Updated Environmental and Social Impact assessment of the rehabilitation of Sub-Stations and transmission line in Freetown, Sierra Leone
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EXECUTIVE SUMMARY

As part of ongoing efforts aimed at the re-construction and development of post-war Sierra Leone, the Government of Sierra Leone (GoSL) is seeking funding from the World Bank under the proposed Sierra Leone Energy Access Project - Sierra Leone Infrastructure Development Fund (P126180) to enable the National Power Authority (NPA) carry out the rehabilitation and reinforcements to the transmission and distribution system (T & D works) of the Western Area of Sierra Leone which includes the capital, Freetown.

In compliance with the procedures of the World Bank, the borrower (NPA) is required to undertake an Environmental Impact Assessment (EIA) of the proposed developments under the T & D rehabilitation and reinforcement works to address potential adverse impacts that could arise during the project implementation and enhance the benefits.

The proposed Project has to meet the environmental requirements of the rules and regulations governing the protection of the environment in Sierra Leone. This ESIA evaluates and presents the environmental impacts that are expected to result from construction and operation of the proposed Project, and in accordance with the related guidelines from World Bank. This ESIA identifies the environmental impacts associated with the proposed Project. It presents recommended mitigation measures that for the environmental impacts identified. These measures are taken to ensure that environmentally sound practices are adhered to in order to safeguard the safety and health of all categories of people within the project area. Some publications were considered which include:

- Environmental Protection Act, 2000
- Greater Freetown Structure Plan Report
- National Environmental Policy, NEP, (1994)
- National Power Authority Act, 1982 (Act No.3)
- National Power Authority (Amendment) Decree, 1993
- National Power Authority Safety Rules
- Factories Act, 1974 (Act No.3)
- World Bank Procedures and Guidelines
  - OP 4.01 – Environmental Assessment
  - OP 4.12 – Involuntary Resettlement
  - EA Source Book Vol. III

The Resettlement Action Plan (RAP) for the T & D network are also being carried out simultaneously to deal with the other components of the ESIA for the segment of the transmission line.
The project components are described in sufficient detail and as consistent with EIA practice in order to point out the issues of environmental concern.

The section on the description of the existing environment presents general information on Sierra Leone and Freetown and the Western Area. Climatic information presented focused on rainfall and wind which are known to impact severely on the electrical transmission and distribution network.

The sections on Impacts identification and Impact Mitigation impacts on the physical environment such as waste generation and issues of public/occupational safety and prescribe appropriate mitigation measures in each case.

The section is rather quite deliberately elaborate, covering special issues such as PCB contamination, EMF and SF6 switchgear into some detail. The NPA does not have any formal application of environmental management in its operations and there is the need to provide them with sufficient detail to assist in them in formulating appropriate policies and guidelines subsequently.

A summary of the findings is presented overleaf in a tabular format.

Table ES 1 is the Impact Matrix which clearly shows the main areas of concern. Apart from the usual transient constructional impacts, the main issues are waste generation, visual intrusion and occupational/public health and safety.

Table ES.1: Impact Matrix

<table>
<thead>
<tr>
<th>Activities</th>
<th>Bio-Physical Environment</th>
<th>Socio-Cultural Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Land/soil degradation</td>
<td>Air quality</td>
</tr>
<tr>
<td>Pre-construction Phase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secure Access to Tx. Routes</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Secure Access to T &amp; D sites</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Clean up Substations</td>
<td>0</td>
<td>0/1</td>
</tr>
<tr>
<td>Construction Phase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport Equipment to Site</td>
<td>1</td>
<td>0/1</td>
</tr>
<tr>
<td>Clearing RoW/Tower route</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Excavating Foundations</td>
<td>1</td>
<td>0/1</td>
</tr>
<tr>
<td>Erecting Towers/Poles</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Stringing Lines</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Table ES 2 is the Environmental Management Action Plan which shows how these impacts are to be handled with related costs.
## Table ES 2: Environmental Management Plan of Action

<table>
<thead>
<tr>
<th>PROJECT ACTIVITY</th>
<th>POTENTIAL ENVIRONMENTAL IMPACTS</th>
<th>PROPOSED MEASURE(S) (including legislation &amp; regulations)</th>
<th>INSTITUTIONAL RESPONSIBILITIES (incl. enforcement &amp; coordination)</th>
<th>COST ESTIMATES</th>
<th>COMMENTS (eg. Secondary impacts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Construction</td>
<td>- Loss of existing land use</td>
<td>- RAP - Compensation</td>
<td>- NPA, Ministry of Lands, Country Planning and Environment</td>
<td>RAP (USD 7.5M)?</td>
<td>NPA to acquire appropriate site for waste disposal</td>
</tr>
<tr>
<td></td>
<td>- Resistance from affected persons</td>
<td>- Public education and awareness campaign</td>
<td>- NPA</td>
<td>USD 1250</td>
<td>USD 15150</td>
</tr>
<tr>
<td></td>
<td>- Clean up Substations</td>
<td>- Construct temporary barriers at substations</td>
<td></td>
<td>USD 14800</td>
<td>Supervision USD 5000</td>
</tr>
<tr>
<td></td>
<td>-Waste generation</td>
<td>Provide waste disposal site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Phase</td>
<td>- Noise, Dust, Air pollutants, Road Accidents</td>
<td>- Adopt best practices as necessary</td>
<td>Contractor</td>
<td>Contractor’s costs</td>
<td>- Appropriate contract clauses to be specified</td>
</tr>
<tr>
<td>Transport Equipment to Site</td>
<td>- Loss of Land use</td>
<td>- RAP – compensation as above</td>
<td>- NPA</td>
<td>Contractor’s costs</td>
<td>- Appr. 3100 persons affected</td>
</tr>
<tr>
<td></td>
<td>- Soil erosion, sedimentation and runoff</td>
<td>- maintain native vegetation cover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearing RoW/Tower route</td>
<td>- Waste generation</td>
<td>- replant disturbed sites</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavating Foundations and Erecting Towers/Poles</td>
<td>- Waste generation</td>
<td>- Segregate and dispose as appropriate</td>
<td>Contractor</td>
<td>Contractor’s costs</td>
<td>- Appropriate contract clauses to be specified</td>
</tr>
<tr>
<td></td>
<td>- Historical/cultural finds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Health and Safety risks Workers assembling towers</td>
<td>- Leave as is and report to appropriate cultural Authorities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Visual intrusion</td>
<td>- Personnel Safety equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Waste generation - mostly metals, insulators etc</td>
<td>- Improve alignment and tensioning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stringing Lines and Replacing existing cables/conductors</td>
<td>- Waste generation</td>
<td>- Segregate and reuse, recycle or dispose as appropriate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construct Substation housing and Install</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</table>

Rehabilitation of transformer substations
<table>
<thead>
<tr>
<th>PROJECT ACTIVITY</th>
<th>POTENTIAL ENVIRONMENTAL IMPACTS</th>
<th>PROPOSED MITIGATION MEASURE(S) (including legislation &amp; regulations)</th>
<th>INSTITUTIONAL RESPONSIBILITIES (incl. enforcement &amp; coordination)</th>
<th>COST ESTIMATES</th>
<th>COMMENTS (eg. Secondary impacts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>new Transformers and Equipment.</td>
<td>- Construction impacts as above - Disposal of Transformers and other items, oil leaks</td>
<td>- Adopt best practices and safety procedures - Adopt best practice</td>
<td>- Contractor/ NPA</td>
<td>- Supervision USD 5000</td>
<td>700,000 for substations</td>
</tr>
<tr>
<td>Operation and Maintenance</td>
<td>- Loss of vegetation cover - Loss of income from fruit trees</td>
<td>- Replant as necessary - Compensate</td>
<td>NPA NPA</td>
<td>To be determined at the time To be determined at the time</td>
<td></td>
</tr>
<tr>
<td>Vegetation Control</td>
<td>- Waste generation - Health and Safety</td>
<td>- Segregate and dispose as necessary - NPA Safety rules and personnel protection</td>
<td>NPA NPA</td>
<td>- USD 30000 for PPE - USD 39000 for RoW</td>
<td></td>
</tr>
<tr>
<td>Line Maintenance</td>
<td>- Waste generation - Health and Safety</td>
<td>- As above - Shore up affected towers</td>
<td>NPA NPA</td>
<td>- As above - USD 12000 - USD 15000 for wastes</td>
<td></td>
</tr>
<tr>
<td>Tower Maintenance</td>
<td>- Waste generation - Health and Safety - Erosion effects on tower pads</td>
<td>- As above</td>
<td>NPA NPA</td>
<td>- USD 12000</td>
<td></td>
</tr>
</tbody>
</table>

Special issues

<p>| EMF | Unknown health hazards | - Protect public from equipment - Public education - | NPA | USD 37000 for training and institutional strengthening in environmental management | Tests to be carried out to determine if PCB exists in NPA systems |
| PC3 in Insulating oils | Health hazard | - Safe handling Procedures - Personnel Protection | NPA | | Training in environmental issues |</p>
<table>
<thead>
<tr>
<th>PROJECT ACTIVITY</th>
<th>POTENTIAL ENVIRONMENTAL IMPACTS</th>
<th>PROPOSED MEASURE(S) (including legislation &amp; regulations)</th>
<th>INSTITUTIONAL RESPONSIBILITIES (incl. enforcement &amp; coordination)</th>
<th>COST ESTIMATES</th>
<th>COMMENTS (eg. Secondary impacts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of SF6 equipment</td>
<td>Health hazards</td>
<td>- Safety Procedures</td>
<td>NPA</td>
<td></td>
<td>Training in environmental issues</td>
</tr>
<tr>
<td>Hazards Management</td>
<td>Health and Safety Hazards</td>
<td>- Training in environmental issues</td>
<td>NPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste Management</td>
<td>Health, Safety and Pollution hazards</td>
<td>- Training in environmental issues</td>
<td>NPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transformer Oil Leaks</td>
<td>Pollution hazards, Health and safety hazards</td>
<td>Construct bunds around transformers</td>
<td>NPA</td>
<td>USD 18000</td>
<td></td>
</tr>
</tbody>
</table>
An outlined Environmental Management Plan has been provided to enable NPA set up guidelines and systems for managing the environmental and health and safety aspects of the project implementation.

