from communities on social and environmental issues that cannot be resolved through design alternatives.

Analysis of Alternatives
The primary objective of the “analysis of alternatives” is to identify the location/technology for a particular sub-project that would generate the least adverse impact, and maximize the positive impacts. The analysis of alternatives should be carried out at two different levels: (a) by PGCB/BREB/PBS along with environmental/social screening; and (b) during carrying out of IEE/ESIA of a sub-project, if needed (e.g., by the consultant engaged for this purpose). A simple format for analysis of alternatives is presented in Appendix C (Form 3a and 3b).

Nature and Extent of Environmental and Social Assessment (ESA)
The level of environmental and social assessment (ESA) of a sub-project would primarily depend on the class/category of the sub-project according to OP 4.01 and ECR 1997. According to WB OP4.01, the proposed project has been classified as “Category B” based on the expected impacts. In the ECR 1997, project category has been assigned based on the nature of projects, not the anticipated impacts. According to ECR 1997, for “Orange A” Category sub-projects, no further environmental assessment would be required, but some additional information would be required; for “Orange B” category sub-projects Initial Environmental Examination (IEE) and Environmental Management Plan (EMP) would be required; while for Red Category sub-projects, full-scale EIA (including SIA) may be required. Sub-projects with social safeguard issues (i.e., loss of land, loss of income, impact on tribal population), identified during environmental/social screening, would also fall under “Red” category. For such sub-projects, SIA (also EIA) as well as RAP and TPP, if needed, will be required. Sub-projects without safeguard issues could fall under “Orange A” or “Orange B” category, depending on the level of anticipated impacts, which would be identified during environmental/social screening. Based on a review of the sub-project description (i.e., Form 1a/1b) and environmental screening (i.e., Form 2a/2b), PGCB/BREB will determine the need for further environmental assessment (i.e., carrying out IEE/EIA/SIA, including EMP).

Guidelines for Carrying out IEE and EIA
The major activities involved in carrying out IEE or EIA include: (a) Identification of sub-project influence area; (b) Establishment of “baseline environment” within the sub-project influence area, against which impacts of the sub-project would be evaluated; (c) Identification of major sub-project activities/processes during construction and operational phases; (d) Assessment and evaluation of impacts of major project activities on the baseline environment during construction and operational phases; (e) Carrying out public consultations; (f) Identification of mitigation measures for reducing/eliminating adverse impacts and enhancing positive impacts; (g) Development of environmental management plan (EMP), including monitoring requirements; and (h) Identification of environmental code of practice (ECoP).

Sub-project Influence Area
The ESMF provides guidelines for identification of sub-project specific influence area and defining environmental baseline for different types of sub-projects to be implemented under the proposed project (see Table E-3). Based on the field visits to sub-project sites in Dhaka, Chittagong and Sylhet divisions, it is apparent that the sub-project influence area would depend not only on the type of sub-project (i.e., substation or power line), but also on the nature site/area where it will be implemented.

**Table E-3: Guidelines for identifying influence area for different types of sub-projects**

<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Influence Area</th>
</tr>
</thead>
</table>
| 132/33kV and 33/11kV Substations, Switching Stations | Areas and communities within around 1 km surrounding the location of the Substation, who are likely to be affected during construction and/or operation of the substations  
Areas on either side (within ~15 m) of the access road from the main road to the Substation |
| 132kV Transmission Lines and Towers              | Areas and communities within the Right of Way (~52 m) of the Transmission line route  
Areas and communities surrounding the new transmission tower (if any) to be constructed  
Areas on either side (within ~15 m) of the access road from the main road to the transmission tower (to be constructed) |
| 33 and 11kV Distribution Lines and Poles          | Areas and communities within the Right of Way (~27 m) of the Distribution line route  
Areas on either side (within ~15 m) of the access road from the main road to the distribution line poles/tower, which could be affected during construction |

**Note:** The routes of transportation of material/equipment to the sub-project site should also be included under influence area

**Environmental Baseline**

For proper environmental assessment, it is very important to define the “environmental baseline” against which environmental impacts of a particular sub-project would be subsequently evaluated. For systematic recording of data, the baseline environment is usually classified into physicochemical environment, biological environment, and socio-economic environment; and important features/parameters under each category are identified and measured/recorded during baseline survey. Tables E-4 and E-5 present guidelines for collection of primary and secondary data on physicochemical and biological parameters, respectively for different types of sub-projects to be implemented under the proposed project.

**Table E-4: Guidelines for collection of sub-project specific physicochemical data/information**

<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Data/ information from secondary source</th>
<th>Data from primary survey/measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of 132/33kV Substations by PGCB</td>
<td>IEFs; Climate; Geology and soil; Hydrology and water resources; and drainage</td>
<td>IEFs; Noise level; Surface water quality(^1); Site topography; EMF</td>
</tr>
<tr>
<td>Construction of 132kV Transmission Line By PGCB</td>
<td>IEFs; Climate; Topography and drainage; Geology and soil; Hydrology and water resources</td>
<td>IEFs; Noise Level; Surface water quality(^2); Traffic, EMF</td>
</tr>
<tr>
<td>Construction of 33/11kV Substations/ Switching Stations by BREB</td>
<td>IEFs; Climate; Geology and soil; Hydrology and water resources; and drainage</td>
<td>IEFs; Noise level; Surface water quality(^3); Site topography; EMF</td>
</tr>
<tr>
<td>Sub-project</td>
<td>Data/information from secondary source</td>
<td>Data from primary survey/ measurement</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>Construction of 33kV &amp; 11kV Distribution Lines by BREB</td>
<td>IEFs; Climate; Geology and soil; Topography and drainage; Hydrology and water resources</td>
<td>IEFs; Noise Level, Surface water quality; Traffic, EMF</td>
</tr>
<tr>
<td>Upgradation of 132/33kV Substations by PGCB</td>
<td>IEFs; Climate; Geology and soil; Hydrology and water resources; and drainage</td>
<td>Noise Level; Traffic</td>
</tr>
<tr>
<td>Rehabilitation of 132kV Transmission Line By PGCB</td>
<td>IEFs; Climate; Topography and drainage; Geology and soil; Hydrology and water resources</td>
<td>Surface water quality; Traffic</td>
</tr>
<tr>
<td>Rehabilitation of 33kV &amp; 11kV Distribution Lines by BREB</td>
<td>IEFs; Climate; Geology and soil; Topography and drainage; Hydrology and water resources</td>
<td>Surface water quality; Traffic</td>
</tr>
</tbody>
</table>

1. If water body is located close to the substation site(s)  
2. If the power line passes over or close to khal/river/wetland lands

**Table E-5:** Guidelines for collection of sub-project specific data/information for describing biological environment

<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Data/information from secondary source</th>
<th>Data from primary survey/ measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction/rehabilitation of 132/33kV Substations by PGCB</td>
<td>General bio-ecological features, Wildlife sanctuary, ECA etc.</td>
<td>Number of trees to be felled; Area to be cleared of vegetation; Filling up of seasonal wetland (if required)</td>
</tr>
</tbody>
</table>
| Construction/Rehabilitation of 132kV Transmission Line By PGCB | General bio-ecological features, Wildlife sanctuary, Floral and faunal diversity; ECA                | Number of trees to be felled or trimmed; Aquatic flora and faunal diversity  
| Construction of 33/11kV Substations/ Switching Stations by BREB | General bio-ecological features, Wildlife sanctuary, ECA                                           | Number of trees to be felled; Area to be cleared of vegetation; Filling up of seasonal wetland (if required) |
| Construction/Rehabilitation of 33kV & 11kV Distribution Lines by BREB | General bio-ecological features, Wildlife sanctuary, ECA; Floral and faunal diversity               | Number of trees to be felled or trimmed                    |

1. If the proposed transmission line crosses river/wetland

For assessment of socio-economic impacts, it is important to have a clear understanding of the baseline socio-economic condition of people, especially those living within the sub-project influence areas. A common approach for assessment of baseline socio-economic condition is questionnaire survey. The questionnaire used for socio-economic survey may therefore cover five major themes: (a) Socio-economic background; (b) Basic services; (c) Education; (d) Economic situation, and (e) Attitude toward the proposed sub-project.

**Assessment and Prediction of Impacts and Mitigation Measures**

The potential environmental impacts during construction and operational phases of sub-projects could be categorized into: (a) ecological impacts; (b) physicochemical impacts; and (c) socio-economic impacts. The impacts (both general and component-specific) and suggested probable mitigation measures are summarized in Tables E-6 to E-8.
### Table E-6: Typical “general impacts” during construction phase of sub-projects and corresponding mitigation and enhancement measures

<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and operation of labor shed for workers</td>
<td>• Generation of sewage and solid waste; water/ environmental pollution</td>
<td>• Construction of sanitary latrine/ septic tank system&lt;br&gt;• Erection of “no litter” sign, provision of waste bins/cans, where appropriate&lt;br&gt;• Health of workers&lt;br&gt;• Raising awareness about hygiene practices among workers&lt;br&gt;• Availability and access to first-aid equipment and medical supplies&lt;br&gt;• Possible development of labor camp into permanent settlement&lt;br&gt;• Contractor to remove labor camp at the completion of contract&lt;br&gt;• Outside labor force causing negative impact on health and social well-being of local people&lt;br&gt;• Contractor to employ local work force, where appropriate; promote health, sanitation and road safety awareness</td>
<td>Contractor (Monitoring by BREB/PGCB)</td>
</tr>
<tr>
<td>General construction works for sub-projects</td>
<td>• Drainage congestion and flooding</td>
<td>• Provision for adequate drainage of storm water&lt;br&gt;• Provision of adequate diversion channel, if required&lt;br&gt;• Provision for pumping of congested water, if needed&lt;br&gt;• Ensure adequate monitoring of drainage effects, especially if construction works are carried out during the wet season&lt;br&gt;• Air pollution&lt;br&gt;• Ensure that all project vehicles are in good operating condition&lt;br&gt;• Spray water on dry surfaces/ unpaved roads regularly&lt;br&gt;• Maintain adequate moisture content of soil during transportation, compaction and handling&lt;br&gt;• Sprinkle and cover stockpiles of loose materials (e.g., fine aggregates)&lt;br&gt;• Avoid use of equipment such as stone crushers at site, which produce significant amount of particulate matter&lt;br&gt;• Traffic congestion, obstruction to pedestrian movement&lt;br&gt;• Schedule deliveries of material/ equipment during off-peak hours&lt;br&gt;• Depute flagman for traffic control&lt;br&gt;• Arrange for signal light at night&lt;br&gt;• Noise pollution&lt;br&gt;• Use of noise suppressors and mufflers in heavy construction equipment&lt;br&gt;• Avoid using of construction equipment producing excessive noise at night&lt;br&gt;• Avoid prolonged exposure to noise (produced by equipment) by workers&lt;br&gt;• Regulate use of horns and avoid use of hydraulic horns in project vehicles</td>
<td>Contractor (Monitoring by BREB/PGCB)</td>
</tr>
<tr>
<td>Activity/Issues</td>
<td>Potential Impacts</td>
<td>Proposed Mitigation and Enhancement Measures</td>
<td>Responsible Parties</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------</td>
<td>---------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>• Water and soil pollution</td>
<td>• Prevent discharge of fuel, lubricants, chemicals, and wastes into adjacent rivers/ khals/ drains.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Destruction of aquatic habitat</td>
<td>• Install sediment basins to trap sediments in storm water prior to discharge to surface water.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Keep noise level (e.g., from equipment) to a minimum level, as certain fauna are very sensitive to loud noise (e.g., during transmission tower construction over river/wetlands)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Accidents</td>
<td>• Follow standard safety protocol.</td>
<td>Contractor (Monitoring by BREB/PGCB)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Environmental health and safety briefing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provision of protective gears as specified in ECoP 20.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provision of appropriate protective measures against accidental fall from elevated height (e.g. using body harness, waist belts, secured climbing devices, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Felling of trees, clearing of vegetation</td>
<td>• Replant vegetation when soils have been exposed or disturbed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Plantation to replace felled trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Spills and leaks of oil, toxic chemicals</td>
<td>• Good housekeeping.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Proper handling of lubricating oil and fuel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Collection, proper treatment, and disposal of spills.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Health and Safety** (see details in ECoP20)

- Exposure to physical hazards from use of heavy equipment and cranes; trip and fall hazards;
- Exposure to dust and noise; falling objects; work in confined spaces;
- Exposure to hazardous materials;
- Exposure to electrical hazards from the use of tools and machinery.

- A safety observer must be appointed at each subproject site by the Contractor before the commencement of work.
- Only allowing trained and certified workers to install, maintain, or repair electrical equipment.
- Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines;
- Proper Personal Protective Equipment (PPE) for all workers and others associated with work.
- Where rehabilitation is required within minimum setback distances, specific training, safety measures, personal safety devices, and other precautions should be defined before work.
<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
</table>
| All construction works | • Beneficial impact on employment generation  
• General degradation of environment  
• Discovery of historical items and cultural remains | • Employ local people in the project activities as much as possible.  
• Environmental enhancement measures, such as plantation, landscaping, traffic/direction signs.  
• Follow “chance find procedure” (see Appendix G) for protection of cultural resources | Contractor (Monitoring by BREB/PGCB) |
| Setting up and operation of asphalt plant and bitumen preparation area (for Sub-station access road construction), if needed | • Air and noise pollution affecting nearby settlements  
• Possible water pollution (surface and groundwater) bituminous products/solvents  
• Cutting down trees to use as fuel wood for heating bitumen  
• Effect on traffic and pedestrian safety | • Locate plant away from residential settlements  
• Consider use of emulsified bitumen  
• Strict control to avoid spills; surround plant area with a ditch with a settling pond/oil trap at the outlet; provision for adequate clean up  
• Strictly prohibit use of fuel wood for heating bitumen  
• Employ traffic control measures and limit possible disruption to non-construction traffic | Contractor (Monitoring by BREB/PGCB) |
| Rehabilitation of Substations | • Possible PCB contamination from dismantling of old transformers with PCB | • Treat PCB of old transformers following specified methods in ECOP (e.g. dehalogenation, electrochemical oxidation, etc.) | |

Table E-7: “Sub-project specific impacts” during construction phase and corresponding mitigation measures
<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction/ Rehabilitation of Transmission Line and Distribution Line</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Installation of poles of transmission / distribution lines adjacent to roadways | • Traffic congestion/ traffic problems  
• Safety                            | • Not storing electric poles/transmission tower components over busy roads/ highways  
• Following standard safety protocols while erecting poles and stretching cables  
• Taking appropriate protective measures against accidental fall from elevated height (e.g. using body harness, waist belts, secured climbing devices, etc.) as specified in ECoP. | Contractor  
(Monitoring by BREB/PGCB)                                           |
| Construction of power line through natural habitat or tree plantation area      | • Impact on biodiversity, vegetation and habitat                                  | • If there’s no alternative, felling, pollarding, lopping and pruning of trees for electric clearance, whenever necessary, to be done with permission from the local forest office/appropriate authority;  
• Hand clearing of vegetation  
• Strict prohibition on use of chemicals for forest clearance/RoW maintenance.  
• Use of existing path/access roads for movement of man and machinery;  
• Carrying tower materials into forests by head loads | Contractor  
(Monitoring by BREB/PGCB)                                           |
| Tower foundation in rivers                                                    | • Impact on fisheries and other aquatic life in rivers  
• Collision with water vessels                                               | • Installation of underwater enclosures to minimize noise propagation  
• Use signage and construction of fender( if necessary) | Contractor  
(Monitoring by BREB/PGCB)                                           |
### Table E-8: “Sub-project specific impacts” during operational phase and corresponding mitigation measures

<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Substation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation of drains in the substations</td>
<td>• Pollution of downstream water body</td>
<td>• Stop direction connection from sanitation facilities to storm drain; ensure installation of septic tank in all establishments</td>
<td>BREB/PGCB</td>
</tr>
<tr>
<td></td>
<td>• Blockage in the drain due to disposal of solid waste</td>
<td>• Creation of awareness; improve SWM system, installing cover in open drains/manholes (if any)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Regular maintenance/cleaning of the drain</td>
<td>• Regular maintenance/cleaning of the drain</td>
<td></td>
</tr>
<tr>
<td>Operation of generators and transformers</td>
<td>• Pollution of water (e.g., from spilled oil, spent oil, other waste)</td>
<td>• Restriction on disposal of spent oil, food and other waste in water; creation of awareness</td>
<td>BREB/PGCB</td>
</tr>
<tr>
<td></td>
<td>• Regular maintenance/cleaning of the drain</td>
<td>• Strict control to avoid spills; provision for adequate clean up</td>
<td></td>
</tr>
<tr>
<td>Operation of Substation</td>
<td>• Security</td>
<td>• Ensuring security of Substation in collaboration with law enforcing agencies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Safety, Health</td>
<td>• Keeping complain book at Substation for recording of people’s complaints</td>
<td></td>
</tr>
<tr>
<td>Transmission Line and Distribution Line</td>
<td></td>
<td>• Ensuring availability of adequate safety gears at Substations</td>
<td>BREB/PGCB</td>
</tr>
<tr>
<td>Regular maintenance</td>
<td>• Safety</td>
<td>• Regular patrolling along the power lines to identify the need for regular and immediate maintenance operation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inspection immediately after a major storm/rainfall event</td>
<td>• Inspection immediately after a major storm/rainfall event</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Regular cutting and trimming of trees around power lines</td>
<td>• Regular cutting and trimming of trees around power lines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Taking appropriate protective measures against accidental fall from elevated height during regular maintenance operations (e.g. using body harness, waist belts, secured climbing devices, etc.)</td>
<td>• Taking appropriate protective measures against accidental fall from elevated height during regular maintenance operations (e.g. using body harness, waist belts, secured climbing devices, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provision for shutting down of line in case of snapping of line</td>
<td>• Provision for shutting down of line in case of snapping of line</td>
<td></td>
</tr>
<tr>
<td>Installation of new transformers</td>
<td>• Safety</td>
<td>• Regular monitoring of power lines to prevent electricity pilferage</td>
<td>BREB/PGCB</td>
</tr>
<tr>
<td></td>
<td>• Adequate caution should be taken to carry out installation works by personnel at elevated height</td>
<td>• Adequate caution should be taken to carry out installation works by personnel at elevated height</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Instrument should be properly anchored with poles</td>
<td>• Instrument should be properly anchored with poles</td>
<td></td>
</tr>
<tr>
<td>Activity/Issues</td>
<td>Potential Impacts</td>
<td>Proposed Mitigation and Enhancement Measures</td>
<td>Responsible Parties</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------</td>
</tr>
</tbody>
</table>
| Maintenance of transmission/distribution lines | • Traffic congestion, obstruction to pedestrian movement, safety  
• Impact on biodiversity, vegetation, habitat                                                                                     | • Depute flagman for traffic control  
• Arrange for signal light at night  
• Following standard safety protocol  
• Felling, pollarding, lopping and pruning of trees for RoW maintenance to be done with permission from the local forest office/appropriate authority                                                                                       | BREB/PGCB           |
| Health and Safety                  | • Safety  
• Exposure to EMF  
• Exposure to chemicals  
• Exposure to electrical hazards from the use of tools and machinery.                                                                 | • Only allowing trained and certified workers to maintain, or repair electrical equipment  
• Taking appropriate protective measures against accidental fall from elevated height during regular maintenance operations (e.g. using body harness, waist belts, secured climbing devices, etc.)  
• Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines;  
• Proper Personal Protective Equipment (PPE) for all workers and others associated with work.  
• Training of workers in the identification of occupational EMF levels and hazards  
• Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure  
• Use of signs, barriers (e.g. locks on doors, use of gates, use of steel posts surrounding transmission towers, particularly in urban areas), and education / public outreach to prevent public contact with potentially dangerous equipment | BREB/PGCB           |
**Monitoring Plan**

The primary objective of the environmental monitoring is to record environmental impacts resulting from the sub-project activities and to ensure implementation of the “mitigation measures” in order to reduce adverse impacts and enhance positive impacts from project activities. Tables E-9 and E-10 present guidelines for monitoring of specific environmental parameters during construction and operation phases of different sub-projects.

**Table E-9: Guidelines for monitoring of environmental parameters during construction phase**

<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Monitoring Parameter and Scenario</th>
<th>Monitoring Frequency</th>
<th>Resource Required and Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of 132/33kV Substations by PGCB; Construction of 33/11kV Substations BREB</td>
<td>Regular monitoring: Noise level</td>
<td>Once every week, particularly during operation of heavy equipment</td>
<td>Contractor, under the guidance of BREB/PGCB</td>
</tr>
<tr>
<td>Construction of 132/33kV Substations by PGCB (near a water body); Construction of 33/11kV Substations by BREB (near a water body); Construction of 132 kV transmission line over river/wetland</td>
<td>Water quality (pH, BOD₅, COD, NH₃, PO₄)</td>
<td>Once during construction period (at a location downstream of the work area)</td>
<td>Contractor, under the guidance of BREB/PGCB</td>
</tr>
<tr>
<td>All sub-projects</td>
<td>Visual observation of drainage congestion, traffic within around sub-project location</td>
<td>Once a week; when drainage/traffic congestion suspected</td>
<td>Contractor, under the guidance of BREB/PGCB</td>
</tr>
<tr>
<td></td>
<td>Occupational health and safety of project personnel (also includes general health, water supply and sanitary provision, etc.)</td>
<td>Once a week, and as and when needed</td>
<td></td>
</tr>
</tbody>
</table>

Note: The PD depending on the location of specific activities should decide actual monitoring time and location.

**Table E-10: Guidelines for monitoring of specific activities during operational phase**

<table>
<thead>
<tr>
<th>Parameters (Sub-project)</th>
<th>Monitoring Frequency</th>
<th>Resource Required and Responsibility</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger Trees (Power Line)</td>
<td>Once every month, and as directed by the Project Engineer</td>
<td>Vehicle with ladder and cutting accessories; O&amp;M team</td>
<td>Results to be reported to Environment and Social Unit (ESU)</td>
</tr>
<tr>
<td>Dielectric strength of Transformers (Substation)</td>
<td>Once in 6 months, and as directed by the Project Engineer</td>
<td>Testing equipment, O&amp;M team</td>
<td></td>
</tr>
<tr>
<td>Tan – δ test (Substation)</td>
<td>Once in 10 years, and as directed by the Project Engineer</td>
<td>Testing equipment, O&amp;M team</td>
<td></td>
</tr>
<tr>
<td>Parameters (Sub-project)</td>
<td>Monitoring Frequency</td>
<td>Resource Required and Responsibility</td>
<td>Comment</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------</td>
<td>-------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Hazardous Material (Substation)</td>
<td>Once every three months, and as directed by the Project Engineer</td>
<td>Laboratory facilities; O&amp;M team</td>
<td></td>
</tr>
<tr>
<td>XLPE cables and trenches within the substation boundary (Substation)</td>
<td>Twice a year to prevent disease</td>
<td>O&amp;M Team</td>
<td></td>
</tr>
</tbody>
</table>

**Environmental Code of Practice (ECoP)**


**Special Environmental Clauses (SECs) for Tender Document**

Apart from the provisions Contract under “General Specification” and “Particular Specification” for different sub-projects, a number of special environmental clauses (SECs) shall be included in the Tender Document under General/Particular Specification (see Section 4.13). These clauses are aimed at ensuring that the Contractor carries out his responsibility of implementing the EMP and other environmental and safety measures.

**Social Management Framework**

Figure E-1 shows the social management flow chart for the proposed project. The social management of the proposed project will start with identification/formulation of sub-projects with community involvement. It will be followed by social (as well as environmental) screening of the sub-project. Based on the social (and environmental) screening, the nature of further social assessment would be determined. If a sub-project is found to have no significant social safeguard issues (e.g., loss of land/income, impact on tribal people), only a social safeguard report (SSR) needs to be prepared summarizing the findings of the screening. On the other hand, if the screening identifies social safeguard issues, the sub-project would be categorized as “Red” (according to ECR 1997), SIA, along with preparation of RAP and TPP, if needed (in addition to EIA). Guidelines for the preparation of SIA and preparation of RAP and TPP have been provided in the ESMF report. After obtaining necessary clearance from DoE (and also WB), the sub-project will proceed to implementation phase, during which the provisions of the EMP, RAP and TPP will be executed, with monitoring by BREB/PGCB.
**Guidelines for Carrying out SIA**

The major activities carried out for SIA include: (a) Baseline social surveys within sub-project influence area; (b) Identification and scoping of possible social impacts of the proposed sub-project activities, and selection of parameters for social impact assessment; (c) Prediction and evaluation of social impacts and suggestion of mitigation measures to offset adverse impacts; (d) Public/stakeholder consultations, including Focus Group Discussions (FGDs) and interviews; (e) Preparation of SIA, as well as RAP, and TPP reports (if needed).

**Socio-economic baseline**

A common approach for assessment of baseline socio-economic condition is questionnaire survey. The primary objectives of a questionnaire survey are: (a) to understand people’s socio-economic condition; (b) to understand extent of people’s access to basic services; and (c) to understand people’s perception regarding the sub-project. A sample questionnaire for baseline socio-economic survey is presented in Appendix J.
**Project activities and parameters for SIA**

The ESMF provides detail description of activities during construction and operational phases of these sub-projects (see Chapter 3). The socio-economic impacts from implementation of the proposed sub-projects include loss of land (for substations); loss of income; impact on tribal population, impact on archaeological/historical sites; traffic congestion; and employment generation. This SMF provides guidelines for assessment of social impacts focusing on loss of land and income, and associated resettlement, and impact on tribal population. The guidelines for addressing the other socio-economic parameters are presented in Chapter 4.

**Public/stakeholder consultation**

Consultation and community participation will be undertaken at subproject identification, planning, design, implementation and evaluation stages. Consultation and participation involving communities and other stakeholders will take place through interpersonal communications, focused group discussions (FGDs) and small and large community meetings. Additionally, radio broadcast and other media forms may be used to further disseminate information. Appendix I presents guidelines for carrying out public consultations at different stages of a sub-project cycle.

**Land requirement and RAP**

The following social safeguard principles would be applied with regard to land requirement for the proposed project:

- Acquisition of private and public lands causing physical displacement of people will be avoided or minimized to the extent possible.
- In unavoidable circumstances, if land is vitally needed, BREB/PGCB may seek voluntary contribution from the concerned land owners, and/or explore alternatives to voluntary contribution without coercion or threat of sanctions. However, voluntary contribution should not be considered for lands more than 1 (one) decimal in size. Besides, owner’s socio-economic background and land use pattern (e.g., if the land in question is his/her primary source of income, if the land is vacant/ fallow) should be considered when considering voluntary contribution. Voluntary nature of the transfer has to be well documented and verifiable.
- BREB/PGCB may also opt to purchase the required lands directly through negotiation and get them in exchange of similar lands or on contribution against compensation.
- BREB/PGCB may purchase land directly from private owners via the Land Purchase Committees; but the process has to be transparent, a verifiable reasonable benchmark for market price has to be established, purchase price should be at current market price and the price should include the costs of taxes and transfers, and copies of deeds is to be shared with the WB. In case of direct purchase of land, RAP will not be required.

However, certain sub-projects (e.g., a substation) may require acquisition of private land and involve population displacement. Once it is determined through the social screening that a sub-project will require land, involve population displacement or loss of livelihoods, a Resettlement Action Plan (RAP) needs to be prepared. Raps are designed to ensure that impacts arising from...
land acquisition, displacement and relocation are mitigated, managed and compensated and livelihoods of displaced persons are restored. Appendix K presents detailed guidelines for preparation of RAP.

**Tribal Peoples Plan (TPP)**

The general sub-project areas in Chittagong and Sylhet division may have small concentrations of tribal inhabitants. The project has taken the exclusion criteria to avoid any negative impact on the tribal communities due to undertaking of the project in those areas. The project rather, intends to extend the benefits towards their welfare. However, detailed guidelines have been prepared for preparation of TPP (in Appendix L), following the World Bank’s Operational Policy on Indigenous Peoples (OP 4.10), to maximize benefits to the tribal peoples.

**Institutional Arrangement and Responsibility**

Figures E-2 and E-3 show activities and institutional responsibilities for overall implementation of the Proposed Rural Electricity Transmission and Distribution Project by BREB and PGCB, respectively. It is noted that BREB agreed to set-up a formal Environment and Social Management Unit/Cell with qualified staff in the regular organogram. For an interim measure, BREB will set-up a Project specific Environment and Social Management Unit under the PMU. PGCB also is in the process of creating an Environment and Social Unit (ESU) in the regular organogram.

**Grievance Redress Mechanism**

A GRC will be formed for each sub-project, headed by the Chairman / Mayor of relevant area. Members will be taken to represent the communities and other stakeholders including representative of local administration, school teachers, local NGOs, women and ward level elected representatives. The GRC will be a forum where people will exercise their rights of participation in the project cycle through suggestions and complaints. GRCs will also be para-legal court of the project to address local problems and complaints related to social and environmental impacts. Appendix M provides detailed description and operational details of GRM.

