WEST AFRICAN POWER POOL

NATIONAL POWER AUTHORITY

225 KV MAN (CÔTE D'IVOIRE) - YEKEPA (LIBERIA) - NZÉRÉKORE (GUINEA) - BUCHANAN (LIBERIA) - MONROVIA (LIBERIA) - BUMBUNA (SIERRA LEONE) - LINSAN (GUINEA) INTERCONNECTION PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (SIERRA LEONE)

DECEMBER 2011

KEPCO KOREA ELECTRIC POWER CORPORATION

CEDA CONSULT

ENVIRONMENTAL CONSULTING SERVICES SIERRA LEONE

Organization of reports for Environmental and Social Impact Assessment (ESIA) Study

Environmental and Social Impacts Assessment (ESIA) Report: This report contains the results of the Environmental and Social Impact Assessment (ESIA). The ESIA is a formal process to predict the environmental consequences of human devel **Environmental and Social Impacts Assessment (ESIA** opment activities and to plan appropriated measures to eliminate or reduce adverse effects and enhances positive effects.

Environmental & Social Management Plan (ESMP) Report: This report contains the measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental impacts or to reduce them to acceptable levels, and the actions needed to implement these measures.

Resettlement Action Plan (RAP) Report: This report contains the resettlement action plan which is based on up-to-date and reliable information about the proposed resettlement and its impacts on the displaced persons and other adversely affected groups, and the legal issues involved in resettlement.

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LISTS OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
BADEA	Arab Bank for Economic Development in Africa
BKPS	Bo Kenema Power Services
CBD	Convention on Biological Diversity
CEDA	Consultants in Environment and Development in Africa
CITES	Convention on the International Trade of Endangered Species
CLSG	Côte d′Ivoire, Liberia, Sierra Leone, Guinea
ECOWAS	Economic Community of West African States
ECRU	Environment and Community Relations Unit
EMD	Environmental Management Department
EMF	Electromagnetic Field
EMS	Environmental Management System
EMT	Environmental Management Team
EPA	Environment Protection Agency
ESIA	Environmental Social Impact Assessment
ESIAT	Environmental Social Impact Assessment Team
ESMP	Environmental and Social Management Plan
EU	European Union
GIS	Geographic Information Systems
GOJ	Government of Japan
GOSL	Government of Sierra Leone
GTG	Global Training Group
HEP	Hydroelectric Power
HIV	Human Immune Deficiency Virus
IBA	Important Birds Area
IEC	International Electronic Technical Commission

IEL	Income Electrix Ltd
IDB	Islamic Development Bank
IFC	International Finance Corporation
IUCN	International Union for Conservon of Nature and Natural Resources
JIC	Joint Implementation Commitee
JICA	Japanese International Cooperation Agency
KEPCO	Korea Electrical Power Corperation
kV	Kilo voltage
LVB	Land Valuation Board
LWDD	Land and Water Development Division
MAFFS	Ministry of Agriculture, Forestry, and Food Security
MEA	Multilateral Environmental Agreements
MEWR	Ministry of Energy and Water Resources
MW	Megawatts
NATCOM	National Telecommunication Company
NPA	National Power Authority
PAPs	Project Affected Persons
PCBs	Polychloro biphenyls
PEMP	Provisional Environmental Management Plan
PET	Project Environmental Team
PHU	Primary Health Units
PIU	Project Implementation Unit
RAP	Resettlement Action Plan
RoW	Right - of – Way
SEST	Socio-Economic Survey Team
SFD	Saudi Fund for Development
SLBS	Sierra Leone Broadcasting Station
SLIS	Sierra Leone Information Systems

STD	Sexually Transmitted Disease
STEWRD	Sustainable and Thriving Environments for West Africa Regional Development
CSSL	Conservation Society of Sierra Leone
SSL	Statistics Sierra Leone
TSP	Total Suspended Particles
UNDP	United Nations Development Project
WAPP	West African Power Pool
WAS	West Africa System
WEL	World Environment Library

EXECUTIVE SUMMARY

1. Introduction/Background

1.1. Overview of the Proposed Project

The West African Power Pool (WAPP) organization was established by the highest decision making body of ECOWAS, the Authority of Heads of State and Government of Member States, as a mechanism and institutional framework for integrating the national power systems of ECOWAS member countries. The objective of the WAPP is to establish a regional electricity market in West Africa through the judicious development and realization of key priority infrastructure that would permit the accessibility to economic energy resources, to all member states of the ECOWAS and help meet the energy needs of the ECOWAS citizenry by providing least cost reliable and sustainable electricity supply for economic development.

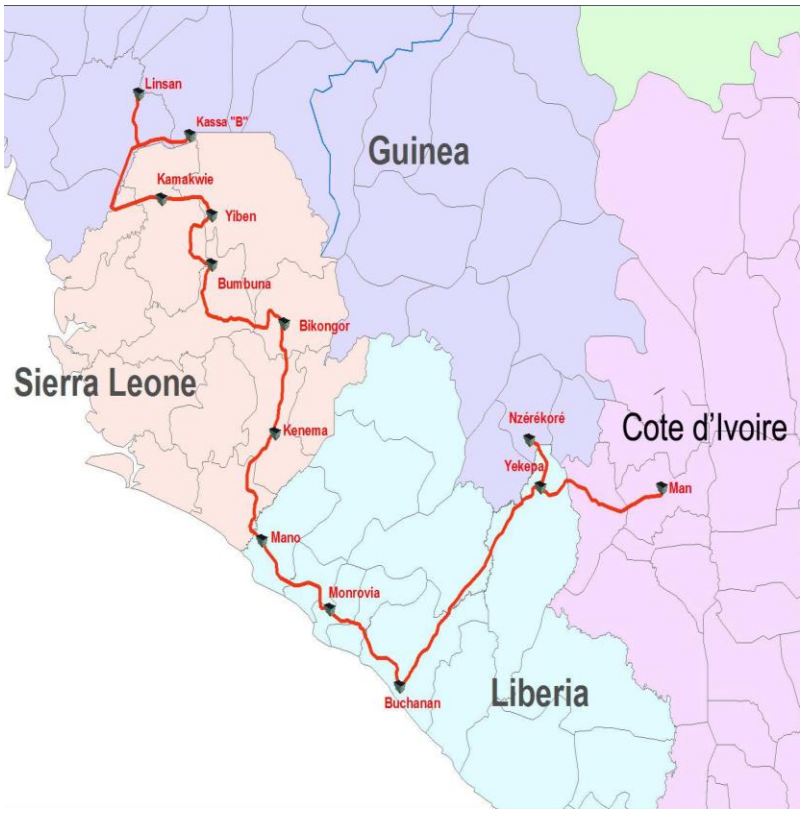
The Implementation Strategy of WAPP is based on developing complementary and mutually reinforcing infrastructure sub-programs, which when realized, will result in an integrated electricity system and market in West Africa.

Prominent among the infrastructure sub-programs to be developed is the WAPP Cote d'Ivoire – Liberia – Sierra Leone – Guinea Redevelopment Subprogram that aims to integrate the post-conflict countries of Liberia, Sierra Leone and Guinea into the WAPP regional electricity market. The situations in the three countries require that their energy supply capacities be urgently augmented and reinforced. The development of the Bumbuna hydro power plant in Sierra Leone, the development of hydropower resources in Guinea and the re-development of the Mount Coffee hydro power plant in Liberia in addition to utilization of gas-generated electricity from Cote d'Ivoire will permit the exchange of low cost power between Cote d'Ivoire, Liberia, Sierra Leone and Guinea. This power exchange will however require a high capacity transmission interconnection from Côte d'Ivoire to Guinea through Sierra Leone and Liberia. Accordingly, the WAPP Secretariat, the Société d'Opération Ivoirienne d'Electricité (SOPIE) of Côte d'Ivoire, the Electricité de Guinée (EDG) of Guinea, the Liberia Electricity Corporation (LEC) of Liberia and the National Power Authority (NPA) of Sierra Leone are undertaking a project that will comprise the construction of a high voltage transmission line from Man (Côte d'Ivoire) to Linsan (Guinea), through Yekepa (Liberia), Buchanan (Liberia), Monrovia (Liberia), Nzérékoré (Guinea) and Bumbuna (Sierra Leone), with associated high voltage substations. This project, which would greatly facilitate the power exchanges among the countries in the West African sub-region, is known as the Côte d'Ivoire – Liberia - Sierra Leone - Guinea Interconnection Project. The project, which would be executed in Côte d'Ivoire, Guinea, Sierra Leone and Liberia, will result in the following:

- Construction of approximately 1,411 km of high voltage transmission line
- Extension of a new high voltage substation in Man (Côte d'Ivoire)
- Construction of a new high voltage substation in Yekepa (Liberia)

- Construction of a new high voltage substation in Nzérékoré (Guinea)
- Construction of a new high voltage substation in Buchanan (Liberia)
- Construction of a new high voltage substation in Monrovia (Liberia)
- Construction of a new high voltage substation in Mano (Liberia)
- Construction of a new high voltage substation in Kenema (Sierra Leone)
- Construction of a new high voltage substation in Bikongor (Sierra Leone)
- Construction of a new high voltage substation in Bumbuna (Sierra Leone)
- Construction of a new high voltage substation in Yiben (Sierra Leone)
- Construction of a new high voltage substation in Kamakwie (Sierra Leone)
- Construction of a new high voltage substation in Linsan (Guinea)
- Rehabilitation of two 66 kV transmission lines from Mount Coffee substation to Bushrod (in Monrovia) and Mount Coffee substation to Paynesville (in Monrovia)

Figure ES-1 Transmission Line route of the proposed Project



Section	Length
Linsan-Kamakwie	160km
Kassa"B" T-Branch	112km
Kamakwie-Yiben	60km
Yiben-Bumbuna	73km
Bumbuna-Bikonggor	146km
Bikonggor-Kenema	96km
Kenema-Mano	115km
Mano-Monrovia	107km
Monrovia-Buchanan	112km
Mount Coffee	50km[1]
Buchanan-Yekepa	229km
Nzerekore-Yekepa	49km
Yekepa-Man	152km
Total	1,411km

[1] The Mount Coffee to Monrovia distribution lines consist of two 66 kV lines from Mount Coffee to Bushrod in Monrovia (24 km) and to Paynesville in Monrovia (26 km).

With funding from the EU-Africa Infrastructure Trust Fund through the European Investment Bank (EIB) and the Kreditanstalt für Wiederaufbau (KfW), the Korean Electric Power Corporation (KEPCO) was contracted on September 8th, 2008 to implement consulting services that included the following:

- Line Route Study:
  - Study and determination of line route and substation locations;
  - Undertake detailed survey and profiling of line route and substations;
  - Drafting and preparation of maps and drawings.
- Environmental and Social Impact Assessment (ESIA):
  - Study of Existing Environment;
  - Identification & Assessment of Potential Environmental Impacts;
  - Identification of Mitigation Measures;
  - Conduct Public Consultations;
  - Preparation of an Environmental & Social Management Plan (ESMP) and a Resettlement Action Plan (RAP).

Sierra Leone was engulfed in a series of civil war between 1991 and 2002 with some sense of civil authority re-established in 1999. Prior to the commencement of the Civil wars, the economy of the Country was supported primarily by mineral exports of rutile, diamonds and bauxite as well as the coffee, cacao and timber industries in the agricultural sector. The civil war and political instability have led to a drastic decline of local production and the whole economy as well as the destruction of infrastructure including the electricity supply system. The recovery of economic activity is on track following the re-establishment of civil authority. An essential and critical requirement for the success of economic recovery activities is the availability of electricity. During the period of civil disorder the country's physical infrastructure, particularly electricity, suffered from lack of maintenance and in cases abandonment. The net result is that Sierra Leone now has a severely limited electricity service. Public supply is unreliable and many individuals and entities undertake self-generation to secure electricity supplies. The services obtained through self-generation are particularly costly. Predictably large sections of the populace have been unable to buy their own generators and so only a very limited part of society has access to electricity supply. The situation in Sierra Leone requires that energy supply capacities be urgently augmented and reinforced.

With the implementation of the West African Power Pool (WAPP) CLSG Interconnection Project, which is expected to foster power exchanges among the countries in the West African sub-region, a high capacity transmission interconnection line from Côte d'Ivoire to Guinea through

Sierra Leone and Liberia will be required. This interconnection line will also be in line with the adopted WAPP Master Plan. The implementation of the Man-Yekepa-Nzérékore -Buchanan-Monrovia-Bumbuna-Linsan interconnection project (the proposed Project) will also further reinforce the interconnection of "Zone A" and "Zone B" of the WAPP through Côte d'Ivoire, thereby increasing opportunities for trade and the establishment of a regional power market.

The Sierra Leone section of the project comprises the construction of five (5) substations and 530km of 225kV transmission line. The project will be carried out within a Right of Way (RoW) of 40 m that will span seven districts namely, Pujehun, Kenema, Kono, Tonkolili, Koinadugu, bombili and Kambia for a distance of about 530km. The transmission line will enter Sierra Leone territory, crossing the Mano and Moa Rivers, through Bombohun, (after Mano on the Liberian border with Sierra Leone) in the Soro Gbema Chiefdom, Pujehun District in the South, follow the existing road network from Potoru, Barri Chiefdom, to enter Kenema Town, the Provincial Headquarter Town in the east of the country. In this section the proposed line route avoids the Gola Forest and other sensitive areas. One substation (Kenema substation) will be constructed in Gofor, 2 km to Kenema on the Potoru – Kenema Highway. From Kenema substation, the transmission line continues to the north to enter Bikongor substation in the Nimiyama Chiefdom, Kono District. From Nimiyama Chiefdom it will go through Jaiama Nimikoro and then follow the existing road to Bumbuna, Kalansogoia Chiefdom. One substation (Bikongor substation) will be constructed in Ndoyorgbo 2 km from Jiaima Nimikoro along the existing road to Bumbuna. Another substation (Bumbuna substation) will be constructed in a town called Kabaray, 2 km to Bumbuna Town. From Bumbuna Town (Town of the Bumbuna Hydroelectric Plant), the line will enter Fadugu, Kasunko Chiefdom. Another substation (Yiben subsation) will be constructed at Kathadougbu Road, 1 km east of Fadugu. From Fadugu, the line will continue to enter Kamakwei, Sella Limba Chiefdom. In Sella Limba Chiefdom, another substation (Kamakwei substation) will be constructed 4 km from Kamakwei in a town called Kathirie, and the line detours the Outamba-Kilimni National Park to the south and crosses the Great Scarcies River to enter Guinea territory.

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, AfDB, EIB and KfW, this ESIA identifies alternatives in the proposed Project that could avoid or minimize significant 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 In addition, the environmental monitoring and evaluation program herein is developed to determine the constant monitoring and evaluation the impacts of the project on the biological, physical socio-economic and cultural environments within the project area.

It is in this light that this ESIA (The Environmental and Social Impacts Assessment) is prepared in order for the WAPP project to ensure the sustainable or wise use of the natural resources in pursuance of social and economic development within the ecosystem's renewal and re-supply process. Also the intent of this ESIA is to inform the public and meet the needs of permitting agencies that are considering the proposed Project. The proposed Project is described briefly below and in detail in Chapter 2 (Project Description) of this ESIA.

The content of this ESIA reflects relevant input received from government officials, agencies, nongovernmental organizations, and concerned members of the public during the ESIA study. Please see Chapter 1.4 of this Executive Summary for a more detailed description of public involvement activities.

The ESIA highlights the most important environmental issues such as the environmental mitigation measures that take into consideration the minimization of potential adverse environmental impacts and the maximization of beneficial impacts that associated with the implementation of the project, 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.

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

This action will ensure the environmental conformity of the project with the environmental rules and regulations of the Republic of Sierra Leone.

1.2. Statement of Objectives/Purpose and Need

The related organizations for this proposed Project each have a unique jurisdiction and subsequently unique objectives, or purpose and need. Therefore, the statement of objectives or purpose and need for the electricity companies and the Environment Protection Agency (EPA), related Ministry are described in detail separately in Chapter 1.4.1 (Institutional Framework) of this ESIA, and are summarized below.

WAPP

As per the decision by ECOWAS, WAPP's purpose and need for the approval and implementation of the proposed Project is to meet the urgent augmentation and reinforcement of the infrastructure within Liberia, Sierra Leone, Guinea connecting with the Cote d'Ivoire transmission network. This Redevelopment Subprogram is to integrate the post-conflict countries of Liberia, Sierra Leone, and Guinea as a WAPP regional electricity market. WAPP has two primary aspects, as follows:

1) Provide electricity connection to Liberia, Sierra Leone, and Guinea by connecting with the existing Man substation (Cote d'Ivoire).

2) Utilization of the Bumbuna hydro power plant (Sierra Leone), and the re-development of the Mount Coffee hydro power plant (Liberia), and the hydro power resources in Guinea in addition to utilization of gas-generated electricity from Cote d'Ivoire

Environment Protection Agency (EPA)

The EPA's primary purpose and objective in approving the proposed Project is to protect the environmental sensitive areas within each country, and to minimize the adverse impacts to the protected areas by the proposed project and complying with the environmental and socio-economic guidelines.

Ministry of Agriculture, Forestry and Food Security (MAFFS)

The purpose and need for action by the MAFFS is to respond to WAPP and each country's Power utility's request for a special use authorization to construct the proposed Project on agricultural area and on the forest and ensure the Project is in compliance with the Land Management Plan (Forest Plan). The objectives are to minimize adverse impacts on agricultural lands and the forest to minimize adverse impacts to forest management activities.

1.3. Approval Process of the ESIA

This ESIA has been prepared by the KEPCO in compliance with WAPP, EPAs and the funding agencies requirements.

Because the proposed transmission line would pass beside the several environmental sensitive areas managed by the MAFFS and being watched by the international environmental groups, the project would also require an environmental permit from the EPA for the portion of the project within a 40 meter-wide easement across forest and agriculture area. The EPA's proposed action is to respond to the scoping report through the issuance of the approval of the scoping report. This action triggers certain legal and policy frameworks such as National Environmental Policy, Environment Protection Agency Act, Environmental Impact Assessment Procedure, Forest Act, and Forestry Regulations. In addition, the proposed Project would include issuing one or more temporary Use for any ground disturbing activities on each region that would occur during construction activities and would be located outside the proposed 40m ROW.

Therefore, this ESIA presents the environmental and social impacts of the proposed Project and alternatives in comparative form, defining the issues and providing a clear basis for choice by decision-makers and the public. The ESIA discloses the environmental impacts expected to result from the construction and operation of the proposed Project and mitigation measures, which if adopted by the NPA or other responsible agencies, could avoid or minimize significant environmental effects. In accordance with WB and the other funding agency guidelines, the ESIA also evaluates alternatives to the proposed Project that could avoid or minimize the significant environmental effects.

The ESIA provides a comparison of the environmental effects of the proposed Project and the alternatives, and identifies the Environmentally Alternative per the funding agencies requirements.

The purpose of the ESIA is to inform the public and deciding officials on the environmental setting and impacts of the proposed Project and alternatives. The ESIA will be used by the relevant authorities in conducting the proceeding to determine whether to grant the proposed Project and by the EPA to determine whether or not to issue an approval on the Environmental & Social Impacts Assessment report. This Executive Summary provides an overview of the proposed Project and alternatives considered, and the environmental findings and mitigation measures of the ESIA.

1.4. Summary of Public Involvement Activities

To date, there have been extensive public participation efforts on the Côte d'Ivoire – Liberia - Sierra Leone - Guinea Interconnection Project (the proposed Project):

- The EPA scoping process for the proposed Project began with the NPA's issuance of the Scoping report of the ESIA on October 19, 2009.
- During the site survey, the consultant held several public consultation meetings to collect and to receive opinions, as well as to provide an opportunity for the public to provide input on alternatives to the project and potential mitigation measures including members of the public, government and public agencies, and organizations and private companies.

1.4.1. Methodology of the Public Consultation

The communities predicted to be affected by the proposed project were identified with the help of the relevant County Assemblies, the Survey Consultants and from field work carried out to identify the communities.

Various stakeholders were consulted during the preparation of the ESIA. These include local communities, city authorities, environmental specialists, county authorities and others. The project received high degree of acceptability in that implementation of the line will boost local economy due to the availability of electricity hence more exposure and increased benefits as more people would receive power through the line and in a way increase economic opportunities.

- Some of the concerns were however raised, and these include the followings:
- The contractors to employ people around their respective surrounding villages.
- The contractors to consider replacing trees which will be destroyed during construction.
- Electricity to be provided at an affordable rate

1.5. Areas of Controversy and Issues to be Resolved

A discussion of areas of controversy included, as well as identification of issues that need to be resolved. These may include issues raised by other agencies and the public during the public consultation process, as well as issues realized during the environmental analysis process. Various issues of concern were expressed at public consultation meetings for the proposed Project.

Some areas of controversy that were raised during the public consultation process include the following:

- Potential impacts to private property, including general aesthetics and property value;
- Potential health impacts due to the generation of new electric and magnetic fields (EMFs);
- Construction-related concerns such as land disturbance, noise, and air quality impacts;
- Biological resources, including wildlife corridors and sensitive species;
- Geology and soil conditions such as potential erosion and compaction; and
- Various other concerns related to environmental issue areas including traffic, public services, and utilities.

Many of the areas of controversy and issues identified in the list above would be resolved through the implementation of applicable mitigation measures, which are summarized in Table ES-2 and discussed in detail in Chapter 5 of this ESIA.

2. Description of Proposed Project and Project Alternatives

This summary provides a physical description of the proposed Project and alternatives. A more detailed description is provided in Chapter 2.2 of this Executive Summary and Chapter 1.6.2.3 of the ESIA report.

2.1. Proposed Project

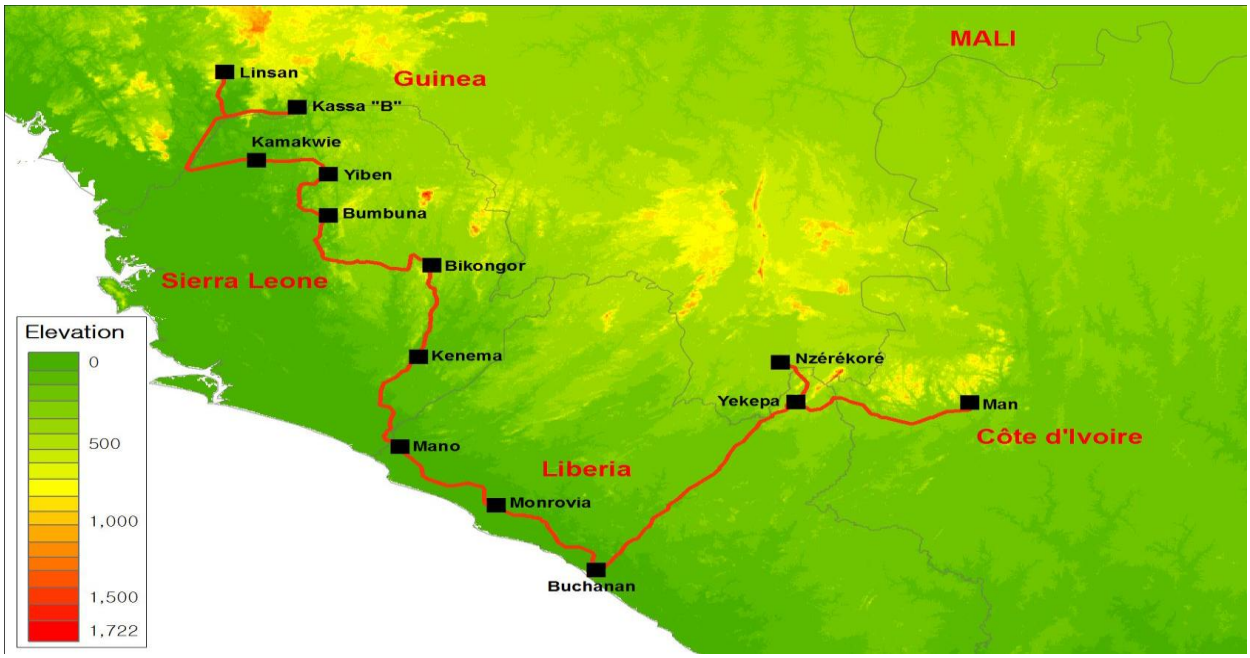
The proposed Project would involve the construction of a new 1,411km 225kV transmission line and its associated substations between SOPIE's existing MAN Substation in Cote d'Ivoire and new LINSAN Substation in Guinea. Figure ES-1 provides details of the proposed Project's major components (along with the Project alternatives).

Location/Proposed Route

The total length of Cote d'Ivoire-Liberia-Sierra Leone-Guinea interconnection line is approximately 1,411km and the section in Sierra Leone is 530km. The entire geography of interconnection line is mountainous except the Buchanan to Mano coastal area in Liberia.

Specially, the section, Linsan in Guinea to Bikongor in Sierra Leone, is hard to access the existing road. Figure 2 presents the geographic features in entire project area. The Man (Cote d"Ivoire) –Yekepa (Liberia) - Nzérékoré (Guinea) section is a mountainous area of height around 500m~1100m. Buchnan to Mano in Liberia is flat area under 50m height and some swamp and rubber farms are in this area. The Saint John River, which is over 600m width, and several other rivers exist in this section. Kenema to Kamakwie in Sierra Leone is hilly area. This section is hard to access the existing roads with transmission line route. This section has several big rivers (Moa, Sewa rivers etc.) over 400~600m width.

Figure ES-2 Geographic Features of the Project Area



2.2. Project Alternatives

Initially, nine (9) alternative line routes for the 3 environmentally sensitive areas (Hotspots) in Sierra Leone section were developed. These alternatives were identified by the consultant in its line route study report; suggested by the by the Funding Agencies, Power utility company and public and government agencies during the study or developed by the ESIA consulting team.

A comprehensive screening analysis was employed to focus on alternatives that would be capable of meeting most of the proposed Project objectives/purpose and need, considered feasible, and would avoid or substantially lessen any significant effects of the proposed Project. Following is a brief description of each of these Hotspots (Gola Forest, Nimini Hills Forest Reserve and Outamba-Kilimi National Park) and analysis of alternative line routes.

- **Gola Forest**

The Funding Agencies recommended investigating another option in Gola Forest to avoid as it is one of the environmentally sensitive areas. Also, the Executive Director of Conservation Society of Sierra Leone indicated that all the segments of Gola Forest would be linked and transboundary park between Sierra Leone and Liberia would be established.

Alternative Option 1 is proposed in order to avoid all the current segments of Gola Foest as well as future transboundary Park, which will be established between Sierra Leone and Liberia. It also ensures that Tiwai Island and Kambui Hills are avoided with a minimum distance of 2.2km and 1.8km respectively. So, Alternative Option 1 is the most preferable line route among all the alternatives.

- **Nimini Hills Forest Reserve**

The Funding Agencies mentioned that there is an area where the line route will have to avoid or moved further away: Nimini Hills Forest Reserve.

Alternative Option 1 was made to avoid the Nimini Hills Forest Reserve to the north because it is ecologically sensitive areas as mentioned by Funding Agencies. Alternative Option 1 is the most preferable line route among all the alternatives as it is possible to avoid the Nimini Hills Forest Reserve.

- **Outamba-Kilimi National Park**

The Funding Agencies and STEWARD (Sustainable and Thriving Environments for West Africa Regional Development) Program Coordinator indicated that Outamba-Kilimi National park is one of the environmentally sensitive areas and there is a possibility that the separated two forests, Outamba and Kilimi Forest would be joined together.

Alternative Option 1 was composed to detour the Outamba-Kilimi National Park to the south. It includes the construction of 114km transmission line in the vicinity of the Outamna-Kilimi National Park. This option is longer than the previous line in this section. However, it is more preferable line route to previous line, as it is possible to avoid the Outamba-Kilimi National Park keeping a distance of at least 1.5km.

3. Impacts and Mitigation Measures

Although the line route is 530km long, the actually area affected by the transmission line project is relatively small. Five (5) substations will be built each in a small area of 200m x 200m. These should be built on flat well drained land, thus no major topographical changes will occur; the land used will invariably have been used for cultivation. The land in the tower footprint will

not be usable, however as there is some flexibility for the tower location no major topographical changes will occur. Thus the proposed transmission line project will impact minimally on the environment in most cases.

This section summarizes the environmental impacts and mitigation measures for the proposed Project. The impacts and mitigation measures discussed in this section are described in full detail in Section 5 of this ESIA. In accordance with the Funding Agencies' policy and guidelines, the impact assessment methodology considers the existing regulatory setting, direct and indirect effects of the Project, any potential growth-inducing impacts, and cumulative impacts

This section presents a summary of the environmental impacts and applicable mitigation measures in Section 3.2; Summary of Impacts to proposed line route corridor in Section 3.3; summary of indirect effects of the proposed Project and alternatives in Section 3.4; a summary of cumulative impacts for the proposed Project and alternatives in Section 3.5; and a of executive summary.

3.1. Impact assessment methodology

The impact assessment methodology used for this project consists of five major steps:

Step 1 : Identification and description of project activities and their interaction with environmental media;

Step 2: Comprehensive preliminary identification of potential impacts;

Step 3: Screening or comparative assessment of impact importance, identification of impacts that are likely to be significant (i.e. identification of focus areas for further study) through application of a basic set of impact significance criteria to the preliminary information available about each impact;

Step 4: Detailed assessment of the identified focus area impacts characterization techniques, quantification of impacts to the extent possible and rigorous qualitative characterization of impacts that cannot be quantified; and

Step 5: Final assessment of the severity levels of impacts through application of the results of the rigorous quantitative and qualitative characterization of impacts developed in Step 4 to a set of objective impact severity criteria; identification of impact warranting mitigation.

3.2. Summary of Impacts and Mitigation Measures

The ESIA describes feasible mitigation measures that could minimize adverse impacts. In addition, within each issue area described in Chapter 5.0 of this ESIA, mitigation measures are recommended where environmental effects could be substantially minimized for all classes of impacts (except beneficial impacts). The major findings of the ESIA analysis are summarized

in the ESIA according to resource issue area. Impact findings and mitigation measures from the construction and operation of the proposed Project are summarized in Table ES-2.

3.3. Summary of Impacts to Proposed Line Route Corridor

Implementation of either the proposed Project or any of its action alternatives would involve both temporary and permanent land disturbances on the proposed line route corridor. Permanent land disturbances due to the tower election (25m^2 per tower) and the placement of substations (40,000m^2 per substation) would be approximately 0.23km^2. Permanent land take due to the tower election (25m^2 per tower) and the placement of substations (40,000m^2 per substation) would be approximately 0.2km^2. For the rest of the RoW, new or improved access and spur roads would be taken temporarily during the construction or operation stage.

The main potential impacts, which require mitigation measures, have been identified for the proposed project. These are loss of land, destruction of buildings, other structures and crops, noise pollution, waste management, water pollution, impacts on flora and fauna, public safety and health, occupational safety and health issues and socio-economic/socio-cultural issues.

3.4. Summary of Indirect Effects

In accordance with the World Bank guideline (Environmental Assessment Sourcebook), "indirect effects" may include any effects that would be caused by the proposed action but which occur later in time or farther in distance from the action. Analysis of the direct and indirect effects of the proposed Project and alternatives is provided for each environmental issue area in Chapter 4.8. The proposed Project is expected to cause indirect effects in the following environmental issue areas:

- Hydrology and Water Quality
- Socioeconomics
- Land Use and Public Recreation
- Utilities

The proposed Project and alternatives would result primarily in direct effects to the other environmental issue areas, including Air Quality; Biological Resources; Cultural Resources; Geology, Soils; Noise; Public Health and Safety; Public Services; Traffic and Transportation. To the degree that the transmission project inhibits aggressive fire fighting, greater impacts could result from wildland fires, such as larger fires potentially causing destruction of biological resources and cultural resources, and leading to greater soil erosion after fire events.

Indirect effects may be represented by a variety of potential impacts, projects, or actions, including growth-inducing effects such as residential and commercial development, and infrastructure and public works projects, among others.

3.5. Summary of Cumulative Impacts

Cumulative impacts refer to the impact on the environment which results from the incremental impact of the Project when added to other past, present and reasonably foreseeable future actions. The relevant projects along our proposed RoW are described in Table ES-1

Table ES-1 Infrastructure Development Project in the Project Area

Project Type	Project Name
Electricity	Global Trading Group (GTG) 15MW and Income Electrix Ltd (IEL) 12MW. G.T.G
Electricity	16 MW thermal plants to be installed at Blackhall Road Power Station.
Electricity	33 kV transmission line and the rehabilitation of selected 11 kV networks in the Western Area.
Electricity	Makali (120 KW) Hydro plant in the Tonkolili District and Charlotte (2.0 MW) in the Western Area
Electricity	The rural electrification and the reinforcement of the medium and low voltage networks in the Western Area.
Electricity	The distribution improvement project Phase I and II
Electricity	Emergency rehabilitation of the Western Area transmission and distribution
Electricity	Large scale Diamond Mining operated by the Koidu holings Ltd. at Koidu, Tankor, Yengema and Tongo in the Kono district
Mining	Small Scale Diamond Mining operated by the Milestone Sierra Leone Ltd at Tefeya, Sandor Chiefdom in the Kono District.
Road Construction	The reconstruction of the Kenema and Pendembu road
Road Construction	Construction of railroad from Bumbuna to Pepel for transportation of iron ore

The increase in regional growth in Sierra Leone may indirectly contribute to potential cumulative impacts in the proposed Project area. An increase in population growth directly affects the demand for jobs and housing, which may increase the number of planned development and improvement projects, such as public service facilities or transportation system expansions in Sierra Leone. Substantial population or employment increases near the area of the proposed Project also substantially increase the population potentially exposed to an accident or other hazard.

3.6. Summary of Mitigations

The Consultant held public consultations with communities affected by the project as well as meetings with members of the stake holders to insure that necessary procedures were put in place to mitigate impacts. Mitigations differ according to the different phases of the project.

During the pre-constructional phase a detailed list of all potential project-affected persons was compiled for the purposes of the payment of fair, adequate and prompt compensation.

During constructional phase adequate and regular maintenance of machinery and the avoidance (as much as possible) of constructional activities in the vicinity of local communities at night will minimize noise nuisance impacts on the local communities. Daytime noise levels are not expected to be a nuisance. The management of waste in the work camp and the construction sites have been planned to exert minimum adverse effects on the environment. The SPC will carry out the monitoring of such parameters as noise, water quality, socio-economic issues and occupational safety and health issues.

The proponent acknowledges that the proposed investment in the transmission line project would be worthless if the safety, health and welfare of the employees are not safeguarded. Management will therefore do its utmost to ensure that safety, health and welfare provisions.

The use of personal protective equipment will be strictly enforced in order to protect workers and prevent accidents. In addition the SPC will ensure the provision of, among others, a first aid box, drinking water and sanitary facilities at the construction sites and the health and welfare of all employees engaged on the project by providing clinic, doctor and ambulance in the work camp with the responsibilities of the Contractors.

During operational phase regular maintenance of the line route will be needed. This will include removing potential hazards from RoW, measures and regulations related to dangerous substances (Transformer oils), security, fire, noise, birds, and extreme weather. The substations shall be fenced and provided with technical and security personnel for operation and security purposes.

During the decommissioning phase the towers, cables and substations will be dismantled and removed; the materials should be reused or recycled as much as possible, in addition all

concrete and steel debris should be removed from the site. During the decommissioning stage, the negative impacts that may result from decommissioning activities will need to be mitigated, these will be similar to the construction phase. The activities in this phase will be similar to project construction activities, and the timeframe and deconstruction workload is expected to similar to that of the construction phase. After the structures and their foundations have been removed the area should be re-vegetated, where farming may be resumed without restriction.

Consultations

Consultations were made with some regulatory agencies, Districts' Officials, project-affected persons and local communities prior to the preparation of this ESIA. The communities predicted to be affected by the proposed Project were identified and consulted to determine the potential impacts the implementation of the proposed project might have on them.

Table ES-2 Summary of Impacts and Mitigation Measures and Monitoring

Project Activity	Potential Impacts	Location	Proposed Mitigation	Net Effects	Monitoring
Line route survey & Design stage	Impact on potential sensitive ecological and inhabited area	Entire RoW	Adequate selection of RoW by avoiding these areas with detailed line route survey during the design stage	Negligible	Monitoring and Identifying the potential sensitive ecological or inhabited areas located along the RoW
During the entire project	Loss of crops	Almost entire RoW & access tracks	Prompt, fair compensation payment	Negligible	During construction & operation
During the entire project	Loss of structures	Certain parts of line route	Prompt, fair compensation payment for resettlement	Removal from historical/ancestral roots	Monitoring during construction & operation to ensure all PAPs are adequately and fairly catered for
During the entire project	Loss of land	Entire RoW & access tracks	Prompt, fair compensation payment	Removal from historical/ancestral roots	Monitoring during construction & operation to ensure all PAPs are adequately and fairly catered for
Construction	Noise impacts	Communities and settlements close to RoW	Avoidance (as much as possible) of work at night	Minor disturbance during daytime	Ambient noise levels shall be measured once every week in communities close to RoW
Construction	Air quality	Communitie	Spray the exposed soil	Negligible	Monitoring – none

Project Activity	Potential Impacts	Location	Proposed Mitigation	Net Effects	Monitoring
		s and settlements close to RoW	surfaces of the tower corridor track as and when needed		
Construction	Potential soil erosion	Entire RoW & access tracks	Limit land clearance to minimum area required and early revegetation	Negligible	Monitor land clearance
Construction & operation	Public safety 1. Open excavations 2. Potential electrocution 3. Potential collapse of towers 4. Others	Entire RoW & access tracks	Tower base excavations in or near settlements or farms will be clearly marked and made inaccessible to the public. All towers will be clearly marked with a red inscription on white background - **"DANGER – 225,000 Volts"** to warn off trespassers, etc.	Negligible	Routine inspections of towers during operational phase
Construction & operation	Flora and Fauna	Entire RoW & access tracks	Limit clearance of vegetation	Negligible	Monitored carefully to ensure that the minimum area requirements are not exceeded
Construction & operation	Occupational safety and health	Entire RoW & access tracks	Provision of personal protective equipment at construction All work to be done according to Safety Rules and Regulations of SPC as well as the World Bank Group EHS Guidelines of 2007 (General and Electric transmission and Distribution), NPA Safety Rules (Electrical and Me chanical)	Negligible	Availability and use of protective equipment
Construction	Impacts on cultural and historical/archa eological sites/items	Cultural/hist orical/archa eological chance finds	Chance finds to be reported to appropriate authorities as a part of the contractor's contract	Negligible	Areas of chance finds will be monitored and secured in order to be handed over to Museums and Monuments Board.
Construction	Public health- STDs/HIV AIDS	Mainly settlements along RoW	Education of workers to avoid casual sex Supply sufficient quantities	Potential single mothers, transmission of	Keep close contact with communities during construction to detect

Project Activity	Potential Impacts	Location	Proposed Mitigation	Net Effects	Monitoring
			of good quality free condoms to workers	STDs/AIDS	incidences of STDs/AIDS
Construction	Traffic impacts	Relevant roads indicated in report	Use of traffic wardens to control traffic at road crossings Development of Traffic Control Plan	Negligible	Presence of traffic wardens at all times during construction. Review the contractor's Traffic Control Plan
Construction	Water pollution	Rivers indicated in the report	Minimize erosion and manage excavated materials, wastewater from excavations and accidental spillage of oil, fuel and paints	Negligible	Streams close to the site(s) of construction to be sampled and analyzed weekly. During the maintenance phase monitoring will be carried out twice yearly.
Construction	Work camp management	Work camp sites	Establish far away from water bodies and settlements Provision of mobile toilet, clinic, doctor and ambulance at work camp sites	Negligible	Distance from each work camp site to nearest water body and settlement. Availability of mobile toilet, clinic, doctor and ambulance;
Construction & operation	Solid Waste generation	Entire RoW & access tracks	Trees, tree stumps and wooden containers not to be given out to the local communities as fuel wood . Usable trees and wood from the RoW clearing should be given out to the local communities. Metal wastes to be collected and disposed of appropriately and/or recycled in consultation with relevant government agencies	Negligible	Collection and disposal of solid waste to be monitored
Operation	Effects of rust treatment and painting of towers	Tower locations	Spilt paint to be quickly mopped up with rags and/or sawdust. The used sawdust and rags will be disposed of at appropriate public waste dumping sites.	Negligible	No monitoring
Operation	Micro shock from a spark	RoW	Minimized by multiple	Negligible	Monitor earthing cables

Project Activity	Potential Impacts	Location	Proposed Mitigation	Net Effects	Monitoring
	discharge		earthlings		
Operation	Fire hazards	RoW	Public education on hazards of bush burning	Negligible	Routine patrols to discourage bush burning
Construction & operation	Employment generation and incomes	Settlements along RoW	Encourage contractors to engage local labour	Standard of living improved	None

4. Project Affected Persons

Consultations have been held with regulatory agencies, District officers and local communities prior to the preparation of the Scoping Report and the Environmental and Social Impacts Assessment.