In addition, the environmental monitoring and evaluation program herein is developed to determine the constant monitoring and evaluation of the impacts of the project on the biological, physical socio-economic and cultural environments within the project area.

The Project Implementation Unit of NPA shall ensure that monitoring programmes are instituted and carried out to cover the listed areas. Relevant records shall be kept to ensure compliance with sound environmental practices recommended in this report.

NPA shall appoint an Environmental Officer who shall oversee and report all monitoring activities and reports to the General Manager through the Environmental Advisory Committee which is also proposed.

Details of consultations held with the various identified stakeholders are presented in a further section on consultations. The report concludes with a recommendation for the implementation of the project subject to monitoring of the various commitments made for mitigating the environmental impacts.
1.0 INTRODUCTION

The National Power Authority (NPA), is a statutory body established by the National Power Authority Act, 1982 (Act No. 3), incorporating the former Sierra Leone Electricity Corporation. NPA is responsible for generation, transmission, distribution and sales of electricity throughout the country, with the exception of the Bo and Kenema Districts, which are served by the Bo Kenema Power Services (BKPS), an autonomous subsidiary of NPA.

The rebel war (1991 – 2002) and its consequences have reduced the operations of NPA to the Western Area, the peninsular on which the capital Freetown is situated.

Presently, the only operational power plant in the Western Area is the Kingtom Power Station which has a total installed generating capacity of 45.54 MW with an available capacity of 28.3 MW. The fuel oils used for power generation at NPA are Marine Fuel Oil (MFO) and Diesel Oil (AGO). These are imported and account for over 60% of NPA’s operating expenses.

The current available capacity in the Western Area of 28.3 MW is inadequate and load shedding is constantly enforced. In 2003, NPA generated 110 GWh of electricity of which 69 GWh was sold. In the previous year, 2002, NPA generated 124 GWh of electricity of which 74 GWh was sold to customers in the following mix.

- Domestic customers - 49%
- Commercial customers - 16%
- Industrial customers - 35%

Technical and non-technical losses reduced from 38% in 2002 to 33% in 2003.

At present, the suppressed demand in the Western Area is estimated to be between 40 – 50 MW. Demand projections for the Western Area from the Lahmeyer Master Plan indicate that demand could grow by up to 6.2% per annum. Reaching 100 MW by 2015. In order to meet the immediate demand of customers in the Western Area, there is need for additional electricity generating power plants.

This will allow flexibility in the operations of the current ageing base old plants, which are close to the end of their economic life. Additional generations will also allow adequate time for thorough maintenance of these ageing plants.

In the continuing efforts to address these and other constraints to sustainable development and growth in post-war Sierra Leone, the Government of Sierra Leone (GoSL) is seeking funding from the World Bank to support the proposed Power and
water Project (PWP). As part of the infrastructure component of the PWP, resources would be provided for the rehabilitation and reinforcement of the Western Area transmission and distribution networks (T & D works).

1.1 Project Components
The T & D rehabilitation and reinforcements will consist of various works on the transmission and distribution system of the Western Area consisting of:

1) The 33 kV overhead sub-transmission line in urban Freetown with a linkage of about 3km of 161 kV high voltage transmission line.

2) Over 200 units of 11/0.415 kV substations providing the city of Freetown and its environs with 3-phase 415 V and single-phase 230 V for various customers.

3) Six (6) units of primary substations.

1.2 Objectives of the EIA
In compliance with the requirements of the World Bank, the borrower (NPA) is required to undertake an Environmental Impact Assessment (EIA) of the proposed activities listed above to determine the potential environmental impacts (both adverse and beneficial) that could arise from the implementation of the project in order to provide mitigating actions for the adverse impacts while maximizing the potential benefits.

An initial screening and evaluation (Scoping) was carried out to:

- Identify the components of the T & D works that could have adverse impacts on the environment and socio-cultural conditions within their sphere of influence
- Identify all relevant stakeholders in relation to the proposed T & D works
- Determine the scope and methodology for assessing the potential impacts expected from the implementation of the T & D works.
- Assemble all necessary information including various Regulatory and Institutional arrangements (World Bank, GoSL etc.) relevant to the conduct of the EIA.

This was followed by an interim phase which focused on the following:

- Studies of project documents and relevant background material provided NPA.
- Consultations with NPS Project staff and Field staff.
- Consultations with Ministry of Lands, Country Planning and Environment.
- Reviewing the existing legal regulatory and institutional arrangements covering the environmental protection in Sierra Leone.
- Reviewing the existing legal regulatory and institutional arrangements covering the establishment and operations of NPS particularly with regard to provisions for environmental compliance and safety issues.
- Sourcing of relevant information on appropriate clearance, right-of-way (RoW) limits and standards to be applied in the design, operation and maintenance of the T & D network in terms of safety and environmental protection; particularly to facilitate the work of the RAP studies.
- Reviewing existing World Bank publications covering relevant policies, procedures and other information related to the project including guidelines on electric transmission systems and industrial safety and hazard management.
- Establishing the appropriate framework for preparing an Environmental Management Plan and its associated Action Plan to meet the requirements for environmental protection and public safety.

1.3 **Approach and Methodology**

Based on the findings of the inception and interim phase, the procedures adopted in this phase of the EIA have been to:

- Focus the detailed assessment on the components covering the transmission and distribution network that could have significant effects on the environment.
- Complete consultations with all relevant stakeholders and consolidate their inputs
- Continue with further detailed analysis of impacts of project components
- Source information for dealing with special issues noted in World Bank guidelines including waste disposal and handling of waste oil.
- Propose Mitigation and Management Plan for dealing with the impacts assessed above
- Prepare Draft report.
2.0  POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1  Legal and Regulatory Framework for Environmental Management
The environmental policy and environmental assessment (EA) legislation and procedures of Sierra Leone and those of the World Bank, which are relevant to the project, are outlined below. In principle, the two are similar in many respects though the World Bank policies are more stringent. Hence, the policies of the World Bank override those of the Sierra Leone should any discrepancy arise.

2.2  Sierra Leone Environmental Requirements
The relevant Sierra Leone national regulatory frameworks include:

- Constitution of Sierra Leone, 1991
- Local Government Act, 2004
- National Land Policy, 2005
- Environmental Protection Agency Act, 2008 and Environmental Protection Agency (Amendment) Act, 2010.

2.2.1  Constitution of Sierra Leone, 1991
The Constitution includes provisions to protect the rights of individuals to private property, and also sets principles under which citizens may be deprived of their property in the public interest as described in Section 21. It also makes provision for the prompt payment of adequate compensation and access to the court or other impartial and independent authority for the determination of the land owner’s interest or right, and the amount of any compensation to which he/she is entitled and for the purpose of obtaining prompt payment of that compensation.

2.2.2  Local Government Act, 2004
The Act establishes the Local Council (LC) as the highest political authority in the locality and confers legislative and executive powers to be exercised in accordance with this Act. This Act in its First Schedule under Section 2 establishes the localities, namely: districts, towns and cities. Part II of this schedule also establishes the number of Paramount Chiefs in each LC. The Third Schedule establishes the functions devolved to the LCs. The Fourth and Fifth Schedules establish departments under each LC, and a Valuation List and Rate Books respectively.

2.2.3  National Lands Policy, 2005
As provided in the Constitution, the 2005 National Land Policy also provides for the compulsory acquisition of land in the public interest. The principles of the land policy include among others: The principle of land as a common national or communal property resource held in trust for the people and which must be used in the long term interest of the people of Sierra Leone. Such a principle only holds where it does not violate existing rights of private ownership. Compensation to be paid for lands acquired through compulsory government acquisition will be fair and adequate and will be
determined, among other things, through negotiations that take into consideration government investment in the area. Local Authorities (City and District Councils) may negotiate for land for project development purposes, but all such grants should be properly documented and processed. No interest in or right over any land belonging to an individual or family can be disposed of without consultation with the owner or occupier of the land. No interest in or right over any land belonging to an individual or family can be compulsorily acquired without payment, in reasonable time, of fair and adequate compensation.

2.2.4 Environmental Protection Agency Act, 2008 and Environmental Protection Agency (Amendment) Act, 2010

The Environmental Protection Agency Act, 2008 established the Sierra Leone Environmental Protection Agency (SLEPA), to provide for the effective protection of the environment and for other related matters. This Act mandates the EPA among others to:

- Advise the minister on the formulation of policies on all aspects of the environment and in particular make recommendations for the protection of the environment.

- Issue environmental permits and pollution abatement notices for controlling the volume, types, constituents and effects of waste discharges, emissions, deposits or other sources of pollutants of substances which are hazardous or potentially dangerous to the quality of the environment or any segment of the environment.

- Prescribe standards and guidelines relating to ambient air, water and soil quality, the pollution of air, water and land and other forms of environmental pollution including the discharge of waste and the control of toxic substances.

- Ensure compliance with any environmental impact assessment procedures laid down in the planning and execution of development projects, including compliance in respect of existing projects.

- Impose and collect environmental protection levies in accordance with this Act or regulations made under this Act.

- Sections 24 of the Act lists project activities requiring an Environmental Impact Assessment license which include infrastructural projects such as roads and bridges. Sections 25 and 26 describe factors for determining whether a project requires an environmental impact assessment and the contents of the environmental impact assessment respectively. The Act describes the procedures to be followed to obtain permits for both existing and proposed undertakings through the conduct of environmental impact assessments.
• The Environmental Protection Agency (Amendment) Act, 2010 sought to give executive powers to the Board.

2.3 World Bank Safeguards Policies
The project is classified as Category B, implying that the expected environmental impacts are largely site-specific, that few if any of the impacts are irreversible, and that mitigation measures can be designed relatively readily. The environmental assessment for a Category B project:
• Examines the project’s potential negative and positive environmental impacts
• Recommends measures to prevent, minimize, mitigate, or compensate for adverse impacts
• Recommends measures to improve environmental performance.