**Training Requirements**

BREB (with support from PBS officials) and PGCB will be responsible for carrying out “environmental/social screening” and “analysis of alternatives” following the ESMF. Therefore, basic training on regulatory requirements, environmental impacts, and environmental assessment and management would greatly improve the capability of relevant BREB and PGCB engineers and experts in carrying out their responsibilities. Both BREB and PGCB will employ individual/supervision/DSM consultant, who would support BREB/PGCB in overall environmental management. However, since the overall responsibility of environmental management lies with PBS/BREB/PGCB, they need to ensure that the consultants are carrying out their responsibilities properly. For this purpose, it is important that the PBS/BREB/PGCB engineers/officials receive advanced training on environmental management and monitoring.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| Identification of sub-project Prepare/ complete:  
  • Sub-project Description (Form-1)  
  • Environmental/social Screening (Form-2)  
  • Analysis of Alternatives (Form-3) | PBS with support from Consultant |
| Review of project documents, including Forms-1, 2 and 3 and Screening/ assessment | Project Environmental and Social Unit (ESU) and Environment specialist of Supervision Consultant |
| Additional Environmental/ Social Assessment (ESA) | Independent consultant |
| Carry out: (a) IEE and EMP or (b) full scale ESIA (including RAP, TPP, if needed); following the ESMF | Project ESU and Environment specialist of Supervision Consultant |
| (1) Review of ESA by BREB  
(2) Obtaining necessary environmental clearance from the DoE and WB | EMP will Implemented by the Contractor and supervised by PBS, with periodic monitoring by Supervision Consultant and project ESU. The RAP and TPP will be implemented by an NGO hired by the BREB under the supervision of the ESU and in coordination with the Contractor |
| Implementation of EMP/RAP/TPP/ ECoP during “construction phase” of project components | One monitoring report by PBS based on monitoring report as prepared by Contractor. Another by Supervision Consultant and ESU; and one by the NGO on social safeguards |
| Preparation of quarterly progress and monitoring reports | NGO and PBS with support from ESU of BREB |
| Implementation of EMP/ SMF during “operational phase” of project components, including monitoring and quarterly reporting | |

**Figure E-2:** Institutional set up, including major activities and assignment of responsibility for their execution, for implementation of proposed project by the BREB
<table>
<thead>
<tr>
<th>Activity</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of sub-project Prepare/ complete: • Sub-project Description (Form-1) • Environmental/social Screening (Form-2) • Analysis of Alternatives (Form-3)</td>
<td>Individual Consultant of Power Cell with PGCB field level staff</td>
</tr>
<tr>
<td>Review of project documents, including Forms-1, 2 and 3 and Screening / assessment</td>
<td>Individual Consultant of project and Environment and Social Unit, PGCB</td>
</tr>
<tr>
<td>Additional Environmental/ Social Assessment (ESA)</td>
<td>Independent consultant</td>
</tr>
<tr>
<td>Carry out: (a) IEE and EMP or (b) full scale ESIA (including RAP, TPP, if needed); following the ESMF</td>
<td>Individual Consultant of project and Environment and Social Unit (ESU) of PGCB</td>
</tr>
<tr>
<td>(3) Review of ESA by PGCB (4) Obtaining necessary environmental clearance from the DoE and WB</td>
<td></td>
</tr>
<tr>
<td>Implementation of EMP/RAP/TPP/ ECoP during “construction phase” of project components.</td>
<td>The RAP and TPP will be implemented by an NGO hired by PGCB under the direct supervision of the ESU and in coordination with the Contractor. EMP will be implemented by Contractor and Supervised by PGCB’s field staff, with periodic monitoring by Individual Consultant and ESU of PGCB</td>
</tr>
<tr>
<td>Preparation of quarterly progress and monitoring reports</td>
<td>Social safeguard report will be prepared by the NGO. One monitoring report will be prepared by the Contractor. Another report by Individual Consultant and ESU of PGCB.</td>
</tr>
<tr>
<td>Implementation of EMP/ SMF during “operational phase” of project components, including monitoring and quarterly reporting</td>
<td>NGO and PGCB’s field staff with supports from ESU of PGCB</td>
</tr>
</tbody>
</table>

**Figure E-3:** Institutional set up, including major activities and assignment of responsibility for their execution, for implementation of proposed project by the PGCB
Budget

The tentative cost estimates and the budget for the remaining suggestive activities, covering both EMF and SMF, have been made and presented in Table E-11. The cost estimates for some of the mitigation measures as will be identified in the EMP that are be part of civil works contract.

Table E-11: Tentative cost estimates for environmental and social management

<table>
<thead>
<tr>
<th>Activities</th>
<th>Amount (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Budget for ESA Consultants</strong></td>
<td></td>
</tr>
<tr>
<td>• For first year project preparation (PGCB)</td>
<td>10,000</td>
</tr>
<tr>
<td>• Preparation of full ESA, if required for subprojects (BREB)</td>
<td>90,000</td>
</tr>
<tr>
<td>• Preparation of full ESA, if required for subprojects (PGCB)</td>
<td>25,000</td>
</tr>
<tr>
<td>• Social Accountability</td>
<td>75,000</td>
</tr>
<tr>
<td><strong>Training Requirements</strong></td>
<td></td>
</tr>
<tr>
<td>• BREB</td>
<td>150,000</td>
</tr>
<tr>
<td>• PGCB</td>
<td>80,000</td>
</tr>
<tr>
<td><strong>Preparation of Environment and Occupational Health &amp; Safety Strategy and Guidelines</strong></td>
<td></td>
</tr>
<tr>
<td>• BREB</td>
<td>90,000</td>
</tr>
<tr>
<td>• PGCB</td>
<td>80,000</td>
</tr>
<tr>
<td><strong>EMP during construction</strong></td>
<td>Will be included in Civil Works</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

1.1 Background

1. To meet the growing electricity demand and to meet the goal of universal access by 2020, the GoB has taken a plan to add more than 11,500MWs electricity to the national grid by the year 2015. To evacuate the additional power, enhancements and extensions are needed in the transmission network of the Power Grid Company of Bangladesh (PGCB) and in the rural distribution network of the Palli Biddyut Samities (PBSs) under Bangladesh Rural Electrification Board (BREB). The proposed “rural electricity transmission and distribution project” involves rehabilitation and augmentation of the 33/11 kV network operated by the Palli Biddyut Samities (PBSs) under the Rural Electrification Board (BREB), transmission enhancement of the Power Grid Company of Bangladesh (PGCB), and capacity building of BREB, the PBSs and PGCB as well as implementation of reform action plan for BREB/PBSs.

2. Many of the 33/11 kV substations and distribution lines managed by the BREB are now overloaded. Over the years, many 33/11 kV distribution lines were extended long distances away from the substations resulting in poor voltage profiles and high system losses. The rural grid system therefore needs augmentation and rehabilitation to improve the quality and reliability of power supply and to improve system efficiency, while catering to the growing load. A study under the IDA financed Rural Electrification and Renewable Energy Development (RERED) identified the need for new 33/11 kV lines and substations; the study also developed a low-cost design for 132/33 kV substations to be operated by PGCB to supply electricity to the rural grid of the BREB/ PBSs. Under the proposed project, the BREB plans to implement the augmentation and rehabilitation needs in the eastern part of Bangladesh (Dhaka, Chittagong, and Sylhet Divisions) with the support of the World Bank.

3. The PGCB currently owns and operates 2,600 km of 230 kV lines and 5,800 km of 132 kV lines, and transmits power from the sector’s single-buyer, Bangladesh Power Development Board (BPDB), to the distribution entities including the PBSs under the BREB. Under the proposed project, the PGCB also intends to enhance its capacity by constructing and upgrading 132 kV lines and 132/33 kV substations.

4. The major components of the proposed project include the following:

Component A: Rural Grid Augmentation and Rehabilitation

5. The component will support the augmentation and rehabilitation needs of 37 PBSs in the eastern part of Bangladesh (Dhaka, Chittagong, and Sylhet Divisions). The proposed investment will reduce systems losses while improving the reliability and quality of supply. The proposed physical targets under the component are summarized in Table 1.1.

1 Similar project for the western part of Bangladesh (Rajshahi, Khulna and Barisal divisions) are under implementation with support from the Japan International Cooperation Agency (JICA).
Table 1.1: Physical components under Component A of the proposed project

<table>
<thead>
<tr>
<th>Network Item (km)</th>
<th>Dhaka Division</th>
<th>Sylhet and Chittagong Divisions</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>33kV lines new &amp; upgrade</td>
<td>2078</td>
<td>1398</td>
<td>3476</td>
</tr>
<tr>
<td>11kV New Line</td>
<td>1530</td>
<td>990</td>
<td>2520</td>
</tr>
<tr>
<td>Total 33kV &amp;11kV Line (km of Lines)</td>
<td>3608</td>
<td>2388</td>
<td>5996</td>
</tr>
<tr>
<td>Switching Stations (Nos.)</td>
<td>22</td>
<td>11</td>
<td>33</td>
</tr>
<tr>
<td>33/11 kV New Substation (Nos.)</td>
<td>73</td>
<td>37</td>
<td>110</td>
</tr>
</tbody>
</table>

Component B: Transmission Enhancement

6. The 33/11 kV network development study identified 13 grid (230/132/33 kV) substations that will be needed for the rural distribution network in the project areas. Out of these substations, 6 are included in the Project to be implemented by the PGCB. One of these substations will be piloted as per the low-cost design suggested under the study. PGCB has also identified a few priority investments in the 132 kV line network to remove the bottlenecks and cater to the growing load in the PBS areas, which will be supported under the proposed project. The proposed physical targets under the component are summarized in Table 1.2.

Table 1.2: Physical components under Component B of the proposed project

<table>
<thead>
<tr>
<th>132 kV new line (km)</th>
<th>132 kV Re-conductoring (km)</th>
<th>New Substation (No)</th>
<th>Upgradation of Substation</th>
<th>Power Transformers</th>
</tr>
</thead>
<tbody>
<tr>
<td>225</td>
<td>458</td>
<td>6</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Component C: Institutional Strengthening

7. Various institutional strengthening needs are expected to be supported under this component as and when needs arise. The expected support would include, among others: (a) tariff study for ensuring financial sustainability of the PBSs; (b) energy audit, updating of BREB master plan; (c) identification of the scope of implementation of the Geographic Information System (GIS); (d) upgradation of MIS system (including inventory management, computerization of accounting systems in BREB); (e) data management systems improvement including support to BREB to improve the capturing and reporting of system reliability and quality indicators (SAIDI, SAIFI, etc.); (f) implementation support for BREB/PBS reform action plan; and (g) training on e-GP and other training and capacity building activities for BREB and PGCB, etc.

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2 While the line lengths and substation numbers have been identified based on network design studies, the exact line routes and substation locations have not been identified yet. Exact line routes and substation locations will be selected based on environment and social screening/assessment as per the ESMF.

3 The exact locations and types for the substations have not been identified yet, which will be determined based on environment and social screening/assessment as per the ESMF.
8. The preliminary cost estimates for the proposed project is as below.

<table>
<thead>
<tr>
<th>Project Components</th>
<th>Project Cost (million US$)</th>
<th>IDA Financing (million US$)</th>
<th>GoB/PBSs/PGCB Financing (million US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Rural Grid Augmentation and Rehabilitation</td>
<td>627</td>
<td>465</td>
<td>162</td>
</tr>
<tr>
<td>B. Transmission Enhancements</td>
<td>160</td>
<td>115</td>
<td>45</td>
</tr>
<tr>
<td>C. Institutional Strengthening</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. BREB</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2. PGCB</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

9. Since the IDA and GoB are the financing sources of the project, the environmental and social assessment of the proposed project should comply with the policies and legislative requirements of the World Bank and the GoB. Thus, the proposed project requires carrying out an Environmental and Social Assessment in accordance with the Environment Conservation Act 1995 (Amended in 2000, 2002 and 2010), the Environment Conservation Rules 1997, and the World Bank Safeguard Policies.

1.2 Framework Approach for Environmental and Social Assessment

10. The proposed project will be implemented in the eastern part of Bangladesh (Dhaka, Chittagong, and Sylhet divisions). However, the exact routes of transmission/distribution lines and substation locations are not identified at this stage. Therefore, a “framework approach” has been adopted for environmental and social assessment (ESA) of the proposed project. On behalf of BREB and PGCB, the Power Cell engaged BRTC, BUET to carry out an Environmental and Social Assessment (ESA), and prepare an Environmental and Social Management Framework (ESMF) for the proposed project to ensure that the proposed infrastructure development takes environmental and social concerns into account.

11. In summary, the Environment and Social Management Framework (ESMF) has been prepared based on:

(a) Assessment of environmental practices in the recently completed and ongoing projects of PGCB and BREB;
(b) The overall baseline at selected sub-project areas;
(c) Evaluation of potential environmental and social impacts of different project components (or sub-projects) (e.g., transmission/distribution lines, substations) to be implemented under the proposed project;
(d) Development of component or sub-project specific standard mitigation measures (for negative impacts), enhancement measures (for positive impacts), and monitoring plan;
(e) Identification of institutional barriers and capacity needs for environmental and social management of all stakeholder organizations (including PGCB, BREB);
(f) Development of institutional arrangement with assignment of responsibilities for environmental and social management and monitoring of sub-projects; and
(g) Public consultations, including Focus Group Discussions (FGDs) involving a wide range of stakeholders.

12. To carry out “overall environmental and social assessment”, a number of existing substations (both 33/11 kV and 132/33 kV) and possible sites of proposed substations were visited in order to obtain first-hand information and insight on typical baseline scenario surrounding the existing and proposed project locations. Route surveys were carried out along proposed routes of new transmission/distribution lines as well as along transmission/distribution lines to be rehabilitated under the proposed project. In addition, social surveys were also carried out at selected project locations in order to gather and document baseline socio-economic conditions of these areas. Informal discussions were held with people living and working in the surrounding areas.

13. The details of “overall environmental and social assessment” (including baseline study and assessment of impacts) and public consultation have been presented in the Appendix N and Appendix O, respectively.

1.3 Objectives of ESMF

14. The ESMF presents general policies, guidelines and procedures to be integrated into the design and implementation of all components or sub-projects under the proposed project. The BREB and PGCB will adopt the ESMF, which lays out the guideline for the environmental and social impact assessment once the line routes and substation locations will be identified. Its overall objective is to assist PGCB and BREB to ensure that:

- Project components (i.e., transmission/distribution line, substations) are implemented considering potential environmental and social issues, especially of those people who would be directly benefited or impacted by the proposed project;
- Project components are designed considering unique socio-cultural and environmental situation prevailing at the areas where the specific project components would be implemented;
- Possible environmental and social impacts of sub-project activities during both construction and operational phases are identified during project formulation and design, and appropriate mitigation/enhancement measures are devised and monitoring plan prepared, as a part of the overall environmental and social management plans;
- Environmental Management Plan (EMP), Social Management Plan (SMP) and Environmental Code of Practices (ECoP) are properly followed; and
• Project activities comply with the relevant policies, rules and regulations of the GoB (e.g., Environmental Conservation Rules 1997) and safeguard policies of the WB. The PGCB/BREB will also be responsible for getting necessary environmental clearance from the Department of Environment (DoE).

15. In general, the ESMF is a guiding document for project-component specific:

• Environmental and social screening;
• Analysis of alternatives;
• Assessment of impacts (both positive and negative);
• Environmental and social impact assessment;
• Public consultation and disclosure;
• Environmental and social management plans (EMP, SMP);
• Implementation of EMP, SMP and ECoP; and
• Monitoring and reporting.
2.0 POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

16. The proposed Bangladesh Rural Electricity Transmission and Distribution Project will be implemented in compliance with applicable environmental laws and regulations. Bangladesh has an environmental legal framework that is conducive to both environmental protection and natural resources conservation. This environmental legal framework applies to the proposed project. In addition, a wide range of laws and regulations related to environmental issues are in place in Bangladesh. Many of these are cross-sectoral and partially related to environmental issues. This chapter presents an overview of the major national environmental laws and regulations that are relevant and may apply to activities supported by the project, institutional arrangement at national and sub-national level, and World Bank safeguard policies.

2.1 National Environmental Policies, Laws and Regulations

National Environmental Policy 1992

17. The concept of environmental protection through national efforts was first recognized and declared in Bangladesh with the adoption of the Environment Policy, 1992 and the Environment Action Plan, 1992. The major objectives of Environmental policy are to i) maintain ecological balance and overall development through protection and improvement of the environment; ii) protect country against natural disaster; iii) identify and regulate activities, which pollute and degrade the environment; iv) ensure environmentally sound development in all sectors; v) ensure sustainable, long term and environmentally sound base of natural resources; and vi) actively remain associate with all international environmental initiatives to the maximum possible extent.

Bangladesh Environmental Conservation Act (ECA), 1995 amended 2002

18. This umbrella Act includes laws for conservation of the environment, improvement of environmental standards, and control and mitigation of environmental pollution. It is currently the main legislative framework document relating to environmental protection in Bangladesh, which repealed the earlier Environment Pollution Control ordinance of 1977.

The main provisions of the Act can be summarized as:

- Declaration of ecologically critical areas, and restrictions on the operations and processes, which can be carried or cannot be initiated in the ecologically critical area;
- Regulation in respect of vehicles emitting smoke harmful for the environment.
- Environmental Clearance;
- Regulation of industries and other development activities with regards to discharge permits;
- Promulgation of standards for quality of air, water, noises and soils for different areas for different purposes;
- Promulgation of standard limits for discharging and emitting waste; and
- Formulation and declaration of environmental guidelines;
19. The first sets of rules to implement the provisions of the Act were promulgated in 1997 (see below: “Environmental Conservation Rules 1997‟”). The Department of Environment (DoE) implements the Act. DoE is headed by a Director General (DG). The DG has complete control over the DoE and the main power of DG, as given in the Act, may be outlined as follows:

• Identification of different types and causes of environmental degradation and pollution;
• Instigating investigation and research regarding environmental conservation, development and pollution.
• Power to close down the activities considered harmful to human life or the environment.
• Power to declare an area affected by pollution as an Ecologically Critical Area. Under the Act, operators of industries/projects must inform the Director General of any pollution incident. In the event of an accidental pollution, the Director General may take control of an operation and the respective operator is bound to help. The operator is responsible for the costs incurred and possible payments for compensation.

20. The Act was amended in 2006 (SRO No. 175-Act/2006 dated August 29, 2006) on collection and recycling of used/non-functional batteries for conservation of environment, improving environmental standard and control and prevention of environmental pollution. According to this amendment, no recycling of battery will be permitted without environmental clearance of DOE. This also restricted the improper disposal of used batteries or any parts of used battery in open place, water bodies, waste bins etc. All used batteries must be sent to the DOE approved battery recycling industry at earliest convenience. No financial transaction was allowed for used/non-functional batteries. However, the act was amended on same issue again in 2008 (SRO No. 29-Act/2008 dated February 11, 2008) to allow financial transaction on mutually agreed fixed cost.


21. These are the first set of rules, promulgated under the Environment Conservation Act 1995. Among other things, these rules set (i) the National Environmental Quality Standards for ambient air, various types of water, industrial effluent, emission, noise, vehicular exhaust etc., (ii) requirement for and procedures to obtain Environmental Clearance, and (iii) requirements for IEE/EIA according to categories of industrial and other development interventions.

22. However, the rules provide the Director General a discretionary authority to grant ‗Environmental Clearance‘ to an applicant, exempting the requirement of site/location clearance, provided the DG considers it to be appropriate.

24. The first step of obtaining *Environmental Clearance* for the project the proponent is to apply for it in prescribed form, together with a covering letter, to the Director/Deputy Director of respective DoE divisional offices. The application should include a project feasibility study report, the EIA report, *No Objection Certificate* (NOC) of the local authority; Mitigation Plan for minimizing potential environmental impacts; and appropriate amount of fees in ‘treasury chalan’ (in the present case the amount is BDT 50,000). The DOE authority reserves the right to request additional information, supporting documents, or other additional materials for the proposed project. Under the conditions specified in the Environment Conservation Rules-1997, the DoE divisional authority must issue environmental site clearance certificates within 60 working days from the date of submitting the application, or the refusal letter with appropriate reasons for such refusal. The clearance issued remains valid for a one-year period and is required to be renewed 30 days prior to its expiry date.

25. Environment Conservation Rules-1997 ensures the right of any aggrieved party to appeal against the notice order or decision to the appellate authority. The appeal should be made to the appellate authority with clear justification and the attested copy of the specific notice, order, or decision of the respective DoE office against, which the appeal is to be made. Prescribed fee is to be paid through treasury Chalan and the relevant papers for the appeal must be placed.

26. Rule 7 of Environment Conservation Rules (ECR) has classified the projects into following four categories based on their site conditions and the impacts on the environment; (a) Green, (b) Orange A, (c) Orange B and (d) Red. Various industries and projects falling under each category have been listed in schedule 1 of ECR 1997. According to the Rules, Environmental Clearance Certificate is issued to all existing and proposed industrial units and projects, falling in the Green Category without undergoing EIA. However, for category Orange A and B and for Red projects, require location clearance certificate and followed by issuing of Environmental Clearance upon the satisfactory submission of the required documents. Green listed industries are considered relatively pollution-free, and therefore do not require *site clearance* from the DoE. On the other hand, Red listed industries are those that can cause 'significant adverse' environmental impacts and are, therefore, required to submit an EIA report. These industrial projects may obtain an initial *Site Clearance* on the basis of an IEE based on the DoE’s prescribed format, and subsequently submit an EIA report for obtaining *Environmental Clearance*. Figure 1 shows the process of application leading to environmental clearance for all four categories of projects.
NOC = No Objection Certificate, usually obtained from local government.

Figure 1: Process of application for environmental clearance in Bangladesh (Source: ECR 1997)

National Land-use Policy, 2001

27. The Government of Bangladesh has adopted national Land use Policy, 2001. The salient features of the policy objectives relevant to the proposed are as follows:

- To prevent the current tendency of gradual and consistent decrease of cultivable land for the production of food to meet the demand of expanding population;
- To ensure that land use is in harmony with natural environment;
- To use land resources in the best possible way and to play supplementary role in controlling the consistent increase in the number of land less people towards the elimination of poverty and the increase of employment;
• To protect natural forest areas, prevent river erosion and destruction of hills;
• To prevent land pollution; and
• To ensure the minimal use of land for construction of both government and nongovernment buildings.

**Environment Court Act, 2000**

28. The aim and objective of the Act is to materialize the Environmental Conservation Act, 1995 through judicial activities. This Act established Environmental Courts (one or more in every division), set the jurisdiction of the courts, and outlined the procedure of activities and power of the courts, right of entry for judicial inspection and for appeal as well as the constitution of Appeal Court.

**Bangladesh Labor Act, 2006**

29. This Act pertains to the occupational rights and safety of factory workers and the provision of a comfortable work environment and reasonable working conditions. In the chapter VI of this law safety precaution regarding explosive or inflammable dust/ gas, protection of eyes, protection against fire, works with cranes and other lifting machinery, lifting of excessive weights are described. And in the Chapter VIII provision safety measure like as appliances of first aid, maintenance of safety record book, rooms for children, housing facilities, medical care, group insurance etc. are illustrated.

**Public Procurement Rule (PPR), 2008**

30. This is the public procurement rules of Bangladesh and this rule shall apply to the Procurement of Goods, Works or Services by any government, semi-government or any statutory body established under any law. The rule includes the adequate measure regarding the “Safety, Security and Protection of the Environment’ in the construction works. This clause includes mainly, the contractor shall take all reasonable steps to (i) safeguard the health and safety of all workers working on the Site and other persons entitled to be on it, and to keep the Site in an orderly state and (ii) protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of the Contractors methods of operation.

**Bangladesh National Building Code**

31. The basic purpose of this code is to establish minimum standards for design, construction, quality of materials, use and occupancy, location and maintenance of all buildings within Bangladesh in order to safeguard, within achievable limits, life, limb, health, property and public welfare. The installation and use of certain equipment, services and appurtenances related, connected or attached to such buildings are also regulated herein to achieve the same purpose.

32. Part-7, Chapter-3 of the Code has clarified the issue of safety of workmen during construction and with relation to this, set out the details about the different safety tools of
specified standard. In relation with the health hazards of the workers during construction, this chapter describes the nature of the different health hazards that normally occur in the site during construction and at the same time specifies the specific measures to be taken to prevent such health hazards. According to this chapter, exhaust ventilation, use of protective devices, medical checkups etc. are the measures to be taken by the particular employer to ensure a healthy workplace for the workers.

33. Chapter-1, part-7 of the Bangladesh National Building Code (BNBC), states the general duties of the employer to the public as well as workers - “All equipment and safeguards required for the construction work such as temporary stair, ladder, ramp, scaffold, hoist, runway, barricade, chute, lift etc. shall be substantially constructed and erected so as not to create any unsafe situation for the workmen using them or the workmen and general public passing under, on or near them”.

34. Chapter -1, Part -7 of the BNBC clearly sets out the constructional responsibilities according to which the relevant authority of a particular construction site shall adopt some precautionary measures to ensure the safety of the workmen. According to section 1.2.1 of chapter 1 of part 7, “in a construction or demolition work, the terms of contract between the owner and the contractor and between a consultant and the owner shall be clearly defined and put in writing. These however will not absolve the owner from any of his responsibilities under the various provisions of this Code and other applicable regulations and bye-laws. The terms of contract between the owner and the contractor will determine the responsibilities and liabilities of either party in the concerned matters, within the provisions of the relevant Acts and Codes (e.g.) the Employers' Liability Act, 1938, the Factories Act 1965, the Fatal Accident Act, 1955 and Workmen's Compensation Act 1923”. (After the introduction of the Bangladesh Labor Act, 2006, these Acts have been repealed).

35. To prevent workers falling from heights, the Code in chapter 3 of part 7 sets out the detailed requirements on the formation and use of scaffolding. According to section 11.2 of the same chapter, “every temporary floor openings shall either have railing of at least 900 mm height or shall be constantly attended. Every floor hole shall be guarded by either a railing with toe board or a hinged cover. Alternatively, the hole may be constantly attended or protected by a removable railing. Every stairway floor opening shall be guarded by railing at least 900 mm high on the exposed sides except at entrance to stairway. Every ladder way floor opening or platform shall be guarded by a guard railing with toe board except at entrance to opening. Every open sided floor or platform 1.2 meters or more above adjacent ground level shall be guarded by a railing on all open sides except where there is entrance to ramp, stairway or fixed ladder. The precautions shall also be taken near the open edges of the floors and the roofs”.

The Electricity Act, 1910

36. The main objective of this act is to amend the laws relating to the supply and use of electrical energy in Bangladesh. This act comprises of guidelines related to licenses, works, and supply for the supply of energy. It also includes guidelines related to supply, transmission and
use of energy by non-licensees. A licensee is a person authorized by the Government to supply energy in any specified area and permitted to lie down or place electric supply lines for the conveyance and transmission of energy. In Part II of this act, guidelines are provided for carrying out works for the supply of energy. This act includes guidelines related to the execution of any works involved in placing of any infrastructure in, under, over, along or across any street, part of a street, railway, tramway, canal or waterway. Also, information on lying of electric supply lines, aerial lines, or other works near sewers, pipes or other electric supply-lines or works is provided in Part II of the act. According to this act a licensee shall, in exercise of any of the powers conferred by or under this act, cause as little damage, detriment and inconvenience as may be, and shall make full compensation of any damage, detriment and inconvenience caused by him or by any one employed by him. In Part IV of this act, Protective Clauses are provided for protection of railways and canals/waterways, docks, wharves and piers, telegraphic, telephonic and electric signaling lines. Part IV also includes guidelines for occurrences of any criminal offences such as dishonest abstraction of energy, installation of artificial means, malicious wasting of energy or injuring works, theft of line materials, tower members, equipment etc. and subsequent procedures to follow up that criminal offence.

Electricity (Amendment) Act, 2012 (Draft)

37. This act is an amendment to The Electricity Act, 1910. In addition to the guidelines provided in the original act (The Electricity Act, 1910), this act includes more specific instruction relating to obligation on licensee to supply energy. According to section 22A (Sub section 1) of this act: a person authorized by a license, or exempted from the requirement to obtain a license, to generate, transmit, distribute or supply electricity – (a) shall, in generating, transmitting, distributing or supplying electricity, have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and (b) shall do what the person reasonably can to mitigate any effect which such generation, transmission, distribution or supply would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects. In section 22A (Sub-section 2) it is mentioned that, without prejudice to the provisions of Sub-section (1), a person authorized by a license, or exempted from the requirement to obtain a license, to generate, transmit, distribute or supply electricity and the Commission shall, in generating, transmitting, distributing or supplying electricity, or as the case may be, in the discharge of the Commission’s functions, avoid, so far as reasonably practicable, causing injury to fisheries or to the stock of fish in any waters. section 22A (Sub-section 3 and 4) of this act also mentions that a generation licensee shall, in circumstances specified by the Commission, be entitled to construct, subject to conditions specified by the commission in consultation with the relevant water authority, water ways and pipelines, and to use water for its licensed activities and the relevant water authority shall not unreasonably deny such right. For this purpose the ‘relevant water authority’ means such authority, as the Commission shall determine.
2.2 National Social Policies, Laws and Regulations

38. Infrastructure development projects using lands in Bangladesh is designed and implemented under the legislative and regulatory framework to compensate the affected persons due to land acquisition using the power of eminent domain. Whenever it appears to the Government that any property in any locality is needed or is likely to be needed for any public purpose or in the public interest, the property is acquired using existing laws and regulations. Land acquisition is governed by the Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ordinance II of 1982). The ordinance supersedes earlier laws including the Land Acquisition Law of 1894 and others that have been in force between 1947 and 1982. In addition to the Ordinance, acquisition of any land or forest area in Chittagong Hill-Tracts (CHT) districts requires consent under the Chittagong Hill-Tracts (Land Acquisition) Regulation 1958, the CHT Regional Council Act 1998 and the Forest Act (1927). There is no national policy in Bangladesh governing social effects of infrastructure development projects on the project area communities. However, the Constitution of Bangladesh provides some rights to the affected persons, communities and groups those are not upheld in the Ordinance II of 1982 which is the instrument followed for land acquisition. The active instruments under the legislative and regulatory framework in Bangladesh are discussed below:

Constitution of Bangladesh

39. The fundamental rights under the Constitution indicate the general guidelines for a policy on resettlement/rehabilitation of citizens adversely affected (whatever be the mechanism) due to any activity of the State. Article 40 of the constitution states categorically that every citizen has the right to practice any lawful occupation which implies that anything impeding such right (a) should not be done or (b) there should be supplementary measures to make good the losses incurred by the citizen. Resettlement and rehabilitation of adversely affected people due to infrastructure projects very clearly falls within this requirement for supplementary measures. However, as per Article 42, sub-clause 2, no law with provision of compensation for acquisition of land can be challenged in a court on the ground that such compensation has been inadequate. However, under World Bank OP 4.12 Involuntary Resettlement, every affected person will have access to a project specific Grievance Redress Mechanism for dispute resolution before the matter is moved to the courts. Complaints, the resolution process and the outcome will be reviewed by the project proponents as well as the Bank.

The Acquisition and Requisition of Immovable Property Ordinance, 1982

40. The principal legal instrument governing land acquisition in Bangladesh is the Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ordinance II of 1982 with amendments up to 1994) and other land laws and administrative manuals relevant to land administration in Bangladesh. According to the Ordinance, whenever it appears to the Government of Bangladesh that any property in any locality is needed or is likely to be needed for any public purpose or in the public interest, the Government can acquire the land provided that no property used by the public for the purpose of religious worship, graveyard and cremation ground. The 1982 Ordinance requires that compensation be paid for (i) land and
assets permanently acquired (including standing crops, trees, houses); and (ii) any other damages caused by such acquisition. The Deputy Commissioner (DC) determines (a) market value of acquired assets on the date of notice of acquisition (based on the registered value of similar property bought and/or sold in the area over the preceding 12 months), and (b) 50% premium on the assessed value (other than crops) due to compulsory acquisition. The 1994 amendment made provisions for payment of crop compensation to tenant cultivators. The law specifies methods for calculation of market value of property based on recorded prices obtained from relevant Government departments such as Registrar (land), Public Works Department (structures), Department of Forest (trees), Department of Agriculture (crops) and Department of Fisheries (fish stock). Given that people devalue land during title transfer to minimize tax payment, compensation for land paid by DC including premium largely remains less than the actual market price.