The land to be affected by the implementation of the proposed Project has the following categories of land-uses:.

- Agricultural lands with perennial crops
- Agricultural lands with non-perennial crops
- Potential Agricultural (or fallow agricultural lands)
- Residential lands (affecting building /structures and residential plots)

4.1. Compensation

For the most part the line route goes through non-residential government owned land which is in use as farmland. Upon completion of the T-line some farming will be permitted, thus compensation will only be required for perennial crops or annual crops if construction takes place during the growing season.

Table ES-3 and Appendix 4 shows the numbers of people and the types of properties to be affected by the proposed project. A total number of 414 householders are expected to be directly impacted by the proposed project with 2,898 dependents. Therefore, total of 3,312 people will be affected by the proposed Project.

Table ES-3 Summary of Project Affected Properties

Category	District (Region)	Property Owner (Householder)
Original Line Route	Pujehun	17
	Kenema	51
	Kono	49
	Tonkolili	63
	Koinadugu	36
	Bombali	32
Alternative Line Route	Pujehun/Kenema (Gola Forest)	80
	Kono (Nimini Hills)	32
	Bombali/Kambia (Outamba-Kilimi National Park)	54
Total		414

Table ES-4: Environmental and Social Management & RAP Cost

ACTIVITY	No	ITEM	Cost (SLL)	Cost(USD)
Activities for ESMP	**1**	Review & Disclosure of Environmental Impact Assessment Report	272,160,000	68,040
	2	Audit for RAP and ESMP	212,000,000	53,000
	3	Environmental Monitoring	1,765,920,000	441,480
	4	Training of environmental management team in house	129,600,000	32,400
	5	Public Health & Safety (including HIV/AIDS Programmes)	864,960,000	216,240
	6	Measuring device for air/water/soil pollution and vehicle, laptop etc.	324,000,000	81,000
	Total ESMP cost		3,568,640,000	892,160

○ **RAP Cost**

Compensation	**1**	Compensation for lands	4,670,100,000	1,167,525
	2	Compensation for trees	971,722,432	242,930
	3	Compensation for food crops	335,340,802	83,835
	4	Building/Structures, Houses	873,408,750	218,352
	5	Constructional damage for plants outside of the ROW, inside access road (=(2+3)*10%)	130,706,323	32,676
	6	Compensation for losses of income ((1+2+4)*10%)	325,761,559	81,440

	7	Add-on amounts for vulnerable project affected persons (=(1+2+3+4)*5%)	342,528,599	85,632
	8	Professional fees, reimbursement for permits etc (=(1+2+3+4)*10%)	685,057,198	171,264
	9	Contingency allowances to cater for the effect of probable increases in property values (=(1+2+3+4)*10%)	685,057,198	171,264
	Subtotal		9,019,682,861	2,254,918
Activities for RAP	**10**	Social action plan, community support	230,636,000	57,659
	11	Livelihood restoration program	213,576,000	53,394
	12	Community infrastructure Program (=(1+2+3+4)*5%)	342,528,599	85,632
	13	External monitoring and Evaluation	106,000,000	26,500
	14	Purification rites / ceremonies	28,000,000	7,000
	15	Indirect cost(=(10+11+12+13+14)*10%)	92,074,059	23,018
	Subtotal		1,012,814,658	253,203
Total RAP cost			10,032,497,519	2,508,121

○ **Total ESMP & RAP Cost**

Total ESM P& RAP Cost	**13,601,137,519**	**3,400,281**

4.2. Cut-off date

The public consultation has been held since November 2009 and the PAP inventory list was verified by the Consultant and NPA in December 2011. So the beginning of Census (Cut-off date) is November 2009 by the definition of the World Bank OP 4.12. During the public consultation with the PAPs, the consultant clearly informed and explained the concept of the "cut-off date" to the PAPs in the presence of the village's population. The consultant also informed that no one shall be registered on the PAPs after the cut-off date. Modification of the PAPs will be made if there are any changes on current RoW

4.3. Grievance Redress Mechanism and Committee

There are three ways in which grievances shall be resolved. These are:

- Grievance Redress Committee
- Arbitration.
- Courts of Law.

During the PAPs investigations, the Consultant held several interviews with local authorities and it was founded that the Town Chief or Paramount Chief took the complaints of mediation before setting up GRC's official organization and the Consultant indicated that a committee which is responsible for settling complaints between local communities should be organized and functioned for the smooth implementation of project.

As requested by the Funding Agencies, KEPCO met with the local authorities of affected chifedoms to ask a written acceptance of the position for the GRC member. To address this issue, two survey teams comprising Environmental Consultants, representatives of NPA and member of Civil Society Group were organized and carried out meaningful consultation meetings with local authorities. The approach used for the establishment of the GRC involved consultation with local administration (including local leaders) along the planned transmission line. During the meetings, details of the Project, environmental and social impacts, compensation process were briefed and it was agreed that in order to ensure practical and accessible Committee to all members of the community, the Paramount Chiefs, head of the local administration in Sierra Leone, of affected chiefdoms are required to be the chairman of the GRC. And the other positions of the committee such as secretary, public relations officer, auditor and adviser were nominated by the Paramount Chief. In case of the absence of the Paramount Chiefs, other representatives such as chiefdom speaker or community elder were took part in the meeting on behalf of the Chief and the outcomes were transmitted to the paramount chiefs. Two Survey Teams took part in 21 consultation meetings with representatives of local communities from 27th November to 3rd December 2011. The names and positions of each member are shown in the table Section 9.5 of RAP.

4.4. Livelihood Restoration Programme

Livelihood restoration measures have been designed to assist severely affected farmers and others lose productive/income generating assets, including those losing their house and for vulnerable households. These measures may include the following

- Provision of agricultural extension services: Severely affected farmers will be assisted to improve productivity on remaining agricultural land, by linking them with government driving programmes such as West Africa Agricultural Productivity Program funded by World Bank.

The Consultant recommends that links will be facilitated by the SPC and Ministry of Agriculture, Forestry Food Security to the local agricultural and rural development when a detailed PAPs investigation has been carried out.

- West Africa Agricultural Productivity Program (WAAPP-1C): Approved 24-Mar-2011, $83.8million of total project cost, To generate and accelerate the adoption of improved technologies in the participating countries' top agricultural commodity priority areas that are aligned with the sub-region's top agricultural commodity priorities.

❖ Skills training: Displaced PAPs will be provided the skills training programme such as soap or baskets production in the job training centres and social organisations in and out of District, which would help them to maintain and/or improve their income generation potential. The skills training programme will be designed during project implementation.

❖ Project related job opportunities: PAPs will be prioritized in gaining employment in the works linked to the project including the short pre-recruitment training. Information about the employment opportunities will be comprehensively available at to local community

5. Environmental and Social Management Structure

WAPP-SPC (Special Purpose Company) will be set-up to implement and operate the Project and the proposed structure in the SPC in charge of dealing with environmental and social issues is shown as below.

Project Implementation Unit (PIU)

Although the WAPP-SPC Establishment Study has been initiated it is certain that the formation of the actual WAPP-SPC would take some time. 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 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.

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 ensuring project's compliance with all relevant environmental, social, health and safety regulations and liaising with all relevant regulatory bodies and organizations.

Construction Contractor

Prior to the commencement of construction works all contractors should be required to prepare their own ESMPs (CEMP), alos it shall be adequately implemented. The plan should specify 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. 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

Owner's Engineer

The Owners Engineer shall have full technical responsibility for the Pre-Award tasks; ie., 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.

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.

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) and the Method of Statement to be prepared by the construction contractor.

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 Owner's Engineer, EPA and/or other relevant authorities.

6. Conclusion

This Environmental and Social Impacts Assessment has identified potential impacts on the physical, biological, socio-economic/cultural environments, occupational safety, health and welfare of the employees. Mitigation and potential remedial measures have also been outlined. These will be actively pursued in order to minimize or, if possible, eliminate the identified negative impacts.

The transmission line project cannot be carried out without any impacts on the environment. Indeed, some of the impacts are unavoidable. However, the mitigation measures put forward are expected, as far as possible, to be able to minimize the impacts so as to make them pose no threats to the continued sustainability of the environment.

A review of the identified impacts shows that there will be some significant adverse irreversible impacts on the environment (e.g. land ownership and land-use characteristics). Other impacts will be minimal and temporary.

The benefits to be derived from the implementation of the project are immense, especially considering the problems of electricity supply experienced in Sierra Leone in the past. The implementation of the project will ensure that the objective of ECOWAS to establish a regional electricity market in West Africa through the judicious development and realization of key priority infrastructure that would permit accessibility to economic energy resources, to all member states of the ECOWAS shall be realized.

The proposed transmission line is therefore designed to fulfill the objective of providing a more reliable and secure transmission of power to meet the expected increase in demand of electrical power within the ECOWAS sub region.

The key drivers for increasing electricity consumption are growth in per capita GDP, growth in population, urbanization, development of basic industries, more opportunities for the education, enhancement of women right, rural electrification towards poverty alleviation and the attainment of the Millennium Development Goals.

The National Power Authority believes that this ESIA has sufficiently dealt with the significant issues on the ground and will therefore meet the expectations of the EPA and warrant the issuance of an Environmental Permit to enable it to proceed with the implementation of the project without delay.

1 INTRODUCTION

The National Power Authority (NPA) was established by an Act of Parliament in 1982. NPA was created as an electric power utility company for the reorganization and regulation of the generation, transmission, distribution and sale of electricity throughout Sierra Leone. The National Power Authority is supervised by the Ministry of Energy and Water Resources, and the National Commission for Privatization.

The National Policy and Strategic Action Plan of the Ministry of Energy and Water Resources, approved by cabinet in November, 2009 admits that activities and development in the energy sector have been haphazard and have failed to meet the requirements of the various sector demands. A first step in addressing the energy situation is the drawing up of a comprehensive policy that lays down the Government's position on energy issues that will form the basis for Government action in this sector. The energy supply sub-sectors covered by this policy are electricity, petroleum and renewable energy, including hydropower. In these sub-sectors the focus is on increasing the supply of modern energy supplies for Sierra Leone. In order to address the problem of limited access to electricity in the country, the policy is geared towards increasing supplies, through a comprehensive reform of the power sub-sector, attracting private investment and putting in place more effective mechanisms for monitoring and control

Specifically, the Ministry's policy on the electricity sub-sector states among others that the Government of Sierra Leone will explore all avenues to ensure reliable power supplies to all energy demand sub-sectors and will encourage the entry of multiple players, including the West African Power Pool (WAPP), into the generation and distribution market. The policy document also states that it will actively pursue regional co-operation and integration in investment matters. In its rural electrification drive, the policy of the Ministry of Energy and Water Resources states among others that it will institute a Rural Electrification Strategy and Plan to address all aspects of rural electrification and power needs making use of institutional structures of local councils and other stakeholders. The rural electrification policy also states that it will facilitate increased availability of energy services including grid and non-grid electrification to rural areas.

As there is a close link between energy exploitation and use and the environment, the policy does not stop short to prescribe policies on Energy and the Environment. The policy states that it will take into account environmental considerations in the development of standards for the energy sector. It states that it will ensure that Environmental Impact Assessments are done as a prerequisite for the implementation of all energy projects.

NPA owns and operates the Western Area Power System, supplying the capital city, Freetown and its environs, while the Bo - Kenema Power Services (BKPS) supply Bo, Kenema Townships and all immediate villages. The Western Area being the centre of Government, commerce, industry and services accounts for 80% of the consumption of electricity produced by NPA. The main generating capacity of NPA is concentrated in the Western Area System and presently

consists of the Kingtom Power Station. Blackhall Road station is presently not functioning. The NPA Western Area System is exclusively dependent on diesel generating plants. Extensive rehabilitation and repairs have been done to the structures and facilities at the Kingtom Power Station. However, current conditions in the Kingtom Power Station indicate that auxiliary facilities are not reliable.

The present power generating capacity in Sierra Leone is well below the actual energy demand. The ten year civil conflict contributed greatly to the destruction of energy infrastructure in the country having a ripple effect on the energy generating and distribution capacity of NPA. In addition, the decline in power generation in the last few years due to equipment failures and fuel shortage has rapidly deteriorated the situation, seriously affecting the various industrial, commercial and residential consumers. In order to ameliorate this situation the Government of Sierra Leone (GoSL) has decided to push forward with the development of its hydropower potential, other renewable energies and consequently finalize its main hydropower project, i. e. the Bumbuna Hydroelectric Project (HEP). The Bumbuna HEP was identified as early as 1970 during a comprehensive survey of Sierra Leone's hydroelectric potential, which was included in a development plan for fifteen years (1970 – 1984). After a preliminary study of the potential of the Seli River, a further review recommended a staged development of its potential with a first stage construction of a dam at the Bumbuna falls and a power house about 1.2 km downstream. Presently the power station is at the tow of the dam.

The commissioning of the Bumbuna HEP on 6th November, 2009, represent the first largest source of renewable energy in Sierra Leone and therefore a reliable option to reduce the high cost of the importation of fuel and spares for thermal plants. The project is being implemented on the River Seli, some 250 km north-east of the capital, Freetown. Power from the Bumbuna HEP is being transmitted over a 204 km long single circuit 161 kV line between Bumbuna and Freetown. In this first phase, two equal units have been installed with a total power of 50 MW. Future phases, which include the construction of another dam at the Yiben site, will allow the output to be progressively increased to over 350 MW. The Bumbuna HEP has an assumed service life of 50 years with a power output guaranteed for at least 99.5% of the lifetime of the plant. Bikongor HEP is also high on the Government's agenda for development.

Other developments funded by the Government of Sierra Leone, World Bank, BADEA/SFD, E.U., I.D.B. and the Government of Japan include the following:

- Rental Power: Global Trading Group (GTG) and Income Electrix Ltd (IEL) were contracted to supply a total of 25 MW to Freetown. (GTG – 15 MW and IEL – 12 MW). The contract for IEL has been terminated, while that for GTG has been extended twice to serve as standby during the commissioning of the Bumbuna Hydro Plant. G.T.G. is funded by the World Bank and the GoSL.

- 16 MW thermal plants to be installed by Jacobsen Elektro of Norway at Blackhall Road Power Station and to be commissioned in 2011. The project is jointly funded by BADEA/SFD and the GoSL.

- World Bank funding of the completion of the 33 kV sub-transmission and the rehabilitation of selected 11 kV networks in the Western Area with a view to strengthen the network, increase its transport capacity from its reduced capacity of 20 MW to over 30 MW, extend its service to the Bumbuna HEP grid, and additional generating capacity is expected.

- Mini-hydros will be developed under Chinese funding at Makali (120 KW) in the Tonkolili District and Charlotte (2. 0 MW) in the Western Area. Work on these projects has started.

- The EU and Islamic Development Bank (IDB) funding for rural electrification and the reinforcement of the medium and low voltage networks in the Western Area, respectively. The latter project is in progress while the former is yet to be implemented.

- The Government of Japan (GoJ) assistance comprises the urgent improvement of the distribution networks and a 25 years Power Sector Master Plan Study all of which is concentrated in the Western Area and its environs. The distribution improvement (Phase 1) entitled the construction of a 5 MVA 33/11 kV substation at Regent, 11 kV overhead line from Regent substation to Kingtom Power Station via Wilberforce and Congo Cross substations and the supply of distribution materials and accessories to NPA for the construction of 11 kV overhead lines from Regent Substation to the Sierra Leone Broadcasting Station (SLBS) at Leicester Peak, Guma Valley Pumping Station at Babadorie, from Falcon Bridge to Blackhall Road Substation in the eastern part of Freetown, and the installation of transformer station at Regent locality, the Water Pumping Station at Leicester Peak and by the American Embassy. The Falcon Bridge – Blackhall Road 11 kV overhead line is now operational evacuating power from Kingtom Power Station to the east of Freetown

- The Phase 11 of the project for the construction of a power house, supply, installation and commissioning of 2 x 5 MW thermal plants at Kingtom Power Station is far advanced. The power station will be in commercial operation in March, 2010.

- The Master Plan Study has been completed and officially presented to the Hon. Minister of Energy and Water Resources. The study was conducted by a JICA Study Team (Yachiyo Engineering Co. Ltd). The output of the Master Plan Study will include a power demand forecast, power plant development plan, distribution system rehabilitation, reinforcement and extension plan with detailed implementation plan that includes project packages and profiles, capacity development plan for NPA staff (Power Generation and Distribution), recommendation to electricity tariff system, evaluation of the business management of NPA, financial and economic analysis on proposed power development

plan, environmental and social considerations on possible power development projects. The basic policies to implement the study include compatibility with development plans and strategies in the country and the Economic Community of West African States (ECOWAS), introduce time frames to suit the current power demand and supply situation, formulate a concrete and realistic implementation plan for the master plan, coordinate with development partners and authorities concerned and collaborate with NPA to transfer master plan formulation technologies through the study.

- Emergency rehabilitation of the Western Area transmission and distribution funded by NPA for the repair of critical inter connectors and the replacement of faulty transformers, undersized conductors/cables,etc. for the distribution of power from the Bumbuna Hydro Plant.

Members of ECOWAS established articles of agreement establishing a new West African Power Pool (WAPP) organization in January, 2006. The objective of the WAPP is to establish a regional electricity market in West Africa through the judicious development and realization of key priority infrastructure that would permit accessibility to economic energy resources to all member states of ECOWAS. In order to further advance the implementation of the priority projects of the West African Power Pool (WAPP), the WAPP Secretariat (temporarily located in Cotonou, Benin) and the WAPP Members have commenced preparatory works towards the implementation of the following priority interconnection projects:

- 330 kV Volta (Ghana) – Mome Hagou (Togo) – Sakete (Benin) Transmission Project
- 330 kV Aboadze (Ghana) – Volta (Ghana) Transmission Project
- 330 kV Aboadze (Ghana) – Prestea (Ghana) Transmission Project
- 225 kV Bolgatanga (Ghana) – Ouagadougou (Burkina Faso) Transmission Project
- Prestea (Ghana) – Kumasi (Ghana) – Han (Ghana) – Transmission Project
- Han (Ghana) – Bobo Dioulasso (Burkina Faso) – Sikasso (Mali) – Bamako (Mali) Transmission Project
- 225 kV OMVG Interconnection Project (Guinea, The Gambia, Guinea Bissau, Senegal) including development of hydropower sites at Kaleta (Guinea) and Sambangalou (Senegal)
- 225 kV Man (Côte d'Ivoire) – Yekepa – (Liberia) – Nzérékore (Guinea) – Buchanan (Liberia) – Monrovia (Liberia) – Bumbuna (Sierra Leone) – Linsan (Guinea) Interconnection Project

In this regard, the Ministry of Energy and Water Resources/National Power Authority intends to construct the Sierra Leone section of the Man (Côte d'Ivoire) – Yekepa – (Liberia) – Nzérékore (Guinea) – Buchanan (Liberia) – Monrovia (Liberia) – Bumbuna (Sierra Leone) – Linsan (Guinea) Interconnection Project. The Sierra Leone section of this project will be constructed by a contractor yet to be assigned and will link up with the Dodo 6 MW BKPS System at Kenema and the 50 MW Bumbuna HEP.

Multiple benefits will be derived from this proposed project and they include both upstream and downstream benefits. With regards to upstream benefits, the proposed project will involve the construction of electric infrastructure that will facilitate the country's participation in energy trade within the sub-region, provide opportunities for rural electrification, and the development of a national electric grid added to the existing 50 MW of Bumbuna and 6 MW of Dodo HEP. Further, five substations will be constructed at Kenema, Bekongor, Bumbuna, Kamakwei and Fadugu. Employment during construction stage will be created and the country will benefit from technology transfer. The downstream benefits will include capacity building of NPA staff in operations and maintenance, and the management of power sales. Also, opportunities to buy/sell electric power will be created. Mining companies will be willing to hook up to the transmission line. Adequate and reliable electric power supply will improve security, good governance, development of industries at national and local levels, and social opportunities. There will also be reduction in import of standby generators, fuel for power generation and the corresponding halt in exodus of much needed foreign exchange. Another important downstream benefit will be the reduction in the depletion of forests which leads to soil erosion, higher temperatures and the emission of CO2, a major contributor to global warming and climate change.

This proposed CLSG Interconnection project is one for which the preparation, submission, and approval of an Environmental and Social Impact Statement is a requirement prior to the commencement of the proposed project. This is in compliance with the Sierra Leone Environment Protection Agency Act, 2008. To this end, NPA and the environmental consultant is undertaking an environmental impact study of the proposed project in order to identify all its adverse and positive impacts.

Some baseline information has been collected through desk studies. Site visits have been undertaken by the consultants in order to gather more baseline information. Gaps in the baseline information have been filled by the collection of additional information by fieldworkers and technicians. The present document is an Environmental and Social Impact Statement submitted by MEWR/NPA and the invironmental consultant as a result of the aforementioned activities.

Table 1 below shows the forecast demand and active generating capacity country-wide. The demand in Freetown cannot be met by the Bumbuna Hydro Plant because of the seasonal variation of the plant and some of the energy will soon be tapped for towns (Makeni, Magburaka and Lunsar) along the 50 MW Bumbuna HEP. Hence the need for thermal plants in Freetown to complement Bumbuna Plant output of 18 MW during the dry season.

Table 1 Current and Planning Generating Capacity of NPA

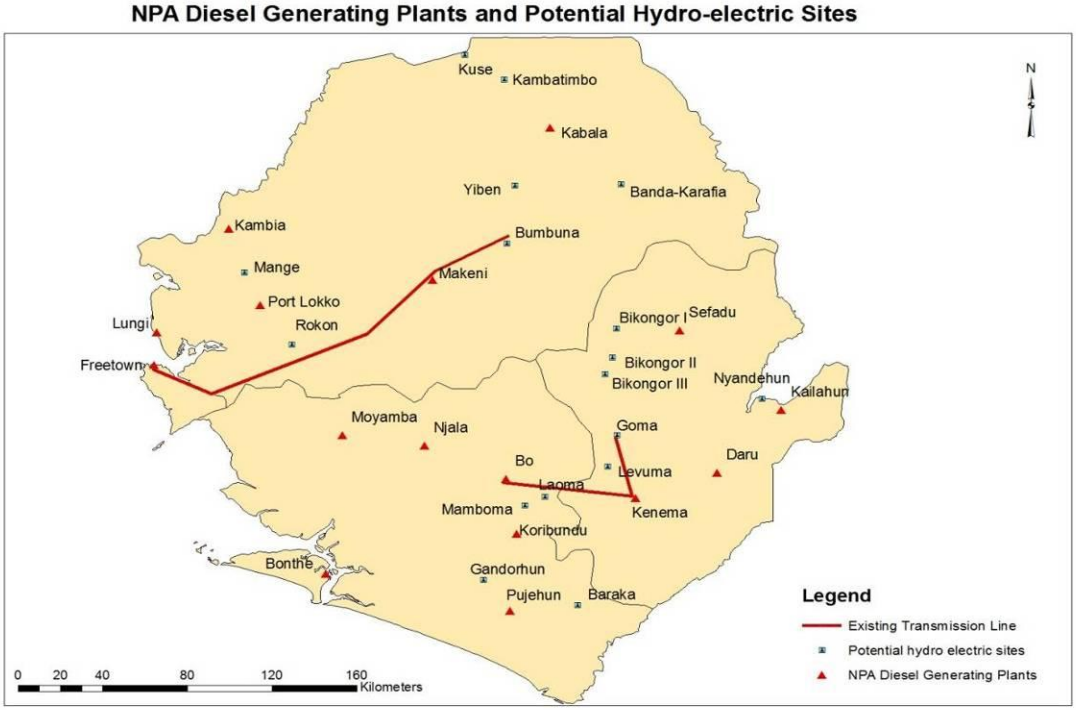
	YEAR	RATED/NOMINAL	YEAR	Remarks

	COMMISSIONED	CAPACITY (MW)	2008	2009	2010	2011	2012	
WESTERN AREA								
A.) Kingtom Power/Station								
1) Sulzer 4	1978	9.2	5.5	5.5	5.5	5.5	5.5	
2) Sulzer 5	1990	9.2	5.5	5.5	5.5	5.5	5.5	
3) Mitsub 6	1995							
4) Caterpillar 1	2001	1.2	0.0	0.0	0.0	0.0	0.0	Disabled
5) Caterpillar 2	2001	1.2	1.0	1.0	1.0	1.0	1.0	
6) Mirrlees 3	2002	6.3	0.0	0.0	0.0	0.0	0.0	Disabled
7) Mirrlees 2(Eskom)	2006	6.9	0.0	0.0	0.0	0.0	0.0	Disabled
8) NEW DEG 7(JICA Grant)	2010	5.0	0.0	0.0	5.0	5.0	5.0	
9) NEW DEG 8 (JICA Grant)	2010	5.0	0.0	0.0	5.0	5.0	5.0	
10) Rental GTG(!-14)	2007	15.0	15.0	12.0	0.0	0.0	0.0	End of Contract
B.) Blackhall Road Power/Station								
1) DEG SFD/BADEA	2010	2x8.28				16.0		
2) Income Electrixs IPP	2008	10.0	2.0	2.0	0.0	0.0	0.0	End of Contract
NORTHERN PROVINCE								
1) Bumbuna H.E Power								
Unit 1	2009	25.0	0	24	24	24	24	
Unit 2	2009	25.0	0	24	24	24	24	
2) Makeni	2006	1.0MW	1.0	1.0	1.0	1.0	1.0	
SOUTHERN & EASTERN PROVINCE								
BKPS (MW)								
1) GOMA	2007	4x1.5MW	6.0	6.0	6.0	6.0	6.0	
2) BO Thermal	2005	5 MW	0.07	0.07	0.07	0.07	0.07	
3) Pujehun	2005	0.062 MW	0.062	0.062	0.062	0.062	0.062	

Figure 1 below shows the locations of thermal plants and hydro power plants in the country. Some of the generating plants are agency stations, i. e. stations that are owned by other agencies, but operated and maintained by NPA. These stations are Njala, Daru and Rokupr owned by Njala University, the Military and the Rice Research Station at Rokupr respectively.

The operation of the CLSG line will reduce the operating period, cost as well as the emissions from the operation of thermal plants.

Figure 1 NPA Diesel Generating, HEP Sites and Transmission Grid



1.1 Purpose and Objectives of the proposed Project

Sierra Leone was engulfed in a series of civil conflicts between 1991 and 2002 with some sense of civil authority re-established in 1999. Prior to the commencement of the civil wars, the economy of the country was supported primarily by mineral exports of rutile, diamonds and bauxite as well as the coffee, cacao and timber industries in the agricultural sector. The civil war and political instability have led to a drastic decline of local production and the whole economy as well as the destruction of infrastructure including the electricity supply system. The recovery of economic activity is on track following the re-establishment of civil authority. An essential and critical requirement for the success of economic recovery activities is the availability of

electricity. During the period of civil disorder the country's physical infrastructure, particularly electricity, suffered from lack of maintenance and in cases abandonment. The net result is that Sierra Leone now has a severely limited electricity service. Public supply is unreliable and many individuals and entities undertake self-generation to secure electricity supplies. The services obtained through self-generation are particularly costly. Predictably large sections of the populace have been unable to buy their own generators and so only a very limited part of society has access to electricity supply.

The situation in Sierra Leone requires that energy supply capacities be urgently augmented and reinforced. The implementation of the proposed CLSG project in Sierra Leone and the future development of potential hydropower resources in the country in addition to utilization of gas-generated electricity will permit the exchange of low cost power between Côte d'Ivoire, Liberia, Sierra Leone and Guinea through this high voltage interconnection transmission line from Man (Côte d'Ivoire) to Linsan (Guinea) through Yekepa (Liberia), Nzérékore (Guinea), Buchanan (Liberia), Monrovia (Liberia) and Bumbuna (Sierra Leone).

With the implementation of the West African Power Pool (WAPP) CLSG Interconnection Project, which is expected to foster power exchanges among the countries in the West African sub-region, a high capacity transmission interconnection line from Côte d'Ivoire to Guinea through Sierra Leone and Liberia will be required. This interconnection line will also be in line with the adopted WAPP Master Plan. The implementation of the interconnection project – Man – Yekepa – Nzérékore – Buchanan – Monrovia – Bumbuna – Linsan - will also further reinforce the interconnection of "Zone A" and "Zone B" of the WAPP through Côte d'Ivoire, thereby increasing opportunities for trade and the establishment of a regional power market.

1.2 Background Information on the proposed Project

The Sierra Leone section of the project comprises the construction of five (5) substations and 530km of 225kV transmission line. The project will be carried out within a Right of Way (RoW) of 40 m that will span seven districts namely, Pujehun, Kenema, Kono, Tonkolili, Koinadugu, bombili and Kambia for a distance of about 530km. The transmission line will enter Sierra Leone territory, crossing the Mano and Moa Rivers, through Bombohun, (after Mano on the Liberian border with Sierra Leone) in the Soro Gbema Chiefdom, Pujehun District in the South, follow the existing road network from Potoru, Barri Chiefdom, to enter Kenema Town, the Provincial Headquarter Town in the east of the country. In this section the proposed line route avoids the Gola Forest and other sensitive areas. One substation (Kenema substation) will be constructed in Gofor, 2 km to Kenema on the Potoru – Kenema Highway. From Kenema substation, the transmission line continues to the north to enter Bikongor substation in the Nimiyama Chiefdom, Kono District. From Nimiyama Chiefdom it will go through Jaiama Nimikoro and then follow the existing road to Bumbuna, Kalansogoia Chiefdom. One substation (Bikongor substation) will be constructed in Ndoyorgbo 2 km from Jiaima Nimikoro along the existing road to Bumbuna.

Another substation (Bumbuna substation) will be constructed in a town called Kabaray, 2 km to Bumbuna Town. From Bumbuna Town (Town of the Bumbuna Hydroelectric Plant), the line will enter Fadugu, Kasunko Chiefdom. Another substation (Yiben subsation) will be constructed at Kathadougbu Road, 1 km east of Fadugu. From Fadugu, the line will continue to enter Kamakwei, Sella Limba Chiefdom. In Sella Limba Chiefdom, another substation (Kamakwei substation) will be constructed 4 km from Kamakwei in a town called Kathirie, and the line detours the Outamba-Kilimni National Park to the south and crosses the Great Scarcies River to enter Guinea territory.

The proposed project will, among others, consist of the erection of steel transmission towers along the route. The height of the towers will be such as to provide a minimum of 8.0 meters clearance between the lines and open ground and 8.0 meters clearance for roads and houses. Typically, as with the existing system, the towers will be about 35 ~ 40 meters high.

The proposed transmission line project will impact minimally on the environment in most cases. The impact assessment methodology used for this project consists of five major steps:

- Step 1 : Identification and description of project activities and their interaction with environmental media;
- Step 2: Comprehensive preliminary identification of potential impacts;
- Step 3: Screening or comparative assessment of impact importance, identification of impacts that are likely to be significant (i.e. identification of focus areas for further study) through application of a basic set of impact significance criteria to the preliminary information available about each impact;
- Step 4: Detailed assessment of the identified focus area impacts characterization techniques, quantification of impacts to the extent possible and rigorous qualitative characterization of impacts that cannot be quantified; and
- Step 5: Final assessment of the severity levels of impacts through application of the results of the rigorous quantitative and qualitative characterization of impacts developed in Step 4 to a set of objective impact severity criteria; identification of impact warranting mitigation.

The project is being financed by the various funding agencies, will be executed by a contractor yet to be assigned. The Ministry of Energy and Water Resources/National Power Authority is the proponent.

1.3 Purpose and scope of the study

It is a legal requirement in Sierra Leone under the Environment Protection Agency Act, 2008 and the Environmental Impact Assessment Procedure, 2001 that development projects of this nature should be subjected to Environmental and Social Impacts Assessment (ESIA). In addition it is the policy of MEWR/NPA to ensure the welfare of the people perceived to be adversely affected by its operations as well as to assist in the sustainable development of the environment within which it operates.

The E.S.I.A. will ensure that the MEWR/NPA:

1. Obtains the necessary environmental licence for the construction and implementation of the project;
2. Comply with the requirements on environmental protection of the funding agencies and government;
3. Implement the project with minimum adverse effects on the physical, biological, socio-cultural and socio-economic environments.

Prior to the preparation of this ESIA, a Scoping report was submitted to the EPA. The main purpose of the Scoping report was to outline the key issues to be addressed in the ESIA in order to eliminate the insignificant issues and focus on those that are significant. In actual fact, the Scoping process provided a preliminary assessment of the:

- Potential impacts of the project;
- The parameters that should be included in the study;
- The availability and usefulness of existing information and the appropriate field survey methods for collecting new information;
- Potential monitoring parameters;
- Potential stakeholders.

The EPA has reviewed the Scoping Report, and in agreeing with the Terms of Reference for the carrying out of the ESIA studies issued an official letter for the ESIA studies in the project operational area to proceed. Comments were made on the fact that the potential transmission line route will have to pass through one legally constituted National Forest Protected Area in the East of the country (Gola Forest National Park) and one designated Protected Forest in the North East of the Country (Nimini Hills). However the Consultant gave a presentation regarding

the three environmental sensitive areas with the alternatives to avoid these protected areas during the consultation with the presense of Chairperson of SL-EPA, Mrs. Jatou Jalloh, Head, Inter-sectoral and International Cooperation Dept. Mr. Momodou A. Bah and NPA on 20th December 2010. This Environmental Impact Statement has therefore been submitted as a result of the aforementioned activities.

1.4 Institutional and Legislative Framework

1.4.1 Institutional Framework

A. Ministry of Energy and Water Resources

Ministry of energy and Water Resources is, in theory, responsible for coordinating the activities of the energy sector and water distribution sub-sectors. In practice, it is mainly active in the electric power distribution services. The development of the energy sector and water supply and the generation of electricity are all functions of this Ministry. It is expected to develop the energy resources and enhance current production to meet and satisfy the needs of the country as well as provide adequate water supply to the nation. It enhances the improvement of water supply and delivery facilities and maintenance of existing ones.

B. Ministry of Works, Housing and Infrastructure

The responsibility for civil works and road construction, maintenance as well as public buildings in the whole country rests with the Ministry of Works, Housing and Infrastructure. It enhances the improvement of road networks by securing bilateral and multilateral agreements with donors. For effective delivery of outputs, management of local and donor funds with donor's funds for primary, secondary and feeder roads, the Sierra Leone Roads authority was created by an Act of Parliament in 1995, with the National Parliament playing and oversight role.

C. Ministry of Agriculture, Forestry and Food Security

This Ministry is mandated to preserve and conserve, as well as to manage commercial exploitation to provide for sustainable and permanent regenerating of the forest reserve. It is responsible for issuing licenses to exploit and maintain all forest types including mangroves, on public lands and to monitor their harvesting so that they are sustainable and ecologically stable.

D. Ministry of Mines and Mineral Resources

This Ministry is charged with the responsibility to supervise mining operations in the country. It issues licenses for all mining operations, enforces laws and provisions contained in the new mining act relating to the rehabilitation of mined out areas.

E. Environment Protection Agency

The Board and Sierra Leone Environment Protection Agency (SLEPA) was established based on the Environment Protection Agency Act in 2008. Requirements of the EPA include the development of an Environmental and Social Impacts Assessment (ESIA) for certain types of projects within Sierra Leone, including exploitation of hydraulic resources, substantial changes in farming and fisheries practices, energy production, mining, and waste disposal.

F. Local Government and Administration

The enactment of the Local Government Act in 2004, paved the way for the establishment of local government councils that replaced the appointed local councils or management committees, which are accountable and answerable to the local communities.

The Local District and or Town Council is the highest political authority in the locality, with legislative and executive powers, and responsible for promoting the development of the locality and the welfare of the people in the locality with the resources at its disposal (The Local Government Act 2004). The local council is responsible among other things, for the mobilization of human and material resources necessary for overall development and welfare of the people of the locality; promoting and supporting productive activity and social development; initiating and maintaining programs for the development of basic infrastructure and provide works and services; initiate, draw up and execute development plans for the locality; oversee Chiefdom Councils in the performance of functions delegated to them by the local councils; determine the rates of local taxes and approved the annual budgets of Chiefdom Councils and oversees the implementation of such budgets. The local council is also responsible for the formation of committees.

The Chairman is elected by universal adult suffrage for a four-year term. The Vice Chairman, who is elected by the elected Councilors, assists the Chairman. In addition, in each council there is the Chief Administrator, who is appointed by the local council and is the Secretary to the local council. He/she heads the administration of the local council.

The local councils are made up several Wards. Each ward establishes a Ward Committee, which consists of every Councilor, the Paramount Chief of the Chiefdom and not more than ten others, at least five of whom shall be women, resident in the ward and elected by the ward residents. The Ward Committee is responsible for mobilizing residents of the ward for the implementation of the self-help and development projects; provide focal point for the discussion of local problems and needs and take remedial

action where necessary; organizes communal and voluntary work; make proposals to the local council for the levying and collection of rates for special projects and programs and educate the residents on their rights and obligations in relation to local government and decentralization.