The Bank’s ten safeguards policies are designed to help ensure that the projects proposed for financing are environmentally and socially sustainable, and thus improve decision-making. The Bank’s Operational Policies (OPs) are meant to ensure that Bank operations do not lead to adverse impacts or cause any harm. The safeguards policies are divided into environmental and social policies, as listed below.

2.3.1 Physical Cultural Resources (OP 4.11)
The policy advises on how the Bank can assist 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. This includes the Convention concerning the Protection of the World Cultural and Natural Heritage, 1972 (UNESCO World Heritage Convention).

2.3.3 Involuntary Resettlement (OP/BP 4.12)
The policy of involuntary resettlement is intended to assist displaced people arising from developing projects, in order not to impoverish any affected people within the area of influence of projects. An action plan that at least restores the standard of living must be instituted, in cases where resettlement is inevitable or loss of assets and impacts on livelihood occurs. Public consultation of “re-settlers” as well as the host communities is critical to the successful resettlement process and implementation of the action plan.

2.3.4 Environmental Assessment (OP 4.01)
Among others, OP 4.01 requires that screening for potential impacts be carried out early, in order to determine the level of the EA. The Bank’s project screening criteria group projects into three categories:
  i. Category A – Full Environmental Assessment
  ii. Category B – Partial Environmental Assessment
iii. Category C – Minimal or no adverse impacts. No Environmental Assessment required.

The EA ensures that the appropriate levels of environmental and social assessment are carried out as part of the project design, including a public consultation process, especially for Category A and B projects. OP 4.01 is applicable to all components of Bank-financed projects, even for co-financed components.

The proposed project may trigger three of these policies namely environmental assessment, involuntary resettlement and disclosure.

**OP 4.12: Involuntary Resettlement**
The World Bank’s safeguards policy on involuntary resettlement, OP 4.12, is to be complied with where involuntary resettlement, impacts on livelihoods and assets, acquisition of land or restrictions to natural resources may take place as a result of the project. It includes requirements that:

- Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs.
- Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development projects, providing sufficient investment resources to enable persons displaced by the project to share in project benefits.
- Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement projects.
- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

According to OP 4.12, the resettlement plan should include measures to ensure that the displaced persons are:

- Informed about their options and rights pertaining to resettlement.
- Consulted on, offered choices among and provided with technically and economically feasible resettlement alternatives.
- Provided prompt and effective compensation at full replacement cost for losses of assets attributed directly to the project.

If the impacts include physical relocation, the resettlement plan should include measures to ensure that the displaced persons are:

- Provided assistance (such as moving allowances) during relocation.
- Provided with residential housing, or housing sites, or as required, agricultural sites for which a combination of productive potential, location
advantages, and other factors is at least equivalent to the advantages of the old site.

The location of the projects is known at this time and there is the possibility of limited land acquisition or restriction of access to land.

**Access to Information Policy**
The policy on Access to Information provides for the disclosure of more information than ever before: on projects under preparation, projects under implementation, analytic and advisory activities (AAA), and Board proceedings. This information will be easily accessible on the World Bank’s external website and available through the Info Shop, public information centres, and the World Bank Group Archives.

At the same time, the policy strikes a balance between maximum access to information and respect for the confidentiality of information pertaining to its clients, shareholders, employees and other parties. Recognizing that the sensitivity of some information declines over time, the policy provides for the eventual declassification and disclosure of restricted information over a period of 5, 10 or 20 years, depending upon information type.

**2.4 Institutional Framework for Environmental Management**
The responsibility for the management and protection of the environment presently lies with the Department of the Environment of the Ministry of Lands, Country Planning, and the Environment (MLCPE). The political head of the Department of the Environment at present is the MLCPE. The administrative head is the Permanent Secretary who is responsible for coordinating the functions of the departments within the ministry viz. Department of Land and Country Planning (DLCP), Department of Surveys and Lands (DSL), Department of Forestry (DoF) and the Environmental Protection Agency (EPA). He/She is also the principal adviser to the minister and the controller of the ministry’s budget. With assistance from the World Bank, the defunct Department of the Environment (DOE) now Environmental Protection Agency, developed the National Environmental Action Plan (NEAP). The country has also prepared its first National Environmental Policy (NEP) with very clear goals, objectives and strategies as outlined below.

**2.5 National Environmental Policy Goals**
The goal of the National Environmental Policy is to achieve sustainable development in Sierra Leone through sound environmental management.

**2.6 National Environmental Policy Objectives**
- Secure for all Sierra Leoneans a quality environment adequate for their health and well-being.
• Conserve and use the environment and natural resources for benefit of present and future generations.
• Restore, maintain and enhance the ecosystems and ecological processes essential for the functioning of the biosphere; preserve biological diversity and the principle of optimum sustainable yield in the use of living natural resources and ecosystems.
• Raise public awareness on environmental issues and promote understanding of the essential linkages between the environment and development, and encourage individual and community participation in environmental improvement efforts.

2.7 Strategies:
These strategies will be pursued in order to achieve the policy goals and objectives:
• Establish and/or strengthen environmental protection standards, monitor changes in and publish relevant data on environmental quality and resource use
• Manage environmental impact assessment (EIA) of proposed activities which may significantly affect the environment or use of a natural resource, and provide relevant information, in a timely manner, to persons likely to be significantly affected by a planned activities and grant them equal access and due process in administrative and judicial proceedings
• Promote environmental management through the creation of administrative and infrastructure support with appropriate financial backing
• Co-operate in good faith with other countries and agencies to achieve optimal use of trans-boundary natural resources and effective trans-boundary environmental protection.

2.8 Ministry of Lands, Country Planning, and the Environment (MLCPE)
The Ministry is responsible for conserving and managing Sierra Leone’s natural environment. It is also responsible for addressing land acquisition and transfer, land ownership and use, and national development in a planning capacity. It provides advisory services to the public on land matters as well as physical planning and management of the forestry resources.

2.9 Ministry of Mineral Resources
Responsible for supervising mining operations in the country, the Ministry of Mineral Resource issues licenses for all mining operations and enforces laws and provisions contained in the Mining Act and its amendments. It is also responsible for enforcing provisions in the new Mining Act relating to the rehabilitation of mined-out areas. The main institutional conflicts are: (i) extent to which the ministry has jurisdiction over marine areas with respect to marine-based mineral resources, offshore dredging and its impact on marine resources and (ii) overlap of water quality monitoring with the interest of the Ministry of Marine Resources.
3.0 PROJECT DESCRIPTION

Phase I will be funded by SLIDF for total amount of USD 19.2 million and consist of three major components.

Component 1. Distribution Network Upgrading, Business Information Systems (BIS) and Metering (estimated at USD 13.8 million). This component is intended to improve distribution capacity and reduce losses on NPA’s system, as well as raise NPA’s commercial performance. Investment under this component include: (i) installation of new commercial and financial information systems to facilitate data collection and management in support to NPA's commercial and financial operations; (ii) pre-paid meters to improve NPA's collection rate and bulk meters to help assessing power flows in the system and addressing thefts; and (iii) new cables and related equipment to improve the capacity and reliability of the distribution network, including upgrading of the distribution lines between Blackhall Road and Wellington sub-station and upgrading of the Wilberforce substation. These investments complement the rehabilitation of the distribution lines between Freetown, Wilberforce and Blackhall Road substations that was completed under the Power and Water Project. The upgrading of Wilberforce substation also enables the construction by JICA of a 33 kV line from there to Goderich substation, further improving the evacuation capacity of NPA’s distribution system. This component also includes technical assistance to support preparation and implementation of the foregoing activities.

Component 2. Technical Assistance for Implementation of Power Sector Reforms (estimated at USD 2.0 million). Funding will be deployed to: (i) provide advisory support to the GoSL in implementing a roadmap for reforms and establishing an Electricity Regulator; (ii) provide consulting services to develop a grid code, licensing procedures, and a standardized power purchase agreement to be used for procurement of private power; (iii) finance one advisor to the CEO of the newly established Generation and Transmission Company for one year; (iv) fund preparation of investment projects to be identified within the upcoming Integrated Resource Planning Study financed by SLIDF.

Component 3. Rural Electrification (estimated at USD 3.4 million). The proposed Project is intended to support GoSL’s long-term vision to improve governance and management of its power sector, rehabilitate and expand power infrastructure and improve power services to support economic and social growth. The Project will focus on expanding distribution capacity, improving reliability and quality of power supply and strengthening NPA’s operational performance. Extensive institutional capacity building will be deployed in synergy with investment funding to support improved sector governance and management and strengthen capacity for project implementation. renewable technologies for rural electrification. Technical assistance under this component will include: (i) development of a policy framework and regulation methodology for
The components of the T & D works being considered in detail in this phase of the EIA may be grouped into three (3) sets of project activities as follows:

- Activities related to the works on the 33 kV and 161 kV overhead transmission lines
- Activities related to the rehabilitation and reinforcement of the components of the distribution network
- Activities related to loss reduction.

This Chapter describes these components in sufficient detail as is consistent with EIA practice so as to be able to identify those aspects that raise environmental concerns.

In presenting these details, it is important to consider them in the context of the overall objectives of the NPA component of the PWP. These objectives are to:

- Provide adequate and reliable power supply to all NPA customers in the Western Area.
- Reduce the losses in the transmission and distribution of electricity
- Assure system integrity and security
- Eliminate or reduce hazards to public and occupational health and safety
- Provide necessary support for sustainable development of the country

In line with existing procedure, all construction activities will be carried out by certified contractors to available documented Standards and Specifications which will be specified in the contract of works and the Project Implementation Manual which will deal with environmental protection measures. To this end NPA has obtained the necessary standards from the Electricity Company of Ghana (ECG) – these are:

- ECG Sub-transmission and Distribution General Technical Requirements, 1999

The details of the T & D components are as follows:

3.1 Activities related to works on the 33 kV and 161 kV transmission lines
The main objective of this component is to complete the 33 kV sub-transmission network (abandoned in 1997) and the associated 3 km section of the 161 kV HV transmission line terminating at the Kingtom switchyard. This component consists of:

- Construction of remaining steel towers for the 33 kV overhead transmission line
- Replacement of broken conductor sections of the 161 kV transmission line
- Rehabilitation of existing 33/11 kV power transformers
- **Stringing Testing and Commissioning**

All the 161 kV towers in the project area are already in place and the conductors have been installed. Some conductors have been damaged by bullets as a result of the conflict and these will need to be replaced. About 40% of the 33 kV towers are also in place, and the materials for completion are available in NPA stores (some of the tower members have been used by NPA as cross arming). The specific activities involved in the completion of the transmission component are:

- **Route clearing** – Prevention of encroachers on the transmission line routes so as to prevent people from interfering with the lines, spots selected for erecting the remaining towers are to be completely clearly, leaving a bare surface at commencement of construction of tower pads.