41. The Ministry of Land (MOL) is authorized to deal with land acquisition. The MOL delegates some of its authority to the Commissioner at Divisional level and to the Deputy Commissioner at the District level. The Deputy Commissioners (DCs) are empowered by the MOL to process land acquisition under the Ordinance and pay compensation to the legal owners of the acquired property. Khas (government owned land) lands should be acquired first when a project requires both khas and private land. If a project requires only khas land, the land will be transferred through an inter-ministerial meeting following the acquisition proposal submitted to DC or MOL as the case may be. The DC is empowered to acquire a maximum of 50 standard bigha (6.75 ha) of land without any litigation where the Divisional Commissioner is involved for approval. Acquisition of land more than 50 standard bigha is approved from the central land allocation committee (CLAC) headed by the chief executive of the Government of Bangladesh proposed by the MOL.

42. The land owner needs to establish ownership by producing record-of-rights in order to be eligible for compensation under the law. The record of rights prepared under 4.143 or 144 of the State Acquisition and Tenancy Act 1950 (revised 1994) are not always updated and as a result legal land owners have faced difficulties trying to “prove” ownership. The affected person (AP) has also to produce rent receipt or receipt of land development tax, but this does not assist in some situations as a person is exempted from payment of rent if the area of land is less than 25 bighas (3.37 ha).

**Constitutional Right of the Tribal People**

43. The Constitution of Bangladesh does not mention the existence of the cultural and ethnic minorities in Bangladesh. The only protective provision for the ethnic minorities that the policy makers often refer to is Article 28(4) which states that: Nothing shall prevent the state from making special provision in favor of women and children or for the advancement of any backward 4.of the citizens. The above provision is an ambiguous one and it does not define who or what constitutes "backward". However, the Government recognizes existence of “tribal peoples” and the need for special attention and in general tribal people are essentially viewed as backward, poor and socio-economically & culturally inferior. Towards this end a special
program was initiated in 1996-97 by the Prime Minister’s Secretariat aimed at improving the socio-economic situation of the indigenous people of Bangladesh, resident outside the Chittagong Hill Tracts.

**The Chittagong Hill Tracts Regulation 1900**

44. The Chittagong Hill Tracts Regulation, 1900 (Regulation I of 1900) is the regulatory framework for State sovereignty over the traditional rights of the tribal peoples living in the Chittagong Hill Tracts (CHTs) region. They are governed through Revenue Circle Chiefs who are local revenue collectors vide an amalnama (authorization by the Government). The Deputy Commissioner and the Commissioner from the Central Government reserve the authority to settle land to the hill-men or non-hill residents or lease out land (non-transferable) for rubber plantation or establishing industries in the CHTs. The regulation provides the right to possessing cultivable land up to 5 acres by hill men or non-hill residents. The headman is responsible for the conservation of the resources of his mouza through exercising his authority to (i) prohibit the removal of forest produces by residents of respective mouzas other than for their domestic purposes or by non-residents for any purpose, (ii) exclude any area or areas in his mouzas from the jhuming (shifting cultivation), (iii) prevent new comers from cutting jhums in his mouza, and (iv) prevent a person from grazing cattle in his mouza.

**The Chittagong Hill –Tracts (Land Acquisition) Regulation, 1958**

45. Most of the land in CHT belongs to the Government either as reserve forest or as unclassified state forest. The CHT Regulation I of 1900 was the sole legal instrument for the governance and administration of the Hill Tracts. Under the regulation, the DC could resume land even though settlement of the same might have been given earlier. The rule prescribed payment of compensation for various interests as in the case of land acquisition. In order to expedite the acquisition of land in CHT, the Government made the Chittagong Hill-Tracts (Land Acquisition) Regulation, 1958. This regulation has provision for payment of compensation for requisitioned property. The compensation may be fixed by agreement or by rules framed on this behalf.

**The CHT Regional Council Act, 1998**

46. The National Parliament of Bangladesh in 24 May 1998 passed the Peace Accord 1997 as the “Chittagong Hill Tracts Regional Council Act, 1998 (Act 12 of 1998). In addition to re-establishing peace, the Accord recognized the ethnic people’s right to land, culture, language, and religion. The Accord set out detailed provisions for strengthening the system of self-governance in the CHT, and redressing the most urgent land-related problems including resolution of land disputes by a commission on land, the transfer of authority for land administration to the hill district councils (HDCs), the cancellation of lease granted to non-residents during the conflict period, the distribution of land to ethnic or “tribal” villages, and the strengthening of customary land rights. Under this Act, no lands, hills and forests within the control and jurisdiction of the HDCs shall be acquired or transferred by the government without consultation and consent of the Regional Council. No law will be executed in the region which is not developed and enacted in consultation and agreement with the tribal peoples in CHT. A
ministry on CHT Affairs was established by appointing a Minister from among the tribal communities of hill districts. An Advisory Council from the CHT region assists this ministry.

2.3 Institutional Arrangements at National and Sub-national Levels

47. As outlined in the National Environment Policy (1992) and National Forest Policy (1994), the Ministry of Environment and Forests (MoEF) acts as the guide and custodian for the conservation and development of the environment and, in the pursuit of that goal, to ensure through appropriate laws and regulations that natural resources, including land, air, water and forests, are exploited and managed in an environmentally sustainable manner. The Department of Environment (DoE), formed in 1989 with a mandate for environmental management later formalized under the Environment Conservation Act, 1995 (ECA’95), acts as the technical arm of the Ministry and is responsible for environmental planning, management, monitoring and enforcement. The DoE is headed by a Director General, with Divisional offices in Dhaka, Chittagong, Bogra, Khulna, Barisal and Sylhet. The Environment Conservation Rules (1997) provide the Director General a discretionary authority to grant ‘Environmental Clearance' to an applicant, exempting the requirement of site/location clearance, provided the DG considers it to be appropriate.

48. The mandate of the Department has expanded over time, evolving from an exclusive focus on pollution control to include natural resources and environmental management, now covering:

- monitoring environmental quality;
- promoting environmental awareness through public information programs;
- controlling and monitoring industrial pollution;
- reviewing environmental impact assessments and managing the environmental clearance process; and,
- establishing regulations and guidelines for activities affecting the environment

2.4 World Bank Environmental and Social Safeguard Policies

49. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. Safeguard policies provide a platform for the participation of stakeholders in project design, and act as an important instrument for building ownership among local populations. The effectiveness and development impact of projects and programs supported by the Bank has substantially increased as a result of attention to these policies. The World Bank has ten environmental, social, and legal safeguard policies which are listed in the following:

Environmental policies:
- OP/BP 4.01 Environmental Assessment
- OP/BP 4.04 Natural Habitats
- OP/BP 4.09 Pest Management
- OP/BP 4.11 Physical Cultural Resources
- OP/BP 4.36 Forests
- OP/BP 4.37 Safety of Dams
50. Operational Policies (OP) are the statement of policy objectives and operational principles including the roles and obligations of the Borrower and the Bank, whereas Bank Procedures (BP) is the mandatory procedures to be followed by the Borrower and the Bank. Apart from these, the IFC guidelines for Environmental Health and safety have been adopted by the World Bank Group which is also relevant for environmental protection and monitoring. In addition to that the Policy on Access to Information of World Bank also relates to environmental safeguard. The environmental safeguard and access to information policy as well as the IFC guidelines are discussed below:

**OP/BP 4.01 Environmental Assessment**

51. This policy is considered to be the umbrella safeguard policy to identify, avoid, and mitigate the potential negative environmental and social impacts associated with Bank lending operations. In World Bank operations, the purpose of Environmental Assessment is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted. The borrower is responsible for carrying out the EA and the Bank advises the borrower on the Bank’s EA requirements. The Bank classifies the proposed project into three major categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts:

  - **Category A:** The proposed project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.
  - **Category B:** The proposed project’s potential adverse environmental impacts on human population or environmentally important areas-including wetlands, forests, grasslands, or other natural habitats- are less adverse than those of Category A projects. These impacts are site specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than Category A projects.
  - **Category C:** The proposed project is likely to have minimal or no adverse environmental impacts.

**OP/BP 4.04 Natural Habitats**

52. The conservation of natural habitats is essential for long-term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions in its economic and sector work, project financing, and policy dialogue. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. The Bank
does not support projects that involve the significant conversion or degradation of critical natural habitats.

**OP/BP 4.09 Pest Management**

53. The aim of the pest management policy is to minimize and manage the environmental and health risks associated with pesticide use and promote and support safe, effective and environmentally sound pest management. The procurement of any pesticide in a Bank-financed project is contingent on an assessment of the nature and degree of associated risks, taking into account the proposed use and the intended user. To manage pests that affect either agriculture or public health, the Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. In Bank-financed projects, the borrower addresses pest management issues in the context of the project’s environmental assessment. In appraising a project that will involve pest management, the Bank assesses the capacity of the country’s regulatory framework and institutions to promote and support safe, effective, and environmentally sound pest management.

**OP/BP 4.11 Physical Cultural Resources**

54. Physical cultural resources are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Their cultural interest may be at the local, provincial or national level, or within the international community. Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people’s cultural identity and practices. The Bank assists countries to avoid or mitigate adverse impacts on physical cultural resources from development projects that it finances. The impacts on physical cultural resources resulting from project activities, including mitigating measures, may not contravene either the borrower’s national legislation, or its obligations under relevant international environmental treaties and agreements. The borrower addresses impacts on physical cultural resources in projects proposed for Bank financing, as an integral part of the environmental assessment (EA) process.

**OP/BP 4.36 Forests**

55. Forest is defined as an area of land of not less than 1.0 hectare with tree crown cover (or equivalent stocking level) of more than 10 percent that have trees with the potential to reach a minimum height of 2 meters at maturity in situ. A forest may consist of either closed forest formations, where trees of various stories and undergrowth cover a high proportion of the ground, or open forest. The definition includes forests dedicated to forest production, protection, multiple uses, or conservation, whether formally recognized or not. The definition excludes areas where other land uses not dependent on tree cover predominate, such as agriculture, grazing or settlements. In countries with low forest cover, the definition may be expanded to include areas covered by trees that fall below the 10 percent threshold for canopy density, but are considered forest under local conditions. The Bank’s forests policy recognizes the importance of forests to reduce poverty in a sustainable manner integrates forests
effectively in economic development, aims to reduce deforestation, promote afforestation and enhance the environmental contribution of forested areas. The Bank assists borrowers with the establishment and sustainable management of environmentally appropriate, socially beneficial, and economically viable forest plantations to help meet growing demands for forest goods and services.

**OP/BP 4.37 Safety of Dams**

56. When the World Bank finances new dams, the Policy Safety on Dams requires that experienced and competent professionals design and supervise construction, and that the borrower adopts and implements dam safety measures through the project cycle. The policy also applies to existing dams where they influence the performance of a project. In this case, a dam safety assessment should be carried out and necessary additional dam safety measures implemented.

**OP/BP 4.12 Involuntary Resettlement**

57. This policy is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts. It promotes participation of displaced people in resettlement planning and implementation, and its key economic objective is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement. The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects.

**OP 4.10 Indigenous People**

58. The term “Indigenous Peoples” is used in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees:

- self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
- customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
- an indigenous language, often different from official language of the country/region.

59. The Bank provides project financing only where free, prior, and informed consultation results in broad community support to the project by the affected Indigenous Peoples. Such Bank-financed projects include measures to (a) avoid potentially adverse effects on the Indigenous Peoples’ communities; or (b) when avoidance is not feasible, minimize, mitigate, or compensate for such effects. Bank-financed projects are also designed to ensure that the Indigenous Peoples receive social and economic benefits that are culturally appropriate and gender and inter-generationally inclusive.
**OP/BP 7.50 Projects on International Waterways**

60. The World Bank recognizes the issues involving projects in international waterways and attaches importance to the riparians making appropriate agreements or arrangements for the entire waterway, or parts thereof. In the absence of such agreements or arrangements, the Bank requires, as a general rule, that the prospective borrower notifies the other riparians of the project. The Policy lays down detailed procedures for the notification requirement, including the role of the Bank in affecting the notification, period of reply and the procedures in case there is an objection by one of the riparians to the project.

**OP/BP 7.60 Projects in Disputed Areas**

61. The World Bank finances projects in disputed areas when either there is no objection from the other claimant to the disputed area, or when special circumstances of case support Bank financing, notwithstanding the objection. The policy details those special circumstances.

**IFC Environmental, Health and Safety Guidelines**

62. The Environmental, Health and Safety (EHS) Guidelines of the World Bank Group (WBG)/International Finance Corporation (IFC), 2008 is the safeguard guidelines for environment, health and safety for the development of the industrial and other projects. They contain performance levels and measures that are considered to be achievable in new facilities at reasonable costs using existing technologies. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures than those provided in these EHS Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

63. The section 4 of EHS Guidelines for “Construction and Decommissioning” provides additional, specific guidance on prevention and control of community health and safety impacts that may occur during new project development, at the end of the project life-cycle, or due to expansion or modification of existing project facilities.

**World Bank Policy on Access to Information**

64. In addition to the safeguard policies, the Access to Information Policy also relates to safeguards. To promote transparency and facilitate accountability, Bank Access to Information Policy supports decision making by the Borrower and Bank by allowing the public access to information on environmental and social aspects of projects in an accessible place and understandable form and language to key stakeholders. The Bank ensures that relevant project-related environmental and social safeguard documents, including the procedures prepared for projects involving subprojects, are disclosed in a timely manner before project appraisal formally begins. The policy requires disclosure in both English and Local language and must meet the World Bank standards.
2.5 Implications of National Policies and Regulations on the Proposed Project

65. The Environmental Conservation Rules (ECR) 1997 (DoE, 1997) classifies projects into four categories according to potential environmental impacts: (1) Green; (2) Orange A; (3) Orange B; and (4) Red. Green category projects are those with mostly positive environmental impacts or negligible negative impacts; Orange A category projects are those with minor and mostly temporary environmental impacts, for which there are standard mitigation measures; Orange B category project are those with moderately significant environmental impacts; while Red category projects are those with significant adverse environmental impacts. Upgradation/rehabilitation of power distribution line also appears to fall under “Red Category”, according to ECR 1997. Based on field visits to potential project sites and experience (of PGCB and BREB) from implementation of similar projects, it appears that upgradation/rehabilitation of transmission/distribution lines are not likely to generate significant environmental/social impacts. Such projects would not require acquisition of land, and would involve construction works along existing corridors of power lines. Therefore, for such upgradation/rehabilitation works, a thorough “environmental/social” screening should be carried out first (following guidelines presented in the ESMF); if the “screening” exercise does not indicate significant environmental/social impacts, the DoE should be approached for permitting less stringent requirement (e.g., IEE and EMP, as required for “Orange B” category projects) for obtaining environmental clearance of such upgradation projects. Construction/installation of substation is not specifically listed in the ECR 1997. Depending on the type of substation (132/33 kV or 33/11 kV) and technology employed (e.g., AIS/GIS substation), land requirement for a substation would vary from approximately 0.33 acre for an indoor type 33/11 kV substation to about 5 acres for a 132/33 kV air insulated switchgear (AIS) grid substation. Acquisition of private land usually generates significant adverse socio-economic impacts. Hence, for construction of a substation requiring land, direct purchase of land at prevailing market price is a preferred option. During field visits to potential projects sites as a part of overall environmental/social assessment, it was learnt that some of the substation under the proposed project would be constructed on Government owned land. For such substations, potential environmental and social impacts are not likely to be significant; these projects could potentially fall under “Orange A” or “Orange B”. The DoE should be approached for guidance in this regard, after carrying out a thorough “environmental/social” screening of such projects (following the guideline presented in the ESMF). These issues have been further discussed in section 4.4.

66. The BNBC, PPR 2008, Bangladesh Labor Act 2006 outlines guidelines for ensuring worker’s health and safety during construction works which would have direct implications in the proposed project. It would be the responsibilities of the contractors to make sure that these guidelines are followed in the workplace environment.

67. Acquisition and Requisition of Immovable Property Ordinance, 1982 may be followed in order to acquire land, if needed, for project components (e.g., substations) in all areas in Bangladesh except for the Chittagong hill tracts. For land acquisition issues in Chittagong hill tracts, the specific acts and regulations related to Chittagong Hill Tracts [The Chittagong Hill –
Tracts (Land Acquisition) Regulation, 1958, The Chittagong Regional Council Act, 1998] needs to be adhered to.

2.6 Implications of World Bank Safeguard Policies on the Proposed Project

68. According to WB Operational Policy (OP 4.01), the nature of environmental assessment to be carried out for a particular sub-project would largely depend on the category of the sub-project. As mentioned earlier, The World Bank Operational Policy (OP) 4.01 classifies projects into three major categories (category A, B and C), depending on the type, location, sensitivity and scale of the project, and nature and magnitude of potential impacts. The rural electricity distribution and transmission project will be a category B project according to World Bank classification, since no large-scale infrastructure investment or major expansion will be implemented under the proposed project. The environmental impacts of the project are expected to be mostly construction related and limited within the project boundaries.

69. It is highly unlikely that any natural habitat formed largely by native plant and animal species will be affected or modified during the construction phase of power transmission and distribution lines. However, the World Bank policy related to conservation of Natural Habitats (OP/BP 4.04) has been triggered as advance precautionary measures. Similarly, the World Bank Policy on Forest (OP/BP 4.36) has also been triggered since some of the transmission and distribution lines may cross forest areas. The possible impact on natural habitats and forest will be addressed through subproject specific environmental screening/assessment and EMP.

70. Since the routes are unknown at this stage, there is possibility that the transmission and distribution lines may pass through areas with physical cultural resources. However, the impacts will be examined as part of the environmental screening/assessment of different subprojects and the criteria for assessment have been provided in the ESMF. In addition, ‘Chance find’ procedures conforming to local legislation on heritage would be evaluated so that any physical or cultural resources are not impacted. Therefore, OP 4.11 (Physical Cultural Resources) has been triggered as advance precautionary measures.

71. The activities of the project will not involve any pesticide application, or activities in forest areas or relate to protection of dams. Hence OP 4.09 and OP 4.37 will not be relevant.

72. The transmission and distribution lines and substations may pass through areas where indigenous people live (specific subproject locations will be determined during implementation). As such OP 4.10 has been triggered for the project. The ESMF includes an Ethnic/ Tribal Peoples Development Framework, based on which site specific Ethnic/ Tribal Peoples Plan (ETPP) will be developed, as and when required.

73. The establishment of new sub-stations will require land; this may be public or private land depending on the routing of the lines and requirements of the substation location. Thus OP 4.12 has been triggered for the project.
74. The project components do not involve any infrastructure development in international waterways or in disputed areas. Therefore the World Bank safeguard policies OP/BP 7.50 and OP/BP 7.60 will not be triggered.

75. The IFC guidelines provide guidance on certain EHS issues, which include standards for environmental parameters (ambient air quality, water and wastewater quality, noise level, waste management), hazard and accident prevention, occupational and community health and safety (during commissioning and decommissioning works), etc. These guidelines will be directly applicable to the proposed project. As a general rule, the IFC guidelines should complement the existing Bangladesh guidelines or standards. In case the Bangladesh guidelines or standards differ from the IFC guidelines, project is expected to follow the more stringent ones.

76. The World Bank access to information policy would be directly followed. The project will make the environmental/social assessment and ESMF documents available to the public by publishing it in their websites. In addition, hard copies of these documents in English (including a summary in Bengali) will be made available in the local and head offices of the PGCB and BREB, so that the local stakeholders can gain access to it if they want.
3.0 MAJOR SUB-PROJECT ACTIVITIES

3.1 Construction of 33/11kV Substations

77. The environmental and social impacts of projects/sub-projects depend primarily on the baseline environment and the nature of project activities. The Chapter describes the typical activities that need to be carried out for implementing different project components (e.g. construction of distribution/transmission lines, substations) under the proposed rural electricity transmission and distribution project.

3.2 Construction of 33/11kV Substations

78. The power distribution system of the country is based on the power generation and transmission through the national grid, which eventually is fed into Substations capable of converting 33kV supply into 11kV and feeding the distribution system with the same. Most of the new substations will be of outdoor type, which typically requires about 0.33 acre land. A line diagram of the different units in a 33/11kV substation is shown in Figure 3.1.

![33/11kV Outdoor-type Substation](image)

**Figure 3.1:** Line diagram showing different units of a 33/11kV Substation

79. Once the selection and acquisition of land for the Substation are done, subsoil investigations have to be carried out to assess the suitability of the soil for construction of the Substation building and other infrastructure. The civil construction works include the
construction of the control room (building) along with the construction of the foundations for different equipment, followed by the construction of the boundary wall and the guard room.

80. After procurement of the 33kV auto reclosers, 11kV auto reclosers and the 33/1.732/11/1.732kV single phase transformers, these are installed in the switchyard within the Substation complex. It should be noted that the weight of such a transformer may exceed 15 tons. Connectivity with the incoming line and the switchgears and between the switchgears and the transformers and the outgoing lines is achieved by laying 33kV, 11kV and 0.415kV cables along with the control cables both inside and outside the control building. Lightening arrestors as well as earthing cable need to be installed to prevent damage of equipment due to lightening during a storm event. The “terminal structures” for the 33kV and 11kV lines need to be constructed within the premises of the Substation for final connectivity with the distribution system.

81. In summary, the following specific activities need to be considered for assessing environmental impacts during construction phase of a 33/11kV Substation.

- Acquisition (of purchase) of land for Substation (if needed);
- Mobilization of material and equipment;
- Civil works, including design and construction of foundation for structures, boundary walls, guard room, etc.;
- Installation of electrical equipment, including 33kV and 11kV Auto reclosers, 33/1.732/11/1.732kV transformers, construction of Terminal structures for 33 and 11kV lines; and
- Testing and commissioning of Substation.

3.3 Construction of 33kV and 11kV Distribution Lines

82. The first step in construction of distribution lines involves conducting a survey of the probable routes. A topographical survey is often conducted along the selected route to assess the need for ground modification and/or preparation. Spun Pre-stressed Concrete (SPC) poles are erected along the selected routes at designated intervals. The height of the poles depends on the supply power. Usually, 16m poles are used for 33kV distribution line, which is also used simultaneously to extend the 11kV and 0.415kV lines. H-poles are used to mount the 11/0.415kV transformers from which three phase lines are extended to the domestic users. Figure 3.2 shows a schematic diagram of H-pole with dual lines for 33kV and 11kV power distribution.

83. After procuring, the SPC poles are stacked along the route at designated storage areas beside the road. A hydraulic jack and drilling rig equipped truck is generally used for the installation of the SPC poles. First, the existing short poles are pulled out and the exposed hole is enlarged and deepened by the truck-mounted drilling rig and the 16m SPC poles (with two concrete blocks at the bottom) are inserted with the help of the hydraulic elbow-jack mounted on the truck. Following erection of poles, assortments are installed for extending the 33kV, 11kV and 0.415kV lines. A copper wire is passed through the poles into the ground to secure
earthing. Lightening arrestor is installed at the top. Drop fuses are mounted on top of the H-poles to prevent short-circuiting.

84. Thus, for the purpose of assessing environmental impact, the following activities related to the construction of 33kV and 11kV lines have been considered in the present study.

- Route survey and analysis of alternative routes for finalizing alignment of distribution lines;
- Mobilization of material and equipment, including procurement of SPC poles, conductor and line materials;
- Construction of distribution lines including erection of the SPC poles using a truck equipped with hydraulic jack and drilling rig; about 45 minutes is required for the erection of a distribution pole;
- Clearing of right of way by cutting/trimming trees where necessary;
- Stretching of cables across poles; and
- Checking, testing and commissioning of distribution line.

Figure 3.2: Typical H-Pole Arrangement along 33 kV and 11kV Distribution Lines
3.4 Rehabilitation of 33 kV Distribution Lines

85. Bangladesh Rural Electrification Board (BREB) is using some old 33KV lines of Bangladesh Power Development Board (BPDB). There are some damaged towers, under specified steels poles, concrete poles, pre-stressed concrete poles, under size conductors, insulators, fittings, clamps, etc. in the old lines. The old lines are to be replaced with 16m pre-stressed concrete poles, higher size (477MCM) conductor, new insulators, clamps, fittings, etc. The old lines are to be rerouted. New grounding of each pole is to be carried out. Thus, the major activities involved in the rehabilitation of 33 kV distribution lines include:

- Mobilization of materials including procurement of SPC Poles, Conductor, earth wire and line materials;
- Construction of new distribution line including replacement of damaged towers, under specified poles by SPC, damaged clamps and fittings by new ones, and replacement of undersize conductor and earth wire by 477MCM conductor and new earth wire;
- Clearing of right of way by cutting/trimming trees where necessary; and
- Testing and commissioning.

3.5 Construction of 132 kV Transmission Lines

86. The first step in the construction of transmission lines involves conducting a survey of the probable routes. A topographical survey is often conducted along the selected route to assess the need for ground modification and/or preparation. In some cases, acquisition (or purchase) of land may be required for construction of transmission tower. Towers are erected along the selected route at designated intervals. Finally, after completion of construction works, checking, testing and commissioning of the transmission lines are carried out.

87. In summary, the following specific activities need to be considered for assessing environmental impacts during construction phase of 132 kV transmission lines.

- Route survey and analysis of alternative routes for finalizing alignment of transmission line;
- Acquisition (or purchase) of land (if required) for construction of transmission tower;
- Mobilization of material and equipment, including procurement of towers components, conductor and line materials;
- Construction of transmissions lines including erection of the towers;
- Clearing of right of way by cutting/trimming trees where necessary;
- Stringing of conductor and earth wire after fixing clamps, insulators; and
- Checking, testing and commissioning of transmission line.

3.6 Rehabilitation of 132 kV Transmission Lines

88. In transmission system of Power Grid Company of Bangladesh, there are 132 kV lines of more than 30 years old, feeding power to old 132/33 kV Substations. Due to aging, the capacity of the conductors is less than the rated value. The earth wire connected to line is damaged due to aging. The fittings, clamps, insulators, etc. are not in good condition due to aging. The groundings of towers need to be replaced. The old conductors need to be replaced by higher
size conductors. Old earth wire, old insulators, clamps and fittings, etc. are to be replaced by new ones. Thus, the major activities involved in the rehabilitation of 132 kV transmission lines include:

- Detailed survey of existing 132 kV lines;
- Mobilization of materials, including procurement of conductors, earth wire and line materials;
- Replacement of damaged clamps, fittings and insulators by new ones;
- Stringing of higher size conductors by replacing old ones;
- Stringing of new earth wire by replacing old ones;
- Clearing right of way by cutting/trimming trees; and
- Testing and commissioning.

### 3.7 Construction and Installation of 132/33 kV Sub-stations (GIS and AIS)

89. Most of the new substations to be constructed under the proposed project will be of Indoor Type (GIS) and Outdoor Type (AIS), which typically requires about 3 acres and 5 acres of land, respectively. However, where adequate land is not available, it is possible to construct such a substation on a smaller piece of land. A line diagram of the different units of an Indoor Type 132/33kV substation is shown in Fig. 3.3. As shown in Fig. 3.3, the 132kV and 33kV Switchgears are installed inside a building, which serves as a control center for the substation. The transformers are installed outside in the Switchyard.

90. Once the selection and acquisition of land for the substation are completed, subsoil investigations have to be carried out to assess the suitability of the soil for construction of the building and other infrastructure. The civil construction works include the construction of the control room (building) along with the construction of the foundations for different equipment, followed by the construction of the boundary wall and the guard room.

91. For GIS Substation, the 132kV switchgears, 33kV switchgears along with the control panels are installed inside the control building. Installation of the 132/33kV transformers for the distribution system and the 33/0.415kV transformer for the Substation is done in the switchyard within the Substation complex (Fig. 3.4). It should be noted that the weight of such transformer may exceed 100 tons. Connectivity with the incoming line and the switchgears and between the switchgears and the transformers and the outgoing lines is achieved by laying 132kV, 33kV and 0.415kV cables along with the control cables both inside and outside the control building. Lightening arrestors as well as earthing cable need to be installed to prevent damage of equipment due to lightening during a storm event. The “terminal structures” for the 132kV and 33kV lines need to be constructed within the premises of the Substation for final connectivity with the transmission system.
92. Prior to stretching the cables, danger trees are trimmed along the cable route. In level terrains, trees, which would reach within 1.524m of a point underneath the outside conductor, are examples of danger trees. As directed by the Engineer-in-Charge, portions of these trees are cut along the right of way so that the movement of trucks and tractors is not hampered by the stumps (Fig. 3.5). In summary, the following specific activities needs to be considered for assessing environmental impacts during construction phase of a 132/33kV Substation:

- Acquisition (or purchase) of land for substation (if needed);
- Mobilization of material and equipment;
- Civil works, including design and construction of control room building, boundary walls, guard room, etc.;
- Installation of electrical equipment, including 132kV and 33kV switchgear, 132/33kV transformers, 33/0.44kV station service transformer, laying of 132, 33 and 0.415kV power cables and control cables, construction of Terminal structures for 132 and 33 kV lines; and
- Testing and commissioning of Substation.
3.8 Operation of Substations

The maintenance operation involves monitoring of transformers, which is usually done by performing Acidity tests of transformer oil at regular interval. Also, Dielectric strength is
measured every 6 to 12 months and if breakdown is found (when < 22kV), measures are taken to increase strength by filtering oil and/or by reclaiming machine mechanical devices. Otherwise, transformer oil is changed as per the regulation. Based on type, the transformer oil may be a hazardous material requiring appropriate disposal. PCBs do not break down when released into the environment but accumulate in the tissues of plants and animals, where they can have hormone-like effects. When burned, PCBs can form highly toxic products, such as chlorinated dioxins and chlorinated dibenzofurans. The production and new uses of PCBs have been banned due to concerns about the accumulation of PCBs and toxicity of their byproducts. In many countries significant programs are in place to reclaim and safely destroy PCB contaminated equipment. In design consideration section of this ESMF, it has been highlighted that PGCB/BREB will ensure purchase and installation of PCB free new transformers. Also necessary clauses will be inserted in bid document for supplying PCB free transformers.

94. Polychlorinated biphenyls were banned in 1979 in the US. Since PCB and transformer oil are miscible in all proportions, and since sometimes the same equipment (drums, pumps, hoses, and so on) uses both types of liquid, contamination of oil-filled transformers is possible. Today, most transformers use a fluid that achieves a much higher performance level than standard naphthenic mineral oil, with far less risk. Mineral oils invariably have an issue with corrosive sulfur that can render them problematic in service, and attempts to balance this out with copper passivators are insufficient compared to readily-available, safer alternatives.