G. Chiefdom and Village

Paramount Chiefs constitute an important component of governance. They are elected for life by Chiefdom Councilors, who in turn are elected by residents in each chiefdom. Each of the 149 chiefdoms in Sierra Leone has a Paramount Chief, or a Regent Chief who is appointed upon the death of a Paramount Chief and until a successor is elected. A Paramount Chief is appointed for general administration, the maintenance of law and order and the development of their chiefdom. The administration of the chiefdom occurs through a hierarchical system of traditional authorities under the Paramount Chief. There is a Chiefdom speaker who assists him and deputizes him when he is absent from the Chiefdom. The Chiefdom is divided into sections comprising a number of villages. A Section Chief heads each section while a Town Chief heads each village. The primary tasks of the Chiefdom Structure are the distribution of land, collection of land taxes and the settlement of disputes. The Paramount Chief works with a Chiefdom Committee, council of elders and the Native Administration. The local government powers relate to raising and disbursing of funds.

The Ministry of Local Government and Rural Development in consultation with the respective Paramount Chiefs appoint local court chairmen in the 149 chiefdoms in the country. The local court buildings are known as court barriers. There are 287 court barriers throughout the country. The Native Administration utilizes the services of the Chiefdom Police and has "locks ups" for law enforcement purposes.

1.4.2 National Policies, Legislation and regulations

Several policies, laws, regulations and guidelines have been introduced to institutionalize environmental protection and management as well as ESIA preparation in Sierra Leone. Those relevant to the operation of a Hydro electric power line are discussed below.

A. The National Environmental Policy, 1990

The National Environmental Policy (NEP) was approved by cabinet in 1990 and subsequently revised in 1994 (GOSL 1994). The policy objectives are to:

(a) secure for all Sierra Leoneans a quality of environmental adequate for their health and well-being

(b) conserve and use the environment and natural resources for the benefit of present and future generation, restore, maintain and enhance the ecosystems and ecological

processes essential for the functioning of the biosphere; to preserve biological diversity, and uphold the principle of optimum sustainable yield on the use of living natural resources and ecosystems: and

(c) raise public awareness and promote understanding of the essential linkages between the environment and to encourage individual and community participation in environmental improvement efforts.

The Policy also contains specific policies on biological diversity and cultural hearing; mining and mineral resources; air quality and noise; sanitation and waste management; toxic and hazardous substances; working environment; energy production and use; settlements, recreation space and greenbelts. One of the strategies to achieve the goals of the NEP is "to make as priority Environmental and Social Impacts Assessment (ESIA) of proposed activities which may significantly affect the environment and the use of a resources."(GoSL 1994).

B. The Environment Protection Agency Act, 2008

The Environment Protection Agency Act (EPA) of 2008 established the Board and Sierra Leone Environment Protection Agency. Requirements of the EPA include the development of an Environmental and Social Impacts Assessment (ESIA) for certain types of projects within Sierra Leone, including exploitation of hydraulic resources, substantial changes in farming and fisheries practices, energy production, mining, and waste disposal.

In compliance with the third schedule of the EPA Act, 2008, an ESIA is required to contain a true statement and description of the following:

- Location of the project and its surroundings;
- Principle, concept, and purpose of the project;
- Description of the possible impacts on the ecosystem and its locality;
- Direct or indirect effects of the project is likely to have on the environment;
- Social, economic, and cultural effects that the project is likely to have on people and society
- Consultation with the communities, interested parties, and Government Ministries
- Actions or measures taken to avoid , prevent, change, mitigate, or remedy the likely effect on people and society;

- Any alternatives to the project;
- Natural resources and the localities to be used in the project;
- Plans for decommissioning the project; and
- Other information for proper review of the potential environmental impact of the project.

The second schedule of this Act, gives several factors for determining whether a potential project requires the preparation of an ESIA. These factors are given below as stated in the schedule.

- The impact on the community
- The location of the project
- Whether the project transforms the locality
- Whether the project has, or is likely to have, a substantial impact on the ecosystem.
- Whether the project results in the diminution of the aesthetic, recreational, scientific, historical, cultural or other environmental quality of the locality.
- Whether the project endangers any species of flora or fauna or the habitat of the flora and fauna of the locality.
- The scale of the project.
- The extent of degradation of the environment.
- Whether the project will result in an increased demand for natural resources in the locality.
- The cumulative impact of the project together with other activities or projects on the environment.
- The contents of the ESIA.

Once submitted, the Executive Director will solicit comments on the ESIA from professional associations, governmental ministries, non – governmental organizations (NGOs) and the public. Following a two- week public comment period, the Executive Director will submit the ESIA and the comments to the Board. The Board may provide recommendations for issuance of the license with terms and conditions that require additional information to further assess environmental impact, and/or disapprove the ESIA in case where the proposed alternatives are expected to have significant adverse effects on the environment, individuals, or society.

ESIA Licenses are normally issued for a twelve-month period or a time specified by the Executive Director. Once the license is issued, the Agency is responsible for monitoring the project and its environmental impacts to verify compliance. The Minister in consultation with the Environment Board may prescribe fees for the license if the terms and conditions of the license are not in compliance with the Environment Protection Agency Act or where there is a substantial change in operations resulting in adverse effect on the environment. At the expiration of this period, the Executive Director has the authority to renew or revoke the license.

In issuing a license for a period based on an ESIA, the Minister also has the authority to establish regulations for national environmental standards pertaining to such areas as water quality, effluent limitations, air quality, wastes, atmospheric protection, ozone layer depletion, noise control, pesticide residues and odors. Internationally banned chemicals are prohibited in Sierra Leone, as well as the discharge of any hazardous substance into the air, land, and waters. Failure to comply with this regulation is an offence, and the defaulting company is liable on conviction.

An Environmental and Social Impact Assessment (ESIA) document for the project will be prepared to address the requirements of the EPA Act of 2008.

C. Forestry Act: 1988

This Act replaces the Forestry Act of 1912. It is based on the recommendations of an FAO technical assistance project, which suggested legislation providing more explicitly than previously for forest management. The Chief Conservator of Forests is made responsible for the management of the forest resources of the country. He is required to compile a national inventory of forest resources and a national forest management plan designed to obtain the "optimum combination of economic, social and environmental benefits. Most of the management provisions of the Act apply only to classified forests, which may be either national or community. A national forest is required to be on State-owned or -leased land, in contrast to reserves under the previous law which were generally on chiefdom (customary) land.

The Project areas are likely to be state or community – owned.

Section 18 of this Act stipulates that:

The chiefdom council of any chiefdom may conclude an agreement with the Chief Conservator of Forests providing for the constitution as a community forest of any land within the chiefdom, subject to the approval of the District officer for the district in which the land is situated.

Every Agreement under this section shall:

- Describe the area included in the forest by reference to geographical features, markers, co-ordinates and measurements and indicate the same on a map of suitable scale, which shall be annexed to the agreement;
- Describe the forest resources and potential of the area;
- Indicate the purpose of the forest, such as supply of fuel, building poles, production of commercial timber, protection of soil and water supplies;
- Contain a detailed inventory of an rights that will be suppressed upon the constitution of the forest and provide for adequate compensation for such rights, either in money or through the allocation or equivalent rights in other land within the chiefdom;
- Contain a list of existing rights that will be confirmed by the agreement; and
- Be valid for such period not exceeding 99 years as it reasonable in view of the purpose for which the forest s to be constituted

The Minister may by notice in the Gazette constitute any state land, and land in respect of which there is an agreement in forces under this section, as a community forest.

A community forest agreement may be terminated or modified by mutual consent of the parties thereto. The Chief Conservator of Forests shall agree to termination or modification of an agreement when the needs of the community require such termination/modification.

Before agreeing to the modification or termination of any community forest agreement, the Chief Conservator of Forests shall give such notice as is reasonably necessary for any person affected to communicate his views on the modification or termination under consideration.

The Minister may at anytime revoke or modify a notice constituting a community forest in a manner contrary to any agreement under this section regarding such forest. The Minister shall also revoke or modify a notice constituting a community forest as necessary to reflect any medication or termination of an agreement.

In addition to secondary regrowth in the project areas, there are limited high moist semi-deciduous fragmented evergreen forests along streams and river courses and around the mountains and residual hills. The ESIA has been developed with due consideration for this Act.

D. Factories Act, 1974

The Factories Act of 1974 addresses worker health and safety issues associated with factories. Portions of the power line construction of the project operations may fall within the definition of a factory based on the following conditions:

- *Part II Section 3(v)* – "any premises in which mechanical power is used in connection with the making or repair of articles of metal or wood incidental to any business carried on by way of trade or for purposes of gain."
- *Part II Section 3(vi)* – "any premises in which articles are made or prepared incidentally to the carrying on of building operations or works of engineering construction, not being premises in which such operations or works are being carried on."
- *Part II Section 3(vii)* – "any premises in which such persons are regularly employed in or in connection with the generating of electrical energy for supply by way of trade, or for supply for the purposes of any industrial or commercial undertaking or of any public building or public institution, or for supply to streets or other public places.

The Factories Act also includes machine safety, safe working conditions, sanitary amenities, periodic inspections, factory registration, and guidelines for reporting injuries, accidents and industrial diseases. Regulations pertinent to the quarry operations project include:

- All workers employed must be at least 18 years of age.
- Companies must register with the Chief Inspector within six months of operation.
- The use of mechanical power and machines must be registered one month prior to use.
- Brief inventories of mining equipments must be provided annually and detailed inventories must be provided once every five years.
- Mine facilities must be kept in a clean state. Dirt and refuse must be removed daily.
- Floors and workrooms must be washed or swept once a week. Inside walls and ceilings must be washed once a year, painted once every five years, or whitewashed once a year.
- Companies should provide suitable workspace, or 11.6m3 per worker.
- Workspaces must be adequately ventilated, lighted, and drained.
- Companies will provide written notice to the Inspector if any employee, while on the premises, is injured and misses more than three days of work.

- If a company believes that a worker is suffering from lead, phosphorous, arsenic, mercurial poisoning or anthrax, or any other chemical contracted on the mine site, the company must notify the Chief Inspector of Factories in Freetown (otherwise referred to as the Inspector).
- If an accident results in death, the company should leave the accident scene undisturbed until a police officer or inspector has had the opportunity to examine the site.
- The Company must report within 24 hours any dangerous occurrence, including severe mechanical failure, collapse, or failure of large machinery used to raise or lower people, explosions and fires, or electrical short circuits.
- An abstract of the Factories Act of 1974 must be posted in prominent positions on the jetty site (i.e. places where workers frequent) as well as the address of the Chief Inspector and of the nearest Inspector. Penalties may result if worker health and safety is compromised.

  A health and safety program has been designed to conform to the provisions of this Act.

E. Safety, Security and Welfare of Employees

Part V of this Act, deals with the aspect of health and stipulates that every factory shall be kept in a clean state and free from effluent arising from any drain, sanitary convenience or nuisance. This part of the Act also states that for overall safety of all employees, the factory or company must not be overcrowded, must be effectively ventilated, and provided with suitable lighting systems. Every care must be taken by the factory holder, to secure the health, safety and welfare of all employees.

As indicated in section 38, it is incumbent on the company to notify the District Inspector, in writing, of any accident or death in the factory. It is also stated in section 39 that all factory contracted diseases identified by a medical Practitioner, must be brought to the notice of the Chief Inspector in Freetown.

Where injury immediately results in death, Section 40 states that the site of the accident must be left undisturbed, after the removal of the corpse, until inspected by a police officer or an inspector.

On receipt of the report of an accident, the inspector shall if he considers it necessary or if directed by a higher authority immediately proceed to the scene of the accident, as indicated in section 41, and shall make enquiry, the inspector is free to use any one under oath, any document, and award fees for giving evidences, as may be fixed by the minister.

Any person, who, without reasonable cause, fails to comply with the terms of summons of the inspector, or refuses to be examined or to answer questions other than that which

may incriminate him, or anyone who obstructs an Inspector or any person acting under his directions in the execution of his duty under section 41, shall be guilty of an offence.

The owner of every factory, according to section 45, must within 24 hours report in writing to an Inspector every dangerous occurrence caused by any machinery or electrical abnormality. Section 26 of part VI stipulates that there shall be kept posted in prominent position in every factory.

- The prescribed abstract of this Act;
- The address of the Chief Inspector and of the nearest Inspector;
- Printed copies of any regulations made under part of this Act which are for the time being in force in the factory; or the prescribed abstracts of such regulations.

F. Offences and Penalties

Part VIII of this Act deals with offences, penalties and legal proceedings. Section 47, subsection 1 of this part, states that in the event of any contravention of the provisions of this Act or of any Regulation or Order made there, the occupier or owner of the factory, shall, be guilty of offence under the Act.

Regarding offences for which there are no penalties provided, section 48 stipulates that, any person guilty of an offence under this Act for which no express penalty is provided by or under the Act, shall be liable to a fine not exceeding fifty Leones or to imprisonment for a term not exceeding one month or both. If the contravention for which he was convicted continues, he shall be guilty of a further offence and liable to a fine not exceeding ten Leones for each day on which the contravention is continued.

Section 50 states that if anyone is killed, or dies, or suffers any bodily injury, in consequence of the occupier or owner of a factory having contravened any provision of this Act, the occupier or owner of the factory, shall, without prejudice to any other penalty, be liable to a fine not exceeding two hundred Leones or to imprisonment for a term not exceeding three months, or to both.

All offences committed under this Act shall, section 56 states, be prosecuted in a magistrate court.

G. Regulation of the Electricity in Sierra Leone

The National Power Authority which was established in 1982 has the responsibility for the reorganization and regulation of the generation, transmission, distribution and supply of electricity throughout Sierra Leone. Part X, Section 72 of the NPA Act mandates the Authority to prescribe standards, rules, procedures and grant licenses for the

transmission, wholesale supply, distribution and sale of electricity and other services in the energy sector.

The provisions of the Ministry of Energy and Water Resources, the supervising Ministry of the Authority require NPA to register the proposed project with the Environment Protection Agency and to obtain an ESIA Licence prior to the commencement of the proposed project.

The proponent has carried out a survey of the line route and has provisionally identified a potential route. To execute the project after all the licenses have been acquired, the Authority would have to legally acquire the Right-of-Way (RoW) and the identified community lands where the substations have to be constructed.

The NPA Act, 1982 empowers the Authority to acquire the Right-of-Way for constructing and operating power transmission systems. The provisions of the Town Planning Act 1946, Town Planning Declaration, 2001 provide the framework for the acquisition of the RoW. This activity could only be carried out with due consultations with the settlements, communities and District Councils considering the issue of proper environmental planning within the projects sphere of influence. For transmission lines, a Right-of-Way of approximately 20m on either side of the poles/tower is the approved width. The RoW along the entire stretch of the route totaling 530 km in Sierra Leone will have to be secured. Conventionally, community residents and farmers alike are allowed to harvest any crops within areas to be acquired prior to securing the RoW. Once the RoW has been acquired, the provisions of the Town Planning Act, 1946 as amended in the Town Planning Declaration in 2001, a number of activities are prohibited within the RoW, including mining, construction of buildings and cultivation of some types of crops or farming.

In Sierra Leone the previous Line Route traversed a legally constituted National Forest Park, the Gola Forest National Park, for a distance of about 8.4 km and also through a designated National Protected Forest, Nimini Hills, for another distance of about 2.5 km. However, Alternatives have been considered to avoid environmentally protected area detouring the Gola Forest National Park, Nimini Hills and Outamba-Kilimi National Park. The details of considering the Alternatives are in the Section 1.6.2.3 "Comparison of the Alternatives in Hotspots" of this ESIA report.

Sierra Leone has an environmental agenda and has therefore signed a number of Multilateral Environmental Agreements and Conventions. The obligation of the Government of Sierra Leone to the C.B.D. and CITES Conventions requires the proponent to respect the principles of sustainable environmental management in its construction and maintenance undertakings of the transmission line. The principles of these MEAs and the World Bank

OP 4.12 (as revised in April, 2004) is applicable to this project. Due consideration has been taken of them in the preparation of this document. In selecting the line route, the over-riding consideration has been the avoidance of environmentally sensitive areas and settlements and the minimization of the destruction of property and farms.

1.4.3 International Environmental Requirements

Three of the related international convention to which Sierra Leone is a signatory and related to the construction and operation of a power line are described in the following sections.

A. The Stockholm Convention on Persistent Organic Pollutants

Sierra Leone became a signatory to the Stockholm Convention on Persistent Organic Pollutants (POPs) on the 27th August 2001. POPs are chemicals that persistently bio-accumulate in fatty tissues, and magnify through the food chain, adversely affecting health and the environment. The Convention seeks the elimination or restriction of production and use of all intentionally produced POPs (industrial chemicals and pesticides). The chemicals stated for elimination are: aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzen (HCB), mirix taxaphene, polychlorinated biphenyls (PCB's).

The Convention also seeks continuing minimization and, where feasible, ultimate elimination of the releases unintentionally produced POPs such as dioxins and furans. Stockpiles and wastes containing POPs must be managed and disposed of in a safe, efficient and environmentally sound manner, taking into account international rules, standards and guidelines. The operations of the jetties in the project axis will involve neither the production nor the use of these pollutants.

B. Convention on Biological Diversity (CBD)

Ratified by Sierra Leone on 12 December, 1994, this Convention's main objectives are to conserve biological diversity, sustainable use of biological resources and fair and equitable distribution of genetic resources.

It is obligatory on all signatory states to effect prescribed undertaking such as:

- Development of national biological prescribed strategies and plans;
- Establishment of protected areas;
- Prevention, control and eradication of invasive and alien species; and
- Provision of educational facilities

C. Convention on the International Trade and Endangered Species

Convention on the International Trade of Endangered Species (CITES) requirements went into effect in Sierra Leone on 16th January 1995. CITES is a convention that provides for the elimination and/or reduction in the trade of certain species, including endangered species. CITES provides a list of species that are required for protection against trade. Species lists in CITES are also those for which trade is strictly prohibited except in exceptional circumstance. The majority of the species lists in CITES are also listed as endangered or threatened by the International Union for Conservation of Nature and Natural Resources (IUCN). CITES also includes species that are not necessarily threatened but for which trade must be controlled to avoid the species becoming threatened or extinct. A number of species such as reptiles, primates, rodents and antelope listed under CITES and IUCN exist in the project operational areas.

D. Lending Institutions, Policies and Guidelines

The hydro electric power line construction project seeks project funding through the World Bank under the supervision and control of the Ministry of Energy and Water Resources. Funding for the project has come from the World Bank and as an international lending institution it has specific environmental requirements, polices and guidelines to be met prior to funding. This financial lending institution has specific requirements that ensure that the project complies with Banks Environmental Guidelines, Polices and other compliance issues for environmental sustainability of the project. Hence, the requirement in this case is that the project must be subjected to an Environmental Assessment, and the development of an Environmental Management plan.

World Bank / African Development Bank / EIB Requirements

Appropriate IFC/ World Bank / African Development Bank / EIB policies and guidelines include:

- Environmental assessment (OP 4.01) – policy and procedures for environmental assessments whereby potential impacts are taken into account in selecting, sitting, planning and designing projects. Designed to ensure that IFC projects are environmentally and socially sound and sustainable;
- Natural habitat (OP 4.04) – police to promote the conservation of endangered plants, animal habitats and protected areas;
- Water Resources Management (OP 4.07) - policy to promote economically viable environmentally sustainable and socially equitable water management. In a bid to

effectively control environmental hazards, and risks associated with them, the the West Africa Power pool through the National Power Authority NPA (SL) Ltd is committed to implementing sound environmental practices through the company's introduction of state-of-the art technology which meets stringent international environmental standards.
- To attain its environmental policy objectives, the West Africa Power Pool is committed to the following:

- To implement a range of preventive measures aimed to preclude any emergency and mitigate impacts on the environment;

- To prioritize actions and measures, projected and under implementation, aimed at preventing an adverse impact on the environment, personnel and local population;

- To ensure compliance with national legislation and guidelines on environmental health and safety;

- To assess the impact of any proposed activities, products and services on the environment, health of personnel and local population;

- To strive for continuous improvement in the quality of environment in the area where the towers erected

- Indigenous people (OP 4.10) - policy to addresses the traditional rights of people including land and water rights and ensures that indigenous people benefit from development project.
- Physical Cultural Resources (OP 4.11) - policy to avoid or mitigate adverse impacts on physical cultural resources from development projects
- Involuntary resettlement (OP 4.12) – police to describe how to proceed when involuntary resettlement is unavoidable.
- Forests (OP 4.36) - policy to assist to borrowers to harness the potential of forests to reduce poverty in sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.
- Environmental, Health and Safety Guidelines (General) - technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP).
- Environmental, Health and Safety Guidelines (Electric Power Transmission and Distribution) - Guidelines to adress the EHS issues associated with electric power transmission and distribution that occur during the construction and operation phases of a facility, along with recommendations for the management.

- Involuntary Resettlement Policy of AfDB – policy to cover involuntary displacement and resettlement of people caused by a African Development Bank financed project and applicable when a project results in relocation or loss of shelter by the persons residing in the project area, assets being lost or livelihoods being affected.
- Social guidelines on involuntary resettlement of EIB

1.5 Project Categorization

The present ESIA is part of the compliance process as detailed in the World Bank's Operational Policy 4.01 and African Development Bank's Environmental and Social Impacts Assessment Procedures.

World Bank classifies the project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts as.

(a) Category A: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.

(b) Category B: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas--including wetlands, forests, grasslands, and other natural habitats--are less adverse than those of Category A projects.

(c) Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

(d) Category FI: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

The African Development Bank's Environmental and Social Impacts Assessment Procedures also provides for classification of the proposed projects into categories 1, 2, 3 and 4 depending on the magnitude of its potential environmental impacts and required report.

(a) Category 1 projects are those that are likely to have the most severe environmental and social impacts and require a full ESIA.

(b) Category 2 projects are likely to have detrimental and site-specific environmental and social impacts that can be minimized by the application of mitigation measures included in an ESMP.

(c) Category 3 shall not induce any adverse environmental and social impacts and do not need further ESA action.

(d) Category 4 projects involve investment of Bank's funds through Financial Intermediaries (FIs) in subprojects that may result in adverse environmental or social impacts. Specific requirements for this type of project include an assessment of FI capacities to handle environmental and social considerations.

The present ESIA is part of the compliance process as detailed in World Bank's operational Policy 4.01 and African Development Bank's Environmental and Social Impacts Assessment Procedures. The construction of the 225 kV transmission line and associated substation facilities classified as Category A of World Bank Category 1 of African Development that call for ESIA, because the Project will be implemented in broad areas and likely to have many impact on the project area.

1.6 Line Route selection of the proposed Project

Parallel with the ESIA study of the proposed Project, the line route study for the proposed Project was implemented by the Consultant at the same time. The purpose of the line route study of the proposed Project was to examine and determine the optimum line route for the proposed Project and prepare the maps and drawings for the selected line route.

1.6.1 Methodology for Line Route and Substation Site Selection

As a first step of the line route study, the Consultant collected transmission line routes and substation selection guidelines from the NPA

Then preliminary line route proposed by WAPP was reviewed and general line route selection criteria have been taken into consideration to organize the draft line route. Also, the existing environmental data and obstacles were evaluated using information from field trips, topographical maps, and data collection activities.

Based on that data, the length of Cote d'Ivoire-Liberia-Sierra Leone-Guinea draft interconnection line was estimated minimum 1,200 km to maximum 1,300km in total and 530km in Sierra Leone section respectively.

The consultant developed several options of transmission line route and substation sites. In the process of developing the each option, the Consultant has also taken into account the following constraints and general considerations, which have repercussions on the feasibility and cost of project implementation:

[Considerations for Transmission Line Selection]

- To avoid crossing protected areas, such as parks, nature reserves, etc
- To be as short and as direct as possible, to minimize costs
- To stay a reasonable distance from urbanized areas
- To avoid crossing tourist areas or important panoramic sites
- To avoid sterilizing fertile land with a commercial agricultural potential
- To avoid the wetlands for tower locations as much as possible during the design stage

[Considerations for Substation Site Selection]

- Availability of Land: Land area measurements would normally be demanded for present and future substation requirements
- Proximity to Load Centers: The substation should feed medium voltage power (34.5kV) to minimize overall system losses and development costs. This will require that new substations be located close to loads.
- General Flatness of Terrain: Where substations are to be constructed, terrain should be generally flat in order to reduce the cost for civil works
- Out-Of-Town Locations: Out-of-town locations, preferably on the outskirts of townships, will help to avoid resettlement, compensation and land use conflict issues. This will minimize the substation's visual impact on the environment.
- Proximity to Major Roads: Easy access during construction and periodic maintenance carried out at the substation demands that it be close to a major road for easy accessibility.
- Natural Drainage: Natural drainage generated by the terrain would help the free flow of rainwater, so that the substation does not flood or become filled with water.
- Connection to an Existing Transmission Line: The substation site should be close to an angle tower so that it can tie into an existing transmission line.

In addition criteria linked to the choice of corridors, the Consultant made an effort to avoid the sensitive area inside the zone of study as far as possible by adopting some environmental constraint. These elements taken into considered are as follows:

[Environmental Constraints]

- Areas Protected by Law
  - National Parks (current or anticipated)
  - Reserves (flora, fauna, ornithological)
  - Protected forests
- Forest Areas and Vegetation
  - Forests and forest grove
  - Plantations (pines, cashew trees, fruit trees)
  - Gallery-forests and coastal vegetation hedges
  - Mangroves
  - Other humid or tropical ecosystems
  - Areas containing threatened species and species of social, economic, cultural and scientific interest
- Faunal Areas
  - Bird migration corridors and flock areas
  - Recognized faunal habitats
  - Threatened species
- Human habitat
  - Populated areas (cities, villages, hamlets, etc.)
  - Land use
  - Anticipated development zones
- Cultural Areas
  - Sacred forests and woods
  - Archaeological or historical sites
  - Panoramic and tourists sites
  - Shrines/religious site/cemeteries
- Critical natural habitat as specified in the World Bank OP 4.04

The satellite images used for the RTLAD (Route Transmission Line Aided Designer) program to select the transmission line route from Man in Cote d'Ivoire to Linsan in Guinea were 65 photographs (23㎞×23㎞/scene) that were high resolution color (Pan-sharpened Color) Cartosat Satellite images (IRS-5m + Resourcesat) with spatial resolution of 2.5 m .

Based on proposed options of the line route and the substations selected by RTLAD program, the Consultant verified suitability of the proposed line route and the substations by site visits. As a result of site visit with authorities concerned, the optimal line route and the substation sites were suggested.

1.6.2 Line Route Selection in Hotspot Areas

1.6.2.1 Introduction

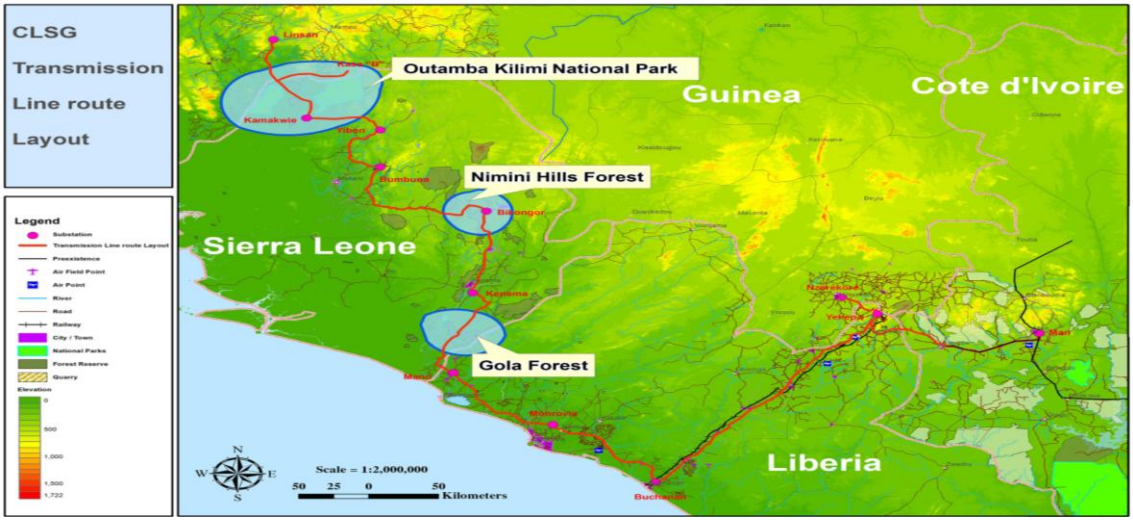
The Funding Agencies interested in the proposed Project dispatched their specialists to Freetown, Sierra Leone (3rd ~ 14th September, 2010) in order to review and examine the previously selected line route, and to do site visits of the affected communities identified along the selected line route.

Also, the Funding Agencies (WB, AfDB, EIB and KfW) organized a video conference on 15th September, 2010 in Cotonou, Benin to discuss their findings and concerns with WAPP and the Consultant. During the conference, three environmentally sensitive areas (Hotpots) along the selected line route in Sierra Leone section were identified and the Funding Agencies gave their comments and recommendations for the modification of the previously selected line route as below.

In general the proposed transmission Line Route is acceptable. There are however a few global biodiversity hotspots for which a more in-depth Analysis of Alternatives will be required. There are areas where the line route will have to avoid or moved further away: Gola Forest and Nimini Forest Hills Reserve, and Outamba-Kalimi National Park in Sierra Leone

The location of the Hotspots along the previously selected transmission line route in Sierra Leone is shown in the map below.

Figure 2 The Location of the Hotspots in Sierra Leone



1.6.2.2 Consultation with Related Stakeholders

After receiving on the comments and recommendations from concerned funding agencies, the Consultant held several meetings with related stakeholders to get their opinion and to investigate further alternative options for the environmentally sensitive areas in Sierra Leone as the table below.

Table 2 Meeting with Related Stakeholders

Organization	Date	Remark
NPA	18th, 20th December 2010	
Conservation Society of Sierra Leone	20th, 21st December	
EU Delegate	20th December 2010	
Environment Protection Agency	20th December 2010	
STEWARD Program	21st December, 2010	
Ministry of Agriculture, Forestry and Food Security	21st December, 2010	
Gola Forest Program	14st January, 2011	

In addition to the discussion with related stakeholders, the Consultant visited the sites to examine and verify the possible alternative line routes in the field in May, September, December 2010, and January 2011

1.6.2.3 Comparison of the Alternatives in the Hotspots

This section provides a comparison of the alternatives in the three environmentally sensitive areas along the transmission line RoW. The comparative analysis presented in this section focuses on the differences among the various alternatives estimated in terms of environmental, social, technical and financial aspects. This section is intended to provide the relevant stakeholders with information about the merits and disadvantages of the alternatives that will assist them in their consideration of determination of transmission line route of the Project and to assist the public in understanding the differences between the alternatives.

The detailed criteria applied to evaluate each alternative line routes are described as below:

- Environmental aspect : Existence of protected area inside or near the alternative, the distance from the nearest protected area
- Social aspect: Number of resettlements within a distance of 300m from each alternative.
- Technical aspect: surrounding topographical condition, number of river-crossing points, and level of difficulty during the construction and operation phases.
- Financial aspect: length of suggested alternative line routes.

NPA recommends that minimum 1km distance between the RoW and protected areas is required to minimize the potential adverse impacts might be arisen from the implementation or operation of the Project. In order to ensure that the selection of the line route is in full compliance with national regulations specifying minimum distance between the line route and protected areas, the Consultant held several meetings with various stakeholders such as Environment Protection Agency (EPA) and Ministry of Agriculture, Forestry and Food Security (MAFFS). During the meetings, Senior Game Superintendent of MAFFS and EPA Environmental Engineer indicated indicated that there are not national regulations in MAFFS specifying the minimum distance between the route and protected areas, however it was confirmed that the minimum 1km distance adopted for Study would be appropriate and acceptable.

To facilitate a clear understanding of the various alternatives, this section provides a summary of the detailed descriptions for each alternative presented in Section 1.6.2.3.1 through 1.6.2.3.3. And the primary features of each alternative are presented in the table to allow for ease of comparison.

1.6.2.3.1 Alternative Line Route in Gola Forest

Description of the Gola Forest

Gola Forest is located in the Eastern Province of Sierra Leone, within the districts of Pujehun, Kenema and Kailahun. The forest spans seven chiefdoms: Koya, Gaura, Tunkia and Nomo chiefdoms in the Kenema district, Barri and Makpele chiefdoms in the Pujehun district, and Malema chiefdom in Kailahun district. The eastern boundary of Gola Forest follows the Moro and Mano Rivers, which form the border between Sierra Leone and Liberia. The Gola Forest reserves consist of several separate forest blocks which are orientated along a southwest – northeast axis. Gola West (67 km^2) and Gola East (205 km^2) are contiguous although a road runs between these two blocks. Gola North is the largest block, having an area of 417 km^2 plus an extension of 61 km^2 which is located northeast of Gola North.

Although no precipitation data is available from the forest itself, there are historic and recent data from villages and towns around the forest. Based on historic rainfall data, annual rainfall in Gola is likely to be 2500–3000 mm.

Gola East and West were gazetted forest reserves in 1926 and Gola North as a timber production forest in 1930, to supply both local and international markets. The reserve as a whole (including Tiwai) has been proposed as a biosphere reserve and parts of Gola North and Gola East have been proposed as strict nature reserves. However, the Gola Forest has been proposed as a biosphere reserve and parts of Gola North and Gola East have been proposed as strict nature reserves. The Gola Forest was declared as National Park in November and gazetted on December 16, 2010. On the January 14, 2011 it was presented to Parliament for the first hearing and deliberation.

Currently, the Across the River Transboundary Peace Park Project (AR_TBPPP) which is an international move towards the conservation of common resources around the border areas between Sierra Leone and Liberia is ongoing. With the establishment of the Transboundary Peace Park by the AR_TBPPP, the segment of the Gola forest in Sierra Leone will be connected to Lofa Forest in Liberia.

Major Considerations

- The Executive Director of Conservation Society of Sierra Leone indicated that there are two ongoing projects regarding the Gola Forest, the Gola Rain Forest Program and the Across the River-transboundary Peace Park Program. In line with these two projects, all the segments of Gola Forest would be linked and transboundary park between Sierra Leone and Liberia would be established. (See the OP2)

- The Project leader of Gola Forest Program indicated that the constitution of the Gola Forest National Park was advertised on December 16, 2010, and it was presented to Parliament of Sierra Leone for the first hearing and deliberation January 14, 2011

- The Funding Agencies recommended investigating another option in Gola Forest to avoid it: along the road from the Mano Border direction Bo which is likely be paved in the near future. Also, they suggested investigating another option locating Kenema substation between Kenema and Bo. (See the OP3)

- The Funding Agencies (World Bank) indicated that they concurred with Alternative Option 1 in this area which would enable the circumvention of the Goal Forest.

Analysis of the Alternative Line Routes

Figure 3 Distance from the Adjacent Protected Area (Gola)

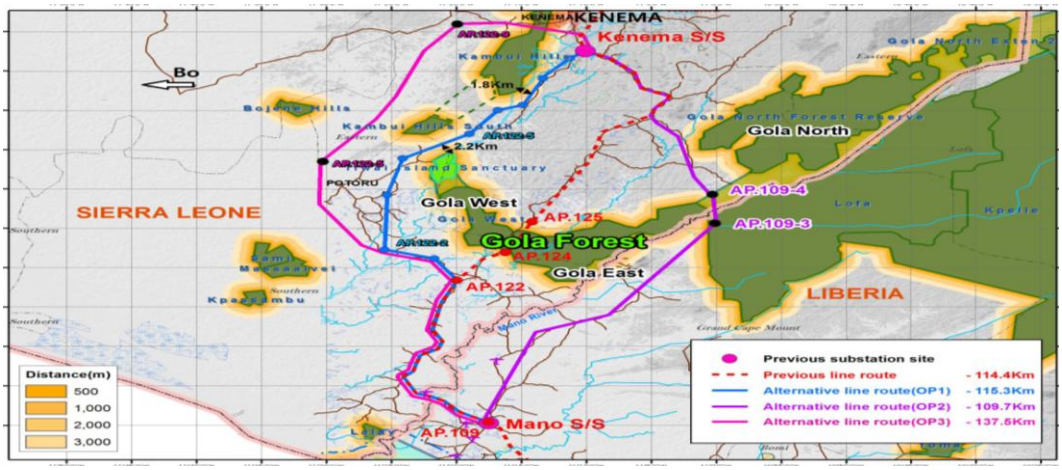
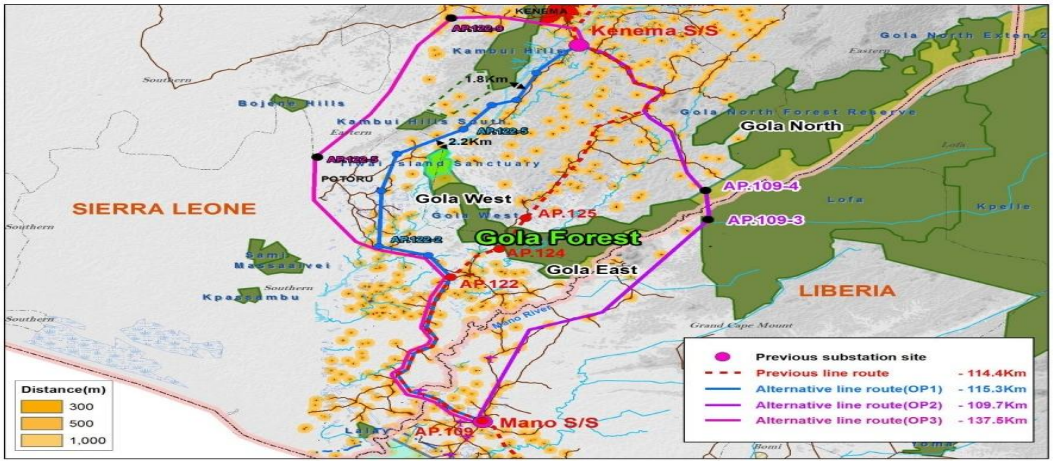


Figure 4 Communities within 300m distance from the Alternatives (Gola)



[Previously Selected Line]

There is a protected area inside the previously selected line route; Gola Forest. In line with the establishment of national park in Gola Forest, on 27th July 2010 the Government of Sierra Leone declared its intention to constitute the Gola Forest as a national park and the proclamation for the constitution of the Gola Forest National Park was gazetted on 16th December, 2010.

Taking 300m as a buffer between proposed option and local communities, this alternative line route encounters 10 villages.

This previous line route is located in flat plains and a hilly area. In general, this line route goes close to the existing Zimmi-Kenema highway to be used as an access road during the construction and maintenance phase, so this condition will be favorable to transport the construction material and maintain the transmission line.