- **Positioning of Towers** – Sites for the 33 kV towers have already been selected (pre-1997) in accordance with standard engineering specifications, but their acquisition still pose possible problems, in the light of the considerations of the EIA and the RAP, some of these spots may need to be changed to minimize adverse impacts.

- **Excavation** – excavations are carried out to lay foundations for tower pads. Some of the excavated soil is used to backfill as necessary.

- **Concrete works** – concrete works for the foundations and footings are carried out as required.

- **Stringing of Lines** – In most cases, lines are strung by manual labour. The minimum clearance of the lines to ground is about 6 m at the lowest point of sag and this increases to about 7 – 9 m in way of road crossings. The RoW for 33 kV lines spans a width of 10 (5 m on either side of the centreline) while that for the 161 kV spans 30 m (15 m on either side of the centerline). In built up urban settlements this space may be reduced in certain situations due to space constraints.

Prior to commencement of construction, there is the need to sensitize the public in the project areas to obtain their cooperation and to avoid disruption to its smooth implementation.

A major concern is the encroachment of commercial and residential structures within the lines RoW. This is particularly significant in the areas between tower #16 (Tengbeh Town area). This issue and its cost implications are the focus of studies being undertaken by the RAP consultant and there may be the need to consider possible relocation of the 161 kV line and the switchyard at Kingtom depending on the funding).
The environmental concerns arising from the rehabilitation activities include minor loss of vegetation cover, noise, dust and waste generation as well as occupational/public health and safety issues. When in operation transmission line raise various issues of concern such as EMP effects, visual intrusion, problems associated with repair and maintenance damage etc. These are considered in detail in Chapter 4 – impacts and Mitigation.

3.2 Activities related to the rehabilitation and reinforcement of the distribution network

The main objective of this component is to carry out repairs/replacements to substation and associated transformers, distribution boards, switchgears and equipment and cables/conductors in the distribution network to enable it meet the expected demand of up to 60 MW as the system improves.

The specific activities involved in this component are:

- Completion of repairs of 5 faulty 11kV feeder cables
- Replacement/Upgrading 15 existing transformers
- Replacement/Upgrading existing conductors at various locations
- Replacement of over 70 LV distribution boards
- Replacement of about 10,000 decayed and substandard wood poles
- Reconstruction of 2.2 km of 11kV overhead lines
- Provision of 40 km of street lighting

As in the case of the sub-transmission works, the need to educate the public ahead of implementation is crucial. The actual works would include excavating existing 11kV cable and replacing them with new ones. Most of the works will result in considerable waste boards. Switchgears etc. are replaced with new ones. Issues related to construction (noise, dust) handling of transformers oils and health and safety will arise with the implementation of this component.

During operation, the over 200 substations and their associated equipment need to be adequately secured from unauthorized access as they pose hazards to the public and also for the system integrity. Electrical power distribution and related operation and maintenance activities have inherent industrial hazards which require careful management. These will be duly addressed in Chapter 4 which deals with impacts and Mitigation, as well as in the Management Plan.

3.3 Activities related to loss reduction

This different between the energy generated by NPA and that sold to customers is considered loss within the distribution system. System losses are currently around
about 33% and this impacts adversely on NPA operations. About 13% of the losses may be classified as technical losses while about 20% are non-technical or commercial losses.

Reduction in technical losses is expected to occur as a result of the proposed rehabilitation and reinforcement of the distribution network. Upgrading from 11kV to 33kV sub-transmission should enhance this objective.

Non-technical losses involve non-payment by customers and faulty metering, billing and collection procedures. The proposal is to improve the commercial operations and introducing pre-payment meters. New customer service centres are to be built.

Individually, these activities do not raise issues of significant environmental concern, however the cumulative effects of some related aspects such as generation of waste material, disposal of old meters etc, could be of concern. These are discussed further in Chapter 4 under Impacts and Mitigation.
4.0 DESCRIPTION OF EXISTING ENVIRONMENT

Map of Sierra Leone
4.1 Methodology for Data Collection
Various techniques were applied for collecting data on the project environment. These included document review, institutional consultations, focus group discussions and field surveys of the existing environment. An account of the existing physical and biological environment and socio-economic conditions (ethnic groups, culture, economic activities, etc.) were assembled. These formed part of the baseline information and the information obtained used in the environmental analysis/assessment. Samples of the questionnaires and the outcomes of the consultations and stakeholder involvements are attached in the Annex. The description of baseline information relevant to the project covers:

- Project district
- Land use categories
- Land acquisition and tenure system
- Socio-economic status
- Physical cultural resources
- Natural resources
- Air quality
- Wildlife and biodiversity
- Climate
- Health

4.2 General
Sierra Leone is bounded on the north and east by Guinea, on the southeast by Liberia, and on the southwest and west by the Atlantic Ocean. The total area of the country is 71,740 sq km (27,699 sq mi). The country is divided into four administrative regions: the Northern, Eastern, and Southern provinces and the Western Area. Freetown, the capital city is part of the Western Area which is the focus of the NPA transmission and distribution works for which the EIA is being undertaken for power distribution purposes, the Western Area is divided into the eastern villages, greater Freetown, western rural areas and the mountain area.

Generally the coastal area is a low-lying plan extended inland from the Atlantic Ocean. The area closest to the ocean is a largely swampy region; however, the Sierra Leone Peninsula, where Freetown is situated, is dominated by hills. To the east the land rises from the coastal plain to a plateau in the north and to filly terrain in the south.

4.3 Climate
The climate of the Western Area is similar to the rest of the country, which is a typical tropical climate. The mean temperature in the Freetown area is about 27°C in January and 26°C in July. Annual rainfall averages more than 3800 mm along the coast with most of the rains falling from May to October. The rains are usually accompanied by thunderstorms. The dry season, from November to April, has high day and night temperatures with low humidity.
The T & D network in the Western Area has suffered considerable damage from storms. Winds speeds in the coastal area are relatively high at an average of 3 – 4 m/s. During the rainy period. Strong squalls develop which can cause damage to structures such as buildings and transmission towers. This situation is of concern in the hilly slopes of Freetown where the transmission systems tend to get damaged during the storms and create hazardous conditions for the public.

4.4 Land Use
Freetown is sited on the Southern bank of the estuary of the Sierra Leone Fiver. The city lies on sloping ground at the foot of a range of hills. It is bordered on the North and the East by the Sierra Leone River, to the South by the hills, and to the West by the Atlantic Ocean. During the consultations with the Ministry of Lands, Town and Country Planning and Environment, the land use pattern in the Greater Freetown area and was projected up to 2011. The route for the 33 kV transmission network likes mostly within the coastal low lands which slow at high density of occupancy.

The lack of adequate planning and development control over the years, as well as constraints to development posed by the conflict (1991-2002) has led to rather inefficient land use. The residential settlements are expanding on the coastal lowlands with increasing encroachment on the hill slopes. Generally, conditions of housing in the central parts of the city have deteriorated due to overcrowding in the low income areas. Commercial activities are concentrated in the central business district and development of shops. Offices and workshops are expanding along the roads leading to the city centre. Industrial activities, on the other hand, are concentrated in the eastern part of the city. All these developments place excessive demands on utility services and have a direct bearing on the expectations of the T & D rehabilitation and reinforcements.

4.5 Population Characteristics
The current estimated population of Sierra Leone is around 5 million of which Freetown and the Western Area account for over 2 million. This represents nearly a fourfold increase over the level existing before the civil conflict. Many people from the rural areas moved into Freetown for refuge during the conflict. This has resulted in considerable pressure on land resources in the Freetown and has particular significance for the protection of the 33 kV and 161 kV transmission lines. The preliminary assessment by the RAP consultant indicates that up to 1500 persons are affected within the RoW of the 161 kV line. Another estimated 1600 persons have been identified within the RoW of the 33 kV line.

A brief description of the country’s physical and social setting is described in the sections below.
Sierra Leone is a small West African country located at latitude 8 300 N and longitude 11300 W, Bordered on the north and east by Guinea for about 652 km, on the south by Liberia for about 306km and on the west by the Atlantic Ocean. Sierra Leone has a total surface area of 71,740 sq. Km of which the total land area is 71,620 sq. km and 120 sq. km is water. The country got its name from the 15-century Portuguese explorer, who was the first to sight and map Freetown Harbor. The original Portuguese name of Serra Lyoa (ion Mountains) referred to the range of hills that surrounds the harbor. Sierra Leone can be divided into four distinct physical regions.

**Coastal Swamp Region**
This extends along the Atlantic for about 320 km. It is a flat, low lying, and frequently flooded plain that is between 32 and 64 km wide and is composed mainly of sands and clays. Its numerous creeks and estuaries contain mangrove swamps. Parallel ridges, often separated by silting lagoons, are common and sometimes form the actual coast.

**Sierra Leone Peninsula**
Freetown, the capital of Sierra Leone, is sited in this region, which has thickly wooded mountains that run parallel to the sea for about 40 km. The Peninsula Mountains rise from the coastal swamps and reach 888 m at Picket Hill.

**Inland from Coastal Plain**
This is the interior plains region. In the north, it comprises featureless grasslands (savannah) that are known as "Bolilands" (boli being a Temne word for those lands that are flooded in the rainy season and hard in the dry season and on which only grass can grow). In the south, the plains comprise rolling wooded country where isolated hills rise abruptly to more than 200 m. The interior contains a variety of landforms ranging from savannah-covered low plains to rocky scarp and hill country. The plateau region, encompassing roughly the eastern half of the country, is composed mainly of granite with a thick laterite (iron-bearing) crust; to the west it is bounded by a narrow outcrop of mineral bearing metamorphic rocks known as the Kambui Schists. Rising above the plateau are a number of mountainous masses.