95. Pentaerythritol tetra fatty acid natural and synthetic esters have emerged as an increasingly common mineral oil alternative. They offset all the main risks associated with mineral oil, such as high flammability, environmental impact and poor moisture tolerance. Esters are also non-toxic to aquatic life, readily biodegradable and provide a lower volatility and higher flash point. Additionally, they have a high fire point of over 300°C and K-class fluids such as these are often used in high-risk transformer applications, such as indoors or offshore. They also have a lower pour point, greater moisture tolerance and improved function at high temperatures.

96. Transformer oils are subject to electrical and mechanical stresses while a transformer is in operation. In addition, there is contamination caused by chemical interactions with windings and other solid insulation, catalyzed by high operating temperature. The original chemical properties of transformer oil change gradually, rendering it ineffective for its intended purpose after many years. Oil in large transformers and electrical apparatus is periodically tested for its electrical and chemical properties, to make sure it is suitable for further use. Sometimes oil condition can be improved by filtration and treatment. Tests can be divided into:
   1. Dissolved gas analysis
   2. Furan analysis
   3. PCB analysis
   4. General electrical & physical tests:
      o Color & Appearance
      o Breakdown Voltage
      o Water Content
97. The details of conducting these tests are available in standards released by IEC, ASTM, IS, BS, and testing can be done by any of the methods. The Furan and DGA tests are specifically not for determining the quality of transformer oil, but for determining any abnormalities in the internal windings of the transformer or the paper insulation of the transformer, which cannot be otherwise detected without a complete overhaul of the transformer. Suggested intervals for these tests are:

- General and physical tests - bi-yearly
- Dissolved gas analysis - yearly
- Furan testing - once every 2 years, subject to the transformer being in operation for min 5 years.

For larger transformers Tan – δ test is performed every 10 – 12 years and if the test result is too high, transformer oil is disposed off following the environmental guidelines.

98. “Oil acidity” is measured in terms of milligrams of standard potassium hydroxide required to neutralize the acid in one gram of the oil. It is a measure of the acid content of the oil. It can be used as an indicator of the presence of contaminants. The neutralization number (Oil Acidity) is most important in indicating chemical change or deterioration of the oil or in chemical change of additives. It serves as a guide for determining when oil should be replaced or reclaimed.

99. The Dielectric Power is the ratio of the power dissipated in the oil in watts to the product of the effective voltage and current in volt-amperes, when tested with a sinusoidal field under prescribed conditions. A high value is an indication of contaminants or deterioration products such as water, oxidation products, metal scrap, etc. Dielectric Power Factor (Tan –δ) is a convenient check of uniformity of insulating materials like transformer oil. The change in dielectric power factor in service oil is used to determine deterioration due to the moisture, foreign material and mechanical damage and thus to anticipate failure in service.

100. Sometimes in Substations the connectivity between the transformers and switchgear room is achieved using XLPE cables. These cables cannot be bent as they may break; they have standard bending radius. Therefore, these cables are laid inside concrete channels. Stagnant water inside this channel following prolonged rain may provide breeding ground for mosquitoes and other disease vectors. Regular maintenance is therefore needed to address this problem.
3.9 Operation of Power Lines

101. The primary objective of the distribution system is to ensure uninterrupted distribution of electricity to the consumers. The main job of the maintenance team is regular patrolling along the power lines to identify the need for regular and immediate maintenance operation. During the process of patrolling, care is taken to trim the overgrown trees falling on to the distribution cables and/or extending into the danger zone (regarded as “danger tree”). It is also imperative to clear the fallen trees following storm or heavy rainfall events. In the urban areas of Bangladesh many residential building have been constructed without leaving any clearance for power cables, virtually erected from the edge of the footpath. Therefore, it is likely that sometimes kites, birds or clothes left for drying may get entangled with the cable system.

102. The maintenance operation should also ensure proper placement of dustbins and or trash containers so that these are not placed underneath an H-pole. Domestic wastes attract numerous crows and scavenger birds. Sometimes, these vectors lead to tripping of the circuit and/or short-circuiting.
4.0 ENVIRONMENTAL MANAGEMENT PROCEDURE

4.1 Overview

103. Under the proposed project, the PGCB/ BREB/PBS will be responsible for identification of sub-projects, preparation of sub-project description, “environmental/social screening” and “analysis of alternatives”. The ESMF presents guidelines (in the form of a simple format) for preparation of description of the sub-projects (Section 4.4). The ESMF also presents a simple format for “environmental/social screening” of sub-projects (Section 4.6) and “analysis of alternatives” (Section 4.7), to be carried out by the PGCB/BREB/PBS. Based on these and other relevant documents, PGCB/BREB/PBS will assess the requirements for subsequent environmental and social assessment (IEE and EMP or ESIA), in consultation with the DoE.

104. The major activities to be carried out for IEE (including EMP) and ESIA include: (i) identification of sub-project influence area; (ii) establishment of “baseline environment”, against which impacts of the proposed sub-project would be evaluated; (iii) analysis of alternatives; (iv) identification of major sub-project activities during both construction and operational phases; (v) assessment, prediction and evaluation of impacts of major project activities on the baseline environment; (vi) carrying out public consultations; (vii) preparation of environmental code of practice (ECoP); and (viii) identification of mitigation measures and preparation of environmental management plans (EMP) including monitoring requirements, and social management framework (SMF) including resettlement policy framework, ethnic/tribal people planning framework, and grievance redress mechanism. The ESMF presents detail guidelines for carrying out each of these major activities.

105. The ESMF also presents occupational health and safety guidelines, and a set of special environmental clauses (SECs) for inclusion in Technical Specification of bidding document. The ESMF also presents institutional framework for environmental/social management of the proposed project to be implemented by the PGCB and the BREB. Finally, the ESMF presents training requirements for ensuring successful environmental management of the proposed rural electricity transmission and distribution project.

106. For convenience, the Environmental Management Procedure and Social Management procedure have been presented separately in this report. Chapter 4 presents the environmental management framework (EMF) and Chapter 5 presents the social management framework (SMF).

4.2 Implementing Agencies

107. The sub-projects to be implemented by BREB and PGCB under the proposed project are listed in Table 4.1.
### Table 4.1: Project components to be implemented under BREB and PGCB

<table>
<thead>
<tr>
<th>Project Components (Sub-projects)</th>
<th>Implemented By</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BREB</td>
</tr>
<tr>
<td>Construction/upgradation of 33 kV line</td>
<td>√</td>
</tr>
<tr>
<td>Construction of 11 kV new line</td>
<td>√</td>
</tr>
<tr>
<td>Switching Station</td>
<td></td>
</tr>
<tr>
<td>New Substations (33/11 kV)</td>
<td>√</td>
</tr>
<tr>
<td>Construction of 132 kV new line</td>
<td>--</td>
</tr>
<tr>
<td>Re-conductoring/Upgradation 132 kV lines</td>
<td></td>
</tr>
<tr>
<td>New Substations (132/33 kV)</td>
<td>--</td>
</tr>
<tr>
<td>Up-gradation of Substations</td>
<td></td>
</tr>
<tr>
<td>Power Transformers</td>
<td>√</td>
</tr>
<tr>
<td>Technical assistance support (e.g., training and capacity building activities; implementation support for reform action plan)</td>
<td>√</td>
</tr>
</tbody>
</table>

### 4.3 Sub-project Categories

108. The sub-projects to be implemented under the proposed rural electricity transmission and distribution project do not appear to pose risk of significant adverse environmental impacts. Accordingly, the overall project could be classified as a “Category B” project, according to WB project classification (OP 4.01). In the ECR 1997, certain sub-projects are listed and categorized (e.g., construction/upgradation of power distribution lines) and the EIA requirements of these projects are also clearly spelled out in the ECR 1997. Sub-projects category according to ECR 1997 is shown in the Table 4.2. However, environmental/social screening of all sub-projects will be carried out first, based on which the ESIA requirements will be determined. In general, the environmental/social screening process identifies what impacts will be generated and what type of mitigation measures will be required for the sub-projects.

### Table 4.2: Classification of sub-projects according to ECR 1997 (GoB, 1997)

<table>
<thead>
<tr>
<th>Project Component/Sub-projects</th>
<th>Project/Sub-project Category according to ECR 1997</th>
<th>Likely Project/Sub-project Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of 33 kV new power distribution line</td>
<td>Red</td>
<td>--</td>
</tr>
<tr>
<td>Upgradation of 33 kV power distribution line</td>
<td>Red</td>
<td>May be classified as “Orange A” or “Orange B” depending on assessment of potential impact</td>
</tr>
<tr>
<td>Construction of 11 kV new power distribution line</td>
<td>Red</td>
<td>--</td>
</tr>
<tr>
<td>Construction of 132 kV new power transmission line</td>
<td>Not specifically listed</td>
<td>Red</td>
</tr>
<tr>
<td>Re-conductoring/Upgradation of 132 kV lines</td>
<td>Not specifically listed</td>
<td>May be classified as “Orange A” or “Orange B” depending on assessment of potential impact</td>
</tr>
</tbody>
</table>
### Project Component/Sub-projects

| Construction of 33/11 kV substation on privately owned land | Not specifically listed | Red |
| Construction of 132/33 kV substation on privately owned land | Not specifically listed | Red |
| Construction of 33/11 kV substation on Government owned land | Not specifically listed | May be classified as “Orange A” or “Orange B” depending on assessment of potential impact |
| Construction of 132/33 kV substation on Government owned land | Not specifically listed | May be classified as “Orange B” or “Red” depending on assessment of potential impact |

**Notes:**
1. According to ECR 1997, “power distribution line laying/relaying/extension” projects fall under “Red” category; i.e. Category is designated based on the nature of project not the anticipated impact.
2. Proposed rural electricity transmission and distribution project could be classified as “Category B” on the expected impact according to WB OP4.01.

### Sub-project Description

109. For proper environmental assessment, it is important that each project component or sub-project is clearly described by the project proponent (BREB/PGCB). The key information required for describing a particular project component would vary depending on the type of sub-project (i.e., substation or power line). According to ECR 1997, a project proponent is required to apply to the Department of Environment (DoE) for environment clearance or site clearance certificate in a prescribed form (Form 3 of ECR 1997), furnishing key project information. Following the format of the “DoE Form 3”, Sub-project Description “Form 1a” (for substations) and “Form 1b” (for power line) has been developed (Appendix A) for documenting description of sub-projects to be implemented under the proposed project. Once a sub-project description is prepared by BREB/PGCB using Form 1a/1b, it will be easier to carry out environmental/social screening of the sub-project and to subsequently complete the “DoE Form 3” during submitting application for environmental/site clearance certificate.

110. The location map of a proposed sub-project should cover the entire physical extent of the sub-project and its surrounding areas.

### Environmental and Social Considerations in Project Formulation

111. By considering certain issues during project formulation, it is often possible to reduce or eliminate some of the possible adverse environmental impacts during both construction and operational phases of a project. For example, efforts to avoid, where possible, critical homestead areas or crossing of rivers/hills/bamboo groves along the route of power lines could greatly reduce adverse impacts during construction and operational phases. Similarly, use of “guard cables” could save cash-in trees along the route of power lines. Such considerations at the project formulation stage could greatly reduce adverse impacts and facilitate proper environmental management of a project. Table 4.3 identifies a number of such issues to be considered for substation and power
line sub-projects. These issues should be adequately addressed during the project formulation stage, as a part of overall environmental management.

Table 4.3: Environmental and social considerations to be included in design to reduce/ eliminate adverse impacts

<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Issues to be Considered at Project Formulation Stage</th>
</tr>
</thead>
</table>
| Substation  | • Use of government-owned land or vacant/fallow (non-productive) land for construction of substations, where possible.  
             • Use of land located at close proximity to existing power lines/load centers, and road network (for easier transportation of material and equipment), where available.  
             • Avoiding lands that are susceptible to inundation/storm surge.  
             • Avoiding ecologically and socially critical areas while selecting land for substations.  
             • Use of Gas Insulated Switchgear (GIS) instead of Air Insulated Switchgear (AIS), in order to reduce land requirement for substation and avoid possible generation of toxic fumes in control building due to flashover inside AIS (especially under high humidity and saline conditions).  
             • Ensuring purchase and installation of PCB free new transformers.  
             • Treating PCB contained in old transformers before disposal using available technologies; namely, super critical oxidation, electro-chemical oxidation, solvated electron technology, chemical reduction method, dehalogenation process, and thermal desorption using pyrolysis, catalyzed dehalogenation and vitrification.  
             • Designing substATIONS considering maximum flood level, and considering wind speed and earthquake load suggested in the Bangladesh National Building Code (BNBC). |
| Power Line  | • Avoiding forest, protected areas, game reserve, national park, and ECAs.  
             • Avoiding as much as possible the homestead areas and sensitive infrastructures (schools, hospital, etc.).  
             • Avoiding crossing of rivers/hills/bamboo groves/cash-in trees, as much as possible. Use of “guard cable” for saving cash-in trees.  
             • Maintaining adequate clearance for right of way (RoW)  
             • Use of Axially Bundled Cables (ABC) or insulated cables, instead of conventional separate cables, in order to prevent possible pilferage of power through illegal connection and provide added security against accident.  
             • Keeping layout of power line tower/pole such that they do not interfere with movement of traffic/peDESTrian.  
             • Designing power lines considering wind speed suggested in the Bangladesh National Building Code (BNBC).  
             • Checking structural adequacy of existing power line towers/poLES (to accommodate new cables) for sub-projects involving power line re-conductoring/rehabilitation.  
             • Selecting alignment of transmission line avoiding routes of migratory birds, nesting sites, significant bird habitat, and take off/landing routes of migratory birds. |
<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Issues to be Considered at Project Formulation Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Safety features in towers constructed over rivers against damage due to collision with water vessels.</td>
</tr>
<tr>
<td></td>
<td>• In order to avoid fire hazards, using technology in power lines (and also substations) which trips the line in fraction of a second.</td>
</tr>
</tbody>
</table>

1 Usually, control room buildings are built to a height of 1.5 storey to avoid storm surge (BPDB, 2008)

Land use of Transmission Line ROW

112. Land use along the transmission line has the potential to influence the safety of the transmission line. Though no land acquisition is required for ROW of transmission lines, it is recommended that PGCB/BREB enter into an agreement with the landowners owning limited rights of ROW for O&M uses and restricting certain use of land that are detrimental to the safety of the transmission lines. The following uses are considered to have “major impact” and must be coordinated by the PGCB/BREB:

• Driveways, access roads, utility crossings;
• Fish ponds;
• Recreational grounds such as parking, playgrounds, cemeteries, swimming pools;
• Gravel pits, quarries, fill, berms, and retaining walls;
• Any activity involving elevation or grade changes more than 0.5 meters;
• Sewage disposal fields, detention/retention ponds, watercourse relocation;
• Portions of non-habitable buildings (e.g. garages, animal sheds);
• Highways, roads and major pipelines parallel to and/or within the ROW;
• Street lamps and other lighting equipment;
• Any activity involving any type of mechanized equipment (e.g. excavators, bulldozers, irrigation systems).

4.6 Environmental/Social Screening

113. All project components or sub-projects to be implemented under the proposed project will be subject to an environmental/social screening in order to prevent execution of projects with significant negative environmental impacts. The purpose of “environmental/social screening” is to get a preliminary idea about the degree and extent potential environmental impacts of a particular sub-project, which would subsequently be used to assess the need for further environmental/social assessment. The sub-projects will be identified by PGCB/BREB/PBS; after selection of a sub-project, the environmental/social screening will be integral part of the sub-project planning and implementation.

114. As noted earlier, PGCB/BREB/PBS will be responsible for carrying out environmental/social screening. The environmental/social screening would involve: (i) reconnaissance of the sub-project areas/routes and their surroundings; (ii) identification of the major sub-project activities (see Chapter 3 for typical sub-project activities); and (iii) preliminary assessment of the impacts of these activities on the ecological, physico-chemical and socio-economic environment of the sub-project surrounding areas (as discussed below).
115. The responsible PGCB/BREB/PBS engineers/officials (see institutional arrangement for project implementation in 4.14) would carry out a reconnaissance survey surrounding the sub-project areas/routes in order to identify important environmental features (e.g., human settlements, educational/religious/historical establishments, water bodies) close to the sub-project location/route. The PGCB/BREB/PBS would carry out the “environmental/social screening” of sub-projects with a preliminary idea about the nature of the sub-project location and sub-project activities by filling in the “Environmental/Social Screening Form 2a (for substation)/ 2b (for power line)” presented in Appendix B.

116. As shown in Form 2a/2b (Appendix B), the potential impacts of a sub-project have been divided into: (A) impacts during construction phase; and (B) impacts during operational phase. For each phase, the impacts have been further categorized into ecological impacts, physicochemical impacts and socio-economic impacts. A number of parameters have been identified for each of these categories. With few exceptions, the potential impact with respect to each parameter has to be classified as “significant”, “moderate” and “insignificant” or “none”. The following section provides guidelines for environmental screening of sub-projects; guidelines for carrying out social screening using the same forms are presented in Chapter 5.

**Ecological Impacts:**

117. **Substation:** For substations, three parameters have been considered for screening of ecological impacts during construction phase (Form 2a); these include felling of trees, clearing of vegetation, and impact on aquatic (water) habitat. If construction of a substation involves felling/clearing of significant number of trees/vegetation, the impact would be classified as “significant”; if it involves feeling/clearing of few trees/vegetation, the impact could be classified as “moderate”, while if felling/clearing of trees/vegetation is not involved, the impact would be “insignificant” or “none”. If there is a water body (e.g., khal, pond) located close to the proposed substation location, then construction of the substation could generate adverse impact (e.g., through discharge of waste/ wastewater from sub-project activities, spills and leaks of oil/chemical) on the aquatic habitat (in the absence of any mitigation/management). The nature of impact would be classified as “significant” or “moderate” or “insignificant”, depending on the proximity of the proposed substation location to the water body, and the nature of the water body (i.e., whether it is an important habitat for aquatic flora/fauna). Operation of a substation is not likely to generate any significant adverse ecological impacts.

118. **Power Line:** For power lines, four parameters have been considered for screening of ecological impacts during construction phase (Form 2b); these include (i) presence of forest/protected areas/game reserve/national park/ ecologically sensitive areas (ECAs) along the power line route; (ii) felling of trees, (iii) clearing of vegetation, and (iv) possible impact on aquatic ecology (for power lines to be constructed on river/wetland). If the proposed route of the power line passes through biodiversity areas, then a detail analysis of alternative routes would be carried out (as noted in Form 2b) to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation and habitat. If it is not possible to completely
avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF (see Section 4.9.3). In such cases, necessary permission needs to be taken from relevant authority (e.g., Forest Department/local forest officer) for construction/maintenance of power line. If construction of the power line involves felling/clearing of significant number of trees/vegetation along its route, the impact would be classified as “significant”; if it involves felling/clearing of few trees/vegetation, the impact could be “moderate”, while if felling/clearing of trees/vegetation is not involved, the impact would be “insignificant” or “none”. Construction of power line towers in river/wetland could aggravate the aquatic ecology, thereby affecting aquatic flora and fauna, during construction phase. Operation of a power line is not likely to generate any significant adverse ecological impacts.

Physicochemical Impacts:

119. **Substation:** The parameters considered for screening of physicochemical impacts during construction phase of a substation include noise and air pollution, and water/environmental pollution, and drainage congestion *(Form 2a)*. If construction of the substation involves use of equipment/machines producing significant noise (e.g., generators, pile driver) and if the proposed substation site is located close to human settlements/schools/hospitals, noise pollution would be significant (in the absence of mitigation measures). Similarly, use of stone crushers, excavation works and movement of vehicle would generate air pollution. Possible air pollution from activities involved in substation construction is not likely to be significant, and may be classified as “minor”, unless the substation site is located very close to sensitive human settlements. If there is a water body (e.g., khal, pond) located close to the proposed substation location, then the potential adverse impact (e.g., through discharge of waste/wastewater from sub-project activities, spills and leaks of oil/chemical) on water quality (in the absence of any mitigation/management) could be classified as “significant’ or “moderate” or “insignificant”, depending on the proximity of the proposed substation location to the water body. If the location of the proposed substation site is such that it obstructs the flow of natural drainage water, then it could generate “significant” drainage congestion/water logging (in the absence of mitigation measures) during both construction and operational phases of the substation; otherwise impact on drainage would most likely be “minor”. Operation of a substation is not likely to generate any significant adverse physicochemical impact, except drainage congestion as noted above.

120. **Power Line:** For construction of power line, three parameters have been considered for screening of physicochemical impacts during construction phase *(Form 2b)*; these include noise pollution, air pollution, and water pollution. For installation of 33 kV and 11 kV distribution lines, air and noise pollution resulting from the operation of truck mounted drilling rig (used for installation of SPC poles) is not likely to be significant; and resulting air and noise pollution impacts could be categorized as “minor”. On the other hand, construction of 132 kV transmission line towers could involve heavy equipment (e.g., pile driver for foundation of transmission tower), and could generate noise and air pollution, affecting nearby human settlements. For construction of 132 kV transmission line, air and noise pollution impacts could be categorized as “significant”, “moderate” and “minor”, depending on the nature of construction works (e.g., whether pile driving would be necessary) and proximity of human
settlements. As noted above, construction of power line towers in river/wetland could aggravate the water quality during construction phase. Operation of a power line is not likely to generate any significant adverse physicochemical impacts.

Socio-economic Impacts:

121. **Substation:** The parameters considered for screening of socio-economic impacts during construction phase of a substation include loss of land; loss of income; impact on tribal population, archaeological/historical sites; traffic congestion; and employment generation. Guidelines for addressing loss of land/income and impact on tribal population have been presented in Chapter 5 (under social management framework, Section 5.4.2). If the proposed substation site is located close to a busy road/highway, then transportation and storage of construction materials could aggravate traffic congestion (especially in the absence of mitigation measures). Operation of a substation is not likely to generate any adverse socio-economic impacts; both construction and operation of a substation would generate employment opportunities.

122. **Power Line:** The parameters considered for screening of socio-economic impacts of a power line include impact on tribal population, archaeological/historical sites, loss of income, traffic/pedestrian movement, safety, and employment. Guidelines for addressing loss of income and impact on tribal population have been presented in Chapter 5 (under social management framework, Section 5.4.2); other parameters have been addressed here. Construction of power lines along busy highways or along narrow roads could generate traffic congestion and interfere with pedestrian movement (in the absence of mitigation measures). Both construction and operation/maintenance of power lines would generate employment opportunities. Operation of power line is not likely to generate any adverse socio-economic impacts.

4.7 **Analysis of Alternatives**

123. The primary objective of the “analysis of alternatives” is to identify the location/technology for a particular sub-project that would generate the least adverse impact, and maximize the positive impacts. The analysis of alternatives should be carried out at two different levels: (a) by PGCB/BREB/PBS along with environmental/social screening; and (b) during carrying out of IEE/ESIA of a sub-project, if needed (e.g., by the consultant engaged for this purpose).

124. In general, for any sub-project, the analysis of alternative should focus on:
   (a) Alternative location (for substation) or route (for power line);
   (b) Alternative design and technology;
   (c) Costs of alternatives; and
   (d) No sub-project scenario.

125. A simple format for analysis of alternatives is presented in Appendix C (Form 3a for substation, Form 3b for power line). The BREB-PBS/PGCB authority will carry out screening for
all proposed alternative sites for substations and routes of the power line based on the screening form 2a/2b. Then, utilizing the information contained in the completed “screening forms (2a/2b)”, the analysis of alternatives would be carried out by using Form 3a/3b. Important considerations in analysis of alternatives routes (for new power lines) include avoiding homestead areas, as much as possible; avoiding crossing of rivers/hills/bamboo groves/cash-in trees, as much as possible. If the homestead areas (or other sensitive infrastructure) are not avoidable in any of the options, the BREB-PBS/PGCB will consult with the owner/respective authority and get their written consent/permission for the construction of transmission/distribution lines in. On the other hand, use of a government-owned land for construction of a new substation would significantly reduce adverse socio-economic impacts. If that is not possible, efforts should be made to avoid ecologically or socially critical areas for construction of substation. Among alternative technologies, use of Gas Insulated Switchgear (GIS) instead of Air Insulated Switchgear (AIS) would reduce land requirement for substation and avoid possible generation of toxic fumes in control building due to flashover inside AIS (especially under high humidity and saline conditions). Under humid/saline environment, the switchgears and electrical accessories of the “Outdoor type” substations undergo considerable stress reducing their operating life, which could be avoided using Indoor type substation. For power lines, use of Axially Bundled Cables (ABC) or insulated cables instead of the conventional separate cables would prevent pilferage of power through illegal connections. The outcome of the “analysis of alternatives”, for example, with respect to location/route of sub-project, technology (e.g., type of substation, type of cables) should be included in the sub-project description Form 1a/1b.

126. Subsequently, if a particular sub-project requires further environmental assessment (IEE/ESIA), the analysis of alternatives should be carried out in more details (by the consultant engaged for this purpose), including quantitative estimates for some parameters (e.g., cost of different technologies). Based on the outcome of this detailed “analysis of alternatives”, the sub-project location/route, technology may have to be modified.

127. Based on the guideline presented in the ESMF, the PGCB/BREB/PBS engineers/official would carry out the “analysis of alternatives” of sub-projects by filling Form 3a/3b. However, as discussed in 4.4.15, the capabilities of the PGCB/BREB engineers in carrying out these activities could be greatly improved through imparting training on environmental/social assessment and management.

4.8 Nature and Extent of Environmental and Social Assessment (ESA)

128. In general, the environmental/social screening process identifies what impacts will be generated and what type of mitigation measures will be required for the sub-projects. Also the screening will help in determining whether a proposed sub-project should follow the Environmental Code of Practices (ECoP) to mitigate/avoid the impacts or need further detail assessment with preparation of separate environmental/social management plan. The level of environmental and social assessment (ESA) of a sub-project would primarily depend on the class/category of the sub-project according to OP 4.01 and ECR 1997. According to WB OP4.01, the proposed rural electricity transmission and distribution project has been classified as
“Category B” based on the expected impacts. As noted earlier, in the ECR 1997, project category has been assigned based on the nature of projects, not the anticipated impacts. According to ECR 1997, for “Orange A” Category sub-projects, no further environmental assessment would be required, but some additional information would be required; for “Orange B” category sub-projects Initial Environmental Examination (IEE) and Environmental Management Plan (EMP) would be required; while for Red Category sub-projects, full-scale EIA (including SIA) may be required. Based on a review of the sub-project description (i.e., Form 1a/1b) and environmental screening (i.e., Form 2a/2b), PGCB/BREB will determine the need for further environmental assessment (i.e., carrying out IEE/ESIA, including EMP).

4.9 Guidelines for Carrying Out IEE and EIA

129. Since the exact locations of the substations and the routes of the transmission and distribution lines (i.e. the sub-projects) are still unknown, the guideline for environmental assessment presented here cover both IEE and EIA (including EMP). As noted earlier, Chapter 5 of this report presents the Social Management Framework (SMF), including detail guideline for carrying out SIA (as well as RAP and TPP, if needed). Both IEE and EIA would cover the same elements. However, the level of details would be different; a full-scale ESIA would present more detailed and quantitative (where appropriate) analysis of impacts. The level of details would be determined through “scoping” at the onset of the environmental assessment process, considering the nature of the sub-project (Form 1a/1b) and level of anticipated impacts (Form 2a/2b).

130. The major activities involved in carrying out environmental assessment (IEE and EIA) include the following:

(a) Identification of sub-project influence area;
(b) Establishment of “baseline environment” within the sub-project influence area, against which impacts of the proposed sub-project would be evaluated;
(c) Identification of major sub-project activities/processes during construction phase and operational phase;
(d) Assessment and evaluation of impacts of major project activities on the baseline environment during construction phase and operational phase;
(e) Carrying out public consultations;
(f) Identification of mitigation measures for reducing/eliminating adverse impacts and enhancing positive impacts;
(g) Development of environmental management plan (EMP), including monitoring requirements, and estimation of cost of EMP (see Section 4.10); and
(h) Identification of environmental code of practice (ECoP), including cost of ECoP (see Section 4.11).

131. As described in Section 4.14 (Institutional Arrangement and Responsibility), the IEE/EIA will be carried out by BREB (by Supervisor Consultant/ Hired consultant/ Environment Unit to be set up in the future) or by PGCB (by DSM consultant/ Environmental Unit to be set up in the
The following section presents detail guidelines and processes for carrying out each of these major activities of IEE/EIA.

4.9.1 Sub-project Influence Area

132. For properly carrying out IEE and EIA, it is important to have a clear understanding about the “sub-project influence area” and “baseline environment”. The ESMF provides guidelines for identification of sub-project specific influence area and defining environmental baseline. In order to establish a sub-project influence area, the activities to be carried out and processes that would take place during both construction phase and operational phase of the sub-project need to be carefully evaluated. Based on the field visits to sub-project sites in Dhaka, Chittagong and Sylhet, it is apparent that the sub-project influence area would depend not only on the type of sub-project (i.e., substation or power line), but also on the nature site/ area where it will be implemented.

133. For construction of substations, influence area primarily include: (a) the areas surrounding the substation site; (b) the area along the access road to the substation; (c) routes of transportation of construction materials (or construction wastes) to (or away from) the sub-project site; and (d) areas of material storage, and labor shed for sub-project works.

134. For construction/ rehabilitation of transmission and distribution lines, areas within the right of way (RoW) along the length of the route of the transmission/distribution line will experience impacts (e.g., traffic congestion, noise and air pollution, damage to crops/vegetation), and therefore should be considered as the sub-project influence area.

135. Based on field visits and discussions with PGCB officials, it was found that the 132 kV transmission lines will be strung on steel towers, a number of which will be constructed in rural areas (e.g. paddy fields). Construction of these towers is likely to affect the surrounding environment (e.g., ecology, land use, crops). Therefore, the areas surrounding the towers should be considered as sub-project influence area during the construction phase. Construction of access roads to these tower construction sites is likely to cause environmental impact (e.g., damage to crop, dust pollution, noise pollution, and alteration/obstruction of cross drainage). Therefore, the areas along the access roads to the tower sites should be considered as influence areas. Table 4.4 provides general guidelines for identification of influence area for different types of sub-projects to be implemented under the proposed project.