The line length of the previous line will be 114.4km. Consequently, total construction cost for this line route will be approximately 12.35 million Euros.

[Alternative Option 1- Selected]

In this alternative, the previously selected line route passing through Gola Forest National Park (8.4km) was adjusted to be located further away from it by detouring to the west. Also, an effort was made to avoid the Tiwai Island and the separated Kambui Hills as much as possible to minimize the adverse impact on the nearest protected area.

Taking 300m as a buffer between proposed option and local communities, this alternative line route encounters 8 villages.

This Alternative Option 1 is located generally hilly area and partially swampy area. And the width of potential access road to be used during the construction is generally 2~2.5m. Due to this site features, many difficulties in delivery of tower materials, construction and future maintenance of transmission line are expected.

The line length of this Alternative Option 1 will be 115.3km which is 0.9km longer than previously selected line. Consequently, total construction cost will be approximately 12.43 million Euros.

[Alternative Option 2]

In this alternative, the previously selected line route passing through Gola Forest National Park (8.4km) was adjusted to be located further away from it. Alternative Option 2 avoids the Gola Forest National Park and Tiwai Island, which is registered as Ramsar site, by detouring it to the east and passes between current Gola East and North in the section AP109-3(OP2) ~AP109-4(OP2)

Taking 300m as a buffer between proposed option and local communities, this alternative line route encounters 5 villages.

This Alternative Option 2 is located generally hilly area. And the width of potential access road to be used during the construction is generally 2~2.5m. Due to this site features, many difficulties in delivery of tower materials, construction and maintenance of towers are expected.

The line length of the Alternative Option 2 will be 109.7km which is 4.9km shorter than previously selected line. Consequently, total construction cost will be approximately 11.89 million Euros.

[Alternative Option 3]

- Transmission line

In this option, the transmission line detours the Gola Forest and Tiwai Island on the West and follow the existing highway to reach the proposed Kenema substation.

Taking 300m as buffer between the proposed option and local communities, this alternative line route encounters 6 villages.

Alternative Option 3 is located generally flat area. And the width of the road to be used for access to tower during the construction is 6~8m and partially paved. Due to this site features, delivery of tower materials, construction and maintenance is expected to be easier than the other options.

The line length of Alternative Option 3 will be 137.5km which is 23.1km longer than previously selected line. Consequently, total construction cost for this alternative will be 14.83 million Euros..

- Location of Kenema Substation

The Consultant proposed current kenema substation site at Gorfor with the support of the NPA based on current situation as stated below.

Bo (Population was 269,000 according to the census in 2008). Kenema (164,125) and sourounding villages benefit from the Bo/Kenema Power Services (BKPS), a semi-autonomous body within the NPA. Bo has a thermal plant with the installed capacity of 5MW and it supplies the power to Bo, Kenema and surrounding villages during the dry season, while Kenema is supplied by the Goma Hydro Electric Power Plant currently upgraded to 6MW (4 x 1.5MW Franzis Turbine) during the rainy season.

The line route from Zimmi to Bo might be composed according to the Funding Agencies' recommendation encounters the following impediments:

- The line route length (from Liberia border to exit Sierra Leone to Guinea) will be augmented appreciably (from 115.3 km to 137.5km)
- Running the line route along the Bo-Kenema Highway to Kenema will eventually traverse the Kambui Hills, an ecological land mark, before entering Kenema.

The current line route with substation at Gorfor is positioned to be easily connected to the Kenema Substation with the downtown provided with a double circuit 33kV transmission lines from the Goma Hydro Electric Plant.

Table 3 Comparative Table of Alternatives in Gola Forest

Condition		Previous Line	Alternative OP1	Alternative OP2	Alternative OP3
Environmental Condition	Protected Area	Not avoided	Avoided	Not avoided	Not avoided
	Adjacent Protected Area (Distance)	Gola Forest (Passing trough)	Tiwai Island (2.2km away)	Future trans-park (passing through)	Kambui Hill (passing through)
Social Condition	No. of Communities within 300m	10	8	5	6
	No. of Communities within 500m	27	25	19	24
Technical Condition	Terrain (Altitude)	Flat plain and hilly (10-270m)	Hilly, partially swampy(10-200m)	Hilly (10-270m)	Flat (10-320m)
	River Crossing	3 (Mano, Moa River)	3 (Mano, Moa River)	1 (Mano River)	3 (Mano, Moa River)
	Length of T-line without existing access load (km)	-	5	18	5
	Construction and Future Maintenance	Medium	Difficult	Difficult	Easy
Financial Condition	T-Line Length(km) (Difference, km)	114.4	115.3 (▲0.9)	109.7 (▼4.7)	137.5 (▲23.1)
	Cost Estimation(Euro)	12,350,000	12,430,000	11,890,000	14,830,000

[Conclusion]

The previous line passed through the Gola Forest for a distance of 8.4km from AP124 ~ AP125, and was selected to go closely along the existing highway that already cuts through the forest to minimize impact on the environment. The line length was to be 114.4km.

In environmental aspect, the Gola Forest, the Tiwai Island and the Kambui Hills are ecological sensitive areas, so protection of these areas should be taken into consideration, as recommended by concerned Funding Agencies.

In Option 2, the line detours the Goal Forest and passes between the Gola East and North. However, as mentioned by Executive Director of Conservation Society of Sierra Leone, all segments of the Gola (East, West, and North) will be connected and new transboundary park will be established between Sierra Leone and Liberia. So, this option will pass through future transboundary park eventually in the section from AP109-3(OP2) to AP109-4(OP2) which is not favorable in terms of environmental protection.

Alternative Option 3 was developed to proceed along with the existing road from Potoro to Bo based on the recommendation from the Funding Agencies. However, in order to reach the proposed Kenema substation from Mano border without touching the Tiwai Island, the Gola Forest and the area between Kambui Hills and its south segment, this option would have to cross the Kambui Hills, another protected area in the section from AP122-9(OP3) to the proposed Kenema substation, for about 2km.

Alternative Option 1 is proposed in order to avoid all the current segments of Gola Foest as well as future transboundary Park, which will be established between Sierra Leone and Liberia. It also ensures that Tiwai Island and Kambui Hills are avoided with a minimum distance of 2.2km and 1.8km respectively. So, Alternative Option 1 is the most preferable line route among all the alternatives as it is possible to avoid all the sensitive areas in this section as confirmed by the Funding Agencies

1.6.2.3.2 Alternative Line Route in Nimini Hills Forest Reserve

Description of the Nimini Hills Forest Reserve

The Nimini Hills Forest Reserve is approximately 129 km2 and located in the southwest of Kono District. Vegetation in the reserve is closed forest belonging to the Upper Guinea forest zone, but the reserve has been partially logged.

The Nimini Hills Forest Reserve was surveyed in 2010 as part of the Sierra Leone National Chimpanzee Census Project. According to the Study, although no signs were found on transects, nests were found in the southwest of the reserve on recess. This indicates that there are some chimpanzees in the reserve, or at least at its periphery, though probably not in

significant numbers. The Nimini Hills retain much of their forest cover, and inventory and management of the forest resources, so there are necessary to maintain this resource into the future.

Major Consideration

- The Funding Agencies mentioned that there is an area where the line route will have to avoid or moved further away: Nimini Hills Forest Reserve

Analysis of the Alternative Line Routes

Figure 5 Distance from the Adjacent Protected Area (Nimini)

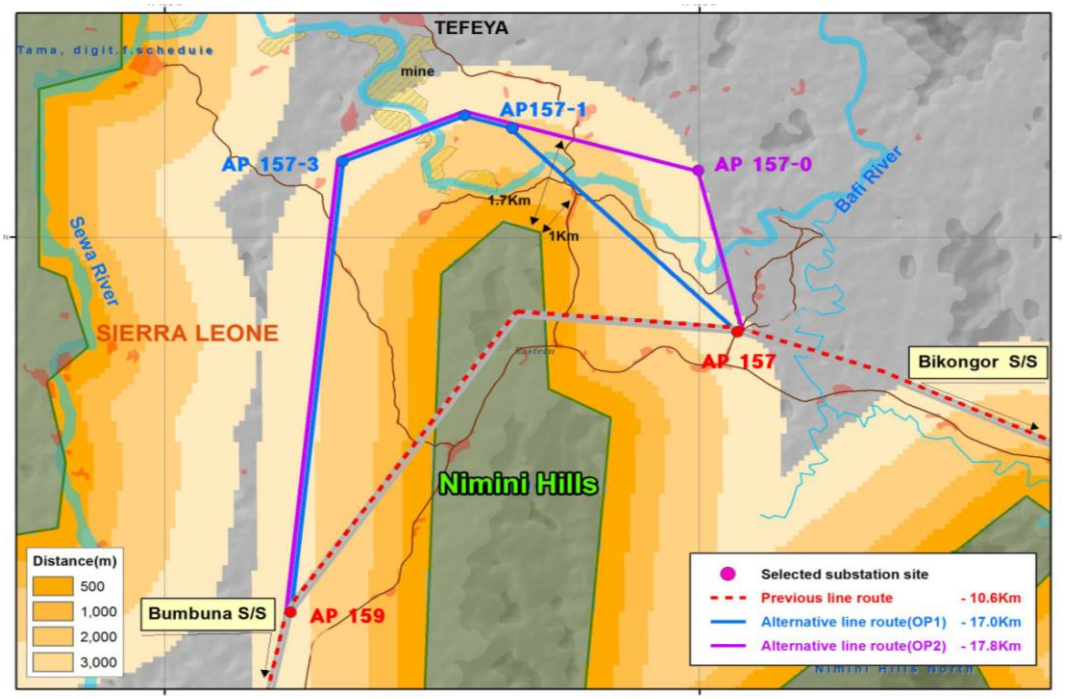
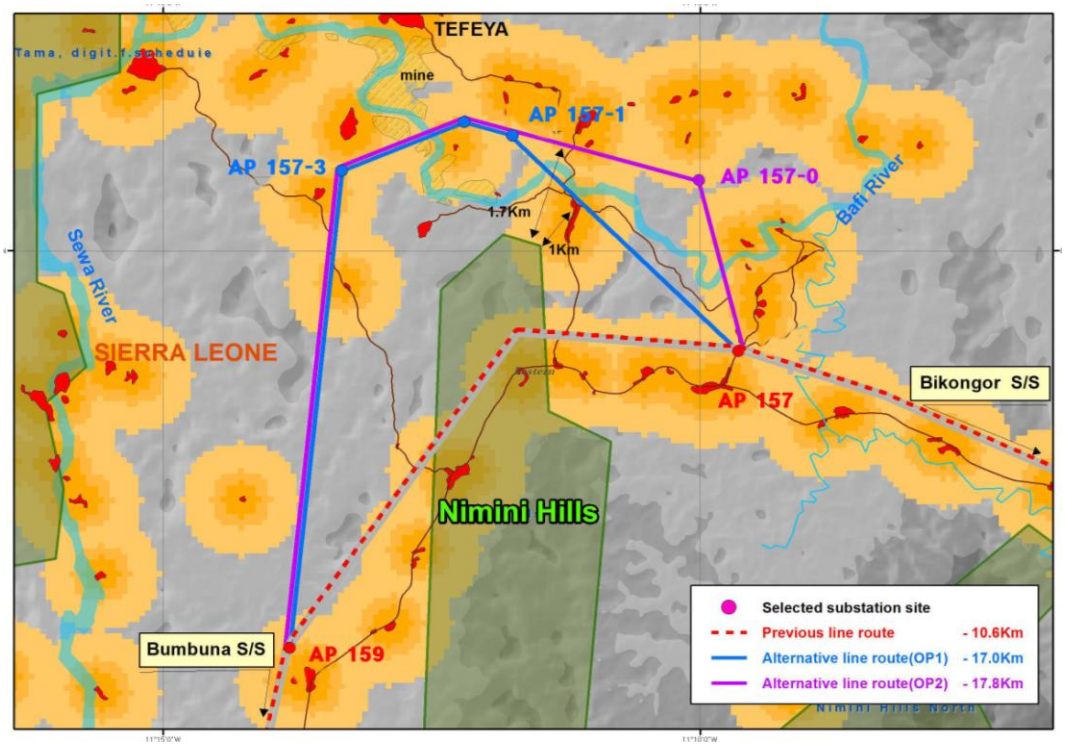


Figure 6 Communities within 300m distance from the Alternatives (Nimini)



[Previously Selected Line]

The transmission line connecting the Bikongor substation with the Bumbuna substation was proposed to traverse the outskirts of Nimini Hills Forest line which is one of the protected forest reserves of Sierra Leone. This route was made to follow the existing Yengema-Njaiama Sewafe road as much as possible to minimize the impacts on the surrounding environment by passing the already developed areas in the Nimini Forest Hills.

Taking 300m as a buffer between the previous line route and local communities, no villages are encountered.

This previous line route traverses northern parts of the Nimini Hills along with existing road. This area is located in relatively high area but the transversal slope is not steep. Because the transmission line is located on the southern side of the Bafi River, so it does not need to cross the River, this is the favorable condition for the transportation of the construction material and future maintenance.

The line length of this previous line will be 10.6km. Consequently, the total construction cost for this line route will be approximately 1.13 million Euros

[Alternative Option 1- Selected]

In this alternative, the previously selected line route passing through Nimini Hills Forest (3km) was adjusted to be located further away from it by detouring to the North with the distance of at least 1km.

Taking 300m as a buffer between proposed option and local communities, this alternative line route encounters 2 villages.

Alternative Option 1 is located near the mining area and generally hilly area. And, the width of the potential access road to be used during the construction is generally 2.5m. In order to make enough buffer from the Nimini Forest Hills, it inevitably crosses the near Bafi River which is not suitable in terms of future maintenance. Due to these site features, many difficulties in delivery of tower materials, construction and maintenance of towers are expected.

The line length of Alternative Option 1 will be 17km which is 6.4km longer than previously selected line. Consequently, total construction cost will be approximately 1.84 million Euros.

[Alternative Option 2]

In this alternative, the previously selected line route passing through Nimini Hills Forest (3km) was adjusted to be located further away from it by detouring to the North with the distance of at least 1.7km. Also, an effort was made to avoid the big villages located between Nimini Forest Hills and Bafi River.

Taking 300m as a buffer between proposed option and local communities, this alternative line route encounters 2 villages.

Alternative Option 2 is located near the mining area and generally hilly area. And, the geological features and site conditions of this line route are similar to Alternative Option 1. In order to make enough of a buffer from the Nimini Forest Hills as the case of Alternative Option 1, it inevitably crosses the neighboring Bafi River two times. Due to these site features, many difficulties in delivery of tower materials, construction and maintenance of towers are expected.

The line length of Alternative Option 1 will be 17.8km which is 7.2km longer than previously selected line. Consequently, total construction cost will be approximately 1.93 million Euros.

Table 4 Comparative Table of Alternatives in Nimini Hills

Condition		Previous Line	Alternative OP1	Alternative OP2
Environmental Condition	Protected Area	Not avoided	Avoided	Avoided

Condition		Previous Line	Alternative OP1	Alternative OP2
	Adjacent Protected Area (Distance)	Nimini Hills Forest (Passing trough)	Nimini Hills Forest (1km away)	Nimini Hills Forest (1.7km away)
Social Condition	No. of Communities within 300m	-	2	2
	No. of Communities within 500m	5	4	5
Technical Condition	Terrain (Altitude)	Hilly and flat (330-450m)	Hilly, riverside and mining area (310-380m)	Hilly, riverside and mining area (310-390m)
	River Crossing	-	2 (Bafi River)	2 (Bafi River)
	Length of T-line without existing access load (km)		5	5
	Construction and Future Maintenance	Easy	Difficult	Difficult
Financial Condition	T-Line Length(km) / Difference (km)	10.6	17.0 (▲6.4)	17.8 (▲7.2)
	Cost Estimation(Euro)	1,130,000	1,840,000	1,930,000

[Conclusion]

The previously selected line includes construction of 10.6km of transmission line in the vicinity of the Nimini Hills. This composition has several advantages for construction and maintenance because it runs along the existing highway. However, this line route would pass outskirt of the hotspots, Nimini Hills Forest Reserve. The Funding Agencies, however, mentioned that the Nimini Hills Forest Reserve is an ecologically sensitive area.

The Alternative Option 2 keeps a distance of at least 1.7km from the protected areas. Other conditions are similar to Option 1, however the length of transmission line is longer than Option 1 which will cost more for the construction of transmission line.

Alternative Option 1 was made to avoid the Nimini Hills Forest Reserve to the north because it is ecologically sensitive areas as mentioned by Funding Agencies. A minimum 1km buffer zone from Option 1 to the Nimini Hills Forest Reserve was created. The Option 1 is 6.4km longer than

previous line, however Option 1 is the most preferable line route among all the alternatives as it is possible to avoid the Nimini Hills Forest Reserve.

1.6.2.3.3 Alternative Line Route in Outamba-Kilimi National Park

Description of the Outamba Kilimi National Park

Outamba Kilimi National Park is the first national park in Sierra Leone. Located in the far north of Sierra Leone on the border with Guinea, it is divided into the larger Outamba section (783km^2) in the east and Kilimi section (274 km^2) in the west of northern Bombali district. The terrain is relatively flat with low rolling hills or plateaus which offer excellent views across the spectacular landscape. The eastern side of Outamba is more varied, with more hills reaching 300-400m elevation. Vegetation is primarily southern Guinea savanna woodland with trees such as Lophira and Daniellia. A small proportion of the area is made up of forest, narrow riverine forest, or small patches of savanna. The savanna grasses are primarily a tall elephant grass which is burned annually by people in the park. Almost all areas of the park are affected by the burning.

The site supports at least nine species of primates including Western Chimpanzee, red colobus, black and white colobus, sooty mangabey, and olive baboons. The total number of bird species recorded in the park is 220. A small population of forest elephant occurs at Outamba. Other large mammals include leopard, pygmy hippopotamus, water chevrotain, Maxwell's duiker, and forest buffalo. Both sections of the reserve are located within one chiefdom (Tambakha, the least populated of all chiefdoms in the country).

Major Considerations

- The Funding Agencies recommended verifying future plans in Outamba-Kilimi National Park area and accordingly selecting the most optimal transmission line route.
- The Ag. Director of Ministry of of Agriculture, Forestry and Food Security of Government of Sierra Leone indicated there is a major corridor between two separated Outmaba and Kilimi Parks which is used for the passage of wild life.
- The STEWARD (Sustainable and Thriving Environments for West Africa Regional Development) Program Coordinator indicated that Outamba-Kilimi National park is one of the environmentally sensitive areas and there is a possibility that the separated two forests, Outamba and Kilimi Forest would be joined together. Also, it was indicated that transboundary park between Sierra Leone and Guinea including Outamba-Kilimi National Park would be established in future.

Analysis of the Alternative Line Routes

Figure 7 Distance from the Adjacent Protected Area (Outamba-Kilimi)

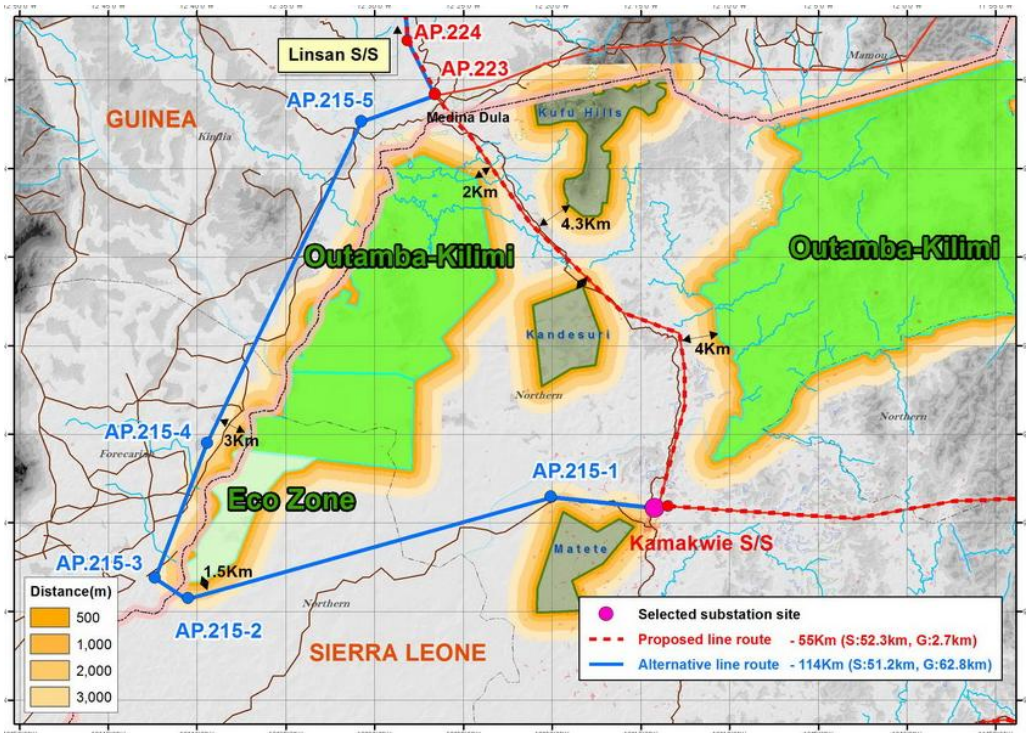
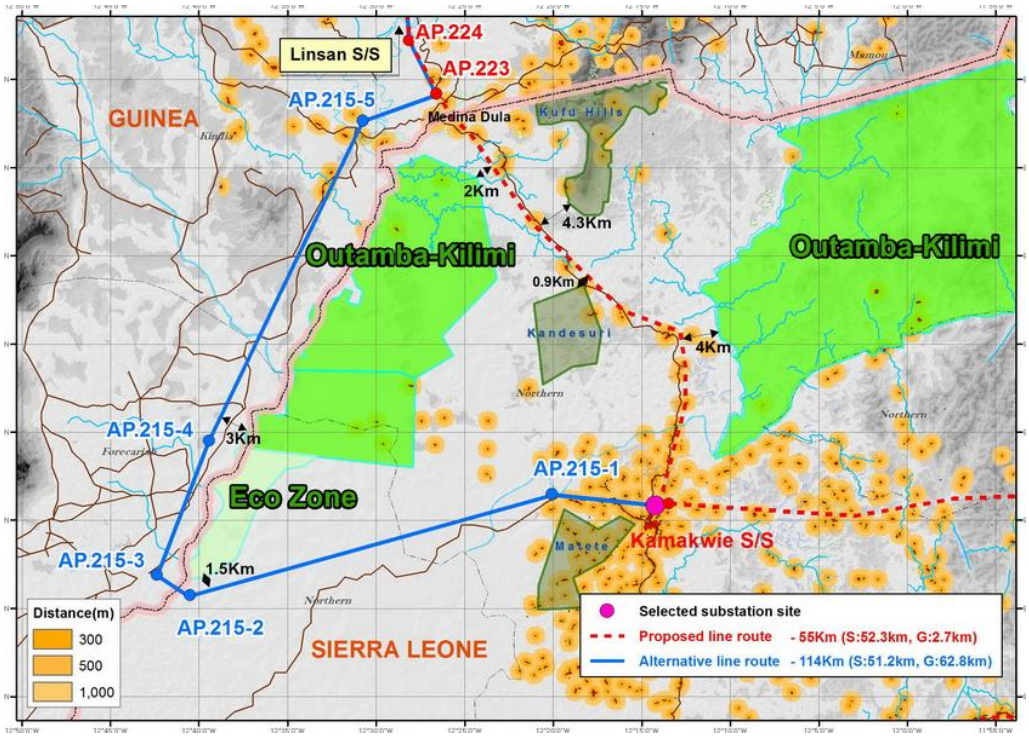


Figure 8 Communities within 300m distance from the Alternative (Outamba-Kilimi)



[Previously Selected Line]

The transmission line connecting the Kamakwie substation of Sierra Leone with the Linsan substation of Guinea was proposed to traverse between separated two forests, Outamba and Kilimi forests not crossing themselves. This line route was made to use the existing road and path as much as possible and to connect the Linsan substation with the shortest transmission line. However, as indicated by the Ministry of Agriculture, Forestry and Food Security (MAFFS) of Sierra Leone, there is a possibility that the separated two forests might be joined together in the future.

Taking 300m as a buffer between this line route and local communities, this previous line route encounters 4 villages.

This previous line route is located in generally flat area partially hilly area. This line route goes close to the road exists between the Outamba and the Kilimi Forests to be used as an access road during the construction and maintenance phase, so this condition will be favorable to transport the construction material and maintain the transmission line.

The line length of this previous line will be 55km and the construction cost will be approximately 5.91 million Euros.

[Alternative Option 1-Selected]

In this alternative, the previously selected line route traversing between passing through Outamba and Kimili National Parks was adjusted to be located further away from it by detouring to the south and west. Potential eco zone of the parks was also taken into consideration as well as the current boundaries of the parks.

Taking 300m as a buffer between proposed option and local communities, this alternative line route encounters 5 villages.

Alternative option 1 is located in generally flat area partially hilly area. And the width of the potential access road to be used during the construction is generally 2.5-3.0m and there are more river crossing points more than the previous line. Due to these site features, not many difficulties but more than Option1 in delivery of tower materials, construction and maintenance of towers are expected.

The line length of Alternative Option 1 in Sierra Leone section will be 51.2km which is 1.1km shorter than previously selected line. Consequently, total construction cost will be approximately 5.41 milliom Euros.

Table 5 Comparative Table of Alternative in Outamba-Kilimi

Condition	Previous Line	Alternative OP1

Condition		Previous Line	Alternative OP1
Environmental Condition	Protected Area	Not Avoided	Avoided
	Adjacent Protected Area (Distance)	Outamba-Kilimi National Park (Passing trough)	Outamba-Kilimi National Park (1.5km)
Social Condition	No. of Communities within 300m	4	5
	No. of Communities within 500m	8	9
Technical Condition	Terrain (Altitude)	Flat partially hilly (80-190m)	Flat partially hilly (50-230m)
	River Crossing	1 (Kaba River)	3 (Kaba River, Great Scarcies River, Kilissi River)
	Length of T-line without existing access load (km)	-	-
	Construction and Future Maintenance	Easy	Difficult
Financial Condition	T-Line Length(km) / Difference (km)	52.3	51.2 (▼1.1)
	Cost Estimation(Euro)	5,620,000	5,410,000

Ref: The information on this table is for Sierra Leone section only and Guinea section was excluded.

[Conclusion]

The previous line route was selected to pass between two separate parks and its length is 52.3km in Sierra Leone section. It aimed to make a shortest line route between the proposed Kamakwie and Linsan substation by following the existing road and facilitate convenient construction and maintenance of the transmission line. However, the Outamba-Kilimi National Park was referred as Hotspot by the Funding Agencies and several NGOs. Therefore, it is necessary to minimize the potential impacts on this area as much as possible.

Alternative Option 1 was composed to detour the Outamba-Kilimi National Park to the south and west. It includes the construction of 51.2km transmission line in the vicinity of the Outamna-Kilimi National Park. It is more preferable line route to previous line, as it is possible to avoid the Outamba-Kilimi National Park keeping a distance of at least 1.5km

2 PROJECT DESCRIPTION

NPA intends to undertake a project that will comprise the construction of a 225 kV high voltage transmission line for a distance of approximately 530 km from Bombohun in the Soro Gbema Chiefdom, Pujehun District, south of the country through Kenema, Headquarter Town of the Eastern Province on to Bkongor, Kono District, Bumbuna, Fadugu and then Kamakwei, in the north, and through Tambakka Chiefdom, Bombali District, then kambia district to Guinea border.

The proposed transmission line passes through seven (7) districts. During itrs course in the Pujehun and Kenema District, it will pass along the Zimmi – Bambako-Sahun-Gofor-Kenema.

The proposed line by-passes the Kambui Hills in Kenema District. The proposed line route also bypasses the Outamba-Kilimi National Park in Bombali District in its path to Kamakwei onto Laya in Guinea.

Furthermore, NPA intends to construct five new high voltage substations along the electric transmission line route.

Studies and surveys have been conducted in the selection of the line route and the substation sites identified by the Consultant.

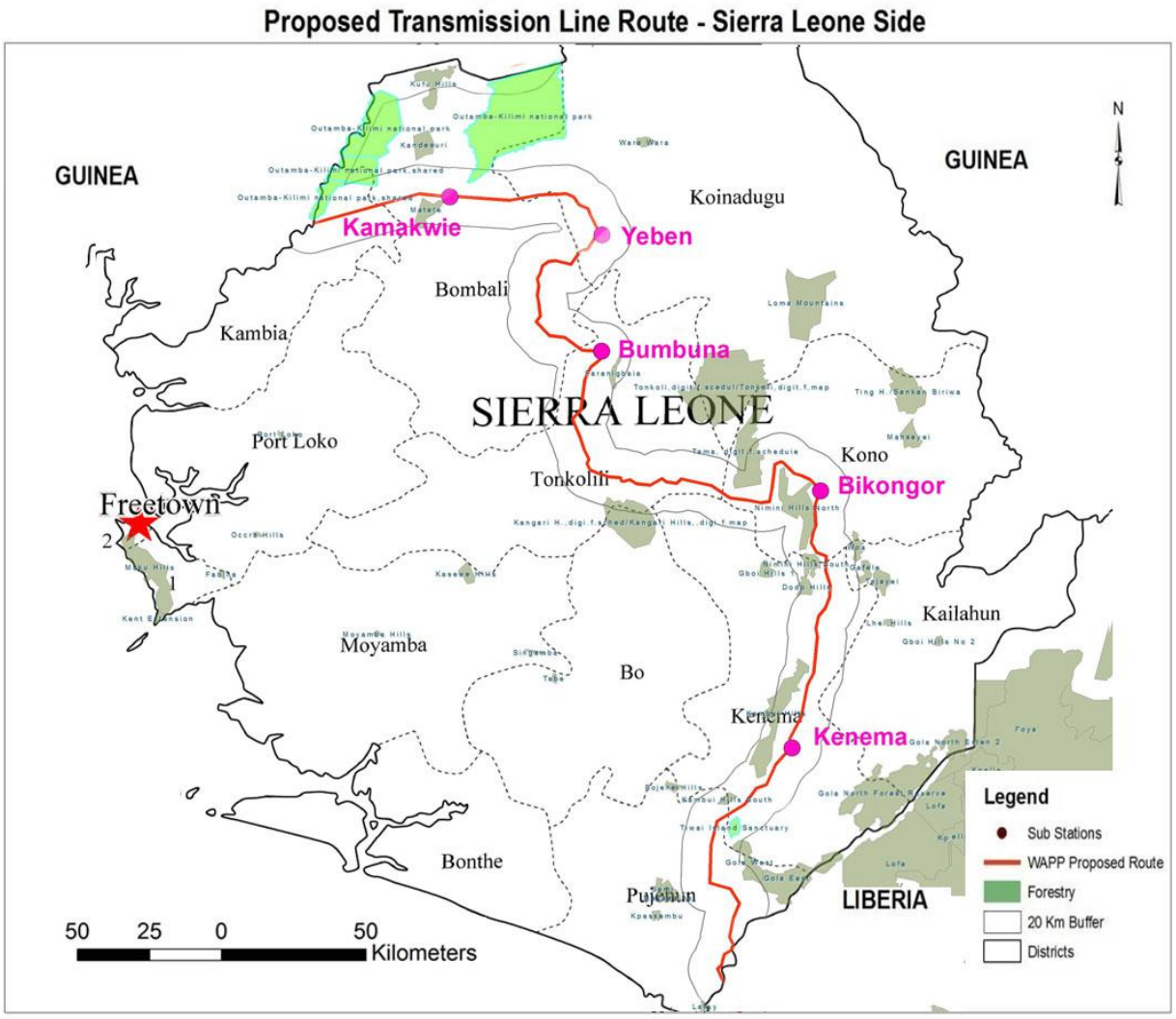
Table 6 below presents the substation sites that are the preferred options, the chiefdoms and districts in which they are located.

Table 6 Substation Sites Location

NO	NAME OF SUBSTATION	LOCATION	CHIEFDOM	DISTRICT
1.	KENEMA	GOFOR – 2 km TO KENEMA TOWN from Zimmy	NONGOWA	KENEMA
2.	BIKONGOR	NDOYOGBOR – 2 km TO JIAIMA NIMIKORO H/Q TOWN	JIAIMA NIMIKORO	KONO
3.	BUMBUNA	KABARAY – 3 km TO BUMBUNA	KALANSOGOIA	TONKOLILI
4.	YIBEN	**KATAADOMGBU** ROAD – **FADUGU** TOWN	KASUNKO	KOINADUGU
5.	KAMAKWEI	**KATHIRIE** – 4 km FROM **KAMAKWEI** TOWN GOING TO FINTONIA	SELLA LIMBA	BOMBALI

Figure 9 shows a map of Sierra Leone and the proposed Transmission Line Route.

Figure 9 Map of Proposed transmission line route



The project, which is at the preconstruction stage, requires an Environmental and Social Impact Assessment Study to be carried out in line with the Environment Protection Act, 2008 and the Environmental Assessment Procedure, 2001. The relevant aspects of the proposed project, as regards the ESIA are the construction, operation and maintenance of the five substations, and the construction of the 530 km transmission line through the seven districts and the protected forests it will be traversing.

The elements of the project that have already been carried out during the pre-construction stage are the preparation of feasibility line route study to identify the route to be taken by the proposed transmission line and the location of the five substations.

The Environmental Impact Statement concentrated on environmental, socio-economic and cultural impact issues that relate to delivery to site of equipment and material, erection of towers, stringing of lines, construction of substations, testing and commissioning of a total of approximately 530 kilometers 225 kV transmission line. The line will be fitted with an optic fiber conductor (OPGW), which will be used for power system protection, control and communication.

The proposed project will, among others, consist of the erection of steel transmission towers along the route. The height of the towers will be such as to provide a minimum of 8.0 meters clearance between the lines and open ground and 8.0 meters clearance for roads and houses. Typically, as with the existing system, the towers will be about 35 ~ 40 meters high.

2.1 Description of Activities

2.1.1 Pre-construction Phase

The activities to be undertaken during this phase of the proposed project include:

- Project planning and design
- Line route survey
- Consultations
- Sourcing of funds and contractors
- Collection of baseline data such as flora and fauna survey, socio-economic and other baseline data for the preparation of the ESIA report.
- Preparation and submission of an Environmental and Social Impacts Assessment report.
- Acquisition of Project Environmental Permit
- Acquisition of the right-of-way (RoW)

2.1.1.1 Project planning and design

This phase of the project cycle involves the conceptualization, feasibility survey and preparation of feasibility study report.

2.1.1.2 Line route survey

This activity was carried out by survey consultants from Korea Electric Power Corporation (KEPCO). They carried out the survey of routes, established profiles and selected the best route from several different options taking several factors into consideration. Some of the factors

taken into consideration in the choice of the proposed line route included overall distance and the avoidance of the potential destruction of properties and other environmentally sensitive areas by the alignment of the route off industrial, settlements and commercial areas, cultural resources such as sacred groves, cemeteries, and other potentially sensitive areas.

The details of transmission line route and substations site selection are indicated in Section 5 and 6 of the "Amended Final Line Route Study Report (September 2011)".

2.1.1.3 Consultations

During the environmental and social impact studies, some traditional authorities, communities, opinion leaders, District and Town Councils, and regulatory agencies were consulted. This was to enable the ESIA team gain access to the proposed route and substation sites as they had to particularly identify the preferred options of the proposed substation sites.

2.1.1.4 Sourcing of funds and award of contracts

Another activity that will depend to a large extent on the issuance of an environmental permit will be the sourcing of funding for such a major development. The proponent may source funding from the major funding agencies such as the European Investment Bank, World Bank, African Development Bank and KfW. The ESIA prepared in accordance with internationally acceptable standards. With the availability of funds, the proponent may then go ahead and award the contract for the actual construction of the proposed transmission line.

2.1.1.5 Preparation and submission of an ESIA

Collection of baseline data such as information on flora and fauna in the protected forests and line route, potential affected communities, types and size of farms, socio-economic status of the settlements in the project area and other baseline data are necessary for the preparation of the ESIA and the compensation of land and crop owning families.

2.1.1.6 Acquisition of Project Environmental Permit

After submitting the ESIA report including an Environmental and Social Management Plan (ESMP) and a Resettlement Action Plan (RAP), Project Environmental Permit will be issued from the Environment Protection Agency (EPA) of Sierra Leone.

2.1.1.7 Acquisition of the Right-of-Way (RoW)

Based on the issuance of an environmental permit from the EPA, the proponent may then go ahead and acquire the right-of-way in compliance with all laws, regulations, operational directives and guidelines.

The NPA Act, 1982 provides for the governance, other details and responsibilities of NPA, the proponent of this interconnection project. The relevant parts of the Act affecting the transmission and distribution works of the project are:

1. Part III, Section 33 covering the removal of trees and other objects interfering with transmission lines.
2. Part V, Sections 40 – 47 covering acquisition of land by NPA for carrying out its functions as well as power to enter various premises in the course of their work. It also covers relationships between NPA and other agencies in the conduct of their operations.
3. Part IX, Sections 64 – 71 covering offences and sanctions relating to interference with the NPA network. This provides NPA with the necessary power to protect its installations from public interference.
4. Part X, Sections 72 – 73 covering the role of NPA in making regulations specifying among others, minimum standards and specifications for design, construction, protection and maintenance of installations and equipment in the network.

Thus, the NPA Act provides the necessary legal backing to enable NPA to protect the network from interference by the public, and this includes the need for the acquisition of the RoW. Many substations and the network may be exposed to acts of vandalism and this may pose severe threat and hazards to the general public. This issue was considered very serious and hence the relevant sections of the Act will be enforced to protect the transmission and distribution of the electricity from this CLSG interconnection project.

The World Bank Safeguard Policy on Environment (OP 4.01) states that the Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. The policy also provides for classification of proposed projects into categories A, B, C and F1 depending on the type, location, sensitivity and scale of the project and the nature and magnitude of its potential environmental impacts.

The World Bank Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution, (April, 2007) provide the necessary guidelines for construction of Right-of-Way and Right-of-Way Maintenance. An appropriate link has been established between the ESIA

and RAP studies in order for the appropriate guidelines for RoW limits and clearance to be maintained and to facilitate the determination of project affected persons.

The World Bank Safeguard Policy on Involuntary Resettlement (OP 4.12) provides the necessary guidelines for dealing with the various issues related to impacts of the transmission and distribution works on persons and properties within the RoW along the 225 kV transmission line route as well as in the vicinity of the substations. The Resettlement Action Plan study of this project has been conducted to highlight the social impacts and how they will be addressed.