**Loma Mountains (Northeast)**
This is crowned by Mount Loma Mansa (Mount Bintimani) at 1,948 m (the highest point in Sierra Leone), and the Tingi Hills rise to 1,824 m at Sankanbiriwa Peak.

**4.6 Climate**
The climate is tropical and is characterized by alternating rainy and dry seasons. Conditions are generally hot and humid. Mean monthly temperatures range from 250 C to 280 C in low-lying coastal areas; inland the range may be from 230 C to 280 C. In the northeast, where extremes of temperature are greater, mean daily minimums fall to 130 C in January, and mean daily maximums rise to 320 C in March. During the rainy season, from May to October, humid air masses from the Atlantic dominate.
Precipitation is greater on the coast than inland, with as much as 5,080 mm of rain fall annually on the Peninsula Mountains, while the northeast receives about 2,032 mm a year. The mean annual and seasonal rainfall distribution pattern is as follows:

- Coastal areas receive more than 3,000 mm rain per year with the Western Area recording up to 5000 mm.
- North-central and south eastern regions receive between 2,500 and 3,000 mm.
- The North receives from 2,500 to less than 2,000 mm.
- Distinctly higher rainfall values above 3000 mm are recorded around Makeni, Mabonto and Bumbuna areas presumably due to the relief influence of the Sula Mountain scarp to the east.

The dry season, from November to April, is characterized by the dry harmattan that blows from the Sahara. The rainy season tends to have cooler daily maximum temperatures than the dry season by about 60°C. The relative humidity, however, may be as high as 90 percent for considerable periods, particularly during the wettest months, from July to September.

### 4.7 Soils and Hydrology

The country’s drainage pattern is dense. Numerous rivers have their sources from the well-waters of the Fouta Djallon highlands of Guinea and flow in a general northeast to southwest direction across Sierra Leone. Their middle courses are interrupted by rapids that restrict navigability to only a short distance inland. River levels show considerable seasonal fluctuations. The drainage system has nine major rivers and a series of minor coastal creeks and tidal streams. From north to south, the principal rivers are the Great Scarcies, Little Scarcies, Rokel (which is known in its lower courses as the Sierra Leone River) Gbangbaia, Jong, Sewa, Wanje, Moa, and Mano. The Great Scarcies and Moa form portions of the border with Guinea, while the Mano River forms much of the country’s frontier with Liberia. In most areas, the dominant soils are of the weathered and leached lateritic (iron bearing) type. Red to yellow-brown in color, they contain oxides of iron and aluminium and are acidic. Kaolin clays are important in some areas, and when cultivated a light, readily workable, free-draining soil results, whose productivity depends largely on the nutrients provided from the vegetation previously cleared and burned. In coastal plains lateritic soils developed on sandy deposits are agriculturally poor, but those derived from basic igneous rocks are somewhat better.

### 4.8 Natural Resources

Sierra Leone is a country blessed with abundant mineral resources, which include: diamonds, chromite, rutile (among the largest reserves in the World), iron ore, titanium ores, bauxite, columbite (a black mineral of iron and columbium) pyrochlore, gold, platinum, and manazite. Forests cover more than one-fourth of the country, the most important area of which is the Gola Forest Reserve, a tract of primary tropical rain forests, near the Liberian border.
4.9 Wetlands
The Convention on Wetlands came into force for Sierra Leone on 13 April 2000. Sierra Leone presently has one site designated as a Wetland of International Importance, which is the Sierra Leone River Estuary, with a surface area of 295,000 hectares. The Estuary, near Freetown Peninsula, is dominated by mangrove swamps, with lowland coastal plains to the north. As it enters the Atlantic Ocean, the estuary widens to 11 about 16 km and deepens to form a natural harbor and is said to be the third largest in the world. Of Sierra Leone’s total mangrove, 19 percent is included within the site. The site exceeds the 1 percent threshold for at least eight bird species, namely Ringed and Kentish Plovers, Sanderling, Curlew Sandpiper, Whimbrel, Greenshank and Redshank, and Western Reef Heron; and is a breeding habitat for some of these birds.

4.10 Socio-Economic Features
Sierra Leone is one of the poorest countries in the world, and its economic activity is largely influenced by the public sector. The economy has always been based on the exploitation of natural resources, notably agricultural, marine and mineral resources. The agricultural sector which accounts for 44.1 percent of the Gross Domestic Product (GDP).\(^1\) Agriculture has remained traditional and subsistence in character, incapable of satisfying the food needs of the country by a wide margin, and improving the living standards of the broad mass of the population. Over 70 percent of the country’s labour force is employed in agriculture.

4.11 Population
The population of Sierra Leone is estimated at 6 million, growing at a rate of about 2.6 percent per year. The country’s population is made of many ethnic groups the largest and most prominent being the Mende, Temne, Limba, Kuanko, Sisu, Yalunka, Loko, Mandinka, Kono, Kisi and the Creoles. The population density of about 58 persons per sq. km is relatively high as compared to other countries in Sub-Saharan Africa. The population is concentrated in some particular regions of the country including the Freetown Peninsula and the Kono, Kenema and Bo districts. The northern part of the country is sparsely populated. A large section of the population is unemployed, especially among the youth. An estimated 68 percent live close to the forest or forest regrowth area on which they depend for their livelihood.

4.12 Land Tenure
Land tenure in the Republic of Sierra Leone is characterized by a dual ownership structure. Land in the Western Area observes the English system of Freehold Interests. This area includes the capital city Freetown and is clearly distinguishable from the rest of the country by the level and quality of development. Land in the rest of the country is held in Communal Ownership under customary tenure and is controlled by traditional rulers who administer it on behalf of their communities in accordance with customary

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principles and usage. The result is a dichotomy between modernization and tradition. While in the Western Area interest in land can be assigned with little difficulty, in the Provinces the traditional authorities are unwilling to assign interests in land. A detailed description of the land tenure system follows.

**Western Area**
Land tenure in the Western Area traces its history from the British Colonial administration. The area settled by the freed slaves was declared a Colony of the British Empire, and the settlers, having lived in England and having experienced the English way of life and system of governance, were more inclined to live their lives like the British. As a result of this and other socio-political considerations, British concepts of tenure were introduced in the colony (Western Area). Since the land on which the freed slaves were resettled was purchased in the name of the British monarch, the settlers were therefore tenants of the British Crown and the title passed on to them was the tenancy in fee simple or freehold. After independence in 1961 the Government of Sierra Leone replaced the crown as the “landlord” of the Western Area and the freehold system was allowed to persist.

**Provinces**
Land is communally held under customary tenure in the provinces with minor differences among the various ethnic communities. Land is deemed to belong to the family, comprised of departed ancestors, the living and the unborn. It is regarded as a divine heritage entrusted to the living with a responsibility to ensure its preservation and legacy to future generations.

**Family Interests**
The absolute interest in land is vested in families. The Paramount Chief is regarded as the custodian of the land on behalf of the entire Chiefdom, but decisions regarding land are the preserve of heads of families. The administration of the community interest is vested in the heads of the land-owning families, who are aided by a Council of Elders. Of important, every member of the family has an inherent right to occupy and use any part of the family land.

**Individual Interest**
Where a family member wishes to cultivate any part of the family land, he/she has to obtain special permission from the family head who would normally allocate land to him/her. In some societies, the individual has to pay (locally referred to as kola or “handshake”) the family head as acknowledgement of the land granted to him/her. The grant, however, does not confer ownership of the land but only the right to use the land.

**State or Public Lands**
There are two types of State lands in Sierra Leone: Crown Lands and Government Reservations. Crown Lands are found in the Western Area while Government Reservations are found in the Provinces. Crown Lands are comprised of lands which have been acquired “for the service of the colony” under the Public Lands Ordinance, 1898.
5.0 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

These chapter discusses the impacts expected at various stages of the project implementation and recommended mitigation actions to minimize these impacts. The identification of these impacts has been informed not only by previous experienced gained on EIA of similar systems (ECG, VRA – Ghana), but also by comments and concerns of stakeholders, including the public. The stakeholders are listed in Chapter 7 – Consultations.

The impacts mitigation is discussed for the different phases of the project implementation which are:

- Pre-construction phase
- Construction phase
- Operation and Maintenance phase

In addition there are certain issues such as potential impacts of oil in transformers, effects of electromagnetic force (EMF) etc. which is discussed under a separate section on special issues.

5.1 Pre-Construction Phase

Securing access to transmission line routes, substations and exposed parts of the T & D network – the main activities to be carried out prior to commencement of construction works are in connection with the need to secure access to transmission line routes and also to prevent further public access to substations and other exposed parts of the T & D network. There is also the need to clean up the substations and remove persons and unauthorized structures around them.

Applying the NPA safety rules, (E6 (1) Working in substations and switching stations with live conductors) the minimum clearance from such live electrical installations should be 2.6 m. It is recommended that such a minimum buffer should be established around all outdoor installations.

The impact of these activities has to do with the change of “land use” by the public and the resistance of the public to requests to move away from such locations. Cleaning of the substations would generate considerable amounts of waste (some of it hazardous) which would need to be properly handled. In some cases cleaning may temporarily impact adversely on ambient air quality but would be beneficial in the long term.

Mitigation

While issues of resettlement and compensation for disturbance and removal of people are being considered by the RAP consultant, it is proposed that NPA should embark on a public education and awareness campaign to gain the cooperation of the public through sensitizing them on the hazards posed by exposure to live power system such
as electrocution, fires, EMG effects etc. This should be done well in advance of actual
commencement of construction and should continue on periodic bases during
implementation. Adequate provision shall be made for handling (segregating and
classification) of wastes and their proper disposal or re-use where possible.