Table 4.4: Guidelines for identifying influence area for different types of sub-projects

<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Influence Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>132/33kV and 33/11kV Substations, Switching Stations</td>
<td>Areas and communities within around 1 km surrounding the location of the Substation, who are likely to be affected during construction and/or operation of the substations. Areas on either side (within ~15 m) of the access road from the main road to the Substation.</td>
</tr>
<tr>
<td>132kV Transmission Lines and Towers</td>
<td>Areas and communities within the Right of Way (~52 m) of the Transmission line route. Areas and communities surrounding the new transmission tower (if any)</td>
</tr>
</tbody>
</table>
### Sub-project | Influence Area
--- | ---
to be constructed. Areas on either side (within ~15 m) of the access road from the main road to the transmission tower (to be constructed).

| 33 and 11kV Distribution Lines and Poles | Areas and communities within the Right of Way (~27m) of the Distribution line route. Areas on either side (within ~15 m) of the access road from the main road to the distribution line poles/tower, which could be affected during construction. |

**Note:** The routes of transportation of material/equipment to the sub-project site should also be included under influence area

### 4.9.2 Environmental Baseline

136. For proper environmental assessment (as a part of IEE and EIA), it is very important to adequately define the “environmental baseline” against which environmental impacts of a particular sub-project would be subsequently evaluated. The characteristics of “environmental baseline” would depend on:

- Nature of the sub-project location,
- Nature/extent of a sub-project and its likely impact,
- Level of environmental assessment (e.g., screening versus full scale EIA)

137. For example, ambient air quality and noise level are important parameters for describing baseline scenario for a substation sub-project, because these parameters are likely to be impacted by the project works. However, these parameters are not likely to be important for sub-projects like “Construction of 132kV Transmission line or 33 or 11V Distribution line”. Similarly, ecological parameters (e.g., diversity of flora and fauna) are not likely to be critical for a power line to be constructed along the main road or through a commercial area, but these could be important for a power line that crosses a river or marshy land, where aquatic floral and faunal habitat could be impacted by the project activities. Obviously the depth of baseline information required for IEE/EIA of a “red” category sub-project would be different from those required for an “orange B” category sub-project.

138. For systematic recording of data, baseline environment is usually classified into physicochemical environment, biological environment, and socio-economic environment; and important features/parameters under each category are identified and measured/recorded during baseline survey. The important features/parameters would depend on the nature of sub-project location, category of sub-project, and level of environmental assessment. The following sections provide guideline on identification of important features/parameters and collection of sub-project specific environmental baseline data.
4.9.2.1 Physicochemical environment

139. The important physicochemical parameters for defining baseline environment include:
   • Important Environmental Features (IEFs),
   • Climate,
   • Topography and drainage,
   • Geology and soil,
   • Hydrology and water resources,
   • Air quality,
   • Noise level,
   • Water quality,
   • Traffic, and
   • Electro-Magnetic Field (EMF)

IEFs and Maps:
140. Typical Important Environmental Features (IEFs) include human settlements, educational institutions (school, college, madrassa, university), health care facilities (hospitals, clinics), commercial/ recreational establishments (markets, restaurants, parks, offices), religious establishments (mosques, temples, churches), major utility infrastructure (water/ wastewater treatment plants, water mains, sewers, power plants, sub-station, gas/ electricity transmission/ distribution lines), landfills, major ponds/ khals and rivers, and historical archaeological establishments, ecologically critical area (ECA), wildlife sanctuary, game reserve, protected area, and national park.

141. Under most circumstances, it is sufficient to identify IEFs based on a survey covering the sub-project influence area (see Table 4.5). Thus, a rapid physical survey will be required to identify the IEFs within the sub-project influence area. It should be noted that many of the IEFs (e.g., historical/ archaeological sites, wildlife sanctuary, and national park) should already be identified and recorded in available maps of the relevant areas. These maps could be utilized during identification of IEFs. For a full-scale EIA, it may be necessary to identify the IEFs through a detailed survey and record their positions (GPS coordinates).

142. The sub-project layout and the identified IEFs within the sub-project influence area should be presented in a suitable map. For this purpose, the sub-project layout and IEF locations should be superimposed on the GIS maps (e.g., land-use maps) or Google images of project area and their surroundings.

Climate:
143. It is important to have a general idea about the climate of the area where the sub-project would be implemented. Important climatic parameters include precipitation, temperature, relative humidity, wind speed and direction. These data should be collected from secondary sources (e.g., from the nearest station of Bangladesh Meteorological Department, BMD); the climatic data of the BMD station closest to the sub-project site should be used. In fact, the required climatic data have already been collected from the Bangladesh
Meteorological Department (BMD) for four weather stations (Dhaka, Sylhet, Cox’s Bazar and Mymensingh), as a part of establishing environmental baseline for carrying out overall environmental and social assessment (presented in Appendix N). These climatic data could be readily used for environmental assessment of any sub-project in these areas, as required.

**Topography and drainage:**
144. Data and information on topography are important for the design of the sub-projects to be implemented by the BREB and PGCB. Information on the topography is essential in fixing the alignment of the transmission and distribution lines. Similarly, topography is also important for the construction of a Substation. For example, it is important to know whether the area where the substation would be constructed suffers from water-logging or inundation problems, which could endanger the equipment and operation of the substation. For the design of these sub-projects, it may be necessary to carry out topographic survey in the sub-project area. However, for environmental assessment (IEE and EIA), secondary information on topography and drainage should be sufficient.

**Geology and soil:**
145. Characteristics of soil could be important if a particular sub-project involves significant excavation/earthworks, because wind-blown dust from these activities could contribute to air pollution. In such cases, characteristics of soils (particularly heavy metal content) are often determined as a part of baseline survey. However, considering the nature and scale of the structures to be constructed in the sub-projects to be implemented under the BREB and PGCB, geology and soil characteristics do not appear to be critical for environmental assessment.

**Hydrology and water resources:**
146. For the design of the sub-project involving the construction of substations and construction of steel towers for the 132 kV transmission lines, information such as water level/highest flood level are important. Information on surface and groundwater levels and their seasonal variations are important in assessing possible impacts due to accidental spillage of lubricants and/or transformer oil. For environmental assessment (IEE and EIA), information on hydrology (e.g., river network, flow, highest water level) and water resources (e.g., discharge, surface and groundwater levels) may be collected from secondary sources (e.g., from Bangladesh Water Development Board, BWDB). The format used in the “overall environmental/social assessment” could be followed for presentation of necessary data/information on hydrology and water resources.

**Air quality:**
147. Data on ambient air quality is not likely to be available for the areas where the BREB and PGCB sub-projects will be implemented. Particulate matter (particularly PM\(_{10}\) and PM\(_{2.5}\)) is the most important air quality parameter from health perspective. However, measurement of air quality is relatively expensive and facilities for air quality measurement are not widely available. Therefore, baseline air quality data (PM) may be collected only for carrying out detailed environmental assessment (EIA).
Noise level:
148. Noise is typically generated from operation of machines and equipment (e.g., pile drivers, excavators, concrete mixing machine), and movement of vehicles. Noise is of particular importance if the sub-project component (e.g., substation, transmission tower) is located close to sensitive installations such as educational institutions, health care facilities, religious establishments, and human settlements. Activities to be carried out during construction phase of the sub-projects would generate noise. For these sub-projects, baseline noise level should be measured and recorded, so that these could be compared with those generated during construction/operation phase of the sub-projects. The location and frequency of baseline noise level measurements would depend on physical extent of project, and presence of sensitive installations (e.g., schools, hospitals) within sub-project influence area. The consultant engaged for carrying out IEE/EIA will be responsible for measurement of baseline noise level at location(s) within the sub-project influence area. Both day-time and night-time noise levels should be measured, using a calibrated noise level meter.

Water quality:
149. A number of activities during the implementation of sub-projects could have impacts on water quality. These include construction of substations and 132kV transmission towers. Accidental spillage of gasoline, transmission oil, transformer oil, etc. may contaminate surface water and/or ground water. Stagnation resulting from obstruction of cross drainage in rural areas following construction of access roads and substations may result in deterioration of water quality in the areas surrounding these sites. For these sub-project activities, baseline water quality of the relevant water bodies should be measured, as a part of baseline survey (by the consultant engaged for carrying out IEE/EIA).

150. With respect to water quality, the dry season is the critical period, and hence water samples for water quality characterization should be collected during the dry season. Important water quality parameters include pH, TDS, TSS, ammonia, nitrate, phosphate, BOD5, and COD.

Traffic:
151. Storage of construction materials, power cables (conductors), SPC poles, steel members of 132kV transmission towers, transformers, etc. on roads adjacent to sub-project sites/routes are likely to cause traffic congestion. Similarly, movement of additional vehicles carrying construction materials and equipment along public roads are likely to increase traffic congestion. For all the sub-projects, it would be necessary to collect traffic data from primary survey, as a part of carrying out IEE/EIA (by the consultant engaged for this purpose); both number and composition of traffic are important.

Electro-Magnetic Fields (EMF):
152. Health concerns over exposure to EMF are often raised when a new transmission line is proposed. To date the research has not been able to establish a cause and effect relationship between exposure to magnetic fields and human disease, nor a plausible biological mechanism by which exposure to EMF could cause disease. Rehabilitation of existing power lines is unlikely to increase EMF but new power lines may increase exposure to EMF. However, this issue needs
to be addressed while conducting a comprehensive impact assessment. Thus, measurement of existing EMF along the selected routes of the existing and new transmission and distribution lines and around the Substation sites would be necessary, as a part of carrying out IEE/EIA (by the consultant engaged for this purpose).

153. Table 4.5 presents guidelines for collection of primary and secondary data on physicochemical environmental parameters for different types of sub-projects to be implemented under the proposed project.

**Table 4.5: Guidelines for collection of sub-project specific physicochemical data/ information**

<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Data/ information from secondary source</th>
<th>Data from primary survey/ measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of 132/33kV Substations by PGCB</td>
<td>IEFs; Climate; Geology and soil; Hydrology and water resources; and drainage</td>
<td>IEFs; Noise level; Surface water quality(^1); Site topography; EMF</td>
</tr>
<tr>
<td>Construction of 132kV Transmission Line By PGCB</td>
<td>IEFs; Climate; Topography and drainage; Geology and soil; Hydrology and water resources</td>
<td>IEFs; Noise Level; Surface water quality(^2); Traffic, EMF</td>
</tr>
<tr>
<td>Construction of 33/11kV Substations/ Switching Stations by BREB</td>
<td>IEFs; Climate; Geology and soil; Hydrology and water resources; and drainage</td>
<td>IEFs; Noise level; Surface water quality(^1); Site topography; EMF</td>
</tr>
<tr>
<td>Construction of 33kV &amp; 11kV Distribution Lines by BREB</td>
<td>IEFs; Climate; Geology and soil; Topography and drainage; Hydrology and water resources</td>
<td>IEFs; Noise Level, Surface water quality(^2); Traffic, EMF</td>
</tr>
<tr>
<td>Upgradation of 132/33kV Substations by PGCB</td>
<td>IEFs; Climate; Geology and soil; Hydrology and water resources; and drainage</td>
<td>Noise Level; Traffic</td>
</tr>
<tr>
<td>Rehabilitation of 132kV Transmission Line By PGCB</td>
<td>IEFs; Climate; Topography and drainage; Geology and soil; Hydrology and water resources</td>
<td>Surface water quality(^2); Traffic</td>
</tr>
<tr>
<td>Rehabilitation of 33kV &amp; 11kV Distribution Lines by BREB</td>
<td>IEFs; Climate; Geology and soil; Topography and drainage; Hydrology and water resources</td>
<td>Surface water quality(^2); Traffic</td>
</tr>
</tbody>
</table>

\(^1\)If water body is located close to the substation site(s)
\(^2\)If the power line passes over or close to khal/river/wetland lands

### 4.9.2.2 Biological environment

154. Important parameters for description of biological environment include:

- General bio-ecological features of the sub-project area and its surroundings (e.g., bio-ecological zone, rivers, wetlands, hills, agricultural lands)
- Wildlife sanctuary, protected area, park, ecologically critical area (ECA)
- Floral habitat and diversity (terrestrial and aquatic)
- Faunal (including fish) habitat and diversity (terrestrial and aquatic)
- Threatened flora and fauna
155. It should be noted that all the sub-projects (namely, Construction of Substations, Construction of Transmission and Distribution Lines) to be carried out by BREB and PGCB are likely to have minor ecological impacts. In most cases, the most significant direct impact would result from felling/cutting of trees/vegetation within the substation sites and along the route of the new transmission/distribution lines. If the alignment of a new power line crosses river/wetland or forest area, then construction of tower could generate some adverse impact on local ecology. However, these are not likely to generate any significant ecological impacts. Thus, general bio-ecological description of the sub-project area would be sufficient for description of baseline biological environment. Table 4.6 provides guidelines for collection and presentation of data for biological environment for the sub-projects to be implemented by BREB and PGCB.

Table 4.6: Guidelines for collection of sub-project specific data/information for describing biological environment

<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Data/information from secondary source</th>
<th>Data from primary survey/measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction/rehabilitation of 132/33kV Substations by PGCB</td>
<td>General bio-ecological features, Wildlife sanctuary, ECA etc.</td>
<td>Number of trees to be felled; Area to be cleared of vegetation; Filling up of seasonal wetland (if required)</td>
</tr>
<tr>
<td>Construction/Rehabilitation of 132kV Transmission Line By PGCB</td>
<td>General bio-ecological features, Wildlife sanctuary, Floral and faunal diversity; ECA</td>
<td>Number of trees to be felled or trimmed; No of pond affected, Aquatic flora and faunal diversity¹</td>
</tr>
<tr>
<td>Construction of 33/11kV Substations/ Switching Stations by BREB</td>
<td>General bio-ecological features, Wildlife sanctuary, ECA</td>
<td>Number of trees to be felled; Area to be cleared of vegetation; Filling up of seasonal wetland (if required)</td>
</tr>
<tr>
<td>Construction/Rehabilitation of 33kV &amp; 11kV Distribution Lines by BREB</td>
<td>General bio-ecological features, Wildlife sanctuary, ECA; Floral and faunal diversity</td>
<td>Number of trees to be felled or trimmed</td>
</tr>
</tbody>
</table>

¹If the proposed transmission line crosses river/wetland

4.9.2.3 Socio-economic environment

156. The socio-economic baseline should be established following the social management framework (SMF), presented in Chapter 5. This section provides a brief overview of the important aspects of socio-economic baseline. It is important to have a clear understanding of the baseline socio-economic condition of people, especially those living within the sub-project influence areas. A common approach for quick assessment of baseline socio-economic condition is questionnaire survey. The primary objectives of a questionnaire survey are:
(a) to understand people’s socio-economic condition;
(b) to understand extent of people’s access to basic services; and
(c) to understand people’s perception regarding the sub-project.

The questionnaire used for socio-economic survey may therefore cover five major themes:
(a) Socio-economic background
(b) Basic services
(c) Education
(d) Economic situation, and
(e) Attitude toward the proposed sub-project.

4.9.3 Assessment and Prediction of Impacts

4.9.3.1 Potential Significant Environmental Impacts during Construction Phase

157. After establishment of sub-project influence area and baseline condition, the next major step in carrying out IEE/EIA is identification of major project activities during both construction and operational phases of the sub-project. Chapter 3 describes the typical activities that are carried out during construction and operational phases of the proposed sub-projects. After identification of the sub-project activities during construction phase, the next step in the IEE/EIA involves assessment/prediction of the impacts of these activities on the baseline environment. The potential environmental impacts during construction phase of sub-projects could be categorized into: (a) ecological impacts; (b) physic-chemical impacts; and (c) socio-economic impacts.

Ecological impacts:
158. Based on primary assessment of the nature and scale of the proposed sub-projects (construction of substations and power lines) and assessment of sub-project locations (based on field visits), it appears that ecological impacts of most sub-projects would be limited to loss of trees/vegetation, and possible adverse impact on aquatic habitat located close to the project location. However, construction of transmission line/tower across rivers/wetland could generate some short-term adverse impacts on aquatic habitat and associated aquatic flora and fauna. Assessment of ecological impacts of the sub-projects should therefore focus on loss of vegetation/trees and aquatic habitat. In general, the ecological impact should focus on:
(a) Impact on flora (aquatic and terrestrial);
(b) Impact on fauna (aquatic and terrestrial) including fish;

159. If the proposed route of the power line passes through areas that are rich in biodiversity (e.g., forest, game reserve, national park, ECAs), then special measures are needed to reduce/eliminate possible adverse impacts. These include the following:
(a) For movement of tension stringing equipment, a 3 m width is usually needed below each conductor; and trees on such strip need to be felled during construction phase (i.e., stringing). After completion of stringing operation, regeneration of natural vegetation should be encouraged along the strip.
(b) Felling, pollarding, lopping and pruning of trees for electric clearance, whenever necessary, should be done with permission from the local forest office/appropriate
authority; hand clearing (instead of machine clearing) to be considered to minimize
damage to vegetation and habitat; use of chemicals for forest clearance/RoW
maintenance should be strictly prohibited.
(c) Existing path/access roads (with up-gradation, if needed) should be used, wherever
possible, for movement of man and machinery; tower materials should be transported
into forests by head loads (instead of vehicles) to reduce adverse impacts on
vegetation/habitat.

160. Commonly, the significance of an ecological impact is determined by: (i) Ecological
“consequence” of the activity, (ii) “Likelihood of occurrence” of the activity, and (iii) Calculating
the product of these two parameters. Consequence and likelihood of ecological impacts
resulting from project activities are discussed below.

161. Table D-1 of Appendix D (Criteria for assessment of ecological impacts) presents the
criteria for estimating “consequence” of any particular “sub-project” activity. As shown in Table
D-1, for adverse/ negative ecological impacts, the “consequence” has been divided into six
categories (critical, major, moderate, minor, low, and none), with corresponding numerical
ranking ranging from 5 (for “critical”) to 0 (for “none”). If a sub-project activity falls into
multiple categories, it is assigned the highest-ranking category for assessment of ecological
impact.

162. Table D-2 of Appendix D presents criteria for “likelihood of occurrence” of an activity/
impact. The likelihood of each identified impact is determined by estimating the probability of
the activity occurring. The likelihood is divided into five categories (almost certain, very likely,
likely, unlikely, and very unlikely), with corresponding ranking ranging from 5 (for “almost
certain”) to 1 (for “very unlikely”).

163. The “significance” of ecological impact for a particular sub-project activity is determined
by multiplying the “consequence ranking” and the “likelihood ranking” of the sub-project
activity, as follows: \( \text{Significance} = \text{Consequence} \times \text{Likelihood} \)

Table 4.7: Ecological impact significance rankings

<table>
<thead>
<tr>
<th>Significance (Consequence × Likelihood)</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;16</td>
<td>Critical</td>
</tr>
<tr>
<td>9-16</td>
<td>High</td>
</tr>
<tr>
<td>6-8</td>
<td>Medium</td>
</tr>
<tr>
<td>2-5</td>
<td>Low</td>
</tr>
<tr>
<td>&lt;2</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

164. Table 4.7 shows “significance” ranking of ecological impacts and Table 4.8 shows a risk
assessment matrix that could be used for estimating “significance” and “risk”, respectively of
ecological impacts for a particular sub-project activity. Table D-3 of Appendix D presents
examples of estimating ecological impacts of some typical sub-project activities.
Table 4.8: Risk assessment matrix

<table>
<thead>
<tr>
<th>Likelihood / Frequency</th>
<th>Consequence Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Almost certain</td>
<td>High</td>
</tr>
<tr>
<td>Very Likely</td>
<td>Moderate</td>
</tr>
<tr>
<td>Likely</td>
<td>Low</td>
</tr>
<tr>
<td>Unlikely</td>
<td>Low</td>
</tr>
<tr>
<td>Very Unlikely</td>
<td>Low</td>
</tr>
</tbody>
</table>

Example: A 33/11kV Substation will be constructed near a tree planted area. The construction activities are unlikely to damage adjacent biological environment and the result will be Low-level impacts. For this scenario, “consequence” is Low with ranking 1 (Table D-1) and the “likelihood of occurrence” is Unlikely with ranking 2 (Table D-2), the “Significance” of ecological impact of this sub-project activity will be as follows: Significance = Consequence × Likelihood; Or, Significance = 1 × 2 = 2
So, the Significance Level is Low (Table 4.7) and the Risk is Low (Table 4.8)

Physicochemical impacts:

165. Possible physicochemical impacts from the sub-project activities to be carried out in different locations may include the following:

- Drainage congestion,
- Noise pollution,
- Air pollution,
- Water pollution, and
- Environmental pollution from solid/construction waste

Drainage congestion:

166. During execution of civil engineering projects, temporary drainage congestion often results from obstruction to natural flow of drainage water due to the storage of materials, piled up excavated material/soil, and temporary embankments constructed to keep the work area dry. Such congestion is particularly important at the project sites adjacent to low-lying areas. Drainage congestions could create significant discomfort to people living in project-surrounding areas.

Noise pollution:

167. Noise pollution could result from a wide range of construction activities, including movement of vehicles (carrying equipment/material to and from site), operation of construction equipment and generators. Significant noise is generated from operation of pile drivers, bulldozers, dump trucks, compactors, mixing machines, generators, etc. (which could be used for construction of substations and transmission towers). Demolition activities, if required, also generate noise. Such noise may cause discomfort to the people living in the surrounding areas at close proximity of the sub-project site, especially if such activities are continued during the night. Noise pollution is particularly important for sensitive establishments, e.g., hospitals, educational/religious institutions.
168. Among noise generating activities, pile drivers produce the most significant noise. For full-scale EIA (if needed), noise level predictions may be made for pile drivers and other major equipment used in the sub-project works, and used to assess noise pollution impacts in areas surrounding the sub-project site. Noise produced by Auger Drill Rig used for installation of electric poles for distribution lines is relatively low, and not likely to generate significant noise pollution.

*Air pollution:*

169. During construction phase, air pollution may result from emissions from machines and equipment (e.g., drilling rig, mixing machines, generators) used for different sub-project activities (e.g., substation and transmission tower construction), and movement of vehicles (carrying material and equipment) to and from the site. However, for the proposed sub-projects, adverse impacts of air pollution are likely to be minor and limited to the areas surrounding the sub-project sites.

*Water pollution:*

170. Water pollution may result from discharge of wastewater (e.g., liquid waste from labor sheds), spills and leaks of oils/chemical into nearby water bodies (e.g., drain, pond, khal, drain, river). The presence and existing use of water bodies surrounding the sub-project site would dictate the level of impact. For example, if a pond located close to a sub-project site is being used for washing/bathing or for fish culture, pollution of the pond from sub-project activities would generate significant adverse impacts. Construction of transmission lines/towers across rivers/wetland could also generate some water pollution during construction phase.

*Environmental pollution from solid/construction waste:*

171. In some sub-projects, construction debris is likely to be generated from different sub-project activities. Solid wastes will also be generated from labor sheds. Improper management of construction debris and solid waste could cause blockage of drainage line/path and environmental pollution.

*Impact on Fisheries and Other Aquatic Life in the Major River*

172. Some of the power transmission line will have to cross some major river like Buriganga, Dhaleswari. The foundation of transmission towers in rivers requires installation of piles of large diameter to a significant depth. Pile driving activities in rivers have potential impact (e.g., due to generation of noise, water pollution) on the aquatic life.

*Socio-economic impacts:*

173. The most significant potential socio-economic impact from the proposed project would be loss of land and loss of income due to acquisition of land for construction of substations. Possible impact on indigenous population is also an important consideration. The social management framework (SMF) presented in Chapter 5 addresses the land acquisition and resettlement issues, and impact on indigenous population. This section addresses the other possible socio-economic impacts, which include the following:
• traffic congestion,
• health and safety,
• employment and commercial activities, and
• impact on archaeological and historical sites, and safeguarding physical cultural resources (PCR).

**Traffic congestion:**

174. During construction phase of sub-projects, traffic congestion may result from stock piling of material by the sides of roads, increased movement of people and vehicles carrying material and equipment. Construction of substation and distribution lines in densely populated areas, and construction of distribution lines along busy highway could aggravate the existing traffic problem during construction phase. This should be addressed with proper traffic management, and avoiding stockpiling of materials in a way that could hamper traffic movement.

**Health and safety:**

175. Safety is an important issue during construction phase. General construction activities pose safety risks, which should be addressed as part of occupational health and safety plan. Section 4.12 provides guideline on occupational health and safety issues.

**Employment and Commercial Activities:**

176. During construction phase, some beneficial impact at local level would come in the form of employment in sub-project related works, which would depend on the nature and extent of the sub-project. For example, labor-intensive sub-project works (e.g., manual excavation) could generate employment for considerable number of semi-skilled workforce. This in turn would induce some positive impacts on some other parameters including commercial activities in the sub-project areas.

**Impact on archeological and historical sites:**

177. Archeological and historical sites are protected resources. Damage of such sites by digging, crushing by heavy equipment, uprooting trees, exposing sites to erosion, or by making the sites more accessible to vandals are of particular concern. A guideline for archaeological impact assessment is presented in Appendix E.

**Safeguarding physical cultural resources (PCR):**

178. Since the exact locations of the sub-projects to be implemented are not known at this moment, a guideline for identification of physical cultural resources (PCR) and determination of the suitability of the sub-projects from the perspective of PCR is provided in Appendix F. The likely impacts to PCR for typical activities of the sub-projects are also discussed in Appendix F. The “Chance Find” procedure for protection of cultural property is presented in Appendix G, following the World Bank Operational Policy OP 4.11 (Physical cultural resources).
179. For convenience, the potential significant impacts during construction phase of the proposed sub-projects (substations and power lines) may be presented in a tabular form; the format is presented in Table 4.9.

Table 4.9: Format to be used for presenting assessment of potential impacts during construction phase of substation and power line sub-projects

<table>
<thead>
<tr>
<th>Environmental Parameter</th>
<th>Positive Impact</th>
<th>No Impact</th>
<th>Adverse Impact</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Moderate</td>
<td>Significant</td>
</tr>
<tr>
<td>Ecological Parameter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss/cutting of tree/vegetation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on wetland/aquatic habitat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physicochemical Parameters</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage congestion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise pollution</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air pollution</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water pollution</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental pollution</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic Parameters</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of land(^1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of income(^1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on indigenous population(^1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic congestion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health and safety</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Archaeological/historical sites</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical cultural resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)To be assessed following the guidelines provided in SMF (Chapter 5)

4.9.3.2 Potential Significant Environmental Impacts during Operational Phase

180. After identification of the activities/processes that would take place during operational phase (see Chapter 3), the potential impacts of these activities/processes on the baseline environment need to be assessed. The potential environmental impacts could also be categorized into: (a) ecological impacts; (b) physicochemical impacts; and (c) socio-economic impacts. In general, the potential adverse impacts of the sub-projects during operational phase are not likely to be significant.

Ecological impacts:

177. During operational phase, the possible impact of the sub-project activities on the biological environment would be insignificant. Some of the sub-projects could cause a change in the habitation characteristics of aquatic/terrestrial fauna in the vicinity of the sub-project locations/routes. Accidental spillage of transformer/generator fuel could have adverse impact on the surrounding aquatic/terrestrial floras or faunas.
Physicochemical impacts:

181. Depending on the type of sub-projects, a number of physicochemical parameters could experience both positive and negative impacts during operation phase of the sub-projects. Important issues and parameters include:

- Drainage and water/environmental pollution,
- Air quality and noise level, and
- Environmental pollution from solid waste

Drainage and water/environmental pollution:

182. Based on field visits of existing similar projects, the proposed sub-projects involving construction of substations (by PGCB or BREB) might have office and residential facilities within the project compound with new approach road. Proper management of solid and liquid wastes generated in these substations is very important to safeguard proper drainage and prevent environmental pollution in the surrounding areas. Poor quality of discharge water from the substations could cause pollution to the final receiving water body.

Air quality and noise level:

183. During operational phase, the generators running within the newly constructed substations by PGCB/BREB could impact air quality and noise level in the surrounding areas. Emissions from the generators can deteriorate the air quality in the adjacent areas.

Socio-economic impacts:

184. This section provides an overview of the possible socio-economic impacts of the sub-projects during operational phase that are not covered under the social management framework (SMF).

Power supply:

185. The proposed project is aimed at increasing penetration and the reliability of power supply. Thus, operations of the substations and power lines under the proposed project would significantly improve reliability of power supply, thereby inducing a wide range of socio-economic benefits.

Public health and safety:

186. Health concerns over exposure to EMF are often raised when a new transmission line is proposed. To date research works have not been able to establish a cause and effect relationship between exposure to magnetic fields and human disease, nor a plausible biological mechanism by which exposure to EMF could cause disease. Nevertheless, the health and safety concern related to such exposures should be addressed.

187. Live fallen lines are a safety concern. Transmission lines are designed to trip out (turn off) if they fall or contact trees. This is not necessarily true for distribution lines. However,
efforts should be made to make sure that the safety issues are properly addressed in the design phase.

188. Safety of transmission line tower constructed over rivers is an important consideration. The towers should be designed and constructed with safety features such that these are not damaged by collision with water vessels.

Employment and commercial activities:
189. Construction of new substations will create new employment opportunities for some people. From field visit it was observed that existing substations include office, housing, and rest house facilities within the compound. This will attract opportunities of other commercial activities for vendors, shop owners, etc. in the vicinity of the newly constructed substations.

Property Values:
190. Property values of an area may be affected due to its proximity to a new power line. Once the proposed power line is constructed, certain land use restrictions may be placed on all land within the right of way (RoW). Urban or industrial land capability/value may be reduced due to restriction on building of certain types of structures. On the contrary, the new power lines (and also Substations) will improve power supply and its reliability in the relevant project areas, which in turn may contribute to increase in land value.

Airports and Airstrips:
191. Transmission and distribution lines sometimes are a potential hazard to aircraft during takeoff and landing. However, available information suggests that this is not an issue of concern for the proposed project.

Implantable Medical Devices:
192. Two types of implantable medical devices, pacemakers and implantable cardiovascular defibrillators (ICDs), have been associated with problems arising from interference caused by EMF, which is often referred to as electromagnetic interference, EMI. EMI can cause inappropriate triggering of a device or inhibit the device from responding appropriately. Proper monitoring is required to detect such occurrences, if any, so that proper warning could be given to people for taking appropriate precautions, if required.

Radio, Television and Mobile Phone Reception:
193. Distribution lines do not usually interfere with mobile phone, television and radio reception. In some cases, interference is possible at locations close to the right of way (RoW) due to weak broadcast signals or poor receiving equipment.
4.10 Environmental Management Plan (EMP)

194. After prediction of assessment of impacts (as discussed in Section 4.9), the environmental management plan (EMP) is prepared. The primary objective of the EMP is to ensure implementation of the identified “mitigation measures” in order to reduce adverse impacts and enhance positive impacts. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operational phases of the sub-projects.

195. The EMP should clearly lay out: (a) the measures to be taken during both construction and operation phases of a sub-project to eliminate or offset adverse environmental impacts, or reduce them to acceptable levels; (b) the actions needed to implement these measures; and (c) a monitoring plan to assess the effectiveness of the mitigation measures employed.