The 1991 Constitution of Sierra Leone, Chapter 111, Section 21 prescribes that fair and adequate compensation should be paid to all affected by state acquisitions. The procedures used by NPA to ensure that all communities and persons, including women, affected by the transmission line project are adequately compensated are set out below:

- Referencing of all properties, land, crops and buildings by officers of the Lands and Surveys Committee of the District Councils and Chiefdom Lands Committee;
- Assessment of the compensable values employing the Valuation Form set out in the First Schedule of the Local Government Act, 2004;
- The assessed report would be vetted and corrections effected where necessary to ensure that the amounts are accurate and fair to both claimants and the Authority. These would then be processed for payment;
- Offers would be made to the claimants on the basis of the Lands and Surveys Committee of the District Councils and the Chiefdom Lands Committee;
- In this regard, such claimants are required to submit counter proposals supported by valuation opinion prepared by private valuation experts of their choice;
- The private reports are considered by NPA in conjunction with the Lands and Surveys Committee of the District Councils and Chiefdom Committees;
- Where necessary, the dissatisfied persons or communities would be invited to negotiate and arrive at acceptable figures;
- Project affected communities and persons may resort to legal action in order to have their grievances addressed;
- In the case of the acquisition of the RoW along the Protected Forests mentioned, SPC would have to obtain clearance from the Government through cabinet concurrence from the Forestry and Wildlife Department of the Ministry of Agriculture, Forestry and food Security.

2.1.2 Constructional phase

The characteristics of the proposed project involve several activities and components. These involved activities such as those discussed below.

2.1.2.1 Tower spotting

Another activity that will be contingent upon the issuance of an environmental licence and the availability of funds will be tower spotting. This is the determination of individual sites for the installation of the towers. It was pointed out here that tower spotting will take place over the entire length of the transmission line.

Activities along with tower spotting included final survey, flora, fauna and soil investigation. This is particularly critical in the protected. These activities necessitate intrusive access and some clearing of vegetation, leading to possible destruction of crops. Geotechnical survey and tower spotting are therefore activities that shall be carried out subsequent to the issuance of an environmental permit and availability of funds from the lending agencies to identify the optimum foundation design for each tower.

The selection of the tower/poles type and foundation design type will follow the collection and analysis of data of each tower location after flora, fauna and soil investigation. After this stage minor adjustments may be made to the final tower location, due to the nature of the biodiversity in especially these protected forest areas, vertical profile of the transmission line corridor, and to avoid habitats of endangered animal and plant species, settlements and structures that may have been constructed subsequent to the collection of baseline data on structures in the proposed RoW. Such adjustments will be limited to a few in the selection of the tower locations.

2.1.2.2 Construction of access and tower corridor tracks

A tower corridor track of approximately 3 m width shall be constructed under towers almost continuously along the centerline of the line route. In Sierra Leone, the existing public roads shall be used to construct and gain access to towers and the proposed line. Where public roads do not exist, as in the case of the protected forest areas, access tracks will be constructed from the closest public roads to the RoW at intervals along the proposed line route. New access tracks, which will be constructed during constructional phase, in addition to the tracks constructed during the line route survey will be retained and maintained for the operational phase. This measure will prevent the clearing of additional vegetation and disturbance to animal species to make way for new access tracks for the operational, phase. The tracks will be used for this phase of the project cycle for the transportation of men and material to the line route for the installation of towers and the stringing of lines.

The tracks will be so constructed as to have a width of about 3 m and will be cleared of tree stumps, shrubs and other vegetation likely to obstruct the transport of construction machinery, equipment and operations and maintenance staff to the tower corridor. Lopped trees will be neatly stacked on one side of the proposed tracks for the use of, or sale by, the communities close to the site of clearance.

2.1.2.3 Clearing of Right-of-Way

The construction and operation of the proposed line will require a right-of-way 20 m on each side of the centre line of the transmission line. The right-of-way will therefore be of width 40 m. The total of 40 m wide corridor, which will run the 530km total length of the transmission line from the Pujehun axis to the Kamakwei axis close to the border of the Guinea side of the project, shall be cleared of vegetation to a height of 1.25 m above ground level.

Trees considered being potentially capable of threatening the proposed transmission line beyond the 20 m width on each side of the centre line of the transmission line will be cut down or pruned as appropriate. These will be trees, which could damage the transmission line if they fall on it or those whose branches may grow so big as to disturb the lines. Cut trees will be neatly stacked to one side of the proposed tracks for the use of, or sale by, the communities close to the site of clearance. All vegetation clearance will be done by physical means. Minimal food crop farming and vegetable gardening will be allowed within the RoW up to a height of around 1.25 m, as this will reduce maintenance costs.

2.1.2.4 Clearance and excavation of tower base and foundation

Areas to be cleared will be the proposed tower base areas. These will be selected spots within the RoW for mounting the towers. The area to be cleared for a single tower will be made up of the dimensions of the tower base (5 m x 5 m). So the total tower base area will be approximately 25 m² per tower. The average span between towers is about 400 m. Thus the total number of towers, approximately 1,325 towers/units will be needed for the purposes of the construction of the transmission line. This total area to be cleared will not be in addition to the total area to be cleared for the RoW but will be within the RoW.

The area to be cleared for a single tower will be made up of the dimension of the tower base (5 m x 5 m) with an additional buffer of 2 m on two sides of the base.

Tower foundations will vary according to the prevailing geology and biodiversity. A majority of them will however have footings of the pad and chimney type, which will be excavated mechanically. By this method a concrete pad will be constructed at the bottom of the

excavation, and each foot of the tower erected within its own 'chimney' of steel reinforced concrete. After about two days, the formwork will be removed, and the excavation will then be backfilled to original ground level and compacted.

The ground surfaces of the tower sites will be so graded as to gently provide drainage away from the tower legs and to avoid the collection of water (leading to the creation of stagnant pools) at the tower bases. Where necessary, (particularly on hillsides) terracing, cribbing or riprap may be used to provide protection for tower foundations.

In areas prone to flooding, (swampy areas) a raft foundation for transmission line towers may be used. The raft foundation is similar in concept to the pad and chimney foundation except that all four feet of each tower will be set on a single raft of concrete.

2.1.2.5 Clearing of tower track

A track of about 3 m width will be cleared and maintained under sections of the proposed line as far as is practicable. This track will be cleared of all obstructing tree stumps and roots in order to allow the unimpeded movement of light maintenance vehicles for patrolling the line and for the transportation of tools and maintenance crew during the constructional and operational phases of the transmission line.

2.1.2.6 Clearing and excavations for substations

A total of five substations will be constructed in the Sierra Leone side of the project. An average of 200 m x 200 m land space will be required for each substation (totaling 200 m x 200 x 5 substations). This total land area required for the construction of the facilities shall then be cleared of all vegetation in order to afford access to construction sites. Sites shall be graded and landscaped.

2.1.2.7 Storage and transmission of equipment and materials

Almost all the materials to be used in the construction of the transmission line will be imported. Such components include tower steel and its components in broken down form, conductors, insulators, transformers, switchgear, etc. Materials that will be produced locally include aggregates, cement, sand, stone and other miscellaneous supplies and services. The imported components will be delivered by ship to the Queen Elizabeth II Port at Cline Town, Freetown. After clearance from the port, the materials shall be stored at the contractor's storage site. It must be noted that the materials for the towers will not be bulky and unwieldy. They will therefore not require any specialized vehicles.

During the construction, the materials will be transported to the site via public roads and access tracks. Vehicle movements will be minimal since the work camps will be sited close to the proposed work sites.

The locations of the work camps cannot be specified now but their construction will not involve extensive vegetation clearance. In addition, the work camps will be constructed:

- At least 1 km from natural water courses and marshlands;
- At least 1 km from the settlements and on relatively level ground.

The locations of the work camps will not impact negatively on cultural properties, and on forest reserves. They will also be so located as to avoid the destruction of crops and buildings.

2.1.2.8 Erection of towers and stringing of transmission lines

After transporting the steelwork and its components from the yards to the site, the erection of the transmission towers will proceed. 1,325 towers/units will be needed for the proposed project.

The towers will have concrete footings with foundation depth of 2 – 3 m or more depending on the nature of soils at the selected tower spots. Once the towers are erected, the conductors and shield wires will be strung and appropriately 'tensioned' to provide the minimum clearance between ground level and the wires.

The proposed line is expected to cross overhead power and transmission lines, highways, roads, and rivers and streams. In crossing such lines, guard structures will be used when installing the conductors to ensure that the line does not cause hazards and nuisance to the public, wildlife and construction staff alike. Due notification will be communicated to the appropriate authorities in cases where these lines will have to cross roads and utility lines. Once the towers have been erected and the lines strung, tests and measurements shall be carried out to ensure that the line performs as expected. Minimum distances such as clearance between the lines and the ground level shall be checked and the lines shall be 'tensioned' as per specification. After the construction of the line, the soil conditions along the Right-of-Way will be assessed for such problems as compaction and erosion and mitigative action taken as appropriate. Areas of bare soil are expected to be re-afforested by native cover plants to stabilize the soil, reduce erosion and prevent invasion by undesirable plant species.

It must be pointed out here that no chemicals will be used for the control of vegetation and that all vegetation control measures shall be done manually. As indicated in Section 2.1, the line will be fitted with optic fiber cable (OPGW), which will be used for system protection, control and communication purposes.

2.1.2.9 Summary of project life cycle phases

Table 7 Key phases of the project and relative timing

Project Phase	Activity Description	Estimated Duration (Months)	Comments
Construction	Clearing of RoW, tower tracks, excavation of tower base, erection and stringing of lines, grading and substation construction, equipment installation	36	Typical industrial construction methods; construction lay down areas to be landscaped (trees/grass) at end of construction
Commissioning	Testing and first operation of equipment; frequent starts and stop operations	9	Frequent starts and stops
Operation	Operation and maintenance of equipment	Indefinite	WAPP operational manuals to be strictly followed during operation of substation and transmission line
Decommissioning	Removal of equipment and pulling down of buildings	Indefinite	Plant and equipment may potentially be recycled

2.1.2.10 Road crossings

The proposed transmission line will encounter one main highway with asphalted surfacing and the rest will be gravelly road. A list of some road crossings to be encountered by the transmission line is shown in the table below.

Table 8 List of Road crossings

Name of Road	District
Bombuhun – Zimmi Highway	Pujrhun District
Zimmi – Kenema highway	Kenema District
Kenema – Tongo Highway	Kenema/Kono District
Tongo – Jiaima Nimikoro	Kenema/Kono District

Jiama Nimikoro – Jiaima Sewafe Road Kono	Kono District
Jiaima Sewafe – Bumbuna Highway	Kono/Bombali District
Bumbuna – Fadugu Road	Bombali/Koinadugu District
Fadugu – Kamakwei Road	Koinadugu/Bombali District
Kamakwei – To Guinea Border	Bombali/Kambia District

2.1.2.11 River crossing list

The proposed transmission line will also encounter some rivers. A list of some of the rivers to be encountered by the transmission line is shown in Table 9.

Table 9 List of River Crossings

Name of River	District
Mano	Pujehun District
Sewa	Kenema District
Moa	Kenema District
Bafi	Kono District
Great and Little Scarcies	Kambia District

2.1.3 Operational Phase

The operational phase of the project will involve the commissioning of the line and maintenance of the RoW, the power lines, towers and substations.

The operation and maintenance of the transmission line will be based on accepted international standards, such as those of the International Electronic Technical Commission (IEC). The NPA has its own specific procedures for the operation and maintenance of its lines as set out in the NPA Safety Rules.

This ESIA document concerns itself with issues, which are considered of paramount importance such as public safety and the safety, health and welfare of the maintenance and operation crew.

The main activities to be carried out during the operating life of the transmission line include surveillance of the condition of the transmission line, towers and RoW; routine and emergency maintenance and repairs; and vegetation control.

The NPA maintains a Distribution and Transmission Department with headquarters at Falconbridge, Freetown responsible for the operation and maintenance of its distribution and transmission network in Sierra Leone. The Department carries out its duties under three broad categories. These are discussed below.

- **Routine running maintenance**

This consists of routine maintenance carried out by the Department to ensure the integrity and safety of the lines. The maintenance activities carried out here include:

- Foot patrol. The Line Maintenance team carries out routine physical examination of the transmission line and its component parts to ensure safety, security and integrity of the line. Such activities are carried out at least twice a year;
- Security patrol. This is done to check on segments of the line close to populated areas for signs of vandalism, branches of trees interfering with lines, tampering, and general security of the lines. It is to ensure an early detection of and rapid response to acts of vandalism and to rectify such situations as promptly as possible;
- Tower auditing and repairs. This provides a means of assessing the ageing process of towers. It starts one year after the commissioning of a line section and it follows a one year cycle. In a cycle of tower auditing, 10% of all suspension towers and all dead-end towers are thoroughly examined. As the line ages, it is subjected to wear and fatigue which may not be noticeable by a distant visual inspection. Detection and tightening of loose bolts on supports and hardware can reduce premature wear and indicate for replacement of worn components before failure;
- In the course of its operation, defects that are identified are repaired. Such defects may include the replacement of defective conductors, flashed over insulators, defective dampers, vandalized components, and maintenance of access tracks and RoW.

- **Planned maintenance**

These are scheduled maintenance Programs that are carried out on the transmission line in accordance with manufacturers of equipment specifications or as a result of the ageing of towers, the lines and other accessories. The repairs may also arise out of the running maintenance activities. These maintenance Programs usually become necessary as a result of the number of hours the substations may have worked, say for example, 3000, 6000 or 9000 hours of operation. Some of the activities carried out under the planned maintenance include:

- Replacement – insulation of sections of the transmission line;
- Treatment of rust and re-painting of tower components;
- Replacement of conventional bolts and nuts with anti-theft fasteners on older line sections;
- Rehabilitation of access roads and tracks;
- Inspection and maintenance of switchgears, protection systems, etc.

➢ **Emergency maintenance**

These are activities relating to correction of sustained faults. These could span a whole spectrum of minor faults (e.g. insulator failure) to such major defects as tower failures. Some of the activities carried out under this program include the construction of temporary by-pass line to replace collapsed sections of lines, reconstruction of the collapsed section, and ground patrols to locate sustained line faults. Aerial patrols may sometimes be necessary to ascertain faults in high overhead transmission lines.

2.2 Consideration of Alternatives

The National Power Authority intends to reinforce the electricity supply situation of seven out of its thirteen districts - Pujehun, Kenema, Kono, Tonkolili, Koinadugu, bombili and Kambia - and at the same time foster power exchange among the countries in the West African sub-region. The proponent has corporate responsibility to ensure that environmental and social management principles are diligently applied in all phases of a project of this nature. In this regard, various alternatives have been considered in terms of line route and substation selection, equipment and the feasibility of the project. The chapter maps out and compares the alternatives considered for the line route and selection of the five substations. This section in this chapter presents in comparative form the alternatives to a "no development" scenario, defining the advantages of each alternative and providing clear basis/criteria for choice among options by the proponent and the public. Some of the information used to compare the alternatives is based on the design/advantage of the design and some of the information is based upon the environmental, social, and economic effects of implementing each alternative. Factors considered that influenced the decisions of the proponent in the selection process are described below:

2.2.1 Scenarios considered

2.2.1.1 The "No Development Scenario"

The situation in Sierra Leone requires that energy supply capacities be urgently augmented and reinforced. Several years of war has devastated the country's energy infrastructure. The purposes and objectives of the proposed project have been outlined under Section 1.1. The main objective is to increase the country's energy capacity, reinforce that capacity and foster exchange of power between some countries in the sub-region. Naturally, it is feasible for the Government to consider other sectors as priority and stay action on the energy sector

.

Taking no action at this stage would undermine the objectives of the project and the overall national energy policy of the county. In the event of the failure of the proponent to carry out the proposed development, the laudable objectives discussed in Section 1.1 may not be achieved. This may result in severe inability to meet the energy demands of the country as demand far exceeds supply. In addition, the economic challenges of operating thermal plants with their attendant high and ever-increasing costs of production coupled with their significantly negative impacts on the environment may be too high a cost on the country's economy, affecting the pace of economic development and poverty alleviation.

The advantages of the "No Development Scenario" are:

- Land that would otherwise be occupied by the five substation sites and the transmission line (or other project alternative) would continue to remain available; in some instances, the population employs these lands for income-earning activities (e.g. agriculture). With the reduced need for land acquisition and development, the likelihood of people being displaced would be reduced.
- No increase in likelihood of environmental impacts.

  Potential impacts that may be avoided if the project Agenda for Change scenario were implemented include:

  - Habitat disruption;
  - Contamination associated with construction;
  - Air quality deterioration;
  - Removal of vegetation;
  - Visual resources, etc.

2.2.1.2 The proposed action – Development Scenario

Under the Proposed Action, the Environment Protection Agency would allow the proponent to carry out the construction of five electrical substations, associated facilities and the 530 km transmission line from Bombuhun village, Soro Gbema Chiefdom, Pujehun District on to the Sierra Leone – Guinea border. Reliable electrical power shall be provided to meet the current and projected electrical energy needs for the sub-region.

Negative environmental and socio-economic impacts indicated above that may be associated with the project would have to be mitigated.

Criteria that informed the decision to site the proposed substations as indicated in Figure 9 include the following:

A. Availability of land

Land would have to be acquired for the proposed project. Thus its availability is critical for the project such as the present one, especially for the substations

B. Proximity to load centers

The substations should be able to feed to the DODO/GOMA 6 MW and the 50 MW Bumbuna HEP when necessary, to minimize overall generation development costs. This will require that new substations be located to load centers

C. General flatness of terrain

Where substations are to be constructed, the terrain should be generally flat in order to reduce the construction costs due to earthworks.

D. Out-of-town locations

Out–of-town locations will help to avoid resettlement, huge compensation costs and land-use conflict issues. It will minimize the substation's visual impact on the environment.

E. Proximity to major roads

Easy access during construction and periodic maintenance carried out at the substations demands that it be close to major roads for easy accessibility.

F. Natural drainage

Natural drainage generated by the terrain would help the free flow of rainwater, so that the substations do not flood or become water logged.

G. Connected to an Existing Transmission Line

The substation sites should be close to an angle tower so that it can tie into either a proposed or an existing transmission line.

The five sites indicated in Figure 9 have been given priority in the selection of the possible substation sites.

3 Description of Existing Environment

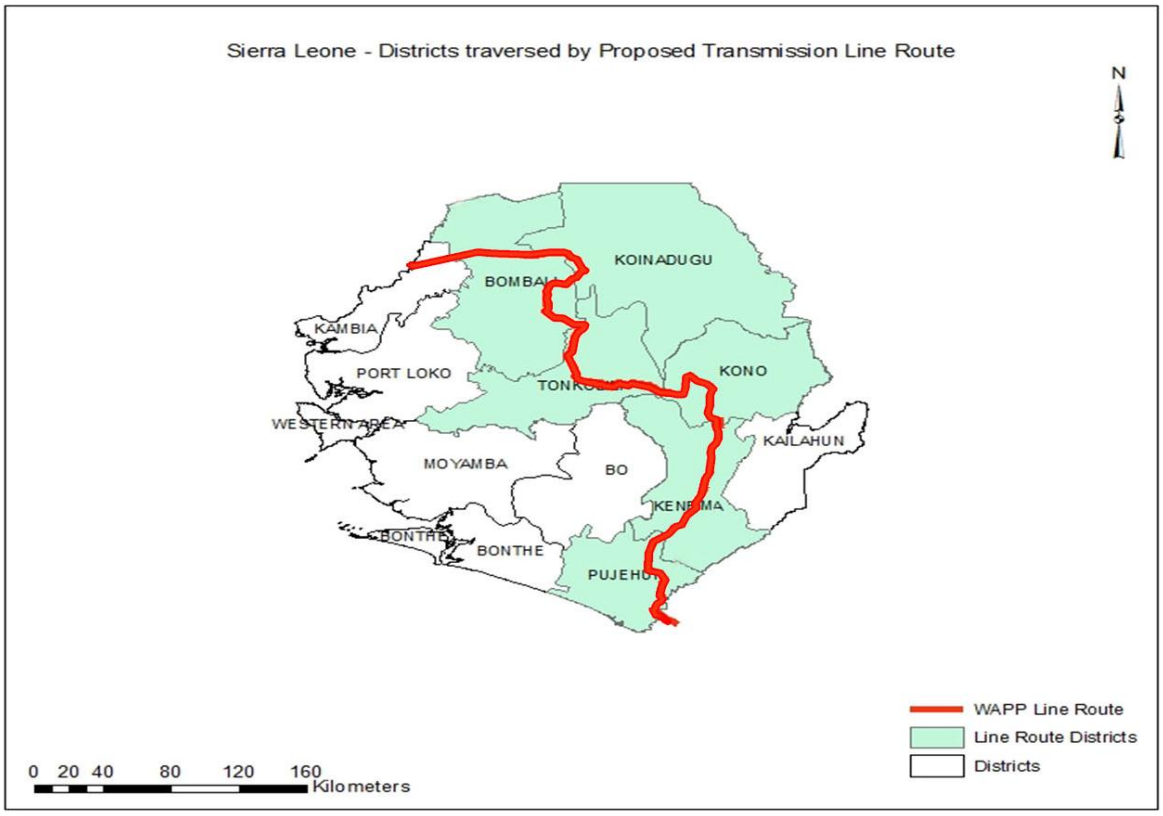
3.1 Location of Proposed Activities

According to the proposed line route, the 225 kV High voltage Transmission Line of the Man-Yekepa-N'zerekore-Buchanan-Monrovia-Bumbuna-Linsan Interconnection Project will traverse seven administrative districts on the Sierra Leone side, namely;

1. Pujehun District
2. Kenema District
3. Kono District
4. Tonkolili District
5. Koinadugu District
6. Bombali District
7. Kambia District

The map in Figure 10 below shows the proposed transmission line route and the districts it traverses:

Figure 10 Proposed Transmission Line Route in Sierra Leone



The total length of the proposed line route is approximately 530 km (331 miles).

3.2 Socio-Economic and Cultural Environment

3.2.1 Communities and Settlements

Several investigations were conducted to identify the occupied settlements/communities that are within the 20 km buffer zone along the proposed line route. These included site visits by a team of consultants led by an Environmental Specialist, and through Geographic Information Systems (GIS) analysis using the technique of map overlay. Consultants were provided with a hardcopy paper map of the proposed route. The paper map was geo-referenced (spatially referenced) and digitized into a map layer in Arc View 9.3. The layer was then superimposed on Sierra Leone's settlement and administrative map layers to reveal the spatial distribution of settlements along the proposed route.

The route avoided traversing settlements, with evidence from investigations that no settlement was identified to locate within the 40 m Right of Way (RoW) corridor. However, a total of 1257 settlements were identified within the 20 km buffer zone. The spatial distribution of settlements within the buffer reflects the spatial distribution of settlements at national level, that is, very densely distributed pattern of small village communities within very proximal distances from the line route. The settlements and their corresponding administrative districts are shown in the Table below:

Table 10 of settlements within 20 km buffer zone of Line Route

District	Region	Number of settlements
Kenema	East	350
Bombali	North	301
Pujehun	South	104
Kono	East	165
Tonkolili	North	217
Koinadugu	North	74
Kambia	North	45
Total		1,257

Data collection and profiling of affected communities and persons were done through visits to several of the affected communities (including all communities hosting the substations), during which consultations were held with Paramount chiefs, Chiefdom and Community Elders, Councilors, Tribal Authorities and affected land owners. Data was also collected from existing

documentation obtained from chiefdom offices, local council offices, and from various Government departments including Statistics Sierra Leone. In addition, the team used GIS mapping techniques to further verify the proposed route and to analyze the buffer zones in order to identify settlements located within, and their characteristics.

3.2.2 Background information on districts traversed by the proposed line route

For each district, socio-economic and cultural information were obtained through extensive consultations with local authorities and existing documentation at chiefdom, council and related Government offices. The Environmental Social Impact Assessment Team (ESIAT) visited several communities along the proposed route and held consultative meetings with relevant authorities.

The overarching aim of this exercise was to compile enough information to help make decisions on how this project will environmentally, socially, economically and culturally affect the communities within the project area. Specifically, this exercise was undertaken with the following objectives:

- To introduce the project to the local communities;
- To explain the benefits, likely environmental risks and other mitigating concerns to affected communities;
- To obtain sufficient and accurate community information including available documentation to help develop community profiles;
- To discuss concerns raised by community members;
- Identify communities affected by the project, particularly those by which, the line passes at very close distances;
- To identify individual properties that may be affected by the project, if any;
- To discuss possible terms of compensation, especially for land owners whose land property will be affected by project work.

The transmission route traverses seven out of the thirteen administrative districts of Sierra Leone. It enters Sierra Leone through the south and moves south-eastward to the east and westward to Tonkolili District (which is geographically at the centre of the country but administratively in the northern region), then northward to Bombali and Koinadugu districts, where it leaves for Linsan in Guinea.

The hierarchy of administrative dispensation in Sierra Leone is organized at national, region, district / local council, chiefdom, section and at settlement/town/village levels. Each region is sub-divided into districts/local councils; each district is further sub-divided into chiefdoms. Chiefdoms are headed by Paramount Chiefs, who combine as both the traditional rulers and heads of the chiefdom local administration. The chiefdom is further sub-divided into sections, headed by a Section Chief answerable to the Paramount Chief. A Section consists of several towns and villages, headed by town chiefs answerable to their Section Chiefs.

3.2.3 Physical Description of Project Area

The ensuing sections describe the climate, vegetation and soils of the project area.

3.2.3.1 Climate

There is limited available data on climatic conditions relating specifically to individual chiefdoms within the project area. However, on the basis of the information available, climatic and other data for the regions covered by the project area have been used to represent the generic climate for the project area. This is also supported by the fact that the project area traverses three of the four regions of the country. During the period of the ESIA field work, none of the climatic stations in the project area were functional to obtain recent climatic indications.

The climate of the project area generally is described as wet tropical monsoon, characterized by two distinct wet and dry seasons each year.

The dry season generally prevails from mid-November to April. This period is characterized by very little or no rain. Within this period, between December and January, the area is affected by the north-easterly trade winds, referred to as the Harmattan winds. They come with cold, hazy and dusty attributes, causing dried lips and noses. The average annual rainfall in the dry season for about 90% of the project area is 175 mm, except for the extreme northern parts of Bombali and Koinadugu districts where annual rainfall may fall under 125 mm. Annual rainfalls for some parts of Kenema and Kono districts may range between 250 mm and 375 mm in dry seasons. The average temperature for the study area is 27.50 C.

The wet season is between May and Mid November. It is characterized with humid conditions, rainfall, lightning and storms. The greater part of the rain is experienced by mid-May to June. The wettest month is August. During the wet season, Pujehun district amongst others in the project area experiences the heaviest rainfall, with an average annual rainfall of 3000 mm. This is obviously due to its proximal influence of the south-western monsoon trade winds originating from the Atlantic Ocean in the South-West. In the rest of the project area, annual rainfall may range between 2000 mm and 3500 mm during the wet season, and the average temperature may drop to 250 C. Figure 11 and 12 illustrate the rainfall pattern for Sierra Leone in the months of April to November, the rainy season.

Figure 11 Sierra Leone Rainfall and Temperature (Mid-November to April)

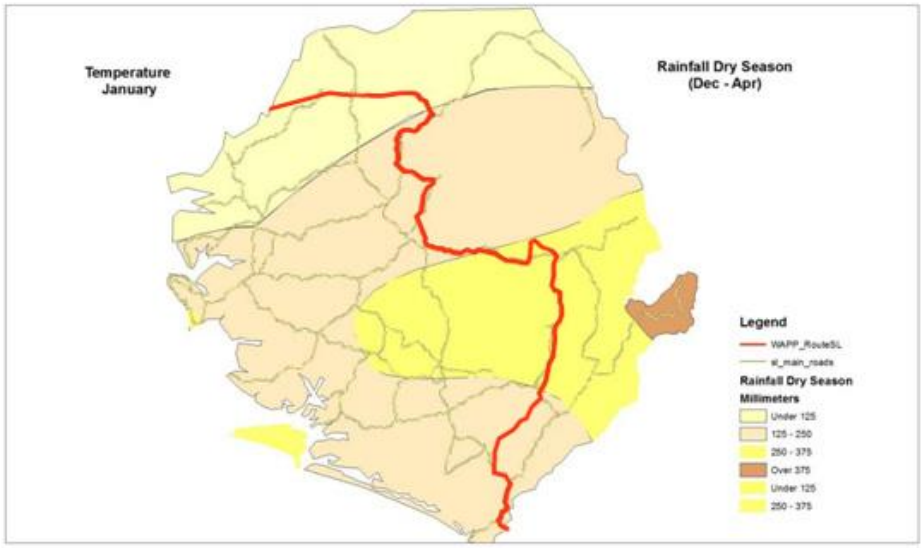
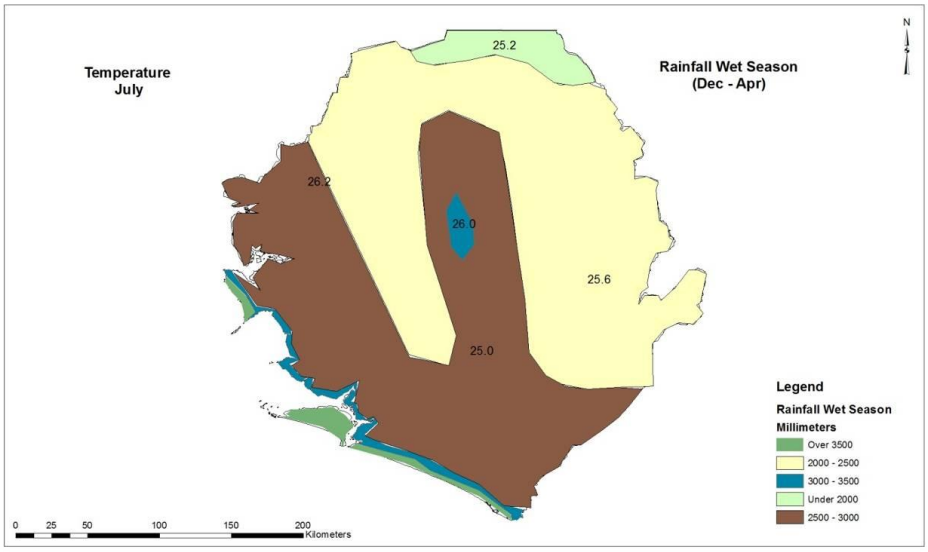


Figure 12 Sierra Leone Rainfall and Temperature (May-Mid-November)



3.2.3.2 Vegetation

Study of vegetation covering project area was done through reviews of existing maps at the Sierra Leone Information Systems (SLIS), Statistics Sierra Leone (SSL), Forestry Division at the Ministry of Agriculture, Forestry and Food Security (MAFFS) and from the First Atlas of Sierra Leone; and through site observations during study visits.

The vegetation of Sierra Leone is continually being altered by economic activities, mainly mining and farming. The major part of the country lies within the moist forest zone of West Africa. A smaller part lies within the moist savannah woodland zone and except in the south, there is a small mangrove zone along the coast. Most of the country is a mosaic of forest regrowth, secondary forest and derived savannah which now covers most of the upland areas of the country and inland swamp plant communities which occur in the moist forest zone, the forest savannah mosaic zone and moist savannah woodlands zone (NBSAP-UNDP, 2003).

The proposed route traverses a vegetation of mainly farm bushes, rain tropical forests and savannah grasslands. About 75% of the project area is covered by farm bushes, with vast areas characterized by thick secondary undergrowths, believed to have been part of the Tropical Rain Forest, but having been subjected to clearing, burning and tree cutting for several years.

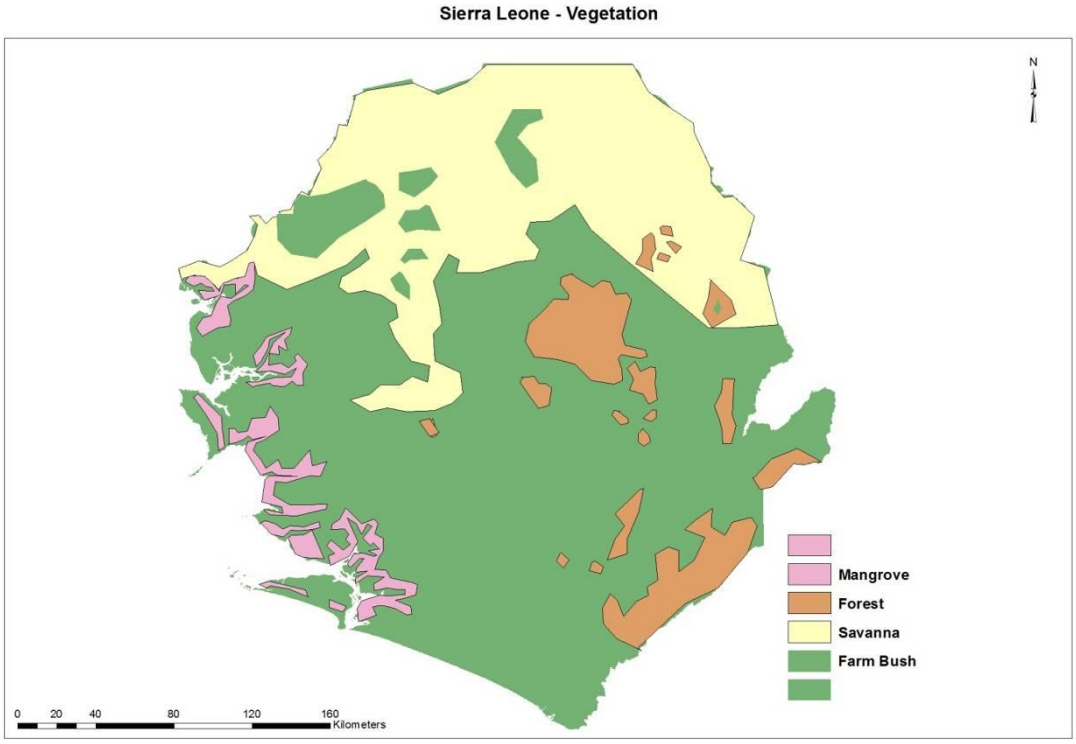
Forests are densest in the south-east and contain varieties of palm trees and to a lesser extent, mahogany and teak. Among the numerous small animals are bush pigs, chimpanzees, monkeys, and porcupines. Crocodiles and hippopotamuses are often found in the rivers. The following are some of the dominant plant species identified in the area of the Forest traversed by the route: Terminalia ivorensis, Terminalia superb, Danniellia thurifera, Parkia bicolour and Parirari excels.

The route also traverses about 2.5 km outside of the Nimini North Forest stretching from Nimikoro chiefdom to Nimiyama Chiefdom in Kono district in the east. The following are some of the dominant plant species identified in the area of the forest traversed by the route: Funtumia Africana, Musanga cecropiodes, Trema guineesnis, Carapa procera, Elaesis guineensis and Spondias mombin.

Most parts of northern Sierra Leone are dominated by savannah vegetation, comprising of grasses and bushes. The proposed route traverses about 135 km of savannah grassland in Bombali and Koinadugu districts in the northern region. Savannah is plagued by annual bush fires. The dominant tree types are Daniella aliveri, parkia biglobosa, Cassia sieberiana, Lophire lanceolata, Borassus aethiopicum, Terminalia albida and Vitex cuneata.

Figure 13 below illustrates the vegetation pattern of Sierra Leone.

Figure 13 Vegetation map of Sierra Leone

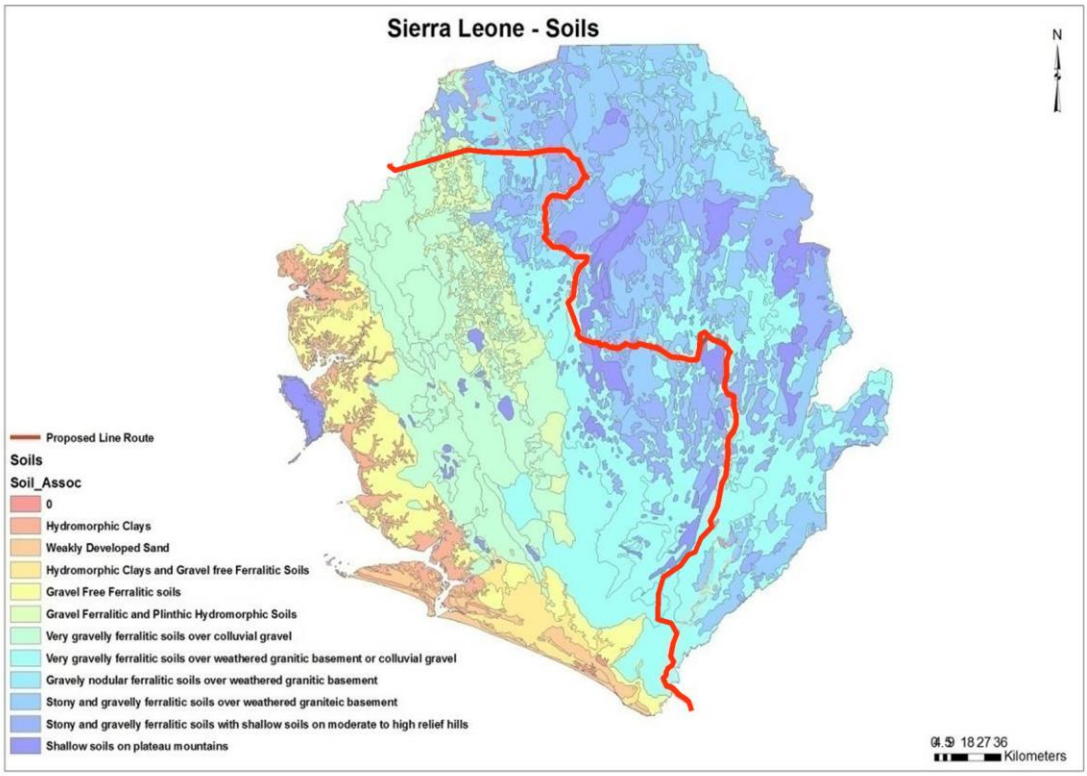


3.2.3.3 Soils

Soils in Sierra Leone have been grouped into 12 soil associations by the Land and Water Development Division (LWDD) each with different attributes. Figure 14 below is a map of Sierra Leone showing soil associations. Most soils in Sierra Leone are acidic (pH 4-5). The soils of Sierra Leone, like most tropical soils, are ferralitic and excessively leached as a result of the humid tropical conditions.

The project area is underlain by a range of soil associations, with dominance of gravelly nodular ferralitic soils over weathered granitic basement on southern interior and plateau plains in the southeast, and the same for the north but on northern interior and plateau plains. The actual terrain traversed by the proposed route is underlain by stony and gravelly ferralitic soils with shallow soils on moderate to high relief hills formed either from predominantly acid rocks or basic and ultrabasic rocks, and by stony and gravelly ferralitic soils over weathered granitic basement or colluvial gravel on low to moderate relief hills.