5.2 Construction Phase
As with most projects of this nature, construction phase impacts are generally of a
transient nature and will be felt mainly during the actual period of construction,
although piles of sand and other construction materials have been known to be
abandoned at worksites long after project completion. The issues involved in the T & D
construction phase are:

a) Transportation of equipment and materials to site – this would involve medium
to heavy duty trucks carrying loads to the various construction sites along the
tower route and to substation sites. Most of the materials are currently stored at
Wellington, Black hall Road and Kingtom, average travel distance should be
between 4 – 10 km per trip. The road network to most of the sites is quite
adequate although access to the hilly areas could be difficult.

The impacts associate with the transportation would include

- Noise from truck movements
- Emissions from vehicle exhausts
- Dust emission from haulage of sand
- Damage to road surfaces and dust generation where roads are not paved
- Possible road accidents including falling objects from trucks.

As shown in the matrix, these impacts would affects would affect soil, soil, air ambient
noise, land use and occupational/public health and safety.

Mitigation
Noise from truck movements is transient and will not require special mitigation except
to educate drivers to avoid unnecessary blaring of horns and revving of engines
especially in the vicinity of residences.

Emissions from vehicles contain pollutant such as CO, CO₂ and smoke, soot and other
products of combustion. The quality of exhaust depends among other things on the
state of maintenance of the engine. The contractor shall ensure that all vehicles used are
properly maintained to avoid excessive air pollution.

Dust emission from haulage of sand shall be mitigated by ensuring that trucks carrying
sand have suitable covering material such as tarpaulin in place. Damage to road
surfaces and dust generation where roads are not paved is an unavoidable impact
especially in the wet season.
Road accidents shall be minimized by ensuring that trucks are in good state of maintenance and that drivers are properly qualified and obey appropriate traffic signals. All materials being transported shall be suitably secured and trucks shall carry suitable warning signal such as “flashing amber light” and “red flags” on long items such as wood poles.

b) Clearing Transmission Lines Right-of-Way (RoW) and Tower Routes/Spots – this involves mainly removal of all unauthorized structures. All trees directly in the way of the lines shall be suitably lopped or completely removed as required for safety. Using the prescribed standards (see Annex 4), no structure are permitted directly beneath the 161 kV, 33 kV or 11 kV lines. Spots for erecting towers shall be suitably cleared and graded.

The impacts arising from this activity include:
- Exposure of soils to erosion and degradation from runoff
- Noise from grading machinery
- Sediments and runoff from exposed soil surfaces polluting receiving water bodies
- Loss of use of land in RoW by existing users

Mitigation
Exposure of soils to erosion and degradation from runoff shall be controlled by concreting the disturbed sites. As much as possible, the native ground cover beneath the lines shall be maintained. During the field surveys, it was noted that there were not many trees directly affected by the transmission lines. Some palm trees in way of towers #10 to #12 which will be affected. Tower pads on the hill slopes are highly prone to erosion and these shall be adequately protected by terracing or using stone cladding.

Noise from grading machinery is unavoidable, however the nuisance effect in residential areas shall be abated by ensuring that work is not carried out beyond the daytime working hours. Wherever possible, manual methods shall be employed in place of machinery.

The impact of loss of use of land in the RoW by existing users is expected to be considerable. The RoW of the 161 kV is 30 m over a distance of about 6 km in the project area, while that of the 33kV is 10 m over a total distance of about 22 km. the RAP consultant has estimated a total of 390 households and up to 3100 persons to be affected by the project implementation. There are possibilities of diverting the lines in certain areas to avoid areas of high density between tower #32 and Blackhall Road substation. Similarly there is the possibility of relocation the 161 kV from it existing location at Kingtom to avoid the density populated areas along the Congo Valley (Congo River).
c) Excavating Foundations and Erecting towers and Poles – this involves works at selected spots where towers and poles are to be located. About 40% the towers are already in place and excavation works will be limited. In the case of the wooden poles, existing poles will be replaced with new ones at the same spots. Typical excavation for mounting the towers and poles will be up to 2 m deep for towers and 1 m deep for poles and the soil will be reused for backfilling. Tower pads will be of concrete construction to avoid direct contact between the metal parts and the soils which tend to be acidic.

The erection of towers and new wood poles will enhance the status of the electrical infrastructure in the T & D network, which is a beneficial impact. A further benefit is that of towers serving as perches for birds.

The adverse impacts associated with these works such as noise and dust generation are similar to those discussed earlier. Other concerns include:

- Waste Generation
- Chance archaeological finds during excavations
- Safety of workers assembling tower members.

Mitigation

Construction activities tend to generate noise both from machinery as well as from the workers on site at level sometimes going beyond 90 dBA. This impact would be significant especially in those sections of the project that pass through residential areas where the acceptable noise limited is less than 60 dBA. The impact of construction noise on residents shall be mitigated by avoiding work during the night. In addition constructors and workers will be instructed to minimize noise during working periods.

Excavation works and site clearing generate dust in the working environment especially during the dry season. This impact is limited to the construction period and may not be very significant in relation to the projects under consideration. The recommended mitigation is to spray exposed surface and sand heaps with water.

Typical waste generated during the construction will be mainly solid waste made up of cleared vegetation, excavated soils, packaging materials and excess/damaged construction materials. All wastes shall be separated and useful items such as wood pieces would be given out to workers for use as fuel wood. Waste receptacles shall be provided at all work sites to be emptied periodically constructors.

Usually during excavations there is the possibility of encountering buried items of archaeological or cultural/historical significance. Any such finds shall be left as is and duly notified to cultural authorities for appropriate action.
Workers assembling tower members and poles have to work at heights of up to 10 m and beyond and there is the risk of slipping/falling. Adequate personnel safety equipment including safety climbing belts and appropriate clothing shall be provided for all workers engaged in such activities.

d) Stringing of lines and replacement of existing cables and conductors - this activity will be mostly carried out manually. There may be the need to use mobile cranes to assist with the replacement of damaged conductors on the 161 kV line (see photo #13)). Some of the 33 kV towers (#2 and #3) are located in cemeteries and working on them will require careful monitoring to avoid damaging any grave/tombs. The stringing process will pose occupational health and safety hazards.

A major impact of erecting and stringing towers/poles is the visual intrusion impact. During the filed survey, it was observed that many of the LV overhead lines are strung haphazardly creating aesthetic problems particularly within the eastern parts of the city. The impact caused by visual intrusion is mainly associated with the LV overhead lines and can be significant in areas intended as tourist attractions. In many parts of Freetown, the poor physical planning and development has resulted in indiscriminately scattered overhead lines, which are visually disruptive.

Overhead lines may create collision hazards to birds; birds which tend to rest on power lines may be affected by heat and electric fields. This type of impact may be considered as residual.

The other significant impact expected from this activity is the large amounts of waste to be generated from replacing over 10,000 wooden poles and a huge quantity of damaged conductors. In addition, the wooden cores of the new conductors which will be used for the stringing and replacements will remain as waste material. Other wastes will include broken and damaged insulators and other similar equipment.

Mitigation
The health and safety impacts shall be addressed by ensuring that workers are provided with and actually use appropriate personal protection equipment during the work. The impact of visual intrusion is another unavoidable issue but every effort shall be made during the replacement works to improve the alignment of the existing LV lines to improve the aesthetic effect within the city centre.

Operational phase

5.2.1 Transformer oils
The presence of transformers on the premises of substations introduces the potential environmental impacts inherent in transformer oils. Polychlorobiphenyls (PCBs) are
harmful substances to the environment. They are not produced during electricity generation or distribution, but which are contained in certain equipment, mainly in transformers and condensers. These are often purchases from the manufacturers of electrical equipment who use them because of their perfect dielectric properties. The transformer oils shall be collected and handled adequately. Qualified agencies or approved by the SPC, Ministry of Energy and Water Resources or NPA shall be engaged for that activities. Annex 1 Regulations for the Prevention of Pollution by Oil, Annex 2 Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk of International Convention for the Prevention of Pollution from Ships (MARPOL) will be referred. The transformers to be purchased will be required to meet all applicable safety standards and will be enclosed in separate secondary containment structures that will prevent any accidental spills or routine leakages that may occur from being released to the environment. The transformers will be serviced outside the country. No further mitigation measures will be required.

5.2.2 Fire hazards
The presence, storage and use of oils, fuels and other flammable products on the premises of substations and work sites may give rise to the very likely hazards of fire outbreaks. In addition, there always is a likelihood of fire outbreaks in substations and work sites that are sited in areas where bushes surround them. Some mitigation measures have been proposed for this impact.

5.2.3 Noise
Assessments of existing substations in the Freetown municipality indicate that generated noise could be heard up to only about 60 m from substation sites. Additional noise in the surrounding area may be heard from generators in the substations, but these are fitted with silencers. This noise fluctuates on a daily basis, particularly the weekdays when vehicular use is at its peak in the vicinity. The noise level will however be maintained well within the guideline value for residential areas of between 35 ~ 40 dB. Existing trees around the proposed substations that will not pose threats to the incoming or outgoing transmission lines will be left in place to act as noise buffer to would-be residents in the future and to road users. No further mitigation for generated noise from substations will be proposed.

5.2.4 Avifauna
Potential impacts by/on bird species present in the area associated with the construction and operation of a substation include electrocutions and disturbance during the construction and maintenance of the substation. Other problems include electrical faults caused by bird excreta when roosting or breeding on electricity
infrastructure within the substation. Mitigating measures have been proposed for this potential impact.

5.2.5 Substation security and public safety

The substations will be located in relatively built up area. Due to the voltages to be handled by the stations, it is important that they are made secure at all times and that unauthorized persons are kept away from the premises. The substations shall be suitably fenced to ward off persons from the premises. Also, Security officers shall man the substations at all times to ensure security and report all incidents that might be out of the ordinary for prompt action. In addition, suitable warning signs indicating the dangers within shall be placed at regular intervals on the fencing to warn would-be encroachers.

5.2.6 Avifauna

Potential impacts by/on bird species present in the area associated with the construction and operation of a substation include electrocutions and disturbance during the construction and maintenance of the substation. Other problems include electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure within the substation. Mitigating measures have been proposed for this potential impact which need prompt action.
6.0 **IMPACT MITIGATION**

Impacts due to the operation of the substations have been discussed in Section 4.7.2. Discussed below are some of the mitigation measures proposed for the potential impacts.