196. The environmental management program should be carried out as an integrated part of the project planning and execution. It must not be seen merely as an activity limited to monitoring and regulating activities against a pre-determined checklist of required actions. Rather it must interact dynamically as a sub-project implementation proceeds, dealing flexibly with environmental impacts, both expected and unexpected. For all sub-projects to be implemented under proposed Rural Electricity Transmission and Distribution Project, the EMP should be a part of the Contract Document.

197. The major components of the EMP include:
   - Mitigation and enhancement measures
   - Monitoring plan
   - Estimation of cost of EMP
   - Institutional arrangement for implementation of EMP

4.10.1 Mitigation and Enhancement Measures

Construction Phase:

198. The overall impact assessment of the proposed sub-projects (substations and power lines) reveals that most of the adverse impacts could be minimized or eliminated by adopting standard mitigation measures; there is also scope to enhance some of the beneficial impacts to be generated from the proposed sub-projects. This section describes the mitigation and enhancement measures that could be applied to the sub-projects under the proposed Rural Electricity Transmission and Distribution Project.

199. In order to identify mitigation/enhancement measures, the potential impacts have been categorized into: (a) “general impacts”, which are typical common impacts to be experienced in most sub-projects, and (b) “sub-project specific impacts”. Table 4.10 shows typical activities to be carried out under different sub-projects, corresponding “general impacts” and suggested mitigation and enhancement measures. It also assigns responsibility for implementation of mitigation and enhancement measures. Obviously all sub-projects would not generate all the
impacts listed in Table 4.10 at the same level/magnitude. Table 4.10 provides general guidelines of mitigation and enhancement measures for the most significant “general impacts”. Table 4.11 shows “sub-project specific” impacts during construction phase and corresponding mitigation/enhancement measures.

**Operational Phase:**

200. During the operational phase, the BREB/PGCB will be responsible for the operation and maintenance of the infrastructure to be developed under the Proposed Rural Electricity Transmission and Distribution Project. Apart from regular operation and maintenance, a number of issues would require special attention for reducing/avoiding possible adverse environmental impacts; for example, regular maintenance and management of storm drains in the substations to reduce risk of water pollution.

201. With respect to storm drains, utmost efforts must be made to keep it operational (i.e., flowing) by restricting discharge of solid wastes into it and by periodically cleaning the drain. Adequate monitoring is also needed to make sure that the storm drain does not receive direct discharge of toilet wastewater from the office, residential quarters located within the substation area. Such discharges would contaminate the drainage water and eventually the receiving water body (river or khal), and would bring about a wide range of adverse environmental and health outcomes.

202. Accidental spillage of transformer/generator fuel into the drainage system is also a serious concern, which can cause environmental pollution. Spilled fuel from transformer/generator, if not properly disposed, could bring about adverse health and environmental impacts.

203. Proper management of traffic and pedestrian movement could often minimize increased risks of accidents during the maintenance of transmission lines/ distribution lines by BREB or PGCB near the roadways. Movement of heavy vehicles (loaded trucks) in local roads is a common cause of road damage at many sub-project sites. Table 4.12 shows some important sub-project specific impacts during operational phase and corresponding mitigation measures.
Table 4.10: Typical “general impacts” during construction phase of sub-projects and corresponding mitigation and enhancement measures

<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
</table>
| Construction and operation of labor shed for workers | • Generation of sewage and solid waste; water/ environmental pollution  
• Health of workers  
• Possible development of labor camp into permanent settlement  
• Outside labor force causing negative impact on health and social well-being of local people | • Construction of sanitary latrine/ septic tank system  
• Erection of “no litter” sign, provision of waste bins/cans, where appropriate  
• Raising awareness about hygiene practices among workers  
• Availability and access to first-aid equipment and medical supplies  
• Contractor to remove labor camp at the completion of contract  
• Contractor to employ local work force, where appropriate; promote health, sanitation and road safety awareness | Contractor  
(Monitoring by BREB/PGCB) |
| General construction works for sub-projects | • Drainage congestion and flooding  
• Air pollution  
• Traffic congestion, obstruction to pedestrian movement  
• Noise pollution | • Provision for adequate drainage of storm water  
• Provision of adequate diversion channel, if required  
• Provision for pumping of congested water, if needed  
• Ensure adequate monitoring of drainage effects, especially if construction works are carried out during the wet season  
• Ensure that all project vehicles are in good operating condition  
• Spray water on dry surfaces/ unpaved roads regularly  
• Maintain adequate moisture content of soil during transportation, compaction and handling  
• Sprinkle and cover stockpiles of loose materials (e.g., fine aggregates)  
• Avoid use of equipment such as stone crushers at site, which produce significant amount of particulate matter  
• Schedule deliveries of material/ equipment during off-peak hours  
• Depute flagman for traffic control  
• Arrange for signal light at night  
• Use of noise suppressors and mufflers in heavy construction equipment  
• Avoid using of construction equipment producing excessive noise at night  
• Avoid prolonged exposure to noise (produced by equipment) by workers  
• Regulate use of horns and avoid use of hydraulic horns in project vehicles | Contractor  
(Monitoring by BREB/PGCB) |
<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
</table>
| • Water and soil pollution     | • Prevent discharge of fuel, lubricants, chemicals, and wastes into adjacent rivers/khals/dains.  
| • Destruction of aquatic habitat| • Install sediment basins to trap sediments in storm water prior to discharge to surface water.  
|                                | • Keep noise level (e.g., from equipment) to a minimum level, as certain fauna are very sensitive to loud noise (e.g., during transmission tower construction over river/wetlands) | • Replant vegetation when soils have been exposed or disturbed.  
|                                | • Plantation to replace felled trees                                               | • Follow standard safety protocol.  
|                                | • Felling of trees, clearing of vegetation                                        | • Environmental health and safety briefing.  
|                                | • Spills and leaks of oil, toxic chemicals                                         | • Provision of protective gears as specified in ECoP 20.  
|                                | • Accidents                                                                        | • Provision of appropriate protective measures against accidental fall from elevated height (e.g. using body harness, waist belts, secured climbing devices, etc.)  
|                                | • Health and Safety (see details in ECoP20)                                        | • A safety observer must be appointed at each subproject site by the Contractor before the commencement of work.  
|                                | • Exposure to physical hazards from use of heavy equipment and cranes; trip and fall hazards;  
|                                | • Exposure to dust and noise; falling objects; work in confined spaces;  
|                                | • Exposure to hazardous materials;  
|                                | • Exposure to electrical hazards from the use of tools and machinery.              | • Only allowing trained and certified workers to install, maintain, or repair electrical equipment.  
|                                |                                                                                   | • Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines;  
|                                |                                                                                   | • Proper Personal Protective Equipment(PPE) for all workers and others associated with work.  
|                                |                                                                                   | • Where rehabilitation is required within minimum setback distances, specific training, safety measures, personal safety devices, and other precautions should be defined before work.  
<p>|                                |                                                                                   | Contractor (Monitoring by BREB/PGCB) |</p>
<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
</table>
| All construction works | • Beneficial impact on employment generation  
• General degradation of environment  
• Discovery of historical items and cultural remains | • Employ local people in the project activities as much as possible.  
• Environmental enhancement measures, such as plantation, landscaping, traffic/ direction signs.  
• Follow “chance find procedure” (see Appendix G) for protection of cultural resources | Contractor (Monitoring by BREB/PGCB) |

**Table 4.11: “Sub-project specific impacts” during construction phase and corresponding mitigation measures**

<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
</table>
| Construction of Substation | • Air and noise pollution affecting nearby settlements  
• Possible water pollution (surface and groundwater) bituminous products/ solvents  
• Cutting down trees to use as fuel wood for heating bitumen  
• Effect on traffic and pedestrian safety | • Locate plant away from residential settlements  
• Consider use of emulsified bitumen  
• Strict control to avoid spills; surround plant area with a ditch with a settling pond/ oil trap at the outlet; provision for adequate clean up  
• Strictly prohibit use of fuel wood for heating bitumen  
• Employ traffic control measures and limit possible disruption to non-construction traffic | Contractor (Monitoring by BREB/PGCB) |
| Rehabilitation of Substations | • Possible PCB contamination from dismantling of old transformers with PCB | • Treat PCB of old transformers following specified methods in ECoP (e.g. dehalogenation, electrochemical oxidation, etc.) | |

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<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
</table>
| Construction/ Rehabilitation of Transmission Line and Distribution Line | Installation of poles of transmission / distribution lines adjacent to roadways | • Traffic congestion/ traffic problems  
• Safety | • Not storing electric poles/transmission tower components over busy roads/ highways  
• Following standard safety protocols while erecting poles and stretching cables  
• Taking appropriate protective measures against accidental fall from elevated height (e.g. using body harness, waist belts, secured climbing devices, etc.) as specified in ECoP. | Contractor (Monitoring by BREB/PGCB) |
| | Construction of power line through natural habitat or tree plantation area | • Impact on biodiversity, vegetation and habitat | • If there’s no alternative, felling, pollarding, lopping and pruning of trees for electric clearance, whenever necessary, to be done with permission from the local forest office/appropriate authority;  
• Hand clearing of vegetation  
• Strict prohibition on use of chemicals for forest clearance/RoW maintenance.  
• Use of existing path/access roads for movement of man and machinery;  
• Carrying tower materials into forests by head loads | Contractor (Monitoring by BREB/PGCB) |
| | Tower foundation in rivers | • Impact on fisheries and other aquatic life in rivers  
• Collision with water vessels | • Installation of underwater enclosures to minimize noise propagation  
• Use signage and construction of fender( if necessary) | Contractor (Monitoring by BREB/PGCB) |
<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Substation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation of drains in the substations</td>
<td>• Pollution of downstream water body</td>
<td>• Stop direction connection from sanitation facilities to storm drain; ensure installation of septic tank in all establishments</td>
<td>BREB/PGCB</td>
</tr>
</tbody>
</table>
|                                        | • Blockage in the drain due to disposal of solid waste                                                   | • Creation of awareness; improve SWM system, installing cover in open drains/manholes (if any)  
• Regular maintenance/cleaning of the drain |                     |
| Operation of generators and transformers| • Pollution of water (e.g., from spilled oil, spent oil, other waste)                                      | • Restriction on disposal of spent oil, food and other waste in water; creation of awareness  
• Strict control to avoid spills; provision for adequate clean up | BREB/PGCB          |
| Operation of Substation                | • Security                                                                                                  | • Ensuring security of Substation in collaboration with law enforcing agencies  
• Keeping complain book at Substation for recording of people’s complaints |                     |
|                                        | • Safety, Health                                                                                           | • Ensuring availability of adequate safety gears at Substations  
• Keeping clean the conduits used for laying the XLP cables connecting switchgears and transformers with proper drainage provisions to prevent the growth of disease vectors such as mosquitoes and flies |                     |
| **Transmission Line and Distribution Line** |                                                                                                            |                                                                                                                                                                                                                                                                                                         |                     |
| Regular maintenance                    | • Safety                                                                                                   | • Regular patrolling along the power lines to identify the need for regular and immediate maintenance operation  
• Inspection immediately after a major storm/rainfall event  
• Regular cutting and trimming of trees around power lines  
• Taking appropriate protective measures against accidental fall from elevated height during regular maintenance operations (e.g. using body harness, waist belts, secured climbing devices, etc.)  
• Provision for shutting down of line in case of snapping of line  
• Regular monitoring of power lines to prevent electricity pilferage | BREB/PGCB          |
| Installation of new transformers       | • Safety                                                                                                   | • Adequate caution should be taken to carry out installation works by personnel at elevated height  
• Instrument should be properly anchored with poles | BREB/PGCB          |
<table>
<thead>
<tr>
<th>Activity/Issues</th>
<th>Potential Impacts</th>
<th>Proposed Mitigation and Enhancement Measures</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance of transmission/distribution lines</td>
<td>• Traffic congestion, obstruction to pedestrian movement, safety&lt;br&gt;• Impact on biodiversity, vegetation, habitat</td>
<td>• Depute flagman for traffic control&lt;br&gt;• Arrange for signal light at night&lt;br&gt;• Following standard safety protocol&lt;br&gt;• Felling, pollarding, lopping and pruning of trees for RoW maintenance to be done with permission from the local forest office/appropriate authority</td>
<td>BREB/PGCB</td>
</tr>
<tr>
<td>Health and Safety</td>
<td>• Safety&lt;br&gt;• Exposure to EMF&lt;br&gt;• Exposure to chemicals&lt;br&gt;• Exposure to electrical hazards from the use of tools and machinery.</td>
<td>• Only allowing trained and certified workers to maintain, or repair electrical equipment&lt;br&gt;• Taking appropriate protective measures against accidental fall from elevated height during regular maintenance operations (e.g. using body harness, waist belts, secured climbing devices, etc.)&lt;br&gt;• Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines;&lt;br&gt;• Proper Personal Protective Equipment (PPE) for all workers and others associated with work.&lt;br&gt;• Training of workers in the identification of occupational EMF levels and hazards&lt;br&gt;• Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure&lt;br&gt;• Use of signs, barriers (e.g. locks on doors, use of gates, use of steel posts surrounding transmission towers, particularly in urban areas), and education / public outreach to prevent public contact with potentially dangerous equipment</td>
<td>BREB/PGCB</td>
</tr>
</tbody>
</table>
4.10.2 Monitoring Plan

204. The primary objective of the environmental monitoring is to record environmental impacts resulting from the sub-project activities and to ensure implementation of the “mitigation measures” identified earlier in order to reduce adverse impacts and enhance positive impacts from project activities.

Monitoring during Construction Phase:

205. During implementation of all sub-projects, the BREB/PGCB will be responsible to monitor and make sure that the environmental mitigation/enhancement measures (including health and safety measures) outlined in the EMP for the particular sub-project are being implemented in accordance to the provisions of the Tender Document.

206. Apart from general monitoring of mitigation/enhancement measures and health and safety protocols (as outlined in the ESMF and Tender Document), important environmental parameters to be monitored during the construction phase of the sub-projects include noise level, water quality, drainage congestion, and traffic problems. However, the requirement and frequency of monitoring would depend on the type of sub-project and field situation. For certain sub-projects (e.g., rehabilitation of existing transmission line/distribution line), monitoring of these parameters is not critical; while monitoring of some of these parameters (e.g., noise level) would be needed only if significant pollution is suspected. Table 4.13 presents guidelines for monitoring of specific environmental parameters during construction phase of different sub-projects. In addition of Table 4.13, the routine monitoring work will be done by PBS/BREB/PGCB to ensure that:

- All personnel at work sites are provided with protective gears like helmets, goggles, boots, etc. so that injuries to personnel are avoided or minimized;
- Workforce likely to be exposed to noise levels beyond regulatory limits is provided with protective gears like hear plugs etc. and regularly rotated;
- Dust suppression measures like sprinkling of water are carried out in relevant operations areas;
- The construction camps have health care facilities and all construction personnel are subjected to routine vaccinations and other preventive/healthcare measures;
- The work and campsites have suitable facilities for handling any emergency situation like fire, explosion, electrocution, etc.;
- All areas intended for storage of hazardous materials are quarantined and provided with adequate facilities to combat emergency situations. All required permits for storage of inflammable/hazardous materials are to be obtained;
- The construction workers, supervisors and engineers are properly trained;
- The operational areas are access controlled and entry is allowed only under authorization;
- The construction camps have in-house community/common entertainment facilities.
### Table 4.13: Guidelines for monitoring of environmental parameters during construction phase

<table>
<thead>
<tr>
<th>Sub-project</th>
<th>Monitoring Parameter and Scenario</th>
<th>Monitoring Frequency</th>
<th>Resource Required and Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of 132/33kV Substations by PGCB; Construction of 33/11kV</td>
<td>Regular monitoring: Noise level</td>
<td>Once every week, particularly during operation of heavy equipment</td>
<td>Contractor, under the guidance of BREB/ PGCB</td>
</tr>
<tr>
<td>Substations BREB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction of 132/33kV Substations by PGCB (near a water body);</td>
<td>Water quality (pH, BOD₅, COD, NH₃, PO₄)</td>
<td>Once during construction period (at a location downstream of the work area)</td>
<td>Contractor, under the guidance of BREB/ PGCB</td>
</tr>
<tr>
<td>Construction of 33/11kV Substations by BREB (near a water body);</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction of 132 kV transmission line over river/wetland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All sub-projects</td>
<td>Visual observation of drainage congestion,</td>
<td>Once a week; when drainage/ traffic congestion suspected</td>
<td>Contractor, under the guidance of BREB/ PGCB</td>
</tr>
<tr>
<td></td>
<td>traffic within around sub-project location</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Occupational health and safety of project</td>
<td>Once a week, and as and when needed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>personnel (including general health, water</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>supply and sanitary provision, etc.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Actual monitoring time and location should be decided depending on the location of specific activities.

### Monitoring during Operational Phase

During operational phase, monitoring of environmental parameters would be required for the sub-projects. Table 4.14 presents guidelines for monitoring of specific environmental parameters during operational phase of selected sub-projects.

### Table 4.14: Guidelines for monitoring during operational phase

<table>
<thead>
<tr>
<th>Parameters (Sub-project)</th>
<th>Monitoring Frequency</th>
<th>Resource Required and Responsibility</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger Trees (Power Line)</td>
<td>Once every month, and as directed by the Project Engineer</td>
<td>Vehicle with ladder and cutting accessories; O&amp;M team</td>
<td>Results to be reported to Environment and Social Unit (ESU)</td>
</tr>
<tr>
<td>Dielectric strength of Transformers (Substation)</td>
<td>Once in 6 months, and as directed by the Project Engineer</td>
<td>Testing equipment, O&amp;M team</td>
<td></td>
</tr>
<tr>
<td>Tan – δ test (Substation)</td>
<td>Once in 10 years, and as directed by the Project Engineer</td>
<td>Testing equipment, O&amp;M team</td>
<td></td>
</tr>
<tr>
<td>Hazardous Material (Substation)</td>
<td>Once every three months, and as directed by the Project Engineer</td>
<td>Laboratory facilities; O&amp;M team</td>
<td></td>
</tr>
</tbody>
</table>
### Parameters (Sub-project) | Monitoring Frequency | Resource Required and Responsibility | Comment
---|---|---|---
XLPE cables and trenches within the substation boundary (Substation) | Twice a year to prevent disease | O&M Team |

#### 4.10.3 Method for Estimation of Cost of EMP

Cost of implementing environmental management plan (EMP) including monitoring activities needs to be estimated as a part of the preparation of EMP. Many of the activities to be carried out as a part of EMP would not involve any additional direct cost e.g., employing local work force, where appropriate; keeping sub-project vehicles in good operating condition; scheduling deliveries of materials/ goods in off-peak hours; good housekeeping, avoiding spills; prohibiting use of fuel wood for heating bitumen; etc. On the other hand, a number of activities would require additional cost. Environmental monitoring during both construction and operational phases would involve direct cost. At the same time, a number mitigation measures (including health and safety measures) would also require additional cost; these include installation of septic tank/sanitary latrine/portable toilets, installation of health and safety signs, awareness documents (signs/ posters), water sprinkling on aggregates and unpaved surfaces, traffic control (e.g., deputing flagman), traffic light, plantation, and protective gear. Table 4.15 provides basis/ method of estimation of costs of different items of EMP. Similar approach should be followed for estimation of cost of additional measures, if required.

**Table 4.15: Method/ basis of estimation of cost of Monitoring**

<table>
<thead>
<tr>
<th>Monitoring Item</th>
<th>Basis of cost/Estimated cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise level</td>
<td>Prevailing rate (~ Tk. 5,000/- per measurement per day)</td>
</tr>
<tr>
<td>Water quality (pH, BOD₅ or COD, NH₃, PO₄)</td>
<td>Prevailing rate (~ Tk. 7,000/- per sample)</td>
</tr>
<tr>
<td>Installation of septic tank/ sanitary latrine/ portable toilet</td>
<td>Prevailing rate/Latest PWD/LGED/BREB/PGCB rates</td>
</tr>
<tr>
<td>Health/ safety signs (size and number to be estimated)</td>
<td>Prevailing PWD/LGED/BREB/PGCB rate /Lump sum amount</td>
</tr>
<tr>
<td>Water sprinkling on aggregate</td>
<td>Latest PWD/LGED rate (if available)/A fixed rate per cubic meter of aggregate per day</td>
</tr>
<tr>
<td>Traffic control (estimate number of flagman needed and duration of work)</td>
<td>Latest PWD/ LGED rate (if available)/A fixed rate per flagman per day/ Lump sum amount</td>
</tr>
<tr>
<td>Traffic light</td>
<td>Latest PWD/ LGED rate (if available)/ Lump sum amount</td>
</tr>
<tr>
<td>Protective gear</td>
<td>Contractor to quote rate of different items of works considering the provision of adequate protective gear for workers, in accordance to the conditions of contract, specified in the Tender Document</td>
</tr>
<tr>
<td>Plantation (including protection/ fencing and conservation during project period)</td>
<td>Prevailing rate (~ Tk. 1,000/- per plant)</td>
</tr>
</tbody>
</table>
4.10.4 Institutional Capacity for Implementation of EMP

209. **Bangladesh Rural Electrification Board (BREB):** BREB has prior experience in implementing IDA-funded RERED project where construction and rehabilitation of lines and substations were supported. To institutionalize the environment and social safeguards, BREB agreed to set-up a formal Environment and Social Management Unit/Cell with qualified regular staff. This will need revision of the BREB’s present organogram. Since the establishment of the Unit/Cell would require several administrative clearances, as an interim measure, BREB will set-up a Project specific Environment and Social Unit (ESU) under the PMU. The project specific “Environment and Social Unit (ESU)” under the leadership of a Superintending Engineer, will assist the Project Management Unit (PMU) of BREB on issues related to environmental management. The ESU with support from relevant Palli Biddyut Samities (PBSs) will carry out “Environmental/Social Screening” and “Analysis of Alternatives” of sub-projects, following the guidelines contained in the ESMF. The environmental and social assessment (ESA) of the sub-project will be carried out by supervision consultant or individual consultant hired by BREB. The PMU of BREB will be responsible for implementation of EMP and preparation of quarterly reports, with support from ESU and supervision consultant. Section 4.14 shows activities and institutional responsibilities for overall implementation of the Proposed Rural Electricity Transmission and Distribution Project by BREB.

210. The BREB developed “checklists” for environmental and social compliance for substation and power line construction, building construction and environmental impact mitigation; and also has health and safety protocols. However, there is need for capacity building of the BREB and Palli Biddyut Samities (PBSs) for environmental management in a more systematic way proposed in the current ESMF. Special attention should be provided on the alternative analysis and occupational health and safety.

211. **Power Grid Company of Bangladesh (PGCB):** PGCB has been implementing the Siddhirganj-Maniknagar 230kV Transmission Line component under IDA-financed SPPP. PGCB is in the process of creating an Environment and Social Unit (ESU) in the regular organogram and the ESU is expected to be set-up under the leadership of a Deputy General Manager, who will be responsible for overall environmental management of sub-projects to be implemented under the proposed project. The team will be assisted by individual consultant to be hired by PGCB at project/sub-project formulation stage; the ESU will be responsible for overseeing implementation of EMP/ECoP as outlined in the ESMF and preparation of quarterly reports. Section 4.14 shows activities and institutional responsibilities for overall implementation of the Proposed Rural Electricity Transmission and Distribution Project by PGCB.

212. However, there is need for capacity building of the PGCB for environmental management in a more systematic way proposed in the current ESMF. Special attention should be provided on the alternative analysis and occupational health and safety.

206. The institutional strengthening component of the proposed project includes provisions for short and long-term training courses of the concerned officials on environmental and social management.
4.11 Environmental Code of Practice (ECoP)

213. The design, construction and installation works related to the proposed project shall take into consideration the relevant environmental and social concerns. Factors to be considered include, but are not limited to:

- the promotion of energy efficiency,
- the efficient use of non-renewable resources,
- the use of renewable resources,
- the social impact of new projects and community concerns,
- the minimization of environmental damage, including visual impacts,
- tree management,
- reduction in and the correct disposal of waste products, and
- the Electromagnetic Field (EMF) issues.

214. The Environmental Code of Practice (ECoP) is prepared as a guideline for environment management of different subprojects, namely, i) Construction of Sub-station, ii) Construction of Transmission/Distribution Lines, and iii) Rehabilitation of Transmission/Distribution Lines, to be implemented by the BREB and PGCB. The main objective of an ECoP is to manage construction operations in harmony with the environment in an effort to contribute to the well-being of the community and the environment by:

- Minimizing pollution
- Sustaining eco-systems
- Conserving cultural heritage, and
- Enhancing amenity

215. The ECoP is designed to be used during the construction of the substations, rehabilitation of the transmission/distribution lines, and construction of the new transmission/distribution lines by the PGCB and BREB. The purpose of the Code of Practice is to ensure that construction activities are conducted in a manner that minimizes impacts on the environment. It promotes awareness and use of best practice in environmental management. ECoP is applicable to the construction sites and associated activities such as stockpile sites, disposal sites for clean excavated materials, etc. Responsibility lies with all the people involved in any given project to adopt environmentally responsible work practices. Best environmental management practice requires environmental awareness, and appreciation of one’s environmental responsibilities. Measures taken to prevent environmental impacts are preferred to those designed to control the impact.

216. The Environmental Code of Practice (ECoP) includes a list of activities associated with construction of the substations, rehabilitation of the transmission/distribution cable, and construction of the new transmission/distribution lines by the PGCB and BREB. The ECoP outlines activities on different issues related to project implementation. The ECoP developed will address the following issues related to the above project components: (1) Project Planning and Design, (2) Route Selection, (3) Tower/Pole Erection, (4) Overhead Power Cable Installation, (5) Installation of Transformer on H-Pole, (6) Substation Site Preparation, (7) Construction of Camps, (8) Topsoil Salvage, Storage and Replacement, (9)

217. A particular sub-project may involve all or some of these issues. Appendix H presents the ECoPs, and Table 4.16 (for BREB) and Table 4.17 (for EGCB) outlines applicability of different ECoP activities for different sub-project activities under for proposed project.

**Table 4.16: Possible application of ECoP relating to different types of sub-projects to be implemented by BREB**

<table>
<thead>
<tr>
<th>Different activities related to ECoP</th>
<th>Bangladesh Rural Electrification Board (BREB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction of 33/11kV Substation</td>
</tr>
<tr>
<td>Project Planning and Design</td>
<td>☑</td>
</tr>
<tr>
<td>Route Selection</td>
<td>☑</td>
</tr>
<tr>
<td>Pole Erection</td>
<td>--</td>
</tr>
<tr>
<td>Overhead Power Cable Installation</td>
<td>--</td>
</tr>
<tr>
<td>Installation of Transformer on H-Pole</td>
<td>☑</td>
</tr>
<tr>
<td>Substation Site Preparation</td>
<td>☑</td>
</tr>
<tr>
<td>Construction Camps</td>
<td>☑</td>
</tr>
<tr>
<td>Topsoil Salvage, Storage and Replacement</td>
<td>☑</td>
</tr>
<tr>
<td>Borrow Areas</td>
<td>☑</td>
</tr>
<tr>
<td>Land Reclamation</td>
<td>☑</td>
</tr>
<tr>
<td>Waste Management</td>
<td>☑</td>
</tr>
<tr>
<td>Water Bodies</td>
<td>☑</td>
</tr>
<tr>
<td>Water Quality</td>
<td>☑</td>
</tr>
<tr>
<td>Public Health and Safety</td>
<td>☑</td>
</tr>
<tr>
<td>Electromagnetic Field</td>
<td>☑</td>
</tr>
<tr>
<td>Material Storage, Transport &amp; Handling</td>
<td>☑</td>
</tr>
<tr>
<td>Cutting of Trees</td>
<td>☑</td>
</tr>
<tr>
<td>Natural Habitats</td>
<td>☑</td>
</tr>
<tr>
<td>Occupational Health and Safety</td>
<td>☑</td>
</tr>
<tr>
<td>Community Health and Safety</td>
<td>☑</td>
</tr>
</tbody>
</table>

☑ = ECoP required; ☑ = ECoP may be required depending on the site/route condition.
Table 4.17: Possible application of ECoP relating to different types of sub-projects to be implemented by PGCB

<table>
<thead>
<tr>
<th>Different activities related to ECoP</th>
<th>Power Grid Company of Bangladesh (PGCB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction/Upgradation of 132/33kV Substation</td>
</tr>
<tr>
<td>Project Planning and Design</td>
<td>✓</td>
</tr>
<tr>
<td>Route Selection</td>
<td>✓</td>
</tr>
<tr>
<td>Tower Erection</td>
<td>--</td>
</tr>
<tr>
<td>Overhead Power Cable Installation</td>
<td>✓</td>
</tr>
<tr>
<td>Installation of Transformer on H-Pole</td>
<td>☒</td>
</tr>
<tr>
<td>Substation Site Preparation</td>
<td>✓</td>
</tr>
<tr>
<td>Construction Camps</td>
<td>✓</td>
</tr>
<tr>
<td>Topsoil Salvage, Storage and Replacement</td>
<td>✓</td>
</tr>
<tr>
<td>Borrow Areas</td>
<td>☒</td>
</tr>
<tr>
<td>Land Reclamation</td>
<td>☒</td>
</tr>
<tr>
<td>Waste Management</td>
<td>✓</td>
</tr>
<tr>
<td>Water Bodies</td>
<td>☒</td>
</tr>
<tr>
<td>Water Quality</td>
<td>✓</td>
</tr>
<tr>
<td>Public Health and Safety</td>
<td>✓</td>
</tr>
<tr>
<td>Electromagnetic Field</td>
<td>✓</td>
</tr>
<tr>
<td>Material Storage, Transport &amp; Handling</td>
<td>✓</td>
</tr>
<tr>
<td>Cutting of Trees</td>
<td>☒</td>
</tr>
<tr>
<td>Natural Habitats</td>
<td>☒</td>
</tr>
<tr>
<td>Occupational Health and Safety</td>
<td>✓</td>
</tr>
<tr>
<td>Community Health and Safety</td>
<td>✓</td>
</tr>
<tr>
<td>PCB Waste Management</td>
<td>✓</td>
</tr>
</tbody>
</table>

✓ = ECoP required; ☒ = ECoP may be required depending on the site/route condition.

4.12 Occupational Health and Safety Guidelines

218. In general, the objectives of occupational health and safety (OHS) plan are: (a) To develop, in the workplace, a collaborative approach to managing occupational health and safety between management and workers; (b) To provide and maintain safe working procedures and operations; (c) To ensure awareness of all potential work related risks and hazards and to develop preventive strategies against these risks and hazards; (d) To provide appropriate training to all concerned to work safely and effectively; (e) To maintain a constant and continuing interest in the improvement of occupational health and safety performance and to provide the required resources necessary for the implementation and maintenance of the OHS plan.