Figure 14 Soil Map of Sierra Leone



3.2.4 Biodiversity Status of Gola Forest

Clearly, the power line will not be passing through the Gola Forest East but there is an existing 8.0 ~ 10.0 meters wide road (See picture below) through the Gola East that was constructed way back in the 60's after Independence to allow for vehicular and human traffic from the Liberian border to the south and east of the country. The following pictures below showing this existing road were taken on a clear day in the month of February, 2010 during confirmation visit by the local and international consultants.

It is true that several surveys in the past including the most recent survey of birds, mammals and trees conducted by the Royal Society for the Protection of Birds (RSPB), Conservation Society of Sierra Leone (CSSL) and the Government of Sierra Leone (GoSL) confirm the existence of listed birds and mammals. This survey was done on a systematic basis throughout the whole of the Gola Forest between October 2005 and June 2007, and it confirms the spread of the biodiversity of the tract of forest. Tables 11 and 12 provide data on the mammals and birds from the October 2005 and June 2007 RSPB and CSSL survey of the Gola Forest.

For this ESIA study, a line transect survey was conducted for mammals, amphibians, reptiles and birds by taking physical observation at regular intervals of 100m along the existing road in the East Gola Forest between Zimmi and Kenema. Surprisingly, mammals were not encountered during this transect survey. Furthermore, the ESIA studies in the months of December 2009 and February 2010 did not encounter mammals. Although birds were seen in flocks of small numbers, the absence of mammals might not be unconnected to the fact that the endangered and threatened species move away from the noise and obstruction by the heavy vehicular and human movements along the RoW. Interviews with local hunters confirmed that these mammals, amphibians, reptiles and birds do not maintain their habitats anywhere near the RoW.

Picture1 Gola Forest

Table 11 List of identified Mammals(Primates) in the Gola Forest

Species	Block	Encounters	No of Transects
Western Chimpanzee	Gola West	0	0
	Gola East	7	5

Species	Block	Encounters	No of Transects
	Gola North	15	8
	Extension 2	3	2
	Total	25	15
Olive Colobus Monkey	Gola West	0	0
	Gola East	1	1
	Gola North	3	2
	Extension 2	0	0
	Total	4	3
Western Red Colobus Monkey	Gola West	2	2
	Gola East	4	1
	Gola North	43	16
	Extension 2	4	2
	Total	53	21
Sooty Mangabey	Gola West	2	2
	Gola East	15	10
	Gola North	36	16
	Extension 2	3	2
	Total	56	30
Diana Monkey	Gola West	20	4
	Gola East	29	11
	Gola North	128	22
	Extension 2	10	3
	Total	187	40
Campbell's Monkey	Gola West	12	3
	Gola East	32	14
	Gola North	38	14
	Extension 2	3	2
	Total	85	33
Lesser Spot-nosed Monkey	Gola West	3	1
	Gola East	8	7
	Gola North	11	7

Species	Block	Encounters	No of Transects
	Extension 2	0	0
	Total	22	15

SOURCE: Royal Society for the Protection of Birds (RSPB) and Conservation Society of Sierra Leone (CSSL), 2007

Table 12 Birds identified in the Gola Forest and their IUCN Status

English Name Status	Scientific Name	IUCN
White-breasted Guineafowl	Agelastes meleagrides	Vulnerable
Rufous Fishing-Owl	Scotopelia ussheri	Endangered
Brown-cheeked Hornbill	Bycanistes cylindricus	Near-threatened
Yellow-casqued Hornbill	Ceratogymna elata	Near-threatened
Yellow-footed Honeyguide	Melignomon eisentrauti	Data deficient
Western Wattled Cuckoo-shrike	Lobotos lobatus	Vulnerable
Baumann's Greenbul	Phyllastrephus baumanni	Data deficient
Yellow-bearded Greenbul	Criniger olivaceus	Vulnerable
Green-tailed Bristlebill	Bleda eximius	Vulnerable
Nimba Flycatcher	Melaenornis annamarulae	Vulnerable
Tessmann's Flycatcher	Muscicapa tessmanni	Data deficient
White-necked Picathartes	Picathartes gymnocephalus	Vulnerable
Rufous-winged Illadopsis	Illadopsis rufescens	Near-threatened
Sharpe's Apalis	Apalis sharpii	Least concern
Copper-tailed Starling	Lamprotornis cupreocauda	Near-threatened
Gola Malimbe	Malimbus ballmanni	Endangered

SOURCE: Royal Society for the Protection of Birds (RSPB) and Conservation Society of Sierra Leone (CSSL), 2007

3.3 General information of the project area

3.3.1 PUJEHUN DISTRICT

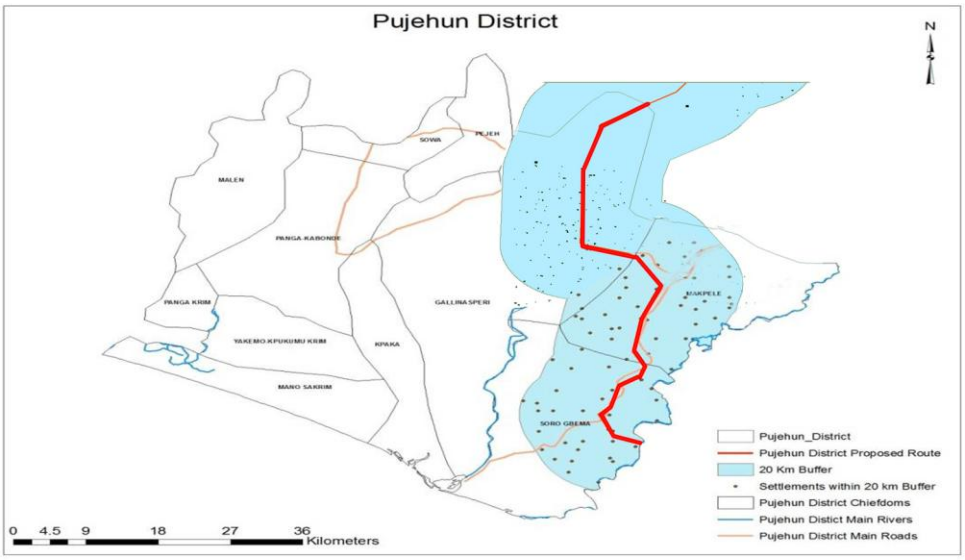
Pujehun District is in the Southern Region of Sierra Leone. It borders the Atlantic Ocean in the southwest, Liberia to the southeast, Kenema district to the northeast, Bo district to the north and Bonthe district to the west. It occupies a total space of 4,186.6 km^2. The main ethnic groups are Mende, Vai, Temne and Sherbro. Main economic activities include diamond mining, fishing,

coffee, cacao and rubber plantations, rice and cassava farming. The district is predominantly Muslim. The district is sub-divided into 12 chiefdoms, namely:

1. Sowa
2. Kpaka
3. Pejeh
4. Soro Gbema
5. Barri
6. Makpele
7. Malen
8. Yakemu Kpukumu krim
9. Kpanga Kabonde
10. Mano Sakrim
11. Gallinas Perri
12. Kpanga Krim

The proposed Line Route traverses three chiefdoms in the district: Soro Gbema, Makpele and Barri chiefdoms over a total distance of approximately 51 km. Figure 15 shows Pujehun district, the proposed line route within, and the distribution of occupied settlements within the 20 km buffer zone along the route.

Figure 15 Proposed Line Route in Pujehun District



The proposed line route avoided built up areas in all settlements in the district, but some settlements are within very close distances to it, as shown in the map above. No settlement falls within the 40 m Right of Way.

A total of 104 settlements fall within the 20 km buffer zone in the district. These include 44 settlements in Soro Gbema chiefdom, 49 settlements in Makpele chiefdom and 7 settlements in Barri chiefdom, according to the following Table 13:

Table 13 Settlements within the buffer zone in Pujehun District

Chiefdom	No. Of Settlements
Barri	7
Soro Gbema	44
Makpele	53
Total	104

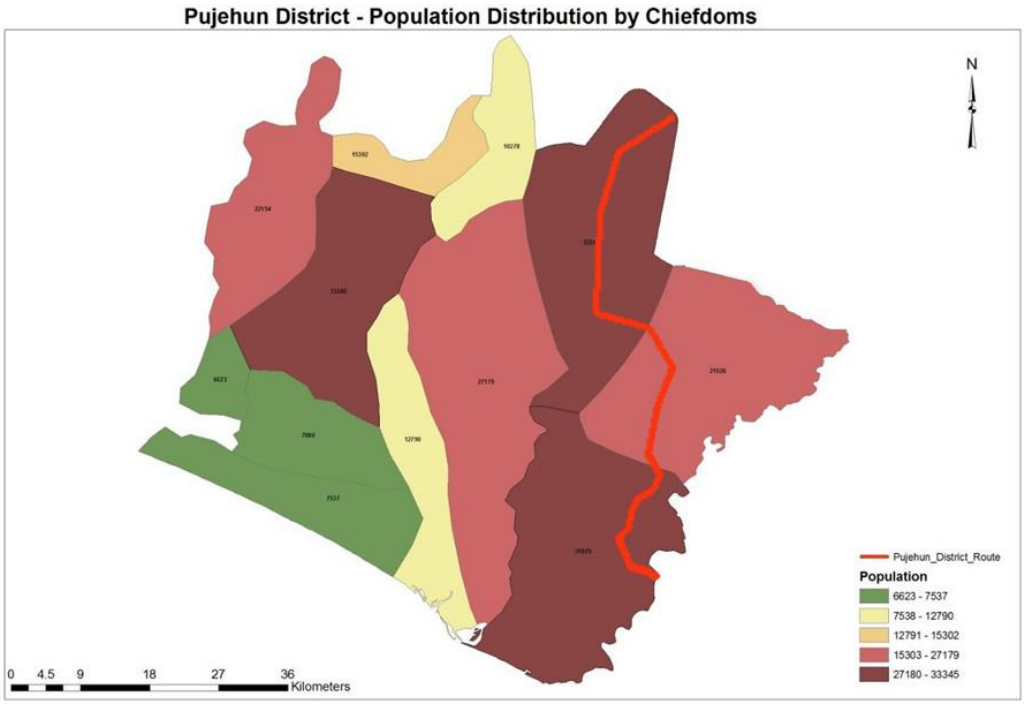
- **Demographic Characteristics**

According to the 2004 National Population and Housing Census, the total population of Pujehun district was 228,392, accounting for 4.6% of the national total. The population of Pujehun district is made up of 118,536 females and 109,857 males representing 51.9% and 48.1% respectively. The projected population for 2009 is 300,002, suggesting that the female/male population is currently at 155,701/144301. With a 2004 population of 228,392, it means that the district's population has grown by 31% over the last four years. The projection shows a population density of 71.6 persons / sq. km, as compared to the national population density of 68 persons / sq. Km., indicating that at this trend, there will be tremendous pressure on land resources. The population growth rate of the district is about 6.5%.

- **Age and Sex Structure**

The labor force, 15-64 years old, account for 51.7% of the total district population. 43.8% are below 15 years old, and only 4.8% are 65 years old and above. The dependency ratio therefore is 1:94.4. The district population is predominantly female, accounting for 52% of the total.

Figure 16 Pujehun District Age Distribution



The total population of the two chiefdoms traversed by the route is 53,900, which is 23.6% of the total district population, with a distribution of 31,955 (14.0%) in Soro Gbema and 21,926 (9.6%) in Makpele.

- **Religious, ethnic and cultural status**

The district is predominantly Muslim, but has a vivid presence and an old history of Christianity. However, there are no religious concerns that could present bottlenecks to any development effort in the district. There are several inter-marriages between Muslims and Christians. The people are predominantly Mended by ethnicity / tribe, and small communities of Via and Krum. Many Temnes from northern Sierra Leone, Fullanis and Madingos from Guinea have migrated to Pujehun district for trading. The district enjoys a rich cultural heritage with the availability of many artifacts and crafts, music and dance, and festivities.

- **Educational status**

The total enrolment at all levels of schools in the district at the beginning of 2004/2005 academic year was 75,418 (SLIS, 2004). In general, the district has 26% of literacy rate. 37% of males are literate and only 17% of females are literate. Although this is a high enrolment figure, it was noted that 70% of primary school teachers were unqualified.

- **Health status**

Infant, Child and Under Five mortality rates (per 1000 live births) have been very high, 197, 99 and 216 respectively, and life expectancy for both sexes at 46. The district has 49 functioning Primary Health Units (PHUs) and one General hospital

- **Economic activities**

Agriculture is the main economic activity in the district. About 85% of the people are engaged in subsistence agricultural activities, using both traditional methods and rudimentary equipment. The systems of farming are largely crop rotation and bush fallowing. The main crops are rice, cassava, sweet potatoes, maize, groundnut, ginger, oil palm, cocoa, coffee and kola nuts. A small minority of less than 5% is engaged in diamond mining activities.

3.3.2 KENEMA DISTRICT

Kenema district is one of three districts that make up the eastern region of Sierra Leone. It borders Tonkolili and Kono to the north, Kailahun to the east, Pujehun to the south-west, Bo to the west and Liberia to the south. It occupies a total area of 6,355.4 km^2 and comprises of sixteen chiefdoms. The district headquarter is Kenema town, and the main ethnic groups are Mende and Temne.

Main economic activities include gold and diamond mining, production of coffee, cacao and rice. The district enjoys religious plurality – Muslims and Christians.

The district is sub-divided into 16 chiefdoms, as shown following table:

Gorama Mended	Tunkia
Wandor	Nomo
Simbaru	Gaura
Kando Lepiama	Dama
Small Bo	Nongowa
Niawa	Dodo
Langorama	Lower Bambara
Koya	Melegohun

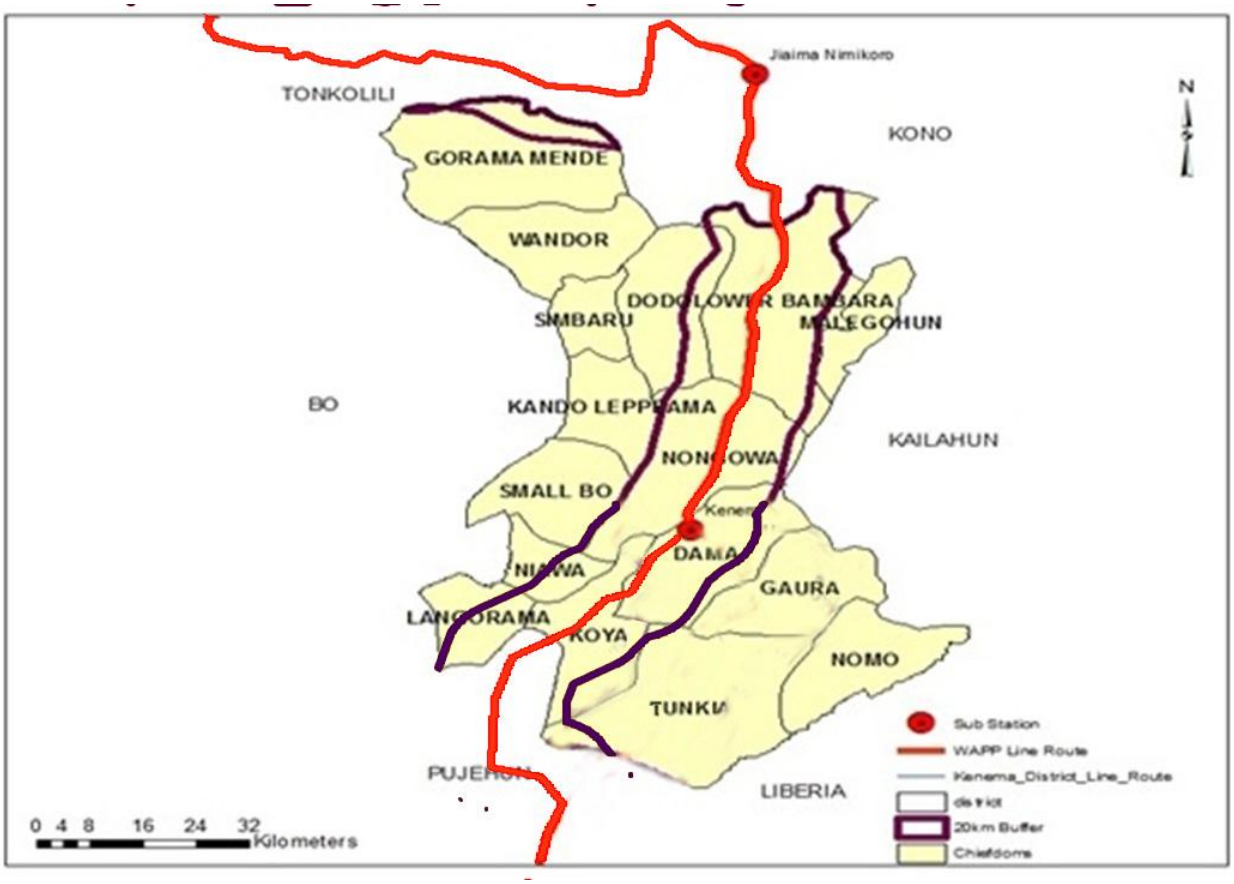
The proposed line route traverses four of the sixteen chiefdoms in Kenema district, namely; Koya, Dama, Nongowa and Lower Bambara chiefdoms, but the 20km buffer covers part of Langorama, Niawa, Dodo and Tunkia chiefdoms. In total, 350 indentified settlements fall within the 20km buffer zone along the route. The following table shows the distribution of 20km buffer settlements by their corresponding chiefdoms:

Table 14 Distribution of settlements within the buffer zone – Kenema District

Chiefdom	Number of Settlements
Tunkia	52
Dama	52
Nongowa	65
Lower Bambara	120
Koya	3
Dodo	18
Niawa	N/A
Langorama	N/A
Total	350

Figure 17 below shows Kenema district, the proposed line route.

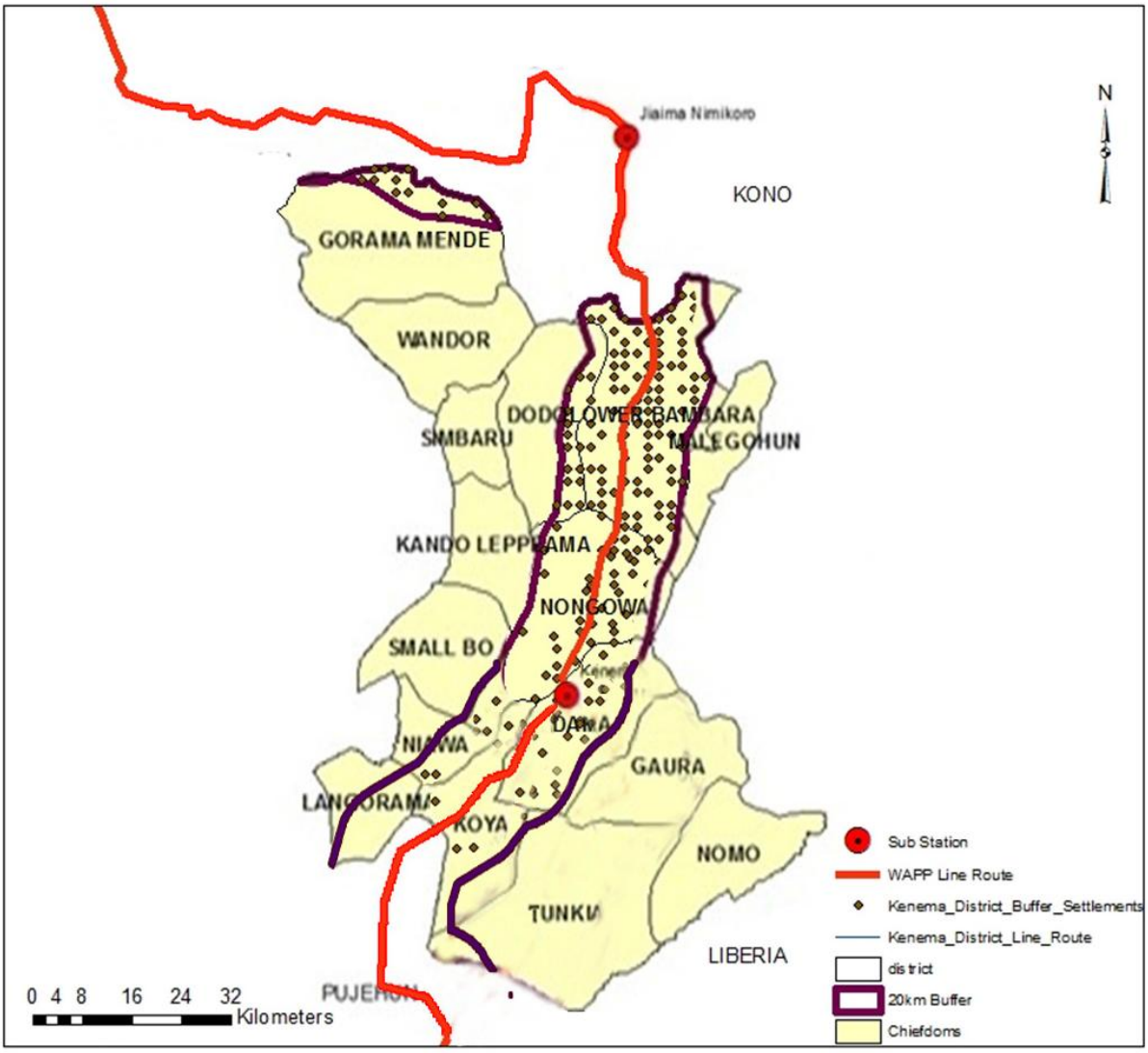
Figure 17 Proposed Line Route in Kenema District



Like in Pujehun district, the line route avoided traversing settlements that are in close proximity to it. It is generally along the route of main motor roads except where it deviates when main roads traverses settlements.

Figure 18 below shows Kenema district, the proposed line route, and the distribution of occupied settlements within the 20 km buffer zone along the route.

Figure 18 Distribution of settlements within the buffer zone – Kenema District



- **Demographic Characteristics**

According to the 2004 National Population and Housing Census, the total population of Kenema district was 497,948 accounting for 10% of the national total. The population of Kenema district is made up of 252,460 males and 245,488 females representing 51% and 49% respectively.

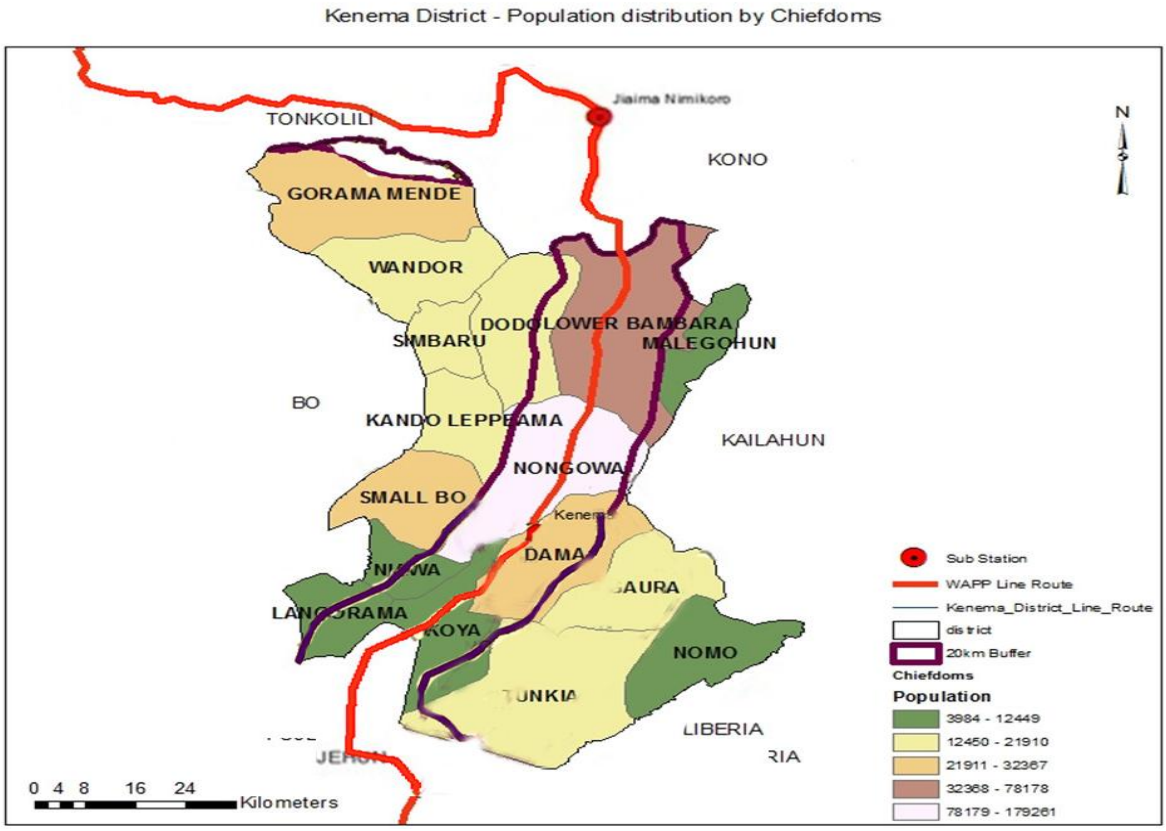
The projected population for 2009 is 578,471, suggesting that the male/female population is currently at 293,288/285,189. With a 2004 population of 578,471, it means that the district's population has grown by 16% over the last four years. The projection shows a population density of 91 persons / sq. Km, as compared to the national population density of 68 persons / sq. km. Again, like in Pujehun district, this is indicating that at this trend, there will be tremendous pressure on land resources. The annual population growth rate of the district is about 4.0%.

- **Age and Sex Structure**

The labor force, 15-64 years old, account for 56.1% of the total district population. 40.0% are below 15 years old, and only 4.0% are 65 years old and above. The dependency ratio therefore is 1:67.1. The district population is predominantly male, accounting for 51% of the total. Figure 19 below illustrates the percentage share of the broad age classifications.

The total population of the five chiefdoms traversed by the route is 322,670, which is 64.8% of the total district population, and comprising of 26, 391 (5.3%) in Dama, 17, 428 (3.5%) in Gaura, 78, 178 (15.7%) in Lower Bambara, 179, 261 (36.0%) in Nongowa, and 21, 412 (4.3%) in Tunkia.

Figure 19 Population Distribution in Kenema



- **Religious, ethnic and cultural status**

Kenema district, like Pujehun district is predominantly Muslim, but there are several Christian communities. Both Muslims and Christians have co-habitated for generations without any issue emanating as bottleneck to development. The people are predominantly Mended. Kenema district is rich in Mended culture.

- **Educational status**

The total enrolment at all levels of schools in the district at the beginning of 2004/2005 academic year was 190,894 (SLIS, 2004). In general, the district has 30.1% of literacy rate. 39% of males are literate and only 22% of females are literate. Unlike Pujehun district, more than 50% of primary school teachers in Kenema district are qualified.

- **Health status**

Infant, Child and Under Five mortality rates (per 1000 live births) have been very high, 132, 105 and 235 respectively, and life expectancy for both sexes at 45. The district has 108 functioning Primary Health Units (PHUs) and one general hospital.

- **Economic activities**

The main economic activities in the district are mining and agriculture. There is extensive mining of diamond along River Sewa, and gold mining in several areas of the district. The main agricultural crops are rice, cassava, potatoes, maize, groundnut, ginger, palm oil, coffee, cocoa and kola nuts.

3.3.3 KONO DISTRICT

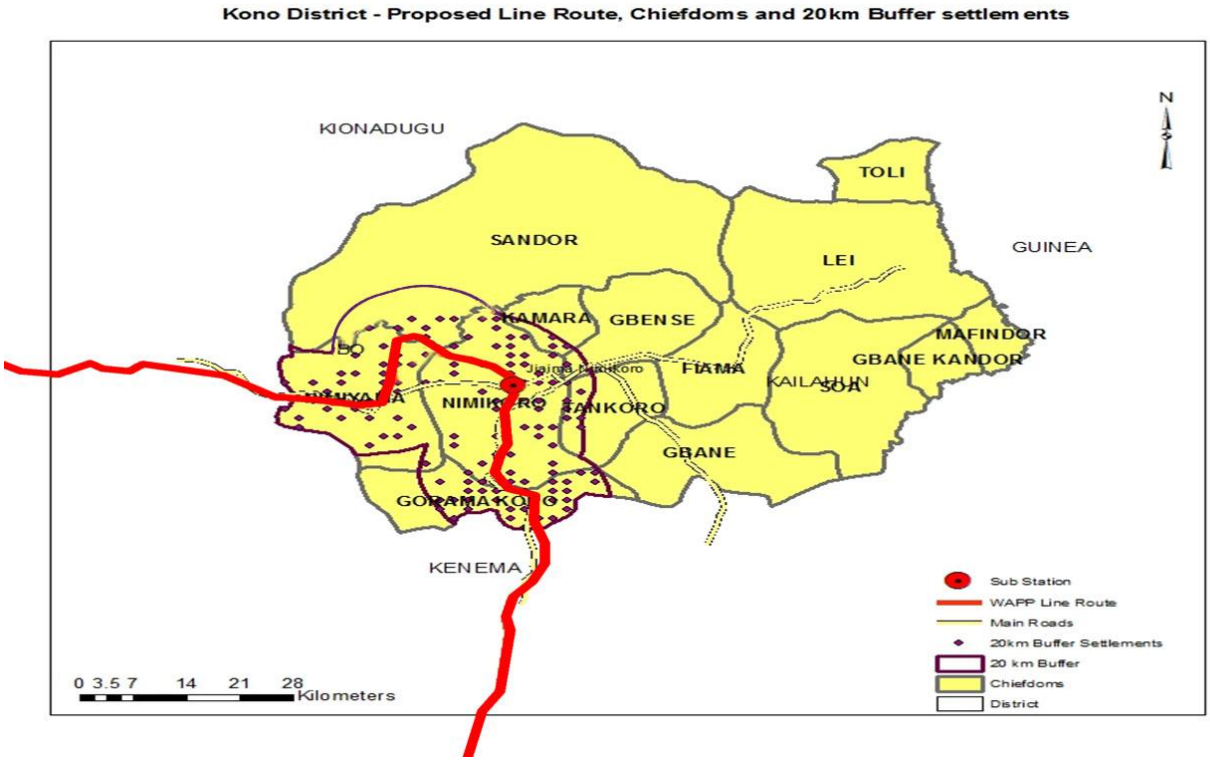
Kono district is one of three districts of Sierra Leone's eastern region. It boarders the Republic of Guinea in the east and Koinadugu district to the north, Tonkolili district to the west and Kenema district to the southwest. It occupies a total space of 5,397.5 Km^2 and comprises of fourteen chiefdoms, as listed below:

Sandor	Toli
Lei	Soa
Gbense	Kamara
Faima	Gbane
Tankoro	Gorama Kono
Nimiyama	Gbane Kandor
Mafindor	Nimikoro

The district headquarter is Koidu town. Kono district is named after its predominant and native ethnic group, the Konos. It is the most diamondiferous district in Sierra Leone. It has therefore experienced more immigration than any other district in Sierra Leone's provinces outside the Western Area Region.

The proposed line route traverses three chiefdoms in the district namely; Gorama Kono, Nimikoro and Nimiyama chiefdoms (See Figure 20), including 165 occupied settlements within a 20km buffer from the route, spatially distributed within very close distances and over a total distance of 79km., as shown in Figure 20. One of the five substations in Sierra Leone is proposed to be located at **Bikongor** in Nimikoro chiefdom in this district, as shown in the map in Figure 20 below.

Figure 20 Proposed Line Route in Kono District



➢ Demographic Characteristics

The 2004 National Population Census recorded 335,401 as the district's total population, accounting for 6.8% of the national total. This is made up of 172,396 males and 163,005 females representing 51.4% and 48.6% respectively. The projected population for 2009 is 279,839, suggesting that the male/female population is currently at 143,837/136,001. With a 2004 population of 335,401, it means that the district's population has dropped by 16% over the last four years. The projection shows a population density of 52 persons / sq. km, as compared to the national population density of 68 persons / sq. km. Unlike Pujehun and Kenema Districts,

this is indicating that at this trend, there will not be a significant increase in population to exert more pressure on land resources. The population has dropped at a rate of about 3.0% per year. The gradual reduction in the district's population as projected must be attributed to the reduction in mining activities.

The total population of the three Kono district chiefdoms traversed by the line route is 82,173, constituting 24.5% of the district population. Amongst them, Nimikoro, host of **Bikongor** sub-station, has the largest population of 44,273 (13.2% of district population).

- **Age and sex characteristics**

The age and sex structure of the population of Kono district is closely similar to Kenema district's, except for the projections, which show Kenema increasing in numbers and Kono conversely reducing. The labor force, 15-64 years old, account for 57% of the total district population. 40.0% are below 15 years old, and only 4.0% are 65 years old and above. The dependency ratio therefore is 1:77.6. The district population is predominantly male, accounting for 51.4% of the total.

Figure 21 Distribution Ratio of Population in Kono

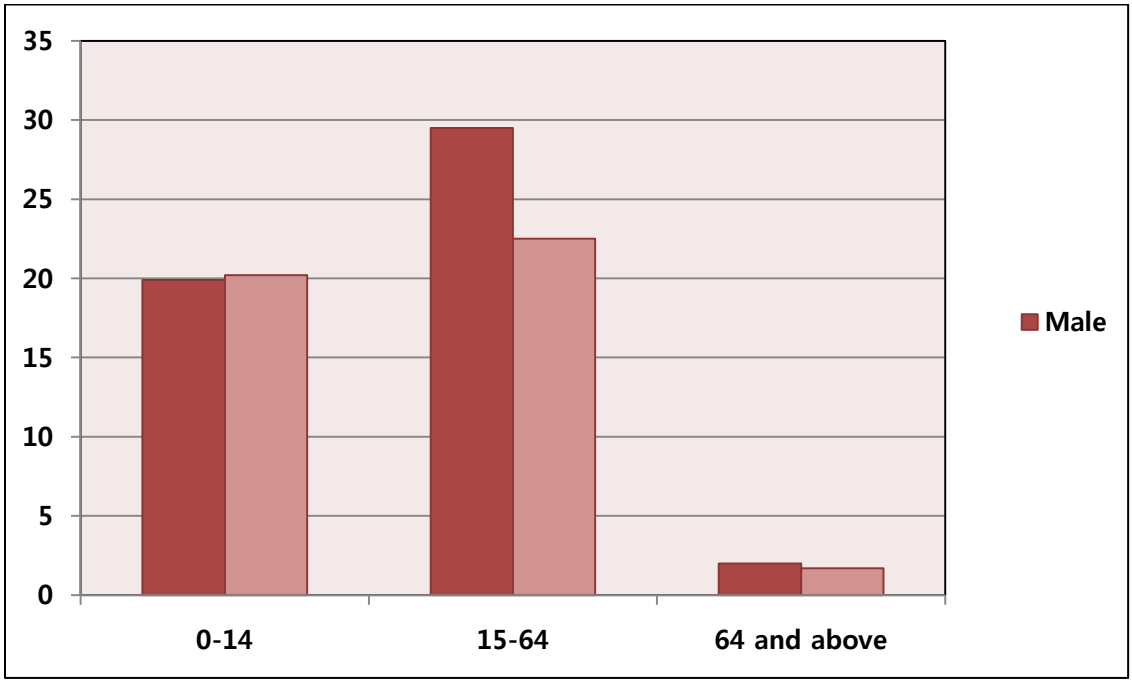
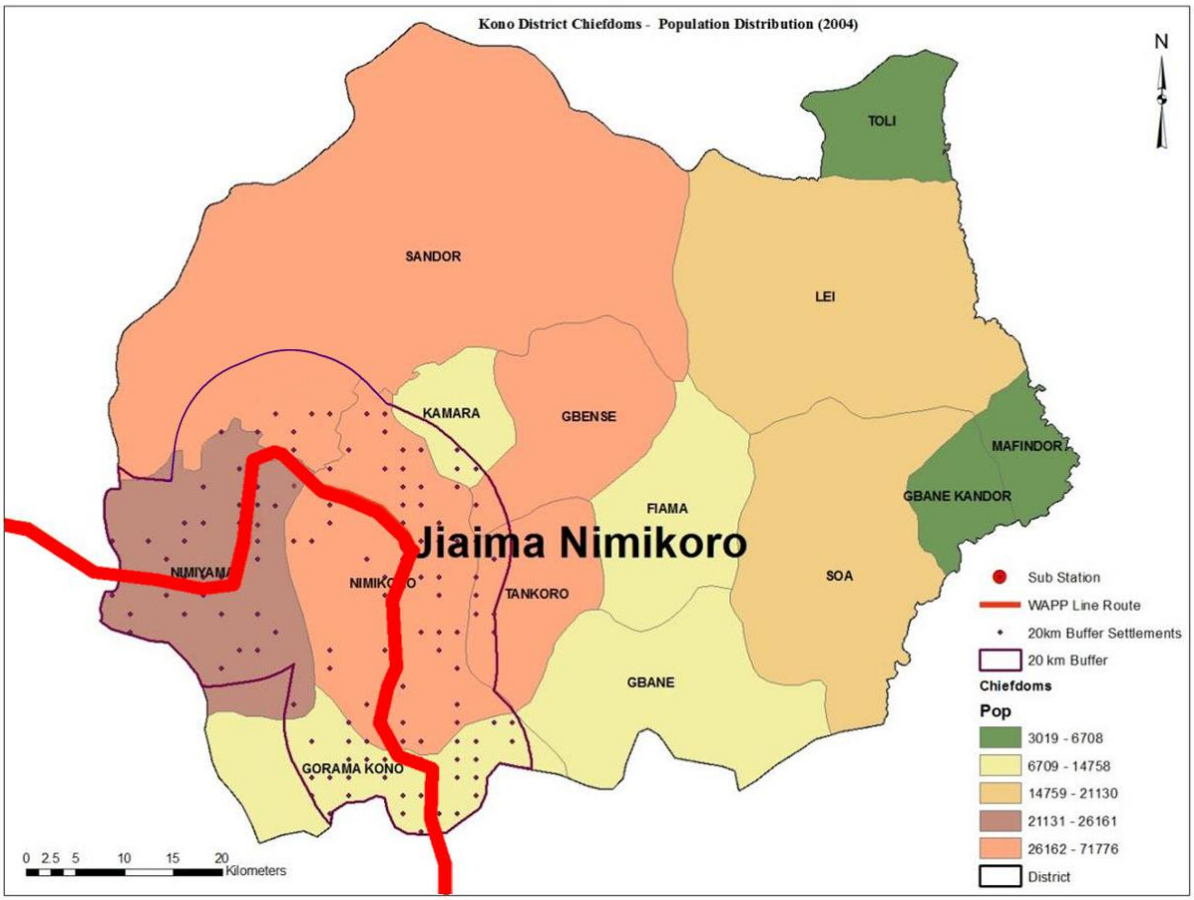


Figure 22 Population Distribution in Kono District



- **Religious, ethnic and cultural status**

The district like Pujehun and Kenema districts enjoy religious plurality, but Muslims predominate. The main ethnic groups are Kono, Mende, Kissi and Temne. Kono, like all districts in Sierra Leone is rich in traditions and culture.