6.1 **Storm drains**
A network of storm drains shall be constructed in the substations to collect and direct storm water away from the substations. This network shall be isolated from the oil and fuel storage areas to ensure that storm water is not contaminated with oil products prior to discharge. No further mitigation is proposed for this potential impact.

6.2 **Fire hazards**
The best defense against fire outbreaks is to ensure they are not caused at all. The SPC shall be well aware of the disastrous consequences of fire outbreaks on its substations. Measures are therefore put in place to ensure that fires do not break out in the substations. Prior to the operation of the substations, and as part of project planning, the in-house NPA Fire Service will carry out a fire survey on the premises of each substation to identify specific firefighting equipment for the substations. These pieces of equipment will be purchased and installed at vantage positions within the substations in addition to the standard water hydrants and fire extinguishers provided for all the substations. This will ensure that substations remain in a high state of preparedness against potential fire outbreaks. In addition, a fire buffer (vegetation break) will be created and maintained around the fencing to ensure that potential bush fires are not able to affect the substations.

6.3 **Avifauna**
The SPC ensures that good housekeeping is done at all times in the substations. Bird nests in areas likely to cause electrical faults shall be promptly removed and transferred to nearby trees, if practicable.

6.4 **Earthing of equipment**
There will be adequate earthing of equipment to prevent shocks and malfunctioning of protection equipment.
7.0 MONITORING PROGRAM

A program has been developed to determine impacts on the physical, biological and socio-economic/cultural environments within the project area and around the proposed substations. The monitoring results are expected to indicate whether the predictions of potential environmental impacts are accurate and also whether the mitigation measures proposed for the management of the impacts are appropriate and adequate. The program will also serve as an early warning system by revealing unforeseen impacts and allowing additional corrective measures to be implemented to arrest the situation and ensure that irreversible damage is not caused. The program is also expected to provide useful guidance for the successful planning and implementation of future power transmission line projects that will be undertaken by the SPC. The monitoring program has been developed for the parameters as mentioned in Chapter 6.1 to 6.7. It is recommended that the Consulting Engineer be given the responsibility, by contractual arrangement in order to monitor the adequate implementation of the CEMP. Therefore, the chapter for Contractors’ obligation and legal requirements is included as the elements to be monitored by implementation agency in chapter 6.6.

7.1 Occupational safety and health issues

The availability and use of personal protective equipment will be closely monitored continuously during both the constructional and operational phases. All employees who refuse to use the protective equipment provided will be properly sanctioned. To ensure that personal protective equipment is always readily available, all defective equipment will be promptly replaced. Regular safety tests as recommended by manufacturers will be conducted on equipment such as cranes and winches.

7.2 Fire hazards

In order to prevent any outbreak of fires, construction work will be monitored continuously to ensure that the execution of works is done strictly adhering to technical specifications relevant to electrical safety. The use of low quality components, inadequate sizing of cables, and negligent execution of works and general non-observance of safety rules will be monitored regularly. Proper and sufficient supervision of workers will be monitored.

7.3 Waste management

The collection and use of wooden wastes as fuel wood by local communities will be monitored on monthly basis. Also, the collection and sale of scrap metal to dealers will be monitored monthly to ensure that metal wastes are managed efficiently. The management of other solid wastes will be monitored on weekly basis to ensure that the wastes are collected promptly and disposed of at appropriate public waste dumping sites. The cleanup of accidental spills of oil, fuel and paints whenever they occur will be monitored to ensure that the cleanup is promptly and properly done.
7.4 Public/Worker safety
Workers will be required to wear PPE and use safety lines while putting up poles and stringing wires. Occurrences of accidents involving transmission lines and structures that affect public safety or worker safety will be monitored and recorded whenever they happen. The frequency and severity of such occurrences will be recorded. This will eventually indicate whether additional mitigation measures are required to make the system safer.

7.5 Identification of project-affected persons and compensation payment
Monitoring of project-affected persons and communities will be carried out for two years to ensure that all affected persons and communities have been identified and payment of adequate compensation duly effected without further delay.

7.6 Substations
During the operational phase of the project the substations will be monitored to ensure that they comply with all regulatory requirements. Parameters that shall be monitored shall include the following:

7.7 Fire safety
The substations will be monitored once a year to ensure that all installed fire extinguishers and water hydrants are in working conditions and that all extinguishers have been recharged as required by the Factories Act, 1974. The perimeter of the substations shall also be inspected to ensure that the vegetation barrier (fire buffer) created against bush fires is well maintained.

7.8 Storm water quality
Storm water being discharged from the network of drains at the substations will be sampled and analyzed quarterly for the first year of operation and twice yearly for all subsequent years. Relevant parameters that will be considered for analysis are:
- BOD
- pH
- DO
- Oil and grease

7.9 Noise
Operating noise levels of the substations shall be monitored to ensure the levels do not go beyond the guideline limit values

7.10 Occupational safety, health and welfare
The safety, health and welfare of the workers is of paramount importance to the SPC. Monitoring shall therefore be carried out on occupational safety and health within the substations during their operational phase. Parameters to be monitored shall include, but not limited to:

7.11 Personal protective equipment
The provision and use of protective gears shall be monitored on a monthly basis to
ensure workers are well protected against the hazards of the workplace

7.12  **Good housekeeping**
Management will ensure that good housekeeping is maintained at all times on the premises. All weeds springing up through the stone carpet of the substations shall be monitored on a daily basis to ensure that there is always a fire break at the perimeter. The premises will be monitored to ensure that potential nesting places of birds are kept free of bird nests that are likely to cause electrical faults.

7.13  **HIV/AIDS**
In addition to the HIV/AIDS education of the workforce by Health Services Department, the SPC will in close cooperation with the District Health Management Team in each district where the substations are located, monitor the incidence rate using national/district totals for any drastic changes during the construction stage of the project cycle.

There exists the likelihood of contacting and or transmitting HIV/AIDS by immigrant/workers in the various work localities. Education on the HIV/AIDS and the use of condoms will be provided by the consultants/contractors.

Even though this monitoring program could be useful, the SPC will ensure, through its educational program, that safe sex is practiced by the construction teams so that incidences of the diseases due to activities of the construction crew are prevented or minimized.

7.14  **Chance Find Procedure**
During the constructional phase, cultural/archaeological ‘chance finds’ - sites of cultural significance such as sacred woods or trees or rock outcrops and historical or archaeological heritage/items or sites which the local residents may not have mentioned at the survey stage will be monitored to ensure that such sites or items are properly managed to the satisfaction of both the local communities, the EPA and/or other relevant authorities.

The “Chance Finds” procedure will be included in the ESMP and will be covered in the contract for civil works, referring to the small areas to be occupied by towers and substations. If in case there is any archaeological site or other physical cultural heritage in any of the proposed camp sites, measures will be taken to change such a site.

In the event that an archaeological resource is discovered during the construction process a Chance Find Procedure such as a rapid archaeological survey will be implemented in substation and camp site. This procedure needs to be included in the Contractor’s EMP (Environmental Management Plan).
A Chance Find Procedure as described in Performance Standard 8 of IFC is a process that prevents archaeological sites from being disturbed until an assessment by a competent specialist is made and actions consistent with the requirements of PS8 are implemented. It is a project-specific procedure that outlines what will happen if previously unknown physical resources are encountered during project construction or operation. The procedure includes record keeping and expert verification procedures, chain of custody instructions for movable finds, and clear criteria for potential temporary work stoppages that could be required for rapid disposition of issues related to the finds.

In accordance with this Procedure, work will cease on a site where archaeological material is found. The consulting engineer will inspect and secure the site, and will then contact the monitoring agency for advice and arrange for a survey or salvage work as appropriate.

### 7.15 Contractor’s obligation and legal requirements

Prior to the commencement of construction works, all contractors should be required to prepare their own ESMPs (CEMP). The plan should be included in the bidding documents and in the contractor’s contract and spell out environmental targets and objectives as outlined in the ESIA/ESMP and how these could be achieved. The Contractor’s ESMP (CEMP) shall include, to the extent practicable, all steps to be taken by the Contractor to protect the environment in accordance with the current provisions of national environmental regulations, the World Bank Groups Environmental Health and Safety General Guidelines and the Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution, 2007 as well as the ESIA/ESMP for this project. Provision should be made for the disposal of chemical/ hazardous wastes as the local facilities do not exist for hazardous waste disposed. Also, for more complex environmental management aspects, the Contractor needs to prepare and implement Method of Statement which needs to be approved by the Supervising Engineer and the SPC upon request.

In order to ensure adequate implementation of the CEMP and specific Method of Statement, the Contractor needs to employ environmental staff for the proposed Project. Notwithstanding the Contractor’s obligation spelt out above, the contractor shall, in addition, endeavour to implement all measures necessary to restore the project sites to acceptable standards and abide by environmental performance indicators specified in the ESIA/ESMP to measure progress towards achieving objectives during execution or upon completion of any works. These measures shall include, but not limited to the following:

(a) Minimizing the effect of dust on the surrounding environment resulting from earth
mixing sites, asphalt mixing sites, dispersing coal ashes, vibrating equipment, temporary access roads, etc, to ensure safety and health of workers and communities living downwind of dust generating activities;

(b) Ensuring that existing water flow regimes in rivers, streams and other natural or irrigation channels are maintained and/or re-established where they are disrupted due to civil works being carried out;

(c) Ensuring that noise levels emanating from machinery, vehicles and noisy construction activities are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and communities near rock blasting areas;

(d) Preventing bitumen, oils, lubricants and waste water used/produced during the execution of works from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs and also ensure that stagnant water in uncovered borrow pits is treated in the best way to avoid creating possible breeding grounds for mosquitoes;

(e) Preventing and minimizing the impacts of quarrying, earth borrowing, piling and building of temporary construction camps and access roads on the biophysical environment including protected areas and arable lands; local communities and their settlements. In as much as possible restore/rehabilitate all sites to acceptable standards;

(f) Ensuring that the flora and fauna of biodiversity of protected areas be preserved and protected. In situations where construction phase of the project disturbs flora and fauna, the Contractor to ensure that requirements of the C.B.D., CITES and Forestry Regulations are applied;

(g) Discouraging construction workers from engaging in the exploitation of natural resources such as hunting, fishing, logging and collection of forest products or any other activity that might have a negative impact on the social and economic welfare of the local communities;

(h) Implementing soil erosion control measures in order to avoid surface run off and siltation;

(i) Ensuring that garbage, sanitation and drinking water facilities are provided in construction workers camps;

(j) Ensuring that in as much as possible local materials are utilized to avoid importation of foreign material and long distance transportation;
(k) Ensuring public safety and meeting traffic safety requirements for the operation of moving machinery in order to avoid accidents;

(l) Discouraging the use of foul or infuriating words on project-affected persons (PAPs) and communities. All such persons and communities and their grievances should be politely referred to the appropriate authorities for redress.