219. For the sub-projects to be implemented by BREB and PGCB, the occupational health and safety primarily focuses on work equipment and protective gear. The following section
provides guidelines/directives for: (a) work equipment, (b) protective gear, and (c) safety and health signs.

4.12.1 Suggested Safety Directives for Work Equipment

It is employer’s (contractor) obligation that every possible measure is taken to ensure the safety of the work equipment made available to workers. During the selection of the work equipment the employer shall pay attention to the specific working conditions which exist at the workplace, especially in relation of safety and health of the workers. A brief list of work equipment safety issues is given below:

- Work equipment control devices which affect safety must be clearly visible and identifiable and appropriately marked where necessary.
- Work equipment presenting hazards due to emissions of gas, vapor, liquid or dust must be fitted with appropriate containment and/or extraction devices near the sources of the hazard.
- Where there is a risk of mechanical contact with moving parts of work equipment which could lead to accidents, those parts must be provided with guards or devices to prevent access to danger zones or to halt movements of dangerous parts before the danger zones are reached.
- Work equipment may be used only for operations and under conditions for which it is appropriate.
- Work equipment must bear warnings and markings essential to ensure the safety of workers.
- All work equipment must be appropriate for protecting workers against the risk of the work equipment catching fire or overheating, or of discharges of gas, dust, liquid, vapor or other substances produced, used or stored in the work equipment.
- All work equipment must be appropriate for preventing the risk of explosion of the work equipment or of substances produced, used or stored in the work equipment.
- All work equipment must be appropriate for protecting exposed workers against the risk of direct or indirect contact with electricity.
- Mobile work equipment such as Bulldozer or Road Rollers with ride-on workers must be designed to restrict, under actual conditions of use, the risks arising from work equipment roll-over.
- Fork-lift trucks carrying one or more workers must be adapted or equipped to limit the risk of the fork-lift truck overturning.
- Self-propelled work equipment, such percussion drills, which may, when in motion, engender risks for persons must have facilities for unauthorized start-up.
- Machinery for lifting loads, such as Crane, must be clearly marked to indicate its nominal load, and must where appropriate be fitted with a load plate giving the nominal load for each configuration of the machinery.
- Work equipment must be erected or dismantled under safe conditions, in particular observing any instructions which may have been furnished by the manufacturer.

4.12.2 Safety Directives for Protective Gears

Personal protective equipment is suggested for use when the risks cannot be avoided or sufficiently limited by technical means. All personal protective equipment must:

- be appropriate for the risks involved, without itself leading to any increased risk
• correspond to existing conditions at the workplace
• fit the wearer correctly after any necessary adjustment.

222. The Contractor shall organize orientation to familiarize workers regarding use of personal protective equipment. Workers shall be informed of all measures to be taken. Consultation and participation shall take place on the matters related to the use of the protective equipment. A partial list of protective gears to be worn by the workers at designated work areas is provided in Table 4.18.

223. **Head Protection:** Protective helmets will be put on at all times mainly at the building and bridge construction sites, under scaffolds, erection and stripping of formworks, etc., where there are possibilities of head injuries from falling/flying objects.

224. **Hearing Protection:** Ear plugs/muffs should be worn in areas where exposure to high noise level is expected. Examples of such activities include percussion drill, bolt driving, etc.

225. **Eye and Face Protection:** Spectacles, Goggles, Face Shield or Arc-welding Mask with Hand Masks, whichever is appropriate, should be worn at times when percussion drilling, spray painting, welding or similar activities are in progress at the field.

226. **Respiratory Protection:** In work areas such as septic tanks, dump sites, sewers etc., where exposure to harmful or toxic gases is likely the workers should wear gas masks, dust filters, or insulating appliances with air supply, whichever is appropriate.

227. **Hand and Arm Protection:** In the work involving piercing, cutting or vibration. For protection against toxic chemicals special chemical resistant gloves should be worn. Over sleeves must be worn to protect ones arms.

228. **Foot Protection:** In road and bridge constructions, working on or under scaffolds, roof works, formwork erection and dismantling safety shoes/boots are essential protective measures.

### 4.12.3 Safety and Health Signs

229. Safety signs, health signs, prohibition sign, warning sign, mandatory sign, emergency escape sign, first-aid sign, information sign, signboard, supplementary signboard, safety color, symbol, pictogram, illuminated sign, acoustic signal, verbal communication and hand signal are essential tools for preventing accidents by providing information in advance.

230. When working on or with overhead lines the provisions of the paragraphs shall be complied with:

- Prior to climbing poles, ladders, scaffolds, or other elevated structures, an inspection shall be made to determine that the structures are capable of sustaining the additional or unbalanced stresses to which they will be subjected.
- Where poles or structures may be unsafe for climbing, they shall not be climbed until made safe by guying, bracing, or other adequate means.
- Before installing or removing wire or cable, strains to which poles and structures will be subjected shall be considered and necessary action taken to prevent failure of supporting structures.
- When setting, moving, or removing poles using cranes, derricks, gin poles, A-frames, or other mechanized equipment near energized lines or equipment, precautions shall be taken to avoid contact with energized lines or equipment, except in bare-hand live-line work, or where barriers or protective devices are used.
- Unless using suitable protective equipment for the voltage involved, employees standing on the ground shall avoid contacting equipment or machinery working adjacent to energized lines or equipment.
- Lifting equipment shall be bonded to an effective ground or it shall be considered energized and barricaded when utilized near energized equipment or lines.
- Pole holes shall not be left unattended or unguarded in areas where employees are currently working.
- Tag lines shall be of a nonconductive type when used near energized lines.

Table 4.18: Brief list of protective gears to be worn during the use of some equipment

<table>
<thead>
<tr>
<th>Works/ Equipment Use</th>
<th>Safety Measures for Workers and/or Work Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Construction Works</td>
<td>HH, STB, HG</td>
</tr>
<tr>
<td>Earth-works</td>
<td>HH, STB, HG</td>
</tr>
<tr>
<td>Electric-works</td>
<td>IB, HG</td>
</tr>
<tr>
<td>Cables and Wires</td>
<td>HG, EG, HH</td>
</tr>
<tr>
<td>Wood-works</td>
<td>HH, STB, HG</td>
</tr>
<tr>
<td>Road Paving</td>
<td>HH, STB, HG, BP, FM</td>
</tr>
<tr>
<td>Cranes</td>
<td>HH, STB, HG, WB</td>
</tr>
<tr>
<td>Pile Driver</td>
<td>HH, STB, HG, EP, WB</td>
</tr>
<tr>
<td>Arc Welder</td>
<td>HH, WV, HG</td>
</tr>
<tr>
<td>Bull Dozer</td>
<td>HH, STB, WB</td>
</tr>
<tr>
<td>Auger Drill</td>
<td>HH, STB, HG, WB</td>
</tr>
<tr>
<td>Concrete Mixer</td>
<td>HH, STB, HG, WB</td>
</tr>
<tr>
<td>Fork Lift</td>
<td>HH, HG, STB, WB</td>
</tr>
<tr>
<td>Elbow Jack</td>
<td>HH, STB, HG</td>
</tr>
<tr>
<td>Sledge/Pick Hammer</td>
<td>HH, STB, HG, WB</td>
</tr>
<tr>
<td>Vibrator</td>
<td>HH, STB, HG, WB</td>
</tr>
<tr>
<td>Pick Axe</td>
<td>HH, STB, HG, WB</td>
</tr>
<tr>
<td>Electric Saw</td>
<td>HG, EG, EM</td>
</tr>
<tr>
<td>Working on Poles, Towers</td>
<td>HH, STB, HG, WB</td>
</tr>
</tbody>
</table>

**Note:** HH = Hard Hat, STB = Steel-tipped Boot, HG = Hand Gloves, BH = Body Harness, WB = Waist Belt, EM = Ear Muff, EP = Ear Plug, WV = Welding Visor, FM = Face Mask, BP = Body Protective Apron, IB = Insulating Boots, EG = Eye protection Glasses

231. For Metal Tower Construction:
- When working in unstable material the excavation for pad- or pile-type footings in excess of 1.5m deep shall be either sloped to the angle of repose as required in design or shored if entry is required. Ladders shall be provided for access to pad- or pile-type footing excavations in excess of 1.33m.
• When working in unstable material provision shall be made for cleaning out auger-type footings without requiring an employee to enter the footing unless shoring is used to protect the employee.
• A designated employee shall be used in directing mobile equipment adjacent to footing excavations.
• No one shall be permitted to remain in the footing while equipment is being spotted for placement.
• Where necessary to assure the stability of mobile equipment the location of use for such equipment shall be graded and leveled.
• Tower assembly shall be carried out with a minimum exposure of employees to falling objects when working at two or more levels on a tower.
• Guy lines shall be used as necessary to maintain sections or parts of sections in position and to reduce the possibility of tipping.
• Members and sections being assembled shall be adequately supported.

232. The construction of transmission towers and the erecting of poles, hoisting machinery, site preparation machinery, and other types of construction machinery shall conform to following applicable requirements:
• No one shall be permitted under a tower which is in the process of erection or assembly, except as may be required to guide and secure the section being set.
• When erecting towers using hoisting equipment adjacent to energized transmission lines, the lines shall be de-energized when practical. If the lines are not de-energized, extraordinary caution shall be exercised to maintain the minimum clearance distances required by PGCB.
• Erection cranes shall be set on firm level foundations and when the cranes are so equipped outriggers shall be used.
• Tag lines shall be utilized to maintain control of tower section being raised and positioned, except where the use of such lines would create a greater hazard.
• The load-line shall not be detached from a tower section until the section is adequately secured.
• Except during emergency restoration procedures erection shall be discontinued in the event of high wind or other adverse weather conditions which would make the work hazardous.
• Equipment and rigging shall be regularly inspected and maintained in safe operating condition.
• Adequate traffic control shall be maintained when crossing highways and railways with equipment as required.
• A designated employee shall be utilized to determine that required clearance is maintained in moving equipment under or near energized lines.

233. For Stringing of Conductors: Conductors being strung in or removed shall be kept under positive control by the use of adequate tension reels, guard structures, tie lines, or other means to prevent accidental contact with energized circuits.
• Guard structure members shall be sound and of adequate dimension and strength, and adequately supported.
• Catch-off anchors, rigging, and hoists shall be of ample capacity to prevent loss of the lines.
• The manufacturer’s load rating shall not be exceeded for stringing lines, pulling lines, sock connections, and all load-bearing hardware and accessories.

• Pulling lines and accessories shall be inspected regularly and replaced or repaired when damaged or when dependability is doubtful.

• Conductor grips shall not be used on wire rope unless designed for this application.

• While the conductor or pulling line is being pulled (in motion) employees shall not be permitted directly under overhead operations, nor shall any employee be permitted on the cross-arm.

• A transmission clipping crew shall have a minimum of two structures clipped in between the crew and the conductor being sagged. When working on bare conductors, clipping and tying crews shall work between grounds at all times. The grounds shall remain intact until the conductors are clipped in, except on dead end structures.

• Except during emergency restoration procedures, work from structures shall be discontinued when adverse weather (such as high wind or strong rain or storm) makes the work hazardous.

• Stringing and clipping operations shall be discontinued during the progress of an electrical storm in the immediate vicinity.

• Reel handling equipment, including pulling and braking machines, shall have ample capacity, operate smoothly, and be leveled and aligned in accordance with the manufacturer’s operating instructions.

• Reliable communications between the reel tender and pulling rig operator shall be provided.

• Each pull shall be snubbed or dead ended at both ends before subsequent pulls.

234. The Contractor will provide or ensure that appropriate safety and/or health signs are in place at their work sites where hazards cannot be avoided or reduced. Workers and their representatives must be informed of all the measures taken concerning health and safety signs at work and must be given suitable instruction about these signs.

### 4.12.4 Implementation and Supervision of Health and Safety Guidelines

235. Occupational health and safety are very important issues, especially for the construction/rehabilitation phase of power lines and substations. Section 4.12 presents detail guideline on occupational health and safety issues. In addition, a detailed ECoP has been developed on health and safety issues (see Section 4.11). Besides, a number of Special Environmental Clauses (SECs) on “health and safety” and “disposal and pollution” have been included in the ESMF for inclusion in the Tender Document.

236. The Contractor will be responsible for implementation of the provisions of the health and safety guidelines, as outlined in the EMP and ECoP (which would form part of the Tender Document). For projects/sub-projects to be implemented by BREB, the Environmental and Social Unit (ESU) and Supervision Consultant (to be hired by BREB) will be responsible for overseeing proper enforcement of the health and safety guidelines. For projects/sub-projects to be implemented by PGCB, the Environment and Social Unit (ESU) of PGCB will be responsible for compliance with the health and safety guidelines outlined in the ESMF.
4.13 Special Environmental Clauses (SECs) for Tender Document

237. Apart from the provisions of Contract under “General Specification” and “Particular Specification” for different sub-projects, the following special environmental clauses (SECs) shall be included in the Tender Document under General/Particular Specification. These clauses are aimed at ensuring that the Contractor carries out his responsibility of implementing the EMP and other environmental and safety measures. Further, a special clause must be included for prohibiting the purchase and installation of transformers containing PCB.

238. To perform the work, the contractor must hire at least one environment, health and safety supervisor for each subproject. Depending on the size of the subproject, BREB/PGCB may recommend more than one supervisors in the bidding document.

239. Environmental Management Plan (EMP): The Contractor shall carry out all mitigation and enhancement measures (including those related to mitigation of air/noise/water pollution; drainage/traffic congestion) as specified in the Environmental Management Plan (EMP), annexed to this Contract.

240. Temporary Works: The Contractor shall make sure that all equipment and safeguards required for the construction work such as temporary stair, ladder, ramp, scaffold, hoist, run away, barricade, chute, lift, etc. are substantially constructed and erected, so as not to create any unsafe situation for the workmen using them or the workmen and general public passing under, on or near them.

241. Health and Safety: All contractors are responsible to:

- Maintain standards of Health and Safety towards all of his employees not less than those laid down by the national standards or statutory regulations.
- Be in compliant with all Health and Safety Terms and Conditions described in ECoP 20 and 21;
- Ensure that all of its workers entering the worksite comply with the Occupational Health and Safety. The Contractor shall provide all appropriate protective clothing and equipment for the work to be done and ensure its proper use. Where required, safety nets, belts, harnesses and lines shall be provided by the contractor. The “safety directives for work equipment” and “safety directives for protective gears”, as specified in the Occupational Health and Safety Guidelines (attached) shall be followed.
- The Contractor shall supply and install PCB free transformers so as to prevent possible exposure to hazardous chemicals.
- Provide and maintain in prominent and well-marked positions all necessary first-aid equipment, medical supplies and other related facilities. A sufficient number of trained personnel will be required to be available at all times to render first aid.
- The Contractor shall provide or ensure that appropriate safety and/or health signs are in place at their work sites where hazards cannot be avoided or reduced.
• Report to the Engineer promptly and in writing particulars of any accident or unusual or unforeseen occurrences on the site, whether these are likely to affect progress of the work or not.
• Safety orientation prior to working at the work-site;
• Unless otherwise agreed to in writing by the BREB/PGCB/PBS Project Contact Person, supply all necessary equipment and tools, including but is not limited to ladders, scuffles, man-lifts, forklifts, and others required in completing the work;
• Ensure that all equipment and tools, including PPE, used on the work-site are in good working condition, properly maintained;
• Ensure that equipment is operated only by those workers who have been properly trained and are skilled in the operation of the equipment;
• Have available for reference a manufacturer's operating manual for all the equipment and tools brought to the work-site;
• Use appropriate authorization to facilitate access to the project site as permitted.
• Ensure good accommodation, water supply and sanitation facilities for all workers

242. Disposal and Pollution:
• The Contractor shall not dispose any waste, rubbish or offensive matter in any place not approved by the Engineer or Statutory Authority having jurisdiction. The Contractor shall not discharge into any watercourse oil, solids, noxious or floating materials.
• The Contractor shall, where required, treat PCB contained in old transformers using available technologies; namely, super critical oxidation, electro-chemical oxidation, solvated electron technology, chemical reduction method, dehalogenation process, and thermal desorption using pyrolysis, catalyzed dehalogenation and vitrification before disposal.
• The Contractor shall take all reasonable precautions to keep public or private roads clean of any spillage or droppings from his vehicles or equipment. Any spillage or droppings which accrue shall be cleaned without delay to the satisfaction of the Engineer.
• The Contractor shall construct sanitary latrine or septic tank system or install portable cabin toilet for disposal of human waste in the site office and temporary labor sheds for workers/employees; the Contractor shall provide waste bins/cans for collection of solid waste at appropriate locations (as directed by the Engineer), and ensure proper transfer/disposal of solid waste.

4.14 Institutional Arrangement and Responsibility

Contractor:

243. In addition of Contractor’s general arrangement to carry out the project works, the Contractor must hire at least one environment, health and safety supervisor for each subproject before the commencement of work. The Contractor/Subcontractor shall abide by the rules of regulation of the Occupational Health and Safety as stipulated in the Labor Act-2006 and BNBC codes. The contractor shall also abide by the clauses of health and safety in General Conditions and Particular Conditions of Contract of the bid document.
244. Role of environment, health and safety supervisor: Primary role is to monitor the movement of people, workers and equipment, give timely warnings of any risk or non-compliance with safe work procedures and, where necessary, stop work if a risk situation escalates or cannot be minimized as well as look the potential environmental issues (air pollution, noise level, water quality, waste management etc.).

245. The tasks of environment and safety supervisor include the following:

- Ensure first aid facilities and personal protective equipment (PPE) for workers at the sites
- Provide orientation to workers before start of the subproject activities.
- Warn the workers of any imminent or deteriorating risk situation that could result in an accident, and instruct when it is safe to proceed
- Ensure restrain from undertaking any other tasks that may distract the workers focus on the work, mainly, work on or near live overhead conductors, work on transmission and communication towers.
- Stop the work, if necessary safety would not be ensured
- Pause the work while the safety observer changes position.
- Ensure special safety during elevated work platform work or crane operations on or near live conductors.
- Ensure proper collection and disposal of solid wastes within the construction site.
- Ensure proper infrastructure facilities, water supply and sanitation facilities for all workers.

246. The contractor will prepare a monitoring report on environment and safety for each subproject at every month during the construction/rehabilitation of transmission line or substation.

**Bangladesh Rural Electrification Board (BREB):**

247. BREB has agreed to set-up a permanent Environment and Social Management Unit/Cell with qualified staff in their regular organogram. Since the establishment of the Unit/Cell would require several administrative clearances, as an interim measure, BREB will set-up a Project specific Environment and Social Unit (ESU). The ESU under the leadership of a Superintending Engineer will assist the Project Management Unit (PMU) of BREB on issues related to environmental and social management. The organogram for project “Environmental and Social Unit” as shown below.

248. Relevant Palli Biddiyut Samities (PBSs), with support from the individual consultant as engaged by the Power Cell, will carry out “Environmental and Social Screening” and “Analysis of Alternatives” of first year sub-projects, following the guidelines contained in the Environmental and Social Management Framework (ESMF).
Further onwards environmental and social assessment (ESA) of the sub-project, as required, will be carried out by Relevant Palli Biddut Samities (PBSs) with support of supervision consultant or individual consultant hired by BREB. The ESU of BREB will review these documents and be responsible for implementation of EMP (as well as RAP and TPP) and preparation of quarterly reports, with support from supervision consultant. BREB will hire an NGO with requisite experience in implementing resettlement programs (if needed) and working in tribal areas for the field level implementation of the RAPs and TPPs, under the direct supervision of the ESU and in close coordination with the contractor. The supervision consultant will have environmental as well as social specialists in its team. Figure 4.8 shows activities and institutional responsibilities for overall implementation of the Proposed Rural Electricity Transmission and Distribution Project by BREB. All mitigation plans such as RAPs TPPs and EMPs will have to be cleared by the Bank before they are translated into Bangla and disclosed locally as well as at the Bank’s InfoShop.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of sub-project</td>
<td>PBS with support from Consultant</td>
</tr>
<tr>
<td>Prepare/ complete:</td>
<td></td>
</tr>
<tr>
<td>• Sub-project Description (Form-1)</td>
<td></td>
</tr>
<tr>
<td>• Environmental/social Screening (Form-2)</td>
<td></td>
</tr>
<tr>
<td>• Analysis of Alternatives (Form-3)</td>
<td></td>
</tr>
<tr>
<td>Review of project documents, including Forms-1, 2 and 3 and Screening/ assessment</td>
<td>Project Environmental and Social Unit (ESU) and Environment specialist of Supervision Consultant</td>
</tr>
<tr>
<td>Additional Environmental/ Social Assessment (ESA)</td>
<td>Independent consultant</td>
</tr>
<tr>
<td>Carry out: (a) IEE and EMP or (b) full scale ESIA (including RAP, TPP, if needed); following the ESMF</td>
<td></td>
</tr>
<tr>
<td>(5) Review of ESA by BREB</td>
<td>Project ESU and Environment specialist of Supervision Consultant</td>
</tr>
<tr>
<td>(6) Obtaining necessary environmental clearance from the DoE and WB</td>
<td></td>
</tr>
<tr>
<td>Implementation of EMP/RAP/TPP/ ECoP during “construction phase” of project components</td>
<td>EMP will Implemented by the Contractor and supervised by PBS, with periodic monitoring by Supervision Consultant and project ESU. The RAP and TPP will be implemented by an NGO hired by the BREB under the supervision of the ESU and in coordination with the Contractor</td>
</tr>
<tr>
<td>Preparation of quarterly progress and monitoring reports</td>
<td>One monitoring report by PBS based on monitoring report as prepared by Contractor. Another by Supervision Consultant and ESU; and one by the NGO on social safeguards</td>
</tr>
<tr>
<td>Implementation of EMP/ SMF during “operational phase” of project components, including monitoring and quarterly reporting</td>
<td>NGO and PBS with support from ESU of BREB</td>
</tr>
</tbody>
</table>

**Figure 4.8:** Institutional set up, including major activities and assignment of responsibility for their execution, for implementation of proposed project by the BREB
Power Grid Company of Bangladesh (PGCB):

250. PGCB is in the process of creating an Environment and Social Unit (ESU) in the regular organogram and the ESU is expected to be set-up before commencement of implementation of the project. The Environment and Social Unit of PGCB under the leadership of Deputy General Manager will be responsible for taking care of issues related to environmental and social management. In addition, PGCB will hire an individual consultant for safeguard management of the project. The Consultant will review the environmental screening/assessment report and carry out the periodic supervision of EMP implementation. The organogram for the proposed Environment and Social Unit, as shown below:

251. The ESU will be responsible for overall environmental and social management of sub-projects to be implemented under the proposed project. The PGCB field level staff will carry out “Environmental and Social Screening” and “Analysis of Alternatives” of sub-projects with the support from individual consultant for first year and onward, following the guidelines contained in the ESMF.

252. Further environmental and social assessment (ESA) will be carried out by the unit or individual consultant to be hired by PGCB. The PGCB ESU will review the documents and be responsible for implementation of EMP (as well as RAP and TPP) and preparation of quarterly reports. PGCB will hire an NGO with requisite experience in implementing resettlement programs and working in tribal areas (if needed) for the field level implementation of the RAPs and TPPs, under the direct supervision of the ESU and in close coordination with the contractor. Figure 4.9 shows activities and institutional responsibilities for overall implementation of the Proposed Rural Electricity Transmission and Distribution Project by PGCB.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of sub-project</td>
<td>Individual Consultant of Power Cell with PGCB field level staff</td>
</tr>
<tr>
<td>Prepare/ complete:</td>
<td></td>
</tr>
<tr>
<td>• Sub-project Description (Form-1)</td>
<td></td>
</tr>
<tr>
<td>• Environmental/social Screening (Form-2)</td>
<td></td>
</tr>
<tr>
<td>• Analysis of Alternatives (Form-3)</td>
<td></td>
</tr>
<tr>
<td>Review of project documents, including Forms-1, 2 and 3 and Screening / assessment</td>
<td>Individual Consultant of project and Environment and Social Unit, PGCB</td>
</tr>
<tr>
<td>Additional Environmental/ Social Assessment (ESA)</td>
<td>Independent consultant</td>
</tr>
<tr>
<td>Carry out: (a) IEE and EMP or (b) full scale ESIA (including RAP, TPP, if needed); following the ESMF</td>
<td>Individual Consultant of project and Environment and Social Unit (ESU) of PGCB</td>
</tr>
<tr>
<td>(7) Review of ESA by PGCB</td>
<td></td>
</tr>
<tr>
<td>(8) Obtaining necessary environmental clearance from the DoE and WB</td>
<td></td>
</tr>
<tr>
<td>Implementation of EMP/RAP/TPP/ ECoP during “construction phase” of project components.</td>
<td>The RAP and TPP will be implemented by an NGO hired by PGCB under the direct supervision of the ESU and in coordination with the Contractor. EMP will be implemented by Contractor and Supervised by PGCB’s field staff, with periodic monitoring by Individual Consultant and ESU of PGCB</td>
</tr>
<tr>
<td>Preparation of quarterly progress and monitoring reports</td>
<td>Social safeguard report will be prepared by the NGO. One monitoring report will be prepared by the Contractor. Another report by Individual Consultant and ESU of PGCB.</td>
</tr>
<tr>
<td>Implementation of EMP/ SMF during “operational phase” of project components, including monitoring and quarterly reporting</td>
<td>NGO and PGCB’s field staff with supports from ESU of PGCB</td>
</tr>
</tbody>
</table>

**Figure 4.9:** Institutional set up, including major activities and assignment of responsibility for their execution, for implementation of proposed project by the PGCB
4.15 Capacity Building and Training Requirements

253. As a part of the “overall environmental and social assessment”, existing environmental practices in recently completed and ongoing projects and capacities of BREB and PGCB have been evaluated through analysis of organizational set up and interviewing officials/engineers. Details of the evaluation are presented under “Overall Environmental Assessment”. It appears that the engineers at the BREB and PGCB have limited exposure to environmental/social assessment and management. As discussed above, BREB (with support from PBS officials) and PGCB will be responsible for carrying out “environmental/social screening” and “analysis of alternatives”, and guidelines have been provided in the ESMF for carrying out these activities. However, basic training on regulatory requirements, environmental impacts, and environmental assessment and management would greatly improve the capability of relevant BREB and PGCB engineers and experts in carrying out their responsibilities under the proposed project. Training for the PBS officials may be arranged in phases, i.e., PBSs where sub-project would be initiated immediately would receive training first, others would gradually receive training as project work progresses. From logistic point of view, the trainings may be organized on a regional basis.

254. Both BREB and PGCB will employ individual/supervision/DSM consultant, who would support BREB/PGCB in overall environmental/social management. However, since the overall responsibility of environmental management lies with BREB/PGCB, they need to ensure that the consultants are carrying out their responsibilities properly. For this purpose, it is important that the BREB/PGCB engineers/officials receive advanced training on environmental management and monitoring. Such training will assist them in properly overseeing the activities of the consultant engaged in environmental management of the proposed project following the ESMF.

255. Table 4.19 summarizes the training requirements of PBSs, BREB and PGCB. It is also advised to arrange basic training for key personnel on regulatory requirements, environmental impacts, and environmental assessment and management at home or abroad. It may be mentioned that cost of training and capacity building is included in the project resources under component 3.

<table>
<thead>
<tr>
<th>Table 4.19: Training requirements for environmental management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training Type/ Contents</strong></td>
</tr>
<tr>
<td>General environmental awareness, regulatory requirements, ESMF frameworks for project, environmental impacts and mitigation, analysis of alternatives, environmental management</td>
</tr>
<tr>
<td>Advanced training on environmental assessment, management (EMP, RAP, TPP, ECoP), monitoring, including details on ESMF framework</td>
</tr>
</tbody>
</table>
4.16 Budget Estimates

256. Cost estimates are prepared for all the mitigation and monitoring measures proposed in the ESMF. The cost estimates for some of the mitigation measures will be identified in the EMP that are be part of civil works contract. The tentative cost estimates and the budget for the remaining suggestive activities, covering both EMF and SMF, are given in the Table 4.20.

Table 4.20: Tentative cost estimates for environmental and social management

<table>
<thead>
<tr>
<th>Activities</th>
<th>Amount (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Budget for ESA Consultants</strong></td>
<td></td>
</tr>
<tr>
<td>• For first year project preparation (PGCB)</td>
<td>10,000</td>
</tr>
<tr>
<td>• Preparation of full ESA, if required for subprojects (BREB)</td>
<td>90,000</td>
</tr>
<tr>
<td>• Preparation of full ESA, if required for subprojects (PGCB)</td>
<td>25,000</td>
</tr>
<tr>
<td><strong>Social Accountability</strong></td>
<td>75,000</td>
</tr>
<tr>
<td><strong>Training Requirements</strong></td>
<td></td>
</tr>
<tr>
<td>• BREB</td>
<td>150,000</td>
</tr>
<tr>
<td>• PGCB</td>
<td>80,000</td>
</tr>
<tr>
<td><strong>Preparation of Environment and Occupational Health &amp; Safety Strategy and Guidelines</strong></td>
<td></td>
</tr>
<tr>
<td>• BREB</td>
<td>90,000</td>
</tr>
<tr>
<td>• PGCB</td>
<td>80,000</td>
</tr>
<tr>
<td><strong>EMP during construction</strong></td>
<td>Will be included in Civil Works</td>
</tr>
</tbody>
</table>

257. The Development Project Proposal (DPP) of GoB for the proposed rural electricity transmission and distribution project should reflect the above activities with budget for successful environmental management of the project.
5.0 Social Management Framework

5.1 Introduction
258. The Social Management Framework (SMF) presented here provides guidelines to identify and address the potential social concerns and impacts of the proposed rural electricity transmission and distribution project, right from the planning stage to its implementation and operational phase. The SMF provides the principles, processes and guidelines for social screening, social impact assessment and preparation of Resettlement Action Plans (RAPs) and Tribal Peoples Plans (TPPs), where necessary. It includes detail guideline for carrying out environmental/social screening, guidelines for consultation and participation at different stages of project implementation (Appendix I), guidelines for social impact assessment (SIA) and preparation of RAP (Appendix K), a Grievance Redress Mechanism (GRM) (Appendix M), and a tribal people planning framework, including guidelines for preparation of tribal people plan (TPP) (Appendix L). A number of other socio-economic issues/parameters (e.g., health and safety, traffic congestion, employment) to be included in ESA have been addressed under EMF presented in Chapter 4.