- **Educational status**

The total enrolment at all levels of schools in the district at the beginning of 2004/2005 academic year was 72, 956 (SLIS, 2004). In general, the district has 31% of literacy rate. 38.3% of males are literate and only 22.2% of females are literate. About 60-65% of primary school teachers in Kono district are unqualified.

- **Health status**

Infant, Child and Under Five mortality rates (per 1000 live births) have been very high, 123, 94 and 208 respectively, and life expectancy for both sexes at 46. The district has 63 functioning Primary Health Units (PHUs) and one general hospital.

- **Economic activities**

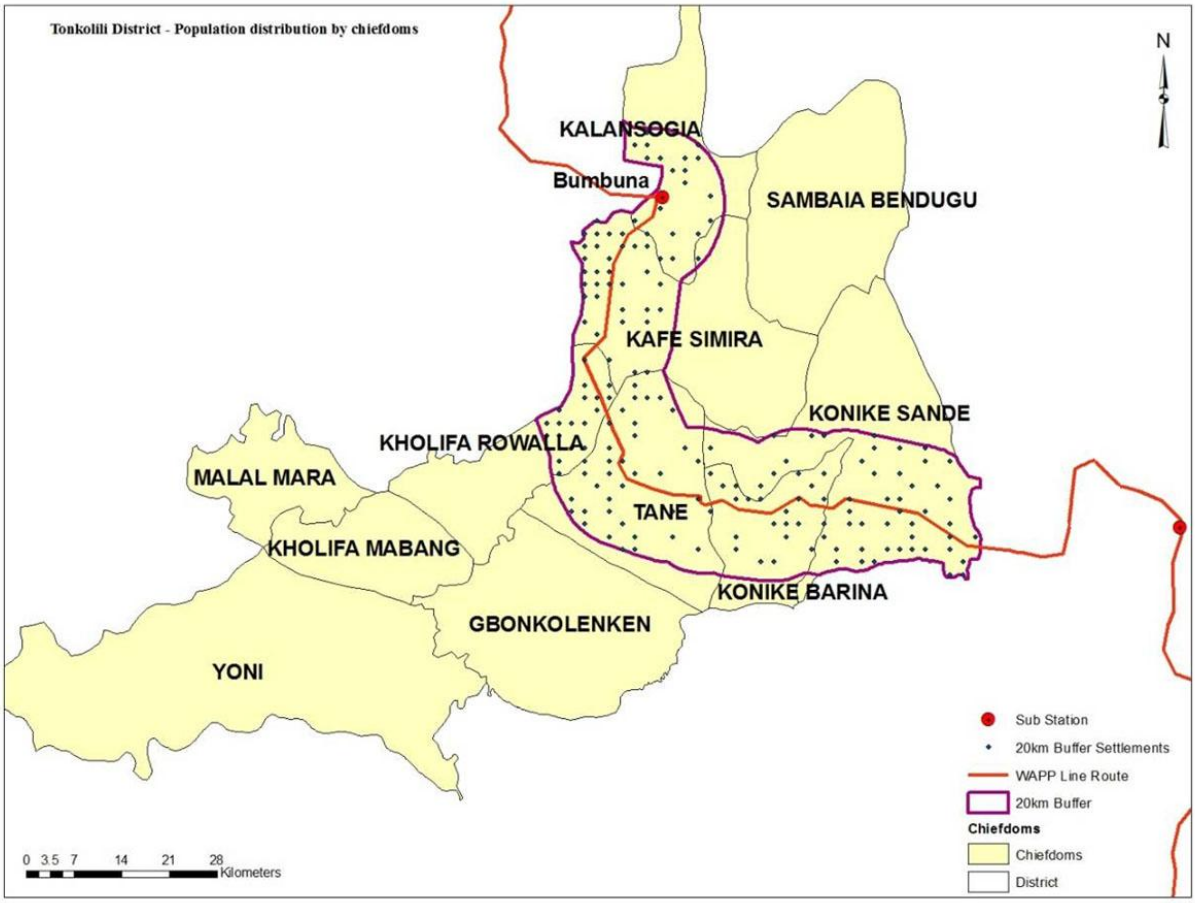
The main economic activities in the district are mining and agriculture. Kono district as the most diamondiferous in Sierra Leone leads in diamond mining activities. Gold is also mined in the district. The main agricultural crops are rice, cassava, potatoes, maize, groundnut, ginger, palm oil, coffee, cocoa and kola nuts.

3.3.4 TONKOLILI DISTRICT

Tonkolili district lies in the central part of Sierra Leone, bordering Bombali district to the northwest, Koinadugu district to the north and northeast, Kono district to the east, Moyamba district to the southwest, Bo and Kenema districts to the southeast. It occupies a total space of 6,444.5 Km^2 and comprises of eleven chiefdoms, namely:

Gbonkoleneken	Konike Barina
Kalansogia	Konike Sande
Kafe Simira	Malal Mara
Kholifa Mabang	Sambaia Bendugu
Kholifa Rowalla	Tane
Yoni	

Figure 23 Proposed Line Route in Tonkolili District



The proposed transmission line route traverses six chiefdoms in the district, namely; Konike Barina, Konike Sanda, Tane, Kholifa Rowalla, Kafe Simira and Kalansogia over a total distance of 104 Km. There are 217 occupied settlements within the 20km buffer zone of the line route. The district hosts the proposed **Bumbuna** Sub-station in Kalansogia chiefdom.

- **Demographic Characteristics**

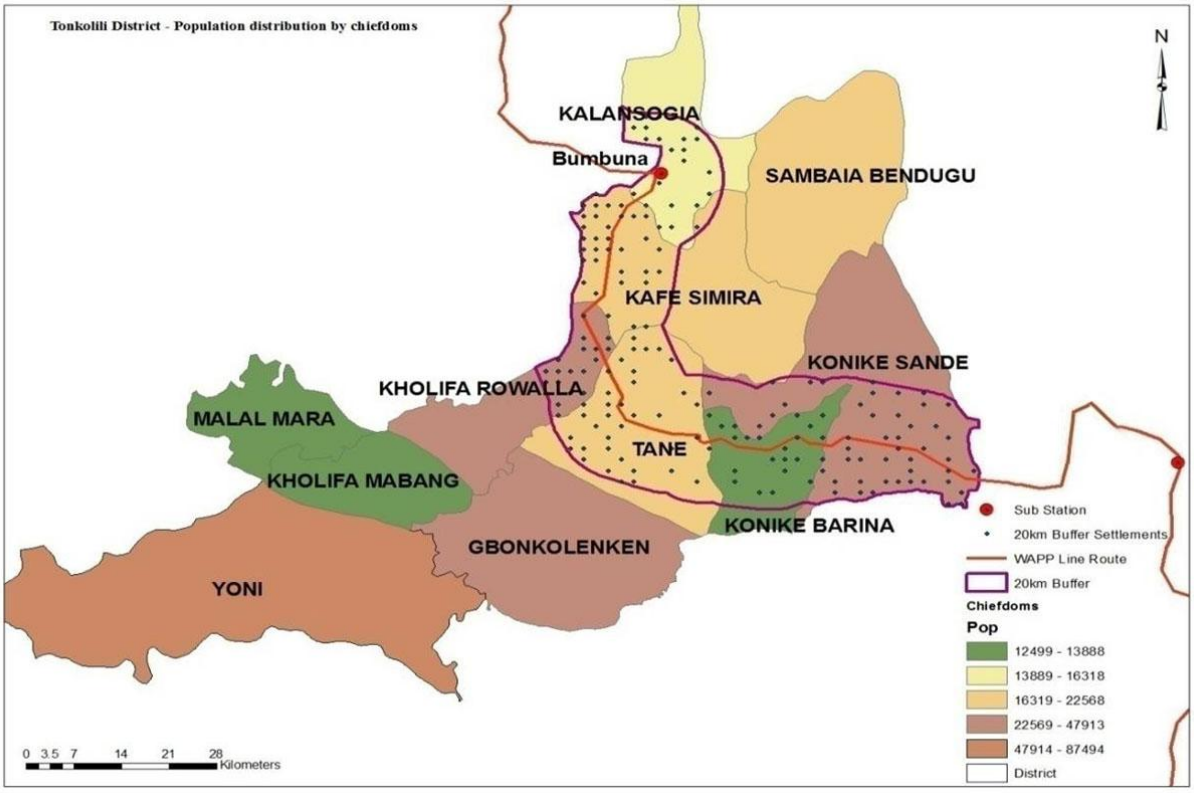
According to the 2004 National Population and Housing Census, the total population of Tonkolili district was 347,197, accounting for 7.0% of the national total. The population of Tonkolili district is made up of 161,794 males and 185,403 females representing 53.4% and 46.6% respectively. The projected population for 2009 is 383,319, suggesting that the male/female population is

currently at 182,602/200,717. With a 2004 population of 347,197, it means that the district's population has grown by 9.4% over the last five years. The population growth rate of the district is about 1.8%.The projection shows a population density of 59 persons / sq. km, as compared to the national population density of 68 persons / sq. km. The total population of the six Tonkolili District chiefdoms traversed by the line route is 162,488, constituting 24.5% of the district population. Amongst them, is Kalansogia, host of Bumbuna Sub-station, has the largest population of 16,318 (4.7 % of district population).

- **Age and Sex characteristics**

The age and sex structure of the population of Tonkolili district is closely similar to Kenema and Pujehun districts. The labor force, 15-64 years old, account for 51% of the total district population. 45.0% are below 15 years old, and only 4.0% are 65 years old and above. The dependency ratio therefore is 1:95.8. The district population is predominantly male, accounting for 53.4% of the total. Figure 24 below shows a map of population distribution in Tonkolili district chiefdoms.

Figure 24 Population Distribution Map of Tonkolili District



- **Religious, ethnic and cultural status**

The district like Pujehun and Kenema districts enjoy religious plurality, but the people are predominantly Muslims. The main ethnic groups are Temne and Limba. Tonkolili, like all districts in Sierra Leone is rich in traditions and culture.

- **Educational status**

The total enrolment at all levels of schools in the district at the beginning of 2004/2005 academic year was 128,359 (SLIS, 2004). In general, the district has 30% of literacy rate. 41.0% of males are literate and 21.0% of females are literate. About 70 - 80% of primary school teachers in Tonkolili district are unqualified.

- **Health status**

Infant, Child and Under Five mortality rates (per 1000 live births) have been very high, 118, 89 and 199 respectively, and life expectancy for both sexes at 48. The district has 52 MCHPs, 18 CHCs, 2 Mission Hospitals, 1 Mission Clinic, 1 NGO Clinic and 1 Government Hospital.

- **Economic activities**

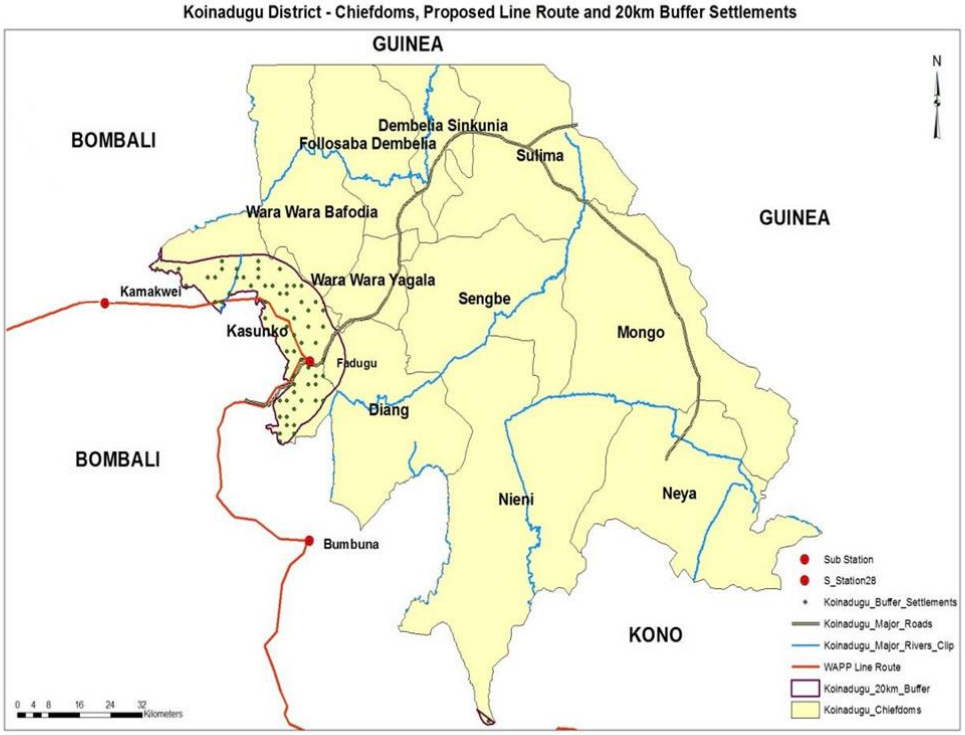
The main economic activities in the district are gold mining and agriculture. The main crops are rice, cassava and potatoes.

3.3.5 KOINADUGU DISTRICT

Koinadugu district is the largest district in Sierra Leone. It lies in the northeast, bordering Republic of Guinea in the north, Kambia district to the northeast, Tonkolili district to the south and Kono district to the east. It occupies a total area of 12,370.8 km^2 and comprises eleven chiefdoms, namely:

Dembelia Sinkunia	Neini
Diang	Neya
Follosaba Dembelia (Dembalia Musala)	Sengbe
Kassunko	Sulima
Mongo	Wara Wara Bafodia
Wara Wara Yangala	

Figure 25 Proposed Line Route in Koinadugu



The proposed line route traverses only Kassunko Chiefdom, for about 40 km. The 20 km buffer zone also falls within Kassunko Chiefdom, covering a total of 74 occupied settlements, including Fadugu where one of the Sub-stations is proposed to be located.

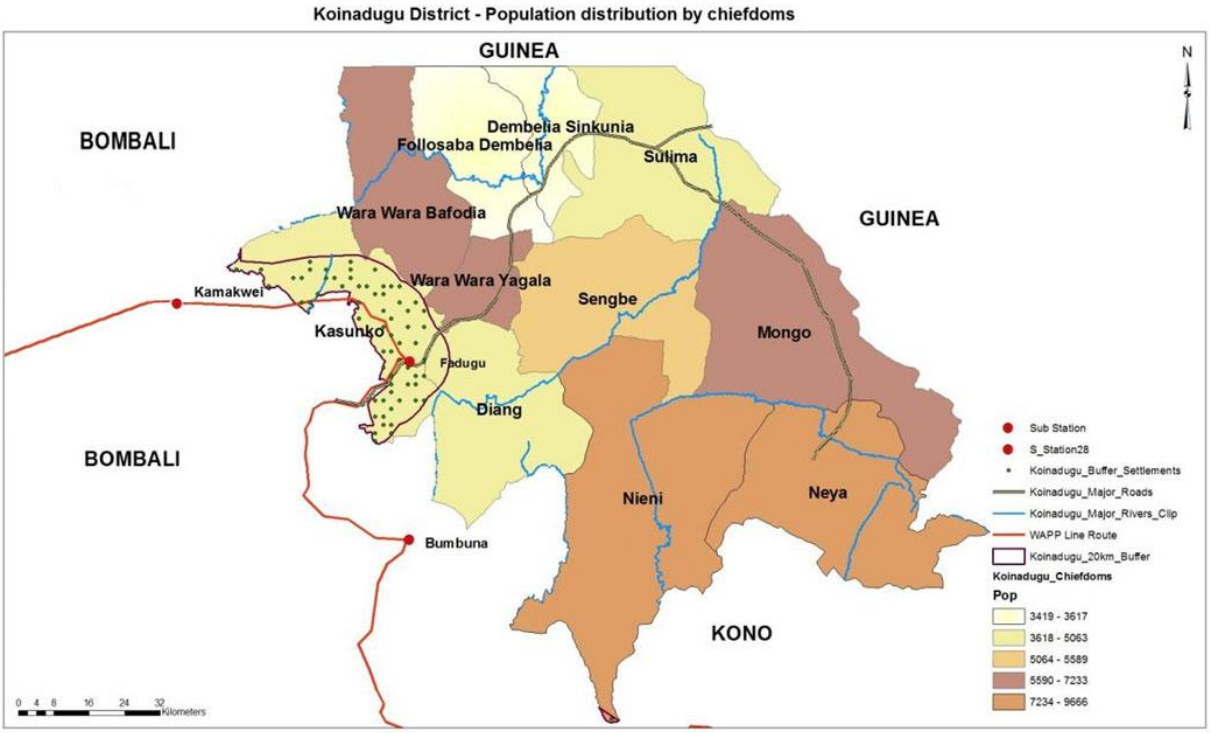
- **Demographic Characteristics**

The 2004 National Population and Housing Census recorded 65,758 people for Koinadugu district, accounting for 5.3% of the national total. The population of Koinadugu district is made up of 30, 841 males and 34,917 females representing 53.4% and 46.6% respectively. The projected population for 2009 is 295,861, suggesting that the male/female population is currently at 139,948/155,913. With a 2004 population of 65,758, it means that the district's population has grown by more than 300% over the last five years. The population growth rate of the district is alarmingly about 60%. The projection shows a population density of 5 persons/ sq. km, showing a sparsely populated district, as compared to the national population density of 68 persons/sq. km. The total population of Kassunko Chiefdom, which is the only chiefdom traversed by the line route is 5,063, constituting 7.7% of the district population.

- **Age and Sex Characteristics**

The labor force, 15-64 years old, account for 51.4% of the total district population. 44.6 % is below 15 years old, and only 4.0% are 65 years old and above. The dependency ratio therefore is 1:95.1. The district population is predominantly female, accounting for 53.4% of the total.

Figure 26 Population distribution in Koinadugu District by Chiefdoms



- **Religious, ethnic and cultural status**

The district population is predominantly Muslim. The main ethnic groups are Limba, Kuranko and Yalunka. The district by its proximity to Guinea has a mix of Guinean and Sierra Leonean cultures.

- **Educational status**

The total enrolment at all levels of schools in the district at the beginning of 2004/2005 academic year was 72,330 (SLIS, 2004). In general, the district has 21% of literacy rate, the least in Sierra Leone. 30.0% of males are literate and 14.0% of females are literate. About 75 - 80% of primary school teachers in Koinadugu district are unqualified.

- **Health status**

Infant, Child and Under Five mortality rates (per 1000 live births) have been very high, 118, 83 and 186 respectively, and life expectancy for both sexes at 49. The district has 27 functioning MCHPs, 15 CHCs and 1 Government Hospital.

- **Economic activities**

The main economic activities in the district are gold mining and diamond mining, cattle rearing and palm oil production. The main crops are rice, cassava and potatoes.

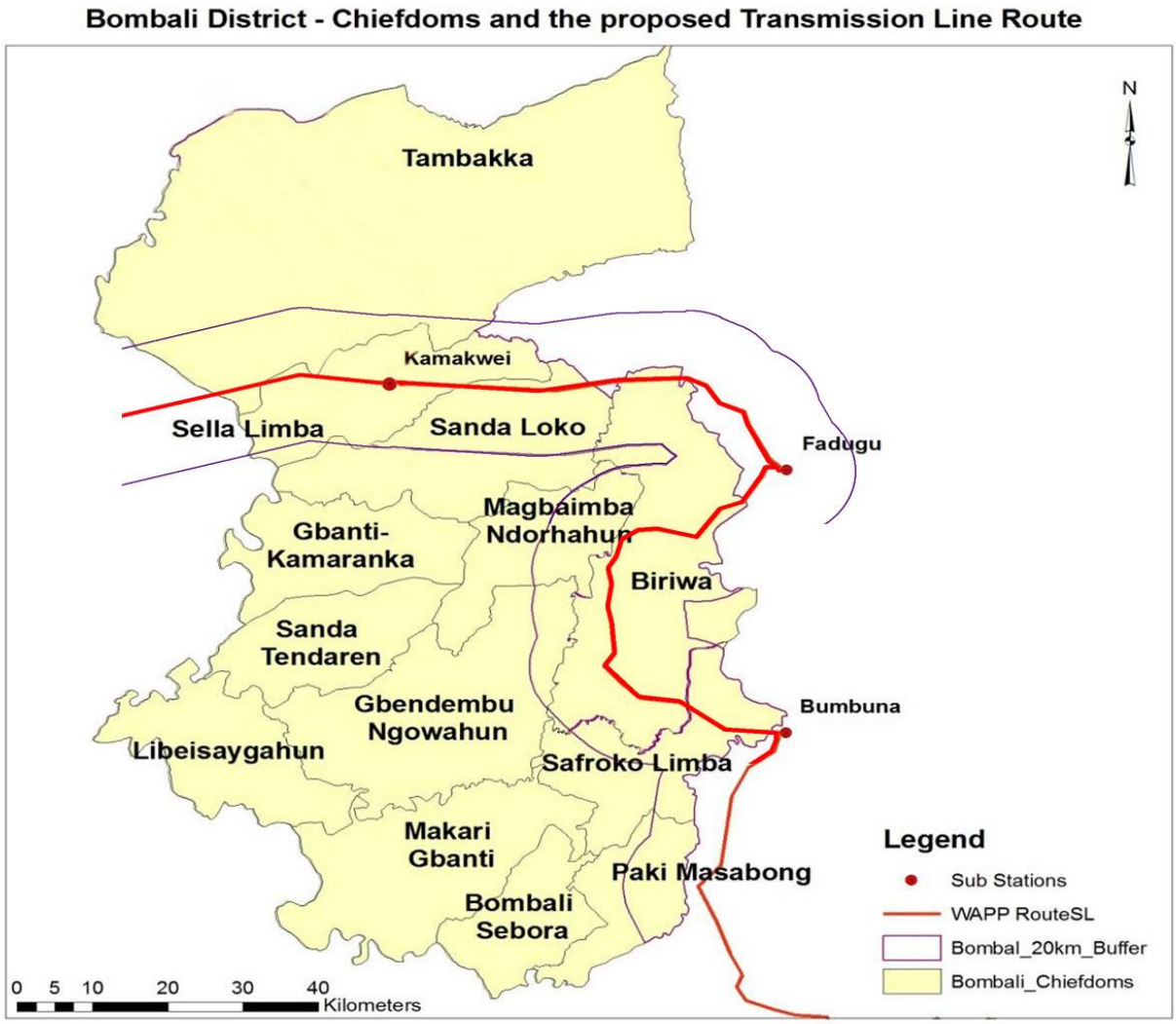
3.3.6 BOMBALI DISTRICT

Bombali district is one of five districts that make up the northern region of Sierra Leone. It borders the Republic of Guinea to the north, Koinadugu district to the east, Tonkolili to the south, Port Loko district to the southwest, and Kambia district o the northwest. Bombali district covers a total area of 8,279.3 km^2 and comprises fourteen chiefdoms, namely;

- Biriwa
- Bombali Sebora
- Gbanti-Kamranka
- Gbendembu Ngwahun
- Libeisaygahun
- Magbaimba Ndorhahun
- Makari Gbanti
- Paki Masabong
- Safroko Limba
- Sanda Loko
- Sanda Tendaren
- Sella Limba
- Tambakka

Figure 27 below shows Bombali district, the chiefdoms, the proposed transmission line route and 20km buffer zone along the route. A total of 296 occupied settlements fall within the 20 km buffer zone within the district.

Figure 27 Proposed Line Route in Bombali



The route traverses Safroko Limba, Biriwa, Sanda Loko, Sella Limba and Tambakka chiefdoms over a total distance of 166 km (104 miles). Bombali district hosts one of the proposed Sub Stations in Kamakwe, Sella Limba Chiefdom.

- **Demographic Characteristics**

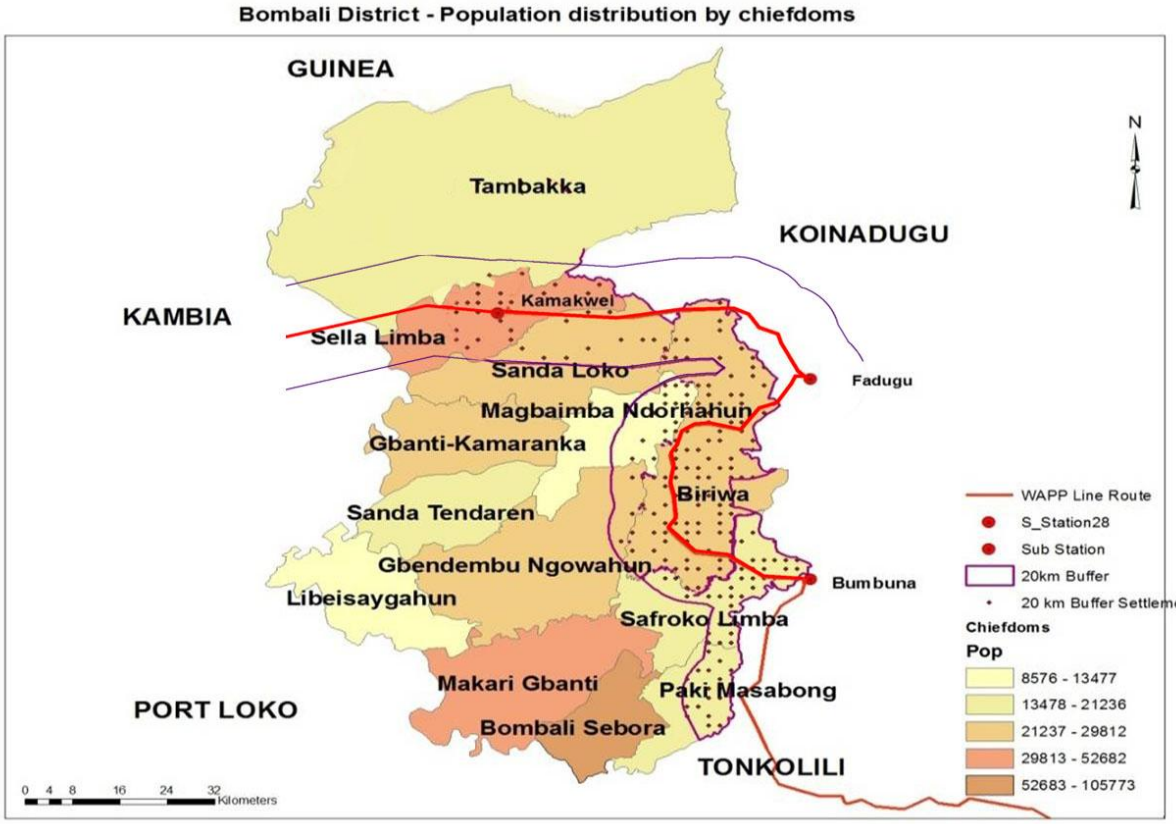
The 2004 National Population and Housing Census recorded 408,390 people for Bombali district, accounting for 8.2% of the national total. The population of Bombali district is made up of 196,027 males and 211,954 females representing 48% and 52% respectively. The projected population for 2009 is 434,440, suggesting that the male/female population is currently at 208,539/ 225,901. With a 2004 population of 408,390, it means that the district's population has

grown by 6.4% % over the last five years. The population growth rate of the district is about 1.2%. The projection shows a population density of 52 persons / sq. Km, as compared to the national population density of 68 persons / sq. Km. The total population of the five chiefdom taveresed by the route is , which is the only chiefdom traversed by the line route is 147,429 constituting 36% of the district population.

- **Age and Sex Characteristics**

The labor force, 15-64 years old, account for 52% of the total district population. 43.0% is below 15 years old, and only 5.0% are 65 years old and above. The dependency ratio therefore is 1:93.1. The district population is predominantly female, accounting for 52.0% of the total. Figure 28 below shows a map of population distribution by Bombali district chiefdoms.

Figure 28 Map of Bombali District – Population Distribution by Chiefdoms



- **Religious, ethnic and cultural status**

The district population is predominantly Muslim. The main ethnic groups are Temne and Limba. The district has a long history with Methodist and Catholic Missions. Both missions have been well established in the district for several years.

- **Educational status**

The total enrolment at all levels of schools in the district at the beginning of 2004/2005 academic year was 121,731 + 18,476 (SLIS, 2004). In general, the district has 35% of literacy rate; 46.8% of males are literate and 24.4% of females are literate. About 50 - 55% of primary school teachers in Bombali district are unqualified.

- **Health status**

Infant, Child and Under Five mortality rates (per 1000 live births) have been very high, 96, 68 and 159 respectively, and life expectancy for both sexes at 52.5, one of the highest per district. The district has 33 functioning CHPs, 45 MCHPs, 1 (one) Government Hospital, 5 Military Hospitals, 2 Mission Clinics, 2 Private Clinics and 1 Private Hospital.

- **Economic activities**

The main economic activities in the district are mining, production of food crops and small ruminants. The main crops are rice, cassava and potatoes, ginger, coffee and cocoa.

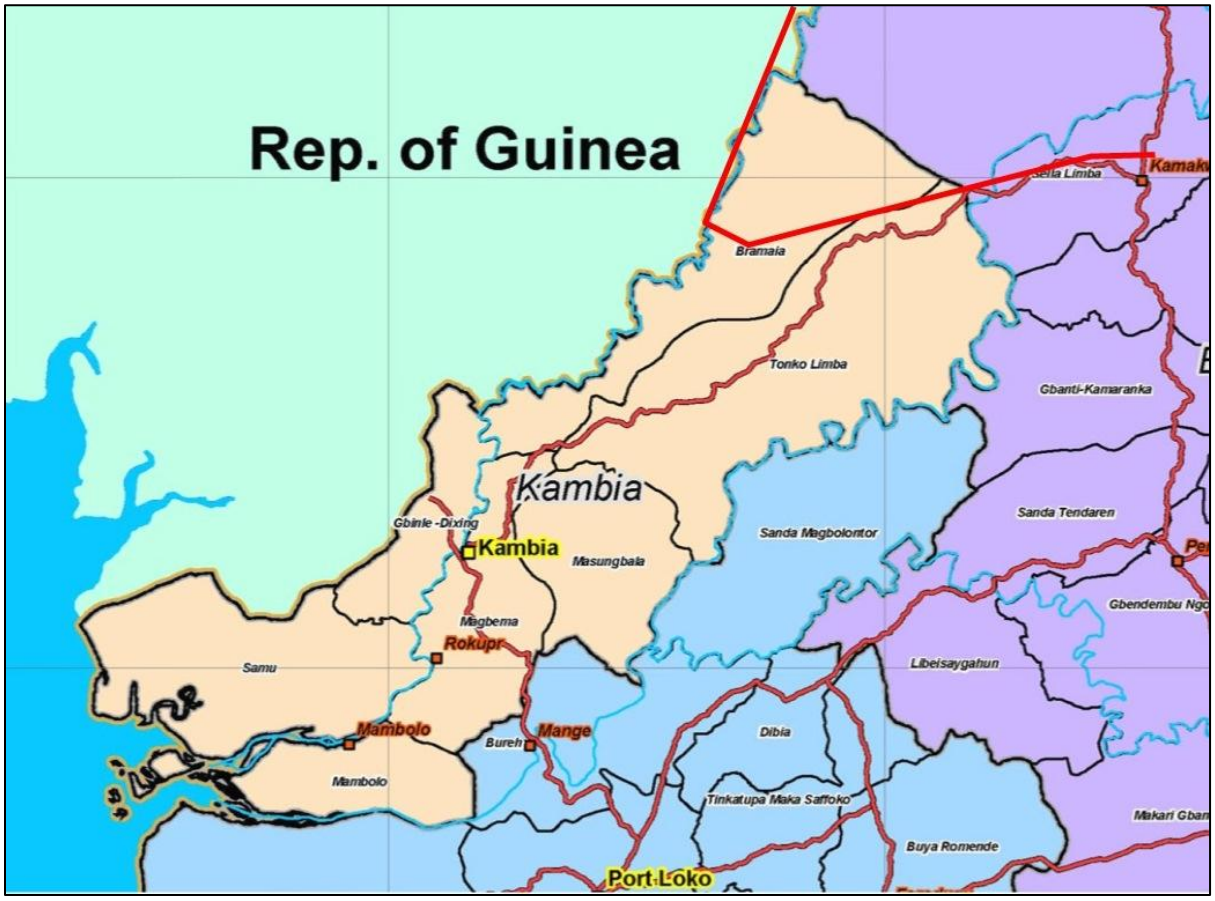
3.3.7 KAMBIA DISTRICT

Kambia district is one of the five districts that make up the northern region of Sierra Leone. It borders the Republic of Guinea to the northwest, Bombali district to the northeast, Tonkolili to the south, Port Loko district to the south. Kambia district comprises seven chiefdoms, namely;

- Bramaia
- Gbinle-Dixing
- Magbeme
- Mambolo
- Masungbala
- Samu
- Tonko Limba

Figure 29 below shows Kambia district, the proposed transmission line route traverses Tonko Linba and Bramaia chiefdom.

Figure 29 Proposed Line Route in Kambia



- **Demographic Characteristics**

The 2004 National Population and Housing Census recorded 270,462 people for Kambia district, accounting for 5.43% of the national total. The population of Kambia district is made up of 127,767 males and 142,609 females (86 special populations) representing 47% and 53% respectively. The total population of the two chiefdom taveresed by the route is 34,281constituting 13% of the district population.

- **Educational status**

Census Literacy Rates in Kambia district was 32% in total, 48% and 18% for male and female respectively. Literacy rates of 10 year olds and above in Kambia district was recorded 59%.

- **Health Status**

The main hospital in Kambia town has been completely destroyed and will need to be rebuilt. Until this is done there will be no inpatient facilities in the region and Kambia will have to depend

on Port Loko hospital for all secondary health needs. The structure of the under-five clinic in Kambia town is virtually intact and simply requires minor repairs, equipment and staff to be operational. Elsewhere it was found that the structures of most community health centres were intact although at least 50% of these were dilapidated through disuse and neglect.

- **Water Supply**

Open wells have been most severely affected with 80% contaminated and not in use, causing acute water problems in most communities. Magebema and Gbinleh Dixon chiefdoms, where destruction has been the most extensive, are more vulnerable in terms of access to clean water supplies where only 5% of the wells assessed were operational. Parts of Samu and Mambolo chiefdoms also have acute problems in terms of access to safe water supplies. In community buildings such as schools, and health centres over 70% of the water supply facilities have either been destroyed or have fallen into disrepair. Currently most communities are dependent upon alternative natural water supplies such as streams, rivers or swamp areas.

- **Economic Activity**

Agricultural production has traditionally been the mainstay of local economy in the Kambia District employing over 80% of the population. Often referred to as the "rice bowl" of Sierra Leone, the District is characterised by small family farm holdings of an average size of two hectares, cultivating both upland and lowland areas and producing a variety of cash crops including rice, cassava, millet, maize, groundnuts and a range of vegetables and tree crops such as palm oil, cashew, mangoes and oranges. Livestock production, in the form of cattle, small ruminants (goats and sheep) and poultry is also a significant feature of farming in the District. Throughout the duration of RUF(Revolutionary United Front) occupation in the Kambia District agricultural production and livestock activity has been disrupted. The destruction of rural infrastructure, including stores and drying floors and destruction of agricultural machinery, unavailability of seeds, inability to cultivate the land because of insecurity and massive displacement, have all led to a considerable decline in agricultural activity and hence impacted on food security in the region. Agricultural support services have been virtually non-existent in the past few years with no extension services in operation or credit facilities available to farmers. Markets, both day and weekend-markets, have also been heavily disrupted with market centres totally vandalised or burnt down.

4 IDENTIFICATION AND ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

4.1 Introduction

The proposed transmission line project has the potential to impact significantly on the environment. These potential impacts require proper management in order to minimize or eliminate the negative impacts and, if possible, maximize the beneficial ones to ensure the sustainability of the environment. In recognition of this fact and in fulfillment of the requirements of the permitting and funding agencies, the MEWR/National Power Authority incorporated this ESIA in its project cycle.

This section of the Environmental and Social Impact Statement (ESIA) Report deals with the methodology used to assess the potential impacts of the proposed transmission line project, and the results from the application of this methodology to the project, using information and baseline data available at the time of writing the report.

The impact assessment methodology used for this consists of five major steps:

- Step 1 : Identification and description of project activities and their interaction with environmental media;
- Step 2: Comprehensive preliminary identification of potential impacts;
- Step 3: Screening or comparative assessment of impact importance, identification of impacts that are likely to be significant (i.e. identification of focus areas for further study) through application of a basic set of impact significance criteria to the preliminary information available about each impact;
- Step 4: Detailed assessment of the identified focus area impacts characterization techniques, quantification of impacts to the extent possible and rigorous qualitative characterization of impacts that cannot be quantified; and
- Step 5: Final assessment of the severity levels of impacts through application of the results of the rigorous quantitative and qualitative characterization of impacts developed in Step 4 to a set of objective impact severity criteria; identification of impact warranting mitigation.

4.2 Project activities and affected environmental compartments

4.2.1 Project activities

The proposed project activities have been discussed in some detail in Section 2.2. The identification process considered the likely impacts of the project in relation to each activity under the three phases of the project, viz:

- Pre-constructional
- Constructional and
- Operational phases

4.2.2 Affected environmental compartments

The proposed project may result in impacts on the environment, socio-economic conditions and/or health and safety. Each of the specific compartments of the environment listed below in Table 15 could adversely be affected by the impacts resulting from one or more of the project activities discussed above The impact identification process described in Section 4.3 was used to evaluate the potential impacts of each of the project activities discussed on the specific environmental compartment listed below, in order to identify and assess the potential project impacts.

Table 15 Initial Scoping

Impact category	Specific environmental compartment
Environmental	Land use
	Habitats and biological resources
	Topography, geology and soils
	Water Sources
	Air quality
	Noise and Vibration
	Solid and hazardous waste
	Energy resources
Socio-economic	Transportation
	Cultural resources
	socioeconomics
Health and safety	Occupational health and safety
	Public health and safety

The above list was later updated and revised as a result of the environmental screening and scoping process. The revised list of affected environmental compartments is shown below in Table 16 as follows:

Table 16 Revised Scoping List

Impact category	Specific environmental compartment
Environmental	Land use
	Habitat, forestry and biological resources
	Topography, geology and soils
	Water Sources
	Air quality
	Noise and vibration
	Solid and hazardous waste
Protected Forests	Gola and Nimini Forests
Socio-economic	Transportation and infrastructure
	Cultural and social conditions
	Means of livelihood
Health and safety	Occupational health and safety
	Public health and safety

4.3 Impact Assessment identification process

All possible potential impacts assessment were identified through a comprehensive impact assessment identification process using matrix of impacts and activities. The matrix arrays project activities against environmental media, and supports a methodical, comprehensive, and objective identification of the impacts each project activity may have on each environmental, socio-economic, and health and safety medium. All potential environmental and socio-economic impacts of the proposed project were initially identified through this approach. The main factors used in determining whether an impact may occur at each intersection between a project activity and a specific environmental medium include:

- Literature reviews (desk study);
- Field observations;
- Discussions with project proponent, health, safety, and environment departmental officers and schedule officers;

- Consultations with local experts;
- Consultations with stakeholders;
- Experience from similar projects worldwide;
- Comments on the Scoping Report from EPA; and
- Professional judgment.