(m) In the event that an archaeological resource is discovered during the construction process a Chance Find Procedure such as a rapid archaeological survey will be implemented in substation and camp site. Cultural resources should be left as is until appropriate authorities have been notified.
8.0 PROVISIONAL ESMP, INSTITUTIONAL ARRANGEMENTS AND TRAINING

The Provisional Environmental Management Plan (PEMP) details active remedial measures and monitoring activities to be continuously carried out to prevent or minimize impacts on the physical, biological and socio-economic/socio-cultural environments as well as to promote occupational safety and health of employees.

8.1 Policy on Environment, Safety and Health

The SPC and its employees will be committed to minimizing the impact of its operations on the environment. SPC will accordingly adhere to the principles of sustainable energy development and contribute to the welfare of people (or communities) adversely affected by its operation. SPC to be established to manage, own and operate the entire Project will:

1. Comply with all relevant and existing legal obligations on the environment, particularly:
   • Promote open communication and dialogue in addressing environmental issues
   • Establish an environmental management system (EMS) with a view to ensuring continuous improvement through:
     - Collaboration with other agencies in pursuit of its environmental management objectives and programs;
     - Support for research, development and technology applications to enhance efficiency of resource management;
     - Contribution to the formulation of public policy and programs that promote sustainable development especially in areas affecting its core business and those of its subsidiaries;

2. Educate, train and motivate its employees about issues of the environment;

3. Assist in improving the standard of living of communities adversely impacted by its operations.

Specific objectives:
The specific objectives of the provisional ESMP are:

1. Establish an Environmental Management System (EMS), which ensures integration of environmental concerns in all areas of planning and making, due diligence, risk minimization, monitoring and continuous improvement of the environment;
2. Comply with both national and international conventions of the environment;

3. Actively promote environmental awareness and individual sense of responsibility through education, training and motivation;

4. Promote open communication on environmental issues;

5. Support research, development and technology applications to enhance efficiency of resource management;

6. Contribute actively to the formulation of public policy and programs that promote sustainable development in the energy sector;

7. Assist in improving the standard of living of communities in the Authority’s areas of operations.

8.2 Environmental Management System

In order to maintain control over the implementation of the project and also ensure that commitments made in the ESIA are acted upon in a comprehensive and acceptable manner, an Environmental Management System and Training Program is developed in this section. This program will help to identify personnel, responsibilities and training requirements for the Project Environmental Management Team to be constituted.

8.2.1 Environmental management structure

It is therefore proposed that a Project Implementation Unit (PIU) should be set up to be broadly responsible for preparing the implementation and operation of the project until the SPC is formed. The details of how this PIU is best to be set up are not yet clear. Therefore, a study, named “Establishing the WAPP CLSG Project Implementation Unit”, has been carried out to develop a suitable structure of the PIU and to make well-founded recommendations on how this PIU is best to be set up and operated by the separated consultant. The present structure of PIU in this report is based one of the options regarding the PIU establishment suggested on that study.

8.3 Organisational structure of the PIU

*Project Implementation Unit (PIU)*

The primary mandate of a PIU under this setup is to oversee the construction of the project and ensure compliance with the terms of the construction contract. The PIU setup therefore must cover all the functions and be fully in place when field work is about to commence; ie about six months after contract award. The set of skills required (by the PIU) to perform its construction oversight mandate is significantly different from the skills required for project preparation, bidding, evaluation and award. Therefore;
Pre-Award tasks are best assigned to a competent Owners Engineer. A representative of the SPC or project sponsors however needs to be assigned to provide the administrative focus, coordination and follow-up necessary for the preparation on schedule of such a complex project. This role could best be performed by the Project Director of the PIU.

To provide the required day-to-day follow-up, coordination and facilitation of the Preaward activities to be performed by the Owners Engineer and others, the Project Director of the PIU (eg. the Project Director) should be recruited and available during the Pre-Award phase if the project is not to be delayed.

It is recommended that the PIU be headed by a Project Director who has overall responsibility for the proper implementation of the project as well as the management and functioning of all the other PIU staff and resources. The Director being the head of the PIU is to be stationed at the Head Office. The Director is expected to make quarterly visits to the project site or field offices.

### 8.4 Environment & Community Relations Unit (ECRU)

It is necessary to set up the Environment & Community Relations Unit (ECRU) as a substructure of PIU to deal with environmental and social aspects of the Project. The ECRU will be responsible for the following:

- Ensuring project’s compliance with all relevant environmental, social, health and safety regulations
- Liaising with all relevant regulatory bodies and organizations - EPA, Ministry of Land Mines and Energy and the National Social Security and Welfare Corporation (NASSCORPS)
- Formulation and review of environmental and social policies and practices associated with projects
- Liaising with relevant NPA Departments on all health, environmental, safety and social matters connected to the Project
- Assisting in the education and training of project staff in environmental, social and safety awareness
- Making budgetary provisions for projects’ environmental programs
- Undertaking environmental and social monitoring activities for projects

### 8.5 Owner’s Engineer

The Owners Engineer shall have full technical responsibility for the Pre-Award tasks; i.e. preparation, issuance and clarification of bidding documents; as well as serve as the technical expert for the Evaluation of Bids, Negotiation and Award of construction contracts.
They need to be made responsible, by contractual arrangement for the supervision of adequate implementation of the CESMP (Contractor’s own Environmental and Social Management Plan).

The role of the Owner’s Engineer shall however change after the award of contracts to become one of providing technical support to the PIU for the construction phase. Accordingly, the Owners Engineer is expected, during the construction phase, to:

- Undertake the review and approval of detailed designs by experts at its Home Office while supporting with occasional site advisory visits as needed.
- Provide a Resident Team in the field (e.g. comprising Project Engineer and one other expert) to provide technical direction for works supervision.
- Reviewing and approving and monitoring of Implementation of the Contractor’s EMP (CEMP)
- Requesting the Contractor Traffic Control Plan and specific Method of Statement for complex environmental management aspects if necessary, reviewing it
- Day to Day supervision and surveillance of environmental and social activities in the field
- Reporting the monitoring results to PIU regularly

8.6 Job description of PIU staff

Project Director

The Project Director bears overall and executive responsibility for achieving the desired project objectives on time and within budget. He/she is to coordinate all project activities from initiation to completion; using appropriate project management tools, techniques, creativity and suitable management skills to reach the predetermined objectives. As the executive head of the units, the Project Director is also to provide leadership to the Project Implementation Unit, whose functions include engineering design approvals, construction supervision, quality assurance/quality control, cost control, payment certification, contracts management, health / safety and environment compliance for the satisfactory execution of the project works.

The detailed job description of the Project Director includes the following:

- Coordinate all pre-award and preparatory activities, especially of the Owners’ Engineer, and also expedite the actions of all project sponsors/stakeholders for the effectiveness and availability of the funding for the project.
- Coordinate tendering, evaluation, negotiation, award and execution of construction contracts for the works.
- Conceptualize and prepare the overall project plan & execution strategies for review and approval and manage the approved plan to achieve project deliverables and objectives.
- Provide technical and administrative direction during the implementation of the project.
- Engage, procure, deploy and effectively manage all human and material resources of the PIU.
- Manage the interface between the project and project affected persons.
- Liaise with SPC Management, National Authorities and Funding Partners on project related matters.
- Monitor and report regularly on the status/progress of work, cost, schedule, anticipated challenges and risk facing the project as well as the evolution of any contractual issues.
- Develop a cost report per month that details costs and expenditure for the period, forecast for completion of the project with an aim of minimizing the variance.
- Promote team work and a spirit of cooperation among PIU employees and guide, drive and motivate the team to achieve project goals.
- The Project Director will supervise and control all PIU staff and will be answerable and subject to the authority of the SPC for the performance of the PIU. The Director would have to coordinate the work of the Owners’ Engineer.

8.7 Environmental Coordinator
The primary responsibility of this staff is the acquisition of environmental permits and Right of Way (RoW) and ensuring of environmental compliance by the project team. He/she is to arrange property enumeration and facilitate the prompt payment of due compensation. He/she is to ensure adherence to the Environmental and Social Impact Assessment and report on the Environmental Management Plan and Resettlement Action Plan, and oversee community relation activities.

- Facilitate processes for acquisition of environmental permits and Rights of Way (RoW)
- Arrange the preparation and review of Environmental Management Plans and Resettlement Action Plans and coordinate their implementation.
  - Coordinate the activities of the relevant institutions for the enumeration of property and the processing of compensation payments
  - Coordinate community interactions and activities with Project Affected Persons.
  - Enforce environmental mitigation measures as well as social safeguards on the project
  - Supervise the implementation of all recommendations in the Environmental and Social Impact Assessment report

The environmental coordinator reports to the Project Director.

8.8 Field Environmental Officers
In pursuance of the objective of ensuring compliance with environmental regulations, Environmental officers will be staffed to supervise environmentally related activities of
the Project in the field. Environmental officers are responsible for:

- Monitoring all environmental and social programs for pre-construction, construction and operational phases of the project, including those related to bio-physical and socioeconomic/cultural components in the field;
- Working closely and coordinating efforts with the EPA and other enforcement bodies to ensure full compliance with all legal and regulatory requirements;

He will report directly to the Project Director through Liaison Officer. Also he will work closely with the member of Owner’s Engineer.