5.2 Objectives of the SMF
259. The SMF is designed to ensure that the social development principles are mainstreamed into the project design. The objectives of the SMF are the following:
- Enhance social development outcomes of the activities to be implemented under individual sub-projects;
- Promote transparency in project implementation through the use of extensive stakeholder consultation and disclosure procedures;
- Avoid, minimize, and mitigate adverse social impacts including loss of livelihood, if any;
- Identify and compensate for unavoidable adverse social impacts that sub-projects might cause on people, including protection against loss of livelihoods;
- Ensure compliance with the relevant GoB policies and those of the World Bank on social safeguards and other social issues; and
- Strengthen social management capacity within BREB and PGCB.
- Provide guidelines for preparation of all mitigation plans such as RAPs and TPPs.

5.3 Social Management Principles

5.3.1 Inclusion
260. The vulnerable section of the communities including the very poor, women, tribal people, minority communities, and the marginalized and/or, disabled people, etc. are to get benefit from the sub-projects and the SMF.

5.3.2 Participation
261. The communities are empowered with an opportunity to decide, implement and monitor the development programs. Accordingly, the focus should be to promote participatory processes throughout the sub-project cycles.
5.3.3 Transparency

262. Stakeholders can exercise their rights to access information on the proposed development project. The BREB and PGCB are to disclose project information in public domain. This creates an enabling environment to develop trust among implementing partners and builds in checks and balances to strengthen the system. Sub-project information will be disclosed in public domain including the environmental/social screening/assessment reports and resettlement action plan, where applicable.

5.3.4 Social Accountability

263. Social accountability tools are to be implemented to improve peoples’ participation and transparency. Steps to strengthen transparency and accountability include strengthening of supply and demand side of Social Accountability. For this purpose, ICT based monitoring and grievance management systems will be developed involving “real time” flow of information and “real time” decision making and undertaking corrective measures. On the supply side, it may cover uploading of relevant data from the sub-project sites (e.g., regarding environmental/social screening, RAP and its implementation). On the demand side, the focus will be on grievance management; for this purpose, a help line service may be piloted to redress complaints related to social safeguard management.

5.3.5 Social Safeguards

264. The guiding principle for the SMF to be followed and incorporated in all mitigation plans such as RAPs and TPPs when they are prepared are the following:

- All project affected people (PAPs) will be compensated for losses resulting from project interventions regardless of title to land (e.g., encroachers will be eligible for entitlements mentioned specifically in the entitlement matrix in Annex K).
- All compensation will be at replacement value (current market price at which the asset can be replaced) without deducting depreciation and salvage value.
- The cut-off date will be publicly announced by the project and will determine who are to be included as PAPs. The consultation and communication component will be an ongoing activity of the project.
- A Grievance Redress Mechanism will be developed and implemented to respond to all complaints.

265. Legal and policy framework provides guidelines for acquisition of land and assets and compensation measures for the assets acquired. The project is to be designed to avoid or minimize, to the extent possible, the adverse impacts caused by displacement associated with the implementation of sub-projects. The BREB and PGCB are to prepare subproject proposals based on the following principles, which are to be mainstreamed by adopting appropriate process for social impact assessment and mitigation of impacts:

- Acquisition of private and public lands causing physical displacement of people will be avoided or minimized to the extent possible.
- In unavoidable circumstances, if land is vitally needed, BREB/PGCB may seek voluntary contribution from the concerned land owners, and/or explore alternatives to voluntary contribution without coercion or threat of sanctions. However, voluntary contribution should not be considered for lands more than 1 (one) decimal in size. Besides, owner’s socio-economic background and land use pattern (e.g., if
the land in question is his/her primary source of income, if the land is vacant/ fallow) should be considered when considering voluntary contribution. Voluntary nature of the transfer has to be well documented and verifiable.

- BREB/PGCB may also opt to purchase the required lands directly through negotiation and get them in exchange of similar lands or on contribution against compensation.
- BREB/PGCB may purchase land directly from private owners via the Land Purchase Committees; but the process has to be transparent, a verifiable reasonable benchmark for market price has to be established for each area, purchase price should be at current market price and the price should include the costs of taxes and transfers, and copies of deeds is to be shared with the WB. In case of direct purchase of land, RAP will not be required.
- In case of direct purchase or accepting voluntary donation, the ESU of BREB/PGCB (individual consultant may also be hired to assist the Land Purchase Committees) will undertake brief social assessments and surveys to establish profiles of the seller/donor, the type of land and land use pattern including whether or not there are any encumbrances on the land and other anticipated impacts (for example on community owned infrastructure or obstruction to common property use, etc.). These will be submitted as part of the sub-project proposal and will include documented evidence of adequate consultation, willingness on the part of the seller/donor and signed MoUs. The ESU will review and approve the documents before sending these to the Bank for further clearance.
- Compensation for all affected structures will be done at replacement value plus its shifting cost.
- All impacts on income and livelihoods will be compensated for, and livelihood restoration programs will be undertaken.
- Lands owned by tribal people will be avoided in all circumstances and lands owned by any other vulnerable groups will be considered in exceptional circumstances, if no other feasible alternatives are available.
- Displaced people will be compensated and assisted for livelihood restoration, and demolished physical structures will be replaced or compensated commensurate to ground situations.

5.3.6 Communication Strategy

266. Strategic communications approach is a social process of dialogue, negotiation, and consensus building through the use of a variety of methods. Based on principles of inclusion, transparency and accountability, the communication strategy aims to enhance the ability of stakeholders to engage, influence local level institutions and hold them accountable for their work. The communications model is a community owned communication strategy that encourages civic engagement, where the community is part of the planning and monitoring process of the schemes. This is a long term process of continued dialogue, clarifying issues under discussions and finding solutions to matters of common concern. Through engagement, a space is created where issues can be openly discussed, compromises can be negotiated and solutions acceptable to the majority are accepted and ratified. This strategy seeks to foster social, political, and institutional changes at different levels by building trust among implementers and the users, promoting a two-way communication, exchanging knowledge and skills for a sustainable change in both availability of services and behavior.
that is consistent with fact on the ground. The best technically designed project can fail or have weak results if decision makers and the beneficiaries are not duly consulted, informed and mobilized.

5.3.7 **Grievance Response**

267. The proposed project is to establish a Grievance Redress Mechanism (GRM) to answer to queries, receive suggestions and address complaints and grievances about any irregularities in application of the guidelines adopted in the ESMF, and assessment and mitigation of environmental/social impacts. The mechanism will assist in resolving issues/conflicts amicably and quickly, saving the aggrieved persons from having to resort to expensive, time-consuming legal action. The mechanism will however not deprive a person of his/her right to go to the courts of law. Grievance response focal points are to be available at the project level; a Grievance Redress Committee (GRC) is to be formed.

5.3.8 **Approval and Access to Information**

268. Environmental/social screening (Appendix B) of each sub-project and IEE/ESIA/RAP/TPP wherever required, are to be subject to review and clearance by the Bank. Whenever requested, BREB/PGCB will provide the Bank with copies of the filled out environmental/social screening forms for all sub-projects to be implemented by BREB/PGCB.

269. All summary of all safeguard documents including the ESMF, ESIA, RAPs, TPPs and other social plans are to be translated into Bangla (local language) and disclosed locally, and the English versions disclosed through the Bank’s Info-shop. The BREB and PGCB are to upload the ESMF in their official websites along with a Bangla translation of the summary.

5.4 **Social Management Procedure**

5.4.1 **Overall Social Management Plan**

270. Figure 5.1 shows the social management flow chart for the proposed project. The social management of the proposed project will start with identification/formulation of sub-projects with community involvement. It will be followed by social (as well as environmental) screening of the sub-project. Based on the social (and environmental) screening, the nature of further social assessment would be determined. If a sub-project is found to have no significant social safeguard issues (e.g., loss of land/income, impact on tribal people), only a social safeguard report (SSR) needs to be prepared summarizing the findings of the screening. On the other hand, if the screening identifies social safeguard issues, the sub-project would be categorized as “Red” (according to ECR 1997), requiring social impact assessment (SIA), along with preparation of resettlement action plan (RAP) and tribal people plan (TPP), if needed (in addition to preparation of EIA report, as explained in Chapter 4. The SIA and preparation of RAP and TPP (if needed) will be carried out following the guidelines presented in this Chapter. Guidelines for carrying out IEE/EIA have been presented in Chapter 4 (Section 4.9). After obtaining necessary clearance from DoE (and also WB), the sub-project will proceed to implementation phase, during which the provisions of the EMP, RAP and TPP will be executed, as prescribed in these documents, with monitoring by BREB/PGCB.
5.4.2 Environmental/Social Screening

As noted earlier, sub-projects to be implemented will be identified by BREB/PGCB through community engagement. Appendix I presents guideline for “consultation and participation” at different stages of project cycle, including project identification/formulation stage. As discussed in Chapter 4, PGCB/BREB/PBS will be responsible for carrying out environmental/social screening of sub-projects. The environmental/social screening would involve: (i) reconnaissance of the sub-project areas/routes and their surroundings; (ii) identification of the major sub-project activities (see Chapter 3 for typical sub-project activities); and (iii) preliminary assessment of the impacts of these activities on the ecological, physicochemical and socio-economic environment of the sub-project surrounding areas. Section 4.6 provides guideline for carrying out environmental/social screening (by filling out Form 2a/2b, presented in Appendix B) focusing on the ecological and physicochemical parameters. This section provides guideline for environmental/social screening, focusing on social parameters, including loss of land/income, and impact on indigenous population.

Substation:

The parameters considered for screening of social impacts during construction phase of a substation include loss of land, loss of income, and impact on tribal population; other socio-economic parameters for environmental/social screening have been address in Section 4.6 (Chapter 4). If acquisition of private land is required, then it could generate “significant” adverse impact. As noted earlier, land requirement for a substation would vary from approximately 0.33 acre for an indoor type 33/11 kV substation to about 5 acres a 132/33 kV air insulated switchgear (AIS) grid substation. If the proposed site for substation is currently being used for income generating activities (e.g., agriculture), then construction of substation would result of in loss of income. Depending on the nature of income generating activities, the impact could be “significant”, moderate” or “minor”. As a part of screening, it would be identified whether the project activities are likely to affect tribal population. Operation of a substation is not likely to generate any adverse social impacts.

Power Line:

The parameters considered for screening of social impacts during construction phase of a power line include loss of land, loss of income, and impact on tribal population; other socio-economic parameters for environmental and social screening have been address in Section 4.6 (Chapter 4). Construction of transmission tower may require acquisition of land. If acquisition of private land is required, then it may generate “significant” adverse impact. However, land requirement for construction of transmission tower is relatively small. Loss of income may result from temporary disruption of commercial activities at structures/entities (e.g., shops) located very close to the routes of the proposed power line (e.g., on footpaths close to the power line alignment). Presence of tribal population within/surrounding project areas and possible adverse impact of project activities on tribal population will be identified during social screening. Operation of power line is not likely to generate any adverse social impacts.
The environmental and social screening process will determine the nature of ESA that should be subsequently undertaken. The environmental/social screening will provide a rapid assessment of the project characteristics, its beneficiaries, the socio-economic dimensions of the area, and its potential environmental/social impacts and risks. As noted in Chapter 4, results of the environmental/social screening will determine whether or not a sub-project requires further ESA, including Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Resettlement Action Plan (RAP) and Tribal Peoples Plan (TPP).

Subproject Exclusion Criteria:

To ensure that the subprojects meet the main objectives of the project, legal requirements and safeguards, a set of exclusion criteria will be applied during social screening including the following:

- Subprojects requiring land acquisition or population displacement that cannot be compensated for or resettled;
- Subproject affecting mosques, temples, graveyards and cremation grounds, and other places/objects of religious, cultural and historical significance;

![Figure 5.1: Social management flow chart](image-url)
- Subprojects threatening cultural tradition and way of life of tribal peoples; severely restrict their access to common property resources and livelihood activities;
- Subproject interventions with objections from communities on social and environmental issues that cannot be resolved through design alternatives.

276. In addition to the planning level social screening for exclusion factors, a subproject will be dropped from investment at implementation level, if any social and environmental grievances raised from the community cannot be resolved to the satisfaction of the aggrieved persons or community groups.

5.4.3 Nature of Social Assessment Required

277. The level of environmental and social assessment (ESA) of a sub-project would primarily depend on the class/category of the sub-project according to OP 4.01 and ECR 1997. As noted earlier (Section 4.3), some of the sub-projects to be implemented under the proposed project would fall under “Red” category (e.g., construction of new power lines), while others are not specifically listed in ECR 1997. Sub-projects with social safeguard issues (i.e., loss of land, loss of income, impact on tribal population), identified during environmental/social screening, would also fall under “Red” category. For such sub-projects, SIA (also EIA) as well as RAP and TPP, if needed, will be required. Sub-projects without safeguard issues could fall under “Orange A” or “Orange B” category, depending on the level of anticipated impacts, which would be identified during environmental/social screening. For such sub-projects (without social safeguard issues), a social screening report (SSR) may be prepared summarizing the findings of the social assessment. As explained in section 4.8, for “Orange A” Category sub-projects, no further ESA assessment would be required, but some additional information would be required; while for “Orange B” category sub-projects Initial Environmental Examination (IEE) and Environmental Management Plan (EMP) would be required.

278. The guidelines for carrying out IEE and EIA and preparation of EMP have been presented in Chapter 4 under environmental management framework (EMF). The guidelines for carrying out SIA and preparation of RAP and TPP are presented in this Chapter under social management framework (SMF).

5.4.4 Guideline for Carrying out SIA and Preparation of RAP and TPP

279. The principal objectives of the SIA are to identify viable alternatives (route analysis should take into account the entire right of way including that under the transmission lines and cables, not just the placement for towers and substations, when assessing potential impacts and impact minimization); identify potential social impacts, including direct or indirect, permanent or temporary, physical or economic; assessing their significance; design least-cost mitigation measures; develop RAPs and monitoring requirements; develop TPP; formulate institutional arrangements; and ensure meaningful public consultation and information disclosure procedures. The SIA will identify and estimate impacts, risks and opportunities and suggest measures for avoiding or minimizing, mitigating and managing, and compensating adverse social impacts.
The major activities carried out for the Social Impact Assessment (SIA) are summarized below.

- Baseline social surveys covering areas in and around the proposed locations/routes of substations/power lines;
- Identification and scoping of possible social impacts of the proposed sub-project activities, and selection of parameters for social impact assessment;
- Prediction and evaluation of social impacts and suggestion of mitigation measures to offset adverse impacts;
- Analysis of alternatives;
- Public/stakeholder consultations, including Focus Group Discussions (FGDs) and Interviews;
- Preparation of SIA report;
- Preparation of RAP, if needed;
- Preparation of TPP, if needed.

5.4.4.1 Socio-economic baseline

For carrying out SIA, it is important to have a clear understanding to the baseline socio-economic condition of people, especially those living within the sub-project influence areas (see Table 4.4 for typical sub-project influence areas). A common approach for quick assessment of baseline socio-economic condition is questionnaire survey. The primary objectives of a questionnaire survey are:

(a) to understand people’s socio-economic condition;
(b) to understand extent of people’s access to basic services; and
(c) to understand people’s perception regarding the sub-project.

A sample questionnaire for carrying out baseline socio-economic survey is presented in Appendix J. The questionnaire covers five major themes:

(a) Socio-economic background
(b) Basic services
(c) Education
(d) Economic situation, and
(e) Attitude toward the proposed sub-project.

5.4.4.2 Project activities and parameters for SIA

As discussed earlier, the proposed project involves construction of substations (132/33 kV by PGCB; and 33/11 kV by BREB), and construction/rehabilitation of power lines (132 kV by PGCB; 33 kV and 11 kV by BREB). The ESMF provides detail description of activities during construction and operational phases of these sub-projects (see Chapter 3). These activities should be considered for assessment of social impacts of these sub-projects.

The typical socio-economic impacts from implementation of these sub-projects include loss of land (for substations); loss of income; impact on tribal population; impact on archaeological/historical sites; traffic congestion; and employment generation. This SMF presented in this Chapter provides guidelines for assessment of social impacts focusing on:

- Loss of land and income, and associated resettlement; and
- Impact on tribal population.
The guidelines for addressing the other socio-economic parameters are presented in Chapter 4. Guidelines for carrying out “analysis of alternatives” are also presented in Chapter 4.

5.4.4.3 Public/stakeholder consultation

The objectives of consultation and participation process are to inform, consult, engage, collaborate and empower the communities and other local stakeholders in the sub-project cycle at the field level. Consultation and community participation will be undertaken to achieve the following specific objectives at subproject identification, planning, design, implementation and evaluation stages:

- Identification – to sensitize the community about the sub-project and their role, and identify inclusive ground needs;
- Planning – to ensure transparency of the planning process, reflect community expectations in project design, acceptable work schedule and procedures; ensure identification of adverse impacts and measures to mitigate them;
- Implementation – to ensure that benefit accrues to the targeted beneficiaries inclusive of all groups including the very poor and vulnerable groups and the quality of works are satisfactory to the communities.
- Review and evaluation – to evaluate the beneficiary satisfaction and outcomes of the subprojects for intended benefits to targeted beneficiaries.

Involvement of communities is not limited to interactions with them but also disclosing relevant information pertaining to the project tasks and targets. Consultation and participation involves communities and other stakeholders, which will take place through interpersonal communications, focused group discussions (FGDs) and small and large community meetings. Additionally, radio broadcast and other media forms may be used to further disseminate information. Appendix I presents guidelines for carrying out public consultations at different stages of a sub-project cycle.

5.4.4.4 RAP

The project approach discourages acquisition of private lands and displacement of people for project purpose. However, certain sub-projects (e.g., a substation) may require acquisition of private land and involve population displacement. Once it is determined through the social screening that a sub-project will require land, involve population displacement or loss of livelihoods, a Resettlement Action Plan (RAP) needs to be prepared.

RAPs are designed to ensure that impacts arising from land acquisition, displacement and relocation are mitigated, managed and compensated and livelihoods of displaced persons are restored. The RAP focuses on people affected by land acquisition, relocation and restriction of access, and defines a strategy for formalizing arrangements and responsibilities for mitigating impacts caused due to physical and economic displacements.

Appendix K presents detail guideline for preparation of RAP. It presents a discussion on major issues concerning land acquisition and resettlement; it presents impact mitigation
objectives and principles, eligibility for compensation/assistance and principles for providing compensation/assistance. Appendix K provides detail description of land acquisition process, and processes for preparation and implementation of sub-project specific RAP. It presents a method for market price survey, and a compensation and entitlement matrix. It also presents a format/form for voluntary donation of land.

5.4.4.5 Tribal Peoples Plan (TPP)

291. The general sub-project areas in Chittagong and Sylhet division may have small concentration of tribal inhabitants. The project has taken the exclusion criteria (see Section 5.4.2) to avoid any negative impact on the tribal communities due to undertaking of the project in those areas. The project rather intends to extend the benefits towards their welfare. OP 4.10 is triggered when a project engages with, touches on or impacts tribal people in any way, positive or negative. Detail guidelines have been prepared for preparation of TPP, following the World Bank’s Operational Policy on Indigenous Peoples (OP 4.10), to maximize benefits to the tribal peoples. The guidelines presented in Appendix L will apply where sub-projects will be proposed in areas inhabited by tribal peoples.

5.4.4.6 Access to Information

292. Summary of the ESMF report and impact mitigation measures will be translated into Bengali language and disseminated locally. Copies of the full report (in English) and the summary (in Bengali) will be sent to all the concerned offices of BREB/PBSs and PGCB, and will be made available to the public. The draft ESA (two volumes) will also be uploaded in the website of BREB/PGCB and in the Bank InfoShop before appraisal completion.

293. In addition, a national workshop has been planned for presenting the EMF and SMF to the key stakeholders including field level staff of the implementing agencies (BREB, PGCB), community representatives, NGOs, civil society, etc. The comments and the findings from the workshop and other public meetings will be reviewed and incorporated in the final ESA report.

294. During the implementation stage of project, the sub-project specific screening/assessment report will periodically be posted in the BREB/PGCB website before the bidding process.

5.4.5 Project Management

5.4.5.1 Institutional Arrangement

295. Institutional arrangement for implementation of SMF is the same as that for EMF. The institutional arrangement is presented in Chapter 4 (Section 4.14), and summarized below.

Bangladesh Rural Electrification Board (BREB):

296. For sub-projects to be implemented by BREB, an “Environmental and Social Unit” under the leadership of a Superintending Engineer, will assist the Project Management Unit (PMU) of BREB on issues related to environmental management. The “Environmental and Social Unit”, with support from relevant Palli Biddyut Samities (PBSs), will carry out
“Environmental/Social Screening” and “Analysis of Alternatives” of sub-projects, following the guidelines contained in the Environmental and Social Management Framework (ESMF). BREB will be responsible through its Palli Biddut Samities to draw up a verifiable and “real” market price for land in the areas where the sub stations will be implemented to arrive at a benchmark to be followed during direct purchase of land. The process for arriving at this price has to be transparent and discussed in detail.

297. Further environmental and social assessment (ESA) of the sub-project, as required, will be carried out by supervision consultant or individual consultant hired by BREB. The PMU of BREB will be responsible for implementation of EMP (as well as RAP and TPP) and preparation of quarterly reports, with support from “Environmental and Social Unit” and supervision consultant. The supervision consultant will have environmental as well as social specialists in its team. Figure 4.8 (Chapter 4) shows activities and institutional responsibilities for overall implementation of the Proposed Rural Electricity Transmission and Distribution Project by BREB.

**Power Grid Company of Bangladesh (PGCB):**

298. The Environment and Social Unit of PGCB under the leadership of a Deputy General Manager will be responsible for overall environmental management of sub-projects to be implemented under the proposed project. The Unit will carry out “Environmental/Social Screening” and “Analysis of Alternatives” of sub-projects, following the guidelines contained in the Environmental and Social Management Framework (ESMF).

299. Further environmental and social assessment (ESA) will be carried out by individual consultant to be hired by PGCB. The PGCB project team, with support from Environment and Social Unit, will be responsible for implementation of EMP (as well as RAP and TPP) and preparation of quarterly reports. Figure 4.9 (Chapter 4) shows activities and institutional responsibilities for overall implementation of the Proposed Rural Electricity Transmission and Distribution Project by PGCB.

**5.4.5.2 Grievance Redress Mechanism**

300. Grievance Redress Mechanism (GRM) is a valuable tool, which will allow affected people to voice concerns regarding environmental and social impacts of the proposed project. A Grievance Redress Committee (GRC) will be formed to address grievances. The GRC will be a forum where people will exercise their rights of participation in the project cycle through suggestions and complaints. The GRCs will also be para-legal court of the project to address local problems and complaints related to social and environmental impacts. A GRC will be formed for sub-project related Upazila/Thana, headed by the Chairman / Mayor of relevant area. Members will be taken to represent the communities and other stakeholders including representative of local administration, school teachers, local NGOs, women and ward level elected representatives. Members of the GRC will be nominated by the Chairman/Mayor. The Chairman/Mayor will form the GRC and forward the composition to the Project Director (PD) of the sub-project. Table 5.1 shows the composition of the GRC. Appendix M provides detail description and operational details of GRM.
The GRC will ensure proper presentation of complaints and grievances, as well as impartial hearings and transparent decisions. The sub-project-affected persons can register their grievances at the complaint cell. The GRCs will meet periodically to discuss the merit of each case and fix a date for hearing and notify the PAP to submit necessary documents in proof of her/his claim/case. The GRCs will resolve grievances within one month of receipt of complaint. Additional details regarding the functioning of GRC is presented in Appendix M.

### 5.4.5.3 Capacity Building and Training Requirements

The capacity of BREB and PGCB in carrying out environmental/social management of the proposed project and training requirements for capacity building have been discussed in Chapter 4. As discussed in Section 4.15, BREB and PGCB engineers/officials have limited exposure to environmental/social assessment and management. BREB (with support from PBS officials) and PGCB will be responsible for carrying out “environmental/social screening” and “analysis of alternatives” following the ESMF. Therefore, basic training on regulatory requirements, environmental impacts, and environmental assessment and management would greatly improve the capability of relevant BREB and PGCB engineers and experts in carrying out their responsibilities.

Both BREB and PGCB will employ individual/supervision/DSM consultant, who would support BREB/PGCB in overall environmental/social management. However, since the overall responsibility of environmental management lies with BREB/PGCB, they need to ensure that the consultants are carrying out their responsibilities properly. For this purpose, it is important that the BREB/PGCB engineers/officials receive advanced training on environmental management and monitoring. Such training will assist them in properly overseeing the activities of the consultant engaged in environmental management of the proposed project, following the ESMF. Table 4.19 (Chapter 4) summarizes the training requirements of PBSs, BREB and PGCB. It may be mentioned that cost of training and capacity building is included in the project resources under component 3.

### 5.4.5.4 Monitoring and Evaluation

Monitoring and Evaluation (M&E) of sub-projects for social development and safeguard issues are critical activities in order to identify implementation problems and develop solutions. Monitoring is a periodic assessment of planned activities providing mid-
way inputs, facilitating changes and giving necessary feedback on the activities and the directions on which they are going; whereas evaluation is a summing up activity at the end of the project assessing whether the activities have actually achieved their intended goals and purposes.

305. Social development will be monitored using the following indicators. Data regarding these indicators will be collected periodically and will be analyzed to find the outcomes of the processes. However, these indicators will be reviewed at the sub-project preparation stage and customized for specific sub-projects.

<table>
<thead>
<tr>
<th>Inclusiveness</th>
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<tr>
<td>• Access to vulnerable communities considered in sub-project identification, with special focus on tribal people;</td>
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<tr>
<td>• Consultation and communication strategy takes into account accessing vulnerable people and incorporates their feedback into the project design;</td>
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<tr>
<td>• Consultation strategy for Tribal People is tailored and focused, culturally acceptable, implemented in local dialects and emphasizes getting prior consent from tribal people before the project is implemented;</td>
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<tr>
<td>• The specific needs and concerns of tribal people are considered and incorporated in the mitigation plans and implemented in a culturally acceptable manner.</td>
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<thead>
<tr>
<th>Participation</th>
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<tbody>
<tr>
<td>• Representation of women, tribal and vulnerable groups, occupational groups, men and women in consultation process;</td>
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<tr>
<td>• Representation of women, tribal group members and leaders (where relevant), and vulnerable groups in GRCs;</td>
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<tr>
<td>• Beneficiary options reflected in sub-project design and implementation.</td>
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<tr>
<th>Transparency</th>
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<tbody>
<tr>
<td>• Disclosure of project information SMF/RAP/TPP;</td>
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<td>• Community awareness about the sub-project and the social management issues and policies.</td>
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<tr>
<th>Social accountability</th>
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<tbody>
<tr>
<td>• Feedback from communities considered and incorporated for design and implementation;</td>
<td></td>
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<tr>
<td>• Grievance petitions received and cases resolved via the GRM;</td>
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<tr>
<td>• Representation of community peoples in the GRCs and monitoring process (including wide community representation in tribal areas).</td>
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**Indicators for Monitoring Land Acquisition**

306. The following indicators will be used to monitor status of major tasks involved in land acquisition and preparation and implementation of resettlement activities. Once the route is finalized and the substation, tower locations determined, land acquisition needs will be identified. The following activities and outcome indicators will be assessed:

<table>
<thead>
<tr>
<th>Land Acquisition Activities</th>
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<tbody>
<tr>
<td>• Date of finalization of land acquisition proposals (LAPs)</td>
<td></td>
</tr>
<tr>
<td>• Date LAPs submitted to the Deputy Commissioners (DCs)</td>
<td></td>
</tr>
<tr>
<td>• Date Notice-3 issued by DCs</td>
<td></td>
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<tr>
<td>• Date Notice-6 issued by DCs</td>
<td></td>
</tr>
<tr>
<td>• Date Compensation Estimates submitted by DCs to ULBs</td>
<td></td>
</tr>
<tr>
<td>• Date BREB/PGCB reviewed the Compensation Estimates</td>
<td></td>
</tr>
<tr>
<td>• Date BREB/PGCB placed the compensation funds with DCs</td>
<td></td>
</tr>
<tr>
<td>• Date Notice-7 issued by DCs</td>
<td></td>
</tr>
<tr>
<td>• Date the DCs start CUL payment</td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Outcomes</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td>• % of land paid compensation for</td>
<td>• Usage of compensation money</td>
</tr>
<tr>
<td>• % of affected persons compensated</td>
<td>• Number of people displaced from community/area and present location</td>
</tr>
<tr>
<td>• Number of complaints received through the GRM related to land acquisition and compensation process</td>
<td>• Changes in livelihood pattern due to land acquisition</td>
</tr>
<tr>
<td>• Number of complaints handled by the GRCs and resolved via those</td>
<td>• Increase/decrease in marginalization/vulnerability due to land acquisition</td>
</tr>
<tr>
<td>• Number of cases which were not resolved</td>
<td>• Tracking the unresolved complaints and their impact on the project</td>
</tr>
</tbody>
</table>

**Indicators for Monitoring RAP**

**Resettlement**
• Census of project affected persons and assets, and fixing of the cut-off dates for squatters
• Survey of replacement costs and market prices of affected lands and other assets
• Disclosure and consultation process

**Activity**
• Formation of the Grievance Redress Committees (GRCs)
• Preparation of Compensation Budgets for squatters and others (displaced business and other activities) and top-up for title-holders
• Preparation and submission of RAPs for IDA review and clearance
• Preparation of the individual entitlement files for different PAP groups
• Approval of the Compensation Budget

**Impact**
• Payment of resettlement assistance and relocation
• Implementation of the livelihood restoration Plans
• Continuing monitoring and reporting progress in payment
• % of PAPs compensated
• Number of complaints received through the GRM and successfully handled by the GRCs
• Number of cases that remain unresolved

**Outcome**
• Effectiveness of compensation/relocation
• Number of people displaced
• Increase/decrease in vulnerability/marginalization after resettlement completion
• Effectiveness of livelihood restoration measures – were skills marketable, were PAPs earning more/less through the alternative measures, were alternative livelihood measures culturally acceptable?
• Impact of unresolved cases/complaints on the project

**Voluntary land donation**
• Voluntary donations executed with proper documentation and as per process described in the SMF

**Contribution against compensation/Direct Purchase**
• Legal process is followed and documented in obtaining private lands through these process as per the SMF
307. Monitoring is an ongoing process and there may be indicators which come to light as the process of land acquisition, RAP/TPP preparation evolves and progresses. Additional indicators will be added as and when required.

5.4.5.5 Budget

308. Cost estimates have been prepared for all the mitigation and monitoring measures proposed in the EMF (Chapter 4). The cost estimates for some of the mitigation measures as will be identified in the EMP that are be part of civil works contract. The tentative cost estimates and the budget for the remaining suggestive activities, covering both EMF and SMF, have been made and presented in Table 4.20 (Chapter 4).
References

BPDB (2008), Personal communication with officials of Bangladesh Power Development Board.