4.4 Results of impact assessment identification process

Table 17 below shows the expanded impact identification matrix for the various phases (and project activities) of the project cycle, identifies the focus areas by project phase (e.g. pre-constructional phase), project activity (e.g. line route survey), and affected media (e.g. air quality). This table summarizes the identified focus areas. Focus areas are indicated by 0, 1, 2 or 2+. If the impact row associated with a particular activity is 0, the impacts from that activity are considered to be negligible, or of lower significance and screened out of further consideration. The potential impacts associated with each focus area are qualitatively, and where possible quantitatively described and evaluated in the corresponding text under Section 4.5.

The potential impacts have been identified and assessed under the three main phases of the project. These are:

- Pre-constructional phase
- Constructional phase
- Operational phase

Table 17 Impact Identification Matrix

ctivities	Bio-physical Environment							Socio-cultural Environment										
	Geology, Soils	Climate, air quality	Noise	Water Sources	Flora	Fauna	Ecological sensitive	Population	Cultural Heritage	Historical resources	Visual intrusion	Infrastructure	Occupational safety, Health	Tenure, ownership	Land use	Employment	Agriculture	Public Health
Pre-constructional phase																		
Project Feasibility Study	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
line Route Survey	N	N	N	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N
Environmental Impact Study	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Acquisition of RoW	N	N	N	N	L	L	N	N	N	N	N	N	N	H	H	N	M	N
Constructional phase																		
Clearing of Access Tracks	L	N	L	L	L	L	N	N	L	N	N	N	L	H	H	H	H	N
Transportation of Equipment to Site	L	N	L	L	L	L	N	N	N	N	N	N	N	N	L	N	N	L
Clearing of Row	N	N	L	L	L	L	N	N	L	N	N	N	L	H	H	H	H	N
Clearing of Tower Corridor	L	N	L	L	L	L	N	N	N	N	N	N	L	H	H	H	H	N
Excavation of Tower Foundations	N	N	L	L	N	N	N	N	N	N	N	N	N	H	H	N	H	N
Erection of Towers	N	N	N	N	N	N	N	N	N	N	N	N	L	N	N	N	N	N
Stringing Lines	N	N	N	N	N	N	N	N	N	N	L	N	L	N	N	N	N	N
Operational phase																		
EMF effects	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	L
Vegetation Control	N	N	N	L	L	N	N	N	N	N	N	N	L	L	L	H	L	N
Line Maintenance	N	N	N	N	N	N	N	N	N	N	N	N	L	N	N	N	N	N
Tower Maintenance	N	N	N	N	N	N	N	N	N	N	N	N	L	N	N	N	N	N

Key: Negligible (N) High (H).
Low (L)
Medium (M)

4.5 Pre-constructional phase

The activities to be undertaken during this phase of the proposed project include:

- Project planning and design;

- Assessment of alternative routes;
- Line route survey;
- Consultations;
- Acquisition of the Right-of-Way;
- Sourcing funds and engaging contractors;
- Collection of baseline data such as flora and fauna survey, socio-economic and other baseline data for the preparation of the ESIA Report;
- Preparation and submission of an Environmental and Social Impacts Assessment Report;
- Acquisition of Project Environmental Licence;
- Preparation of a Resettlement Action Plan;
- Preparation of an Environmental and Social Management Plan;
- Payment of compensation to project-affected persons;

Most of these activities are expected to have negligible impacts on the environment and will therefore require no mitigative measures. However, the construction and operation of the proposed line will require a right-of-way approximately 20 m on each side of the centre line of the transmission line. The right-of-way will therefore be of width 40 m. The total of 40 m wide corridor, which will run the total length of the transmission line from Pujehun to Kamakwei close to the border of the Guinea side of the project, shall be cleared of vegetation to a height of 1.25 m above ground level, although some minimal vegetable and food crop farming up to 1.25 m may be allowed to cut down on maintenance cost.

Trees considered being potentially capable of threatening the proposed transmission line beyond the 20 m width on each side of the centre line of the transmission line will be cut down or pruned as appropriate. These will be trees, which could damage the transmission line if they fall on it or those whose branches may grow so big as to disturb the lines. All vegetation clearance will be done by physical means.

The acquisition of the Right-of-Way (RoW) and the line route will therefore have potential effects on land ownership, land-use characteristics, flora and fauna within the project environment.

4.5.1 Loss of buildings and land ownership issues

The proposed project cuts across the country starting from the southern region, through the eastern region to the northern region onto Guinea. The project footprint will be 21,400,000m² to include the area required for the towers (1,325 units), and the five substations 200m x 200 m x 5. Areas to be occupied by each tower base (5m X 5m per tower) and 5 substation sites will be permanatly acquired while the rest of RoW and access track will be taken only during the construction or operation stage.This gives a total area of 233,125 m² for premanent land take.

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The acquisition of the RoW and access tracks has the potential to adversely affect land ownership and land use characteristics, as land will have to be acquired from some individuals and communities. The land to be affected by the implementation of the project has the following categories of land-uses:

- Agricultural lands
- Potential agricultural lands (or fallow agricultural lands)
- Residential lands (affecting buildings and residential plots)

The Town Planning Declaration, 2002 as well as the NPA designs criteria for the interconnection line route prohibits activities such as gardening, crop cultivation, and farming, construction of shops or buildings in the RoW. This potential adverse effect on land ownership and land-use requires mitigation measures to minimize the impact on individuals, communities and farming villages.

4.5.2 Line Route survey and substation selection issues

Prior to the acquisition of the RoW and the start of constructional activities the proponent had to undertake a line route survey to determine the most suitable alignment for the transmission line. In addition site surveys had to be carried out to select the optimum sites for the construction of the substations.

During the line route and substation site surveys, Impact on flora and fauna were not considered to be significant since the line route follows, to a large extent, the existing road network in the project area. In the case of the selection of the substations, no adverse impact was realized on flora and fauna as no clearing was done and the substation sites did not include the protected forests.

4.6 Constructional Phase

The construction phase of the project will involve such activities as construction of substations, access and tower corridor tracks, clearing and excavation of tower base areas, cleaning of tower base buffer and RoW, cutting of trees considered too close to the RoW, transportation of

equipment and materials, tower foundation works and erection of towers, stringing of lines and construction of work camps.

These activities have the potential to impact significantly on the physical, biological and socio-cultural, socio-economic environments within the project area of environmental influence. The key potential issues relating to this phase of the proposed project have been identified through field visits and surveys, literature study and consultations with stakeholders. The significant impacts are being discussed in the following sections. It is noted here that impacts for this phase of the project cycle are similar for both the substations and transmission line constructions.

4.6.1 Constructional noise impacts

Noise due to construction machinery during clearing and grading of access and tower corridor tracks, clearing and excavation of tower base areas, clearing of tower buffer and RoW, cutting of trees, transportation of equipment and materials and the conversational shouts of construction workers could increase ambient noise levels in the immediate vicinity of the project area. Also, of concern will be the ambient noise levels and their impact on wildlife in the two Forest Reserves where constructional activities will have to take place. This potential rise in noise level could have impacts on some local communities, fauna along the RoW and on the construction crew.

Some of the towns likely to be affected by ambient noise increases are Kenema, Jiaima Nimikoro, Kamakwei and Fadugu.

It is however expected that impacts on fauna will be temporary and will not be significant. In addition, fauna that may be scared away during this phase of the project will quickly return to the vicinity of the RoW once construction ceases. No further mitigation is proposed for potential noise impacts on fauna.

Mitigation measures have however been proposed for the management of potential noise impacts on towns and villages along the RoW and the construction crew. Noise during construction of the substations may be heard by residents in the vicinity, mostly in relation to construction vehicles entering and leaving the sites. The substation locations are so remote that actual construction-related noise will most likely not be heard by any area residents.

4.6.2 Impact on air quality

Constructional activities, including vegetation clearing, excavation, grading and haulage of construction equipment and materials could degrade air quality on a short term basis in the immediate environs of the proposed project area. Air quality can also be affected by soot from

exhaust fumes of the construction machinery. Although this potential impact will be short lived or temporary, limited only to the constructional phase, mitigation measures have been proposed to minimize the impact especially on towns and villages.

4.6.3 Erosion

Clearing and grading of access and tower corridor tracks, excavation of tower base areas and the construction of access tracks during the constructional phase will expose the disturbed ground surface, which will at least be temporarily unprotected, to the agents of soil erosion such as heat, wind and rain. This potential impact requires mitigation measures to ensure that impacts such as soil loss, pollution of near-by-streams, rivers and siltation of natural waterways are minimized.

4.6.4 Public Safety

The transportation of heavy plant and equipment through towns and villages and the presence of unprotected tower base excavations could pose potential safety problems for the local populace. Mitigation measures have been proposed for this potential impact. In addition, the excavated foundations, if left unguarded, will pose risks to public safety or even animal safety. Mitigation measures have been proposed for this potential impact.

4.6.5 Flora and Fauna

During construction, the removal of vegetation for access tracks, the tower corridor track and the tower base areas will result in permanent loss of vegetation in these areas and will lead to potential faunal displacement.

Other sections of the RoW outside the tower corridor track will also be partially cleared of vegetation up to a height of about 1.25 m. In addition, trees which are located just outside the RoW and are considered likely to threaten the safety of towers and transmission lines will be felled. As stated earlier, this section of vegetation clearing could have potential adverse impacts on flora and fauna. The proposed line route will traverse agricultural farm lands, potential agricultural lands and it was selected not to cross the Gola Forest and Nimini Hills Forest. The list of primate species and other related information in these areas are shown in the table below for a reference.

Measures will, however, be put in place to mitigate the potential impact on flora and fauna.

Table 18 List of Primate Species in the Gola Forest and Nimini Forests

NAME	PROTECTED STATUS
Western Chimpanzee	Endangered
Western Red Colobus Monkey	Vulnerable
Olive Colobus Monkey	Near threatened
Diana Monkey	Vulnerable
Lesser Spot-nosed Monkey	Vulnerable
Campbell's Monkey	Near threatened
Sooty Mangabay	Near threatened

The recent "Important Birds Area" (IBA) Survey produced a bird list indicating 115 species representing 34 families. This includes the following three globally threatened species.

Table 19 List of Globally Threatened Species in the Gola and Nimini Forests

Name	Status
White-necked Rock Fowl	Vulnerable
Black faced Rufous warbla	Vulnerable
Green-tailed Bristlebill	Vulnerable

Intrusion into the habitats of these primates and birds will not occur as the line route does not enter the protected forests.

The potential adverse effects on biodiversity and wildlife in the forests will thus be minimal. Mitigation measures will however be employed to minimize the impact on tree cutting and minimal disturbance to land clearing.

There is no potential to intrude into the habitats of the endangered and vulnerable primates, mammals, amphibians, snakes, insects and birds, to cause them to be driven by the construction and maintenance of the access tower corridor and the tower base areas.

There is also no potential danger of debasement of breeding grounds, electrocution, collision with lines and interference in the navigation of birds.

Additional noise in the surrounding area may be heard from construction machinery and vehicular movements, thus scaring animals away from their habitats. These activities and noise levels will be temporary and as such the movements/disturbances will also be temporary.

There is the potential for fire hazards as a result of bush fires and electrical faults during the construction phase of the proposed project. The bush fires could either originate from NPA operations during RoW maintenance or through the activities of farmers, hunters and palm wine tappers. The occurrence of fires may result to loss of habitats of animals. Mitigation measures for these impacts on the flora and fauna are identified in 5.2.

4.6.6 Occupational safety and health

During this phase of the project, there will be potential for occupational safety and health hazards. The potential for safety and health hazards will be most acute when:

- Technical specifications relevant to safety measures are disregarded in planning and erection of plant and equipment (e.g. the use of low quality components, inadequate, sizing of cables, negligent execution of works, general non-observance of safety rules leading to inherently unsafe systems);
- The operating personnel have not received sufficient training and experience in connection with safety measures and their observance;
- There is improper and insufficient supervision of workers.

The key issues of concern here are noise pollution, machine safety, provision of sanitary/welfare facilities, injuries from falling/swinging objects, accidental fall from heights and the possibility of snakebites.

Mitigation measures are proposed to minimize the potential occupational safety and health hazards to safeguard the safety, health and welfare of the construction workers.

4.6.7 Socio-economic/cultural issues

The proposed project has the potential to impact significantly on the socio-economic and socio-cultural life of the local people within the projects sphere of environmental influence. The relevant socio-economic/cultural issues are discussed in the next section.

4.6.7.1 Loss of properties and land ownership issues

As stated earlier, the acquisition of the RoW and access track areas has the potential to adversely affect land owners ownership and land characteristics, as land will have to be acquired from some villages. The land to be affected by the implementation of the proposed project has the following categories of land-uses:

- Agricultural lands;
- Potential agricultural lands (or fallow agricultural lands)

The Town Planning Declaration, 2002, the NPA Regulations and design criteria of the transmission line and substation prohibit activities such as gardening, crops cultivation, farming and construction of buildings in the RoW.

Table 20 below shows the property type, villages and districts to be affected by the project, particularly the construction of the substations. In the identification of the line route care was taken not to affect any individual land property. As such no individual property is going to be affected by the line route. The affected villages for substation construction have been categorized in Table 20 by types of properties. The land required for each substation construction is 200 m x 200 m.

Table 20 Number of Villages and type of property

District	Affected Village	Property Type
KENEMA	GOFOR	FARM LAND – FALLOW
KONO	NDORYOGBO	FARM LAND – FALLOW
BOMBALI	KATHIRIE	FARM LAND - FALLOW
TONKOLILI	KABARAY	FARM LAND – FALLOW
KOINADUGU	KATAADOMGBU	FARM LAND - FALLOW

The affected properties have been categorized by property types, affected villages and the districts. The potential adverse effect on land ownership and land-use requires mitigation measures to minimize the impact on communities.

4.6.7.2 Land-use conflicts

The constructional activities will result in land-use conflicts. Farm land and potential agricultural lands shall be affected by RoW.

Constructional activities might result in destruction of crops. Potential land-use conflicts are considered to be significant and therefore require appropriate mitigation measures.

4.6.7.3 Impacts on population

Only about 25% of the construction work-force (during the peak of constructional activities), which is expected to be skilled labor, will be recruited from outside the local communities. The

skilled workers from outside the local communities will be accommodated at the work camps. Potential impacts on population and demography are therefore not expected to be significant and will not require any mitigation.

4.6.7.4 Employment generation and incomes

Some employment openings are expected to be created for the local people during this phase of the project. Those local people who will be employed will benefit from the payment of salaries and/or wages. This is expected to lead to improvement of local incomes.

On the other hand, there is the potential for loss of income resulting from loss of crops and farm land. Mitigation for this potential impact is therefore required to minimize the effects on the local people.

4.6.7.5 Potential impacts on public health

The proponent intends to utilize local manpower as much as possible during this phase of the project. Only about 25% of the construction work-force will be recruited from outside the local communities. The skilled workers from outside the communities will be accommodated at the work camps. Despite this small number of "outsiders" and the fact that they will be accommodated at the work camps, the potential danger of the spread of sexually transmitted diseases (STDs) including HIV/AIDS still exists. The spread of these diseases by construction workers, truck drivers and prostitutes attracted to the work camps and construction sites could occur. Mitigation measures are required to minimize this potential impact.

4.6.7.6 Impacts on the providing alternative land or other productive resources

The characteristics of transmission line construction project are quite different from the construction of other infrastructures such as thermal power plant or hydro power plant. It is a linear project which involves in only limited and localized resettlement. Considering that the affected lands area are small and the affected lands are communally owned and cultivated together, the potential conflicts on lands will not be significant.

However, it is necessary to take into consideration for potential for conflict s between PAPs and existing owners.

4.6.7.7 Impacts on vulnerable group

Members of vulnerable groups are often not able to make their voice heard effectively, and account will be taken of this in the consultation and planning processes, as well as in establishing grievance procedures. They are often physically weaker, and may need special help in the relocation/disturbance phase. In particular, female-headed households may lose out to more powerful households when assets will be demolished to make way for the transmission line.

Therefore, old people, women and children shall be considered for additional assistance and need special attentions to ensure that they are supported to be benefited from compensation entitlement and other mitigation measures.

These actions are needed to be provided to old people, women and children:

- Vulnerable Groups including the poor, sick, orphaned and vulnerable children need to be given priority in employment opportunities arising from the project.
- Unskilled labor should be drawn from local communities among women, and income generating opportunities for women will be considered during project construction in the form of food preparation and sale to workers.
- To pay equal remuneration to men and women workers for same work or work of a similar nature is recommended at the project level.
- Households only inhabited by old or feeble shall be given full assistance in building new homes.

Further during construction, it is recommended to identify appropriate micro-programs that could be provided under the Project such as revolving fund financial incentives and assistance for housing construction among others at the government level.

Table 21 Number of Vulnerable Group and Literacy rate

District	Female	Male	Total Population	Vulnerable Group				Literacy rate	
	Number	Number		bellow ages15		Over ages65		male	Female
Pujehun	155,701	144,301	300,002	131,400	44%	14,400	5%	37.0	17.0
Kenema	285,189	293,288	578,471	231,388	40%	23,138	4%	39.0	22.0
Kono	136,001	143,837	279,839	111,935	40%	11,193	4%	38.3	22.2
Tonkolili	200,717	182,602	383,319	172,493	45%	15,332	4%	41.0	21.0
Koinadugu	155,913	138,948	295,861	131,954	45%	11,834	4%	30.0	14.0

District	Female	Male	Total Population	Vulnerable Group				Literacy rate	
	Number	Number		bellow ages15		Over ages65		male	Female
Bombali	225,901	208,539	434,440	186,809	43%	21,722	5%	46.8	24.4

Table 22 Selected Demographic and Social Indicators (World Bank)

Article	Sierra Leone	Sub-Sahara Africa (1993-1999)
Stunting (Children Under five, 1999)	34	38.5
Child Malnutrition (% of children under 5)	27	-
Infant mortality rate (per 1000, in 2000)	170	91.8
Child mortality rate (per 1000, in 2000)	286	151
Maternal Mortality (per 100,000, in 2000)	1,800	-

4.6.8 Visual intrusion

Constructional activities have the potential to impact on scenic landscape values at the project site. The proposed transmission line will not have any impact on scenic views since the site does not have, nor form part of, any scenic views. The project will not have any impact on aesthetically pleasing landscapes since the line will have to pass through most of the time existing road network.

The proposed transmission sites have been carefully selected to be out of town locations. The vegetation around the substations is mostly farm bush. However, the large trees around the substation sites will be left in place to provide vegetative cover and noise buffer and also ensure that no break is introduced in the type and character of the vegetation. If there are no trees then trees will be planted

No further mitigation is planned for the potential impact of the presence of the substations. The transmission line will however not have any impacts on aesthetically pleasing landscapes.

It is expected that the local visual characteristics and expressions of the RoW along existing road networks will be affected by the presence of the transmission towers and lines. Mitigation measures have been proposed to minimize the potential "tower-glare" effects on people especially in towns such as Kenema, Kamakwei and Fadugu, etc.

4.6.9 Traffic impacts

Transportation of equipment and materials on public roads may result in some road safety problems. The potential hazards include vehicular-vehicle conflicts. Vehicular-pedestrian conflicts and falling of improperly secured equipment and materials on roads. The potential for vehicular traffic conflict situations exists especially at the points where access tracks join the main roads. The proposed transmission line route crosses several gravelly roads between Kenema and Jiaima Nimikoro, Bumbuna, Fadugu , Kamakwei, on to the Guinea border.

The proposed project will cause only a short-term increase in local vehicle traffic during the construction period that will be noticed primarily by other users of the roads within the vicinity of the construction sites.

The stringing of transmission lines across these public roads may cause temporary traffic disruptions. Measures have been proposed to minimize potential traffic impacts.

4.6.10 Potential pollution of water bodies

Clearing and grading of access and tower corridor tracks, excavation of tower base areas and the construction of access tracks during the constructional phase will expose the ground surface to the agents of soil erosion. High sediment loads of run-off from these areas could be discharged into nearby water bodies such as the Mano, Wange, Sewa and Moa, etc. The potential for water pollution by oil, lubricants and parts also exists. This potential impact requires mitigation to minimize the possibility of water pollution and also minimize the effects on downstream water usage of these rivers, which are mainly for domestic purposes.

4.6.11 Work camps

Work camps will be established along the RoW during the constructional phase of the proposed project. The contractors will in addition, exploit the option of renting properties within the communities for accommodation purposes.

Issues relating to the establishment, location, waste management and decommissioning of the work camps need to be properly addressed.

4.6.12 Access Road

Construction of transmission line typically includes constructing new access roads or developing existing small tracks. Access roads to the transmission line are required not only for construction but also for maintenance. They may be paved, graveled or graded. The impact of construction of access road will be taken into consideration in the view of environmental, technical and compensation aspects

- Environmental aspects

The construction of access roads can impact the ecological sensitive areas or wetlands through vegetation clearing. These are also dominated by the unpaved road dust emissions due to the long round trip travel distances to the more remote tower construction sites.

- Technical aspects

There is a possibility that passage of heavy machinery during the construction stage can impact the existing roads and tracks which is generally used by the local communities.

- Compensation aspects

If access roads pass the private properties, access to those properties can be disrupted and it will bring conflict between property owners and implementing agencies

4.6.13 Waste generation

Solid wastes in the form of vegetative matter, damaged cables and conductors, rags, excavated materials and packaging materials such as cartons, wooden crates and empty containers will be generated.

Also, the potential for the generation of liquid wastes due to spent oils, water from excavations and accidental spillage of fuel and paint exist.

These wastes must be properly handled to avoid or minimize adverse effects on the environment. Measures have therefore been proposed for waste management.

4.6.14 Impact of temporary workers

There will be an influx of temporary workers which will in fact have a temporary positive impact through local employment opportunities and an increased demand for local goods and services. A negative impact may occur as a result of the influx of temporary workers to the project area placing pressure on existing resources and contributing to local health problems.

Impacts to the local population are expected to begin during the construction phase as a large workforce will be brought in from outside the project area. These often rapid changes in local demographics can result in a number of undesirable pressures and consequences, including:

- Pressures on housing and existing minimal infrastructure.
- Development of spontaneous settlements around the project site often associated with

poor sanitation conditions, inappropriate rent taking.

- Disruptions to local cultures.
- Increased incidences of sexually transmitted diseases (STDs) and HIV/AIDS associated with worker and migrant in-flux.

4.6.15 Impact of abstracting the dust suppression water

Dust control will require the use of adequate measures during each construction activity and will include frequent water applications (dust suppression by water spray).

There is a slight possibility that the impact of abstracting the dust suppression water from the water courses such as the water shortage near the existing village might be occurred.

The Mitigation measure is described in the Chapter 5.2.7.13 in this ESIA report.

4.6.16 Gender issues; gender disparities, gender inequalities

Sierra Leone is party to various international instruments on the promotion of gender equality and women's empowerment. At the global level, treaties, declaration Commitments applicable to Sierra Leone have been included. In line with these matter, the report dealt with the existing status and how and what the proposed project will provide for the gender issue within these region.

The government has been making efforts to spur economic growth and thereby reducing poverty and unemployment, by considering the needs and aspirations of all men, women, boys and girls across economic, social and cultural lines. Mechanisms for implementation of the Policy are currently being developed.

However, it is recommended that a Gender Officer in Special Purpose Company (SPC) represents the organization and a draft Gender Policy for SPC is in place.

Below are some aspects that the transmission line project can contribute to mitigate the gender inequalities and improve life for women:

- Sensitization on the importance of electricity access on social responsibilities of importance to women such as lighting at home; assisting school going children with homework and reading;
- Safer streets at night with lighting;
- Water collection in the absence of electric water pumping close to home;
- Child healthcare in the absence of health centers with reliable and affordable power

necessary to maintain the cold chains, particularly for vaccines.

Furthermore SPC is working towards reducing gender disparity at a corporation level. This has necessitated changes in recruitment policy and training opportunities. The implications for the project are that similar equal-opportunity recruitment policies will be applied at construction and operation phases. This is expected to ensure recruitment of female employees during construction of the transmission line.

More generally, better access to electricity will promote income generating activities at home which would benefit both women and men. In addition to large scale industry growth, reliable electricity supply will enable the growth of small scale industries which employ or serve women such as grain mills and other food processing activities like sugar syrup making.

Some negative gender related impacts may also be expected, particularly resulting from the planned resettlement exercise, which will cause disruption of economic activities. Cognizant of the fact that a number of the households targeted for resettlement are headed by women, the project has put in place mechanisms to ensure that the resettlement and compensation packages are designed for equality, for example, ensuring that access to, and mode of payment for compensation packages, land access and dispute resolution system are not biased against female-headed households and other vulnerable groups.

Therefore, the gender disparities can be enhanced by the Transmission line project as described above.

4.7 Operational phase

Some potential impacts have been identified and assessed for the operational phase of the proposed project. These are as follows for the transmission line and substations.

4.7.1 Transmission line

4.7.1.1 Vegetation clearing

In farm land areas, the safe operation of overhead power lines will necessitate the maintenance of unobstructed lines. Vegetation control measures will therefore have to be applied during the operational phase of the project to manage vegetative growth within the RoW. The method to be used will be physical or mechanical clearing of vegetative growth for the maintenance of the RoW. RoW maintenance could also result in opening-up effects especially the activities of hunters and fuel-wood harvesters. These potential effects are not considered to be significant since much of the area is already extensively degraded as a result of intensive farming and the effects of seasonal bushfires.

Mitigation measures have however, been put in place to minimize the effects of the RoW maintenance.

4.7.1.2 Effects of rust treatment and painting of towers.

Rust may cause failure of towers. Rust treatment and painting of towers, although expected to be infrequent, are likely to cause pollution of nearby rivers and streams if not handled appropriately.

This potential impact requires mitigation measures.

4.7.1.3 Solid waste generation

Solid wastes in the form of vegetative matter, packaging materials, damaged or broken cables, conductors and insulators will be generated during this phase.

Measures have been proposed in Chapter 5 for the management of these wastes.

4.7.1.4 Liquid waste generation

Washing of equipment will result in the discharge of liquid waste during this phase of the proposed project. It is, however, not anticipated that liquid wastes from equipment washings will be generated in significant quantities.

No mitigation measures have therefore been proposed for this potential impact.

Accidental spillage of oil, fuel or paints will however need to be managed.

4.7.1.5 Occupational safety and health issues

Some occupational safety and health hazards are expected during the operational phase of the project. These hazards could be from falling and/or swinging objects, potential collapse of towers, electrocution, falling from heights and snakebites. These hazards pose potential threat to the safety and health of the workers. However, collapse of towers is not a common occurrence because during the over 30 years of NPA's operation and maintenance activities, the NPA has never experienced any collapse of towers. Mitigation has however been proposed to minimize these potential hazards.

4.7.1.6 Public safety

Potential public safety hazards are enhanced for a project such as the proposed transmission line project when the local populace has not been properly educated with regard to the potential hazards. In addition to the hazards posed to the public due to transportation of equipment and materials, other hazards such as potential exposure to Electromagnetic Field (EMF) effects, potential collapse of towers and electrocution will exist during this phase of the project.

The falling of a live electrical conductor could cause severe burns of any object on which it falls. An electrical conductor could fall from the towers as a result of either a mechanical failure of an insulator string on the tower or snapping of the conductor itself. The mechanical failure of an insulator string could be the result of a lightning strike, rusting of insulator pins or a heavy object falling on the transmission line. The failure of a conductor joint could also cause snapping of the conductor.

These potential hazards require mitigation to ensure the safety of the public. One other potential impact of the proposed transmission line project is the perceived danger of transmission lines. Issues relating to the electromagnetic fields are not normally understood by the public. The misconception that EMFs may cause cancer or harm children could create fear and perhaps panic among the local populace. This issue has been further dealt with below.

4.7.1.7 Electromagnetic Field (EMF) effects

According to the World Environmental Library, WEL 1.1, information derived from prolonged observations and experiments in numerous countries indicate that the electric and magnetic fields around power transmission and distribution facilities exhibit frequencies between 50 and 60 Hz have no harmful effects on human health. Magnetic field strengths below 0.4 mT at 50 – 60 Hz induce no detectable biological reaction in humans. The magnetic fields acting on the ground below overhead lines develop maximum field strength of only 0.055 mT for frequencies between 50 and 60 Hz. Therefore, potential effects of EMFs on human health are non-existent according to current knowledge.

However, an electrically grounded person touching an ungrounded metallic object or a conductor in a static or oscillating field may draw electric current from the object and may experience a micro shock from a spark discharge.

This potential effect needs to be mitigated. Mitigation will also be required to address the notion that EMFs may cause or harm children and the resulting fear and possible panic among the local population.

4.7.1.8 Effects of weed control chemicals

The improper application or misuse of weed control chemicals could adversely affect the environment and health of workers handling these chemicals. To avoid these potential problems the SPC employs only physical or mechanical cleaning of weed for the maintenance of the RoW. No further mitigation measure is therefore required for this potential impact.

4.7.1.9 Socio-economic issues

Potential socio-economic issues such as land ownership, land-use conflicts and compensation issues are expected to persist during this phase of the project. Measures have been proposed to manage the residual effects of these potential issues. Impacts on population and demography are however not expected to be significant and will not require any mitigation.

4.7.1.10 Effects on birds

The presence of towers and power transmission lines in the RoW has the potential to impact on birds. There is the potential danger of debasement of breeding grounds, avian electrocution, bird collision with lines and interference in the navigation of birds. No specific breeding grounds of birds have been identified within the RoW. Hence the potential danger of debasement of such areas does not exist. A bird collision incident happens when a bird physically strikes either the overhead conductor or the overhead ground wire of a powerline. In the case of transmission

lines, the overhead ground wire is usually involved. It is generally accepted that birds can usually avoid the highly visible bundled conductors but often fail to see the thin ground wire.

Mitigation measures for the other potential effects on birds have therefore been proposed to minimize the effects.

4.7.1.11 Fire hazards

There is the potential for fire hazards as a result of bush fires and electrical faults during this phase of the proposed project. The bush fires could either originate from NPA operations during RoW maintenance or through the activities of farmers, hunters and palm wine tappers.

This potential hazard will have to be mitigated to minimize the occurrence of fires.

4.7.1.12 Impacts on telecommunications

Consultations carried out with the Sierra Leone National Telecommunication Company NATCOM) and registered mobile companies in the country prior to this project indicate that in cases where telephone lines run parallel or close to high-tension lines, subscribers experience interference as a result of induction effect.

It is known also that resonance effect of power frequency fields may also affect telecommunications.

However, this does not occur with the NPA transmission lines as they usually run outside settlements where interferences are likely to occur. In addition the SPC adopts the procedure of 'trans-positioning" of the conductors (interchanging the individual phases from tower to tower) along the line route, in order to reduce the impedance that causes resonance. The phases are restored to the original at the termination of the lines. Some mitigation measures have however, been proposed for this potential impact.

4.7.2 Impacts as a result of operation of the substation

4.7.2.1 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.

4.7.2.2 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.

4.7.3 Potential dewatering operations

The potential for dewatering tower foundations, which might lead to pollution of surface water bodies due to high suspended particulate matter load during the constructional phase, exists, especially during the rainy season. The discharge of high volumes of water to land might also create temporary swamps or pools of water. There is therefore the need to introduce mitigative measures to minimize the potential impacts.

4.7.3.1 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.

4.7.3.2 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.

4.7.3.3 Substation security and public safety

As indicated elsewhere in this document, the substations will be located in relatively remote areas out of the various towns/villages. 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. No further mitigation is proposed for this impact.

4.7.3.4 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.

4.8 Indirect Benefits arising from the project

In accordance with the World Bank guideline (Environmental Assessment Sourcebook), "indirect effects" may include any effects that would be caused by the proposed action but which occur later in time or farther in distance from the action. Indirect effects may be represented by a variety of potential impacts, projects, or actions, including growth-inducing effects such as residential and commercial development, and infrastructure and public works projects, among others. Indirect benefits will be derived from this proposed project and they include both upstream and downstream benefits. With regards to upstream benefits, the proposed project will involve the construction of electric infrastructure that will facilitate the country's participation in energy trade within the sub-region, provide opportunities for rural electrification. During construction stage, it will be created and the country will benefit from technology transfer. The downstream benefits will include capacity building of NPA staff in operations and maintenance, and the management of power sales. Adequate and reliable electric power supply will improve security, good governance, development of industries at national and local levels, and social opportunities..

The key drivers for increasing access to electricity are primarily to attain of the Millennium Development Goals such as eradication of extreme poverty and hunger, achieve universal primary education, promote gender equality and empower women, reduce child mortality, improve maternal health, combat HIV/AIDS, Malaria and other diseases, and in particular, ensure environmental sustainability towards poverty alleviation.

The benefits to be derived from the implementation of the project are immense, especially considering the problems of supply experienced in Sierra Leone in the recent past. The implementation of the project will ensure that the objective of ECOWAS to establish a regional electricity market in West Africa through the judicious development and realization of key priority infrastructure that would permit accessibility to economic energy resources, to all member states of the ECOWAS shall be realized.

Beneficiaries of the proposed Project

The CLSG project will provide electricity to the mining development project of the company Arcelor Mittal in Liberia and other mining projects such as large scale diamond mining by Koidu holdings around the proposed CLSG project area as well. They are considered main beneficiaries of the Project.

One of the main benefits of the interconnection project would be the supply of relatively cheap energy by Côte d'Ivoire to the other three countries, Liberia, Sierra Leone and Guinea during the 2013 – 2019 period and also the commissioning of an infrastructure which will facilitate the further development of hydropower sites in these same three countries. It is impossible to quantify this benefit, but an approach consists in assuming that the project will allow for reduction of future un-served energy costs in these three countries

It will be assumed that the project would allow for a reduction of un-served energy of around 20 % of demand in the three countries in 2014, decreasing to 10% in 2019, which would correspond to roughly 100 GWh/annum. The cost of un-served energy was taken at 1 Euro / kWh in the region, during the first Workshop on the present study, in May 2009 in Conakry. As an example, it is possible to evaluate this un-served energy by assuming that the interconnection would have the following benefits from 2013 / 2014:

Another sensitivity analysis can be made by taking into account an important non-monetary variable, which is the cost of CO2 emissions. Since the CLSG project should allow for important hydrocarbons savings, it should also allow for substantial CO2 emission reductions for the concerned countries. A reasonable and prudent assumption would be to consider a CO2 emission cost of 20 US$ per ton.

If we consider that the hydrocarbons used in the region would produce roughly three times their weight in CO2, then an equivalent barrel of hydrocarbons would produce 3 equivalent « barrels » of CO2, or ½ ton, which has therefore a 10 US$ cost. Then, when using a 20 US$/ton of CO2 emission reduction cost, it is equivalent to add 10 US$ to the cost of each equivalent "barrel" of hydrocarbons saved by the project.

Another important aspect which can be a condition for a future and real participation of private investors, will be the effective development of the main hydropower projects in the region (mainly in Guinea), which is the driving force for the future profitability of the CLSG project.

In 2013, the generation surplus in Ivory Coast will reach 440 MW and 918 GWh. The analysis of the Guinea's generation development plan shows a surplus of hydroelectric power generation of 70 MW from 2016.

The commissioning of the interconnection at the earliest date (2013 – 14) is better since it will allow for substantial reductions in fuel costs and CO2 emissions in Guinea, Liberia and Sierra Leone, with a relatively interesting investment cost.

If the first stage of the project is realized, available surpluses in Côte d'Ivoire could be exported to the other countries and allow for substantial cost savings in them; it is economically advantageous to realize.

The technical study must show that the 225 kV proposed interconnection will allow the Ivory Coast to export its power surplus of 80 MW in 2013.

Between 2013 and 2020, the development of hydroelectric generation means will provide taking into account the hydraulic generation excess which will be exported to Ivory Coast and the countries included to the West African System.

Most of the benefits appear in the long term (from 2020 afterwards) when the hydroelectric potential of Guinea can be developed and exported to Côte d'Ivoire. The Guinea foresees to

expand its exports to Mali in the framework of the Fomi project and to Senegal and Guinea Bissau in the OMVG project.

Most of the benefits appear in the long term (from 2020 afterwards) when the hydroelectric potential of Guinée can be developed and exported to Côte d'Ivoire;

In 2030, Liberia, Sierra Leone and Guinea export respectively 50 MW, 70 MW and 170 MW to Ivory Coast, is a total importation of Ivory Coast of 290 MW.

For the electrification of the village within the CLSG project area, it is logical to plan to use the HV lines passing close to the villages for supplying them. There are several existing techniques which are discussed below. It is the benefit to the villagers of the HV line since it brings them electricity, whereas otherwise it provides only drawbacks.

The Insulating Ground Cable (IGC) configuration (D in particular) can supply a 100 % three-phase load.

It can be an appricable way at a lower cost, by avoiding multiplication of HV/MV transforming equipment in each substation along the line for the rural electrification.

Under the hypothesis of equipping all the interconnection lines with insulated ground cables for the rural distribution supply (except for Ivory Coast due to its sufficiently developed conventional network), the estimated cost is 3.5 million USD.

- *The Consultant referred to the Feasibility Study Report of the CLSG Project prepared by ACTS and SOGREH Consortium.*

4.9 Cumulative Impacts

A "cumulative impact" is the impact on the environment which results from the incremental impact of the Project when added to other past, present, and reasonably foreseeable future actions.

The process of cumulative environmental change can arise from any of the following types of events:

- Single large events, i.e. a large project;
- Multiple interrelated events, i.e. road projects within a region; and
- Catastrophic sudden events, i.e. a major landslide into a river system.

These can generate additive, multiplicative or synergetic effects, which can then result in damage to the function of one or several eco-system.

Information on other past, present, and reasonably foreseeable future projects near the line route has been collected from relevant authorities such as the Ministry of Works, Housing and Infrastructure and National Power Authority (NPA).

These are the information of other past, present, and reasonably foreseeable future projects near (within 10km of the RoW) the line route:

- Global Trading Group (GTG) 15MW and Income Electrix Ltd (IEL) 12MW. G.T.G
- 16 MW thermal plants to be installed by Jacobsen Elektro of Norway at Blackhall Road Power Station.
- 33 kV transmission line and the rehabilitation of selected 11 kV networks in the Western Area.
- Makali (120 KW) Hydro plant in the Tonkolili District and Charlotte (2.0 MW) in the Western Area.
- The rural electrification and the reinforcement of the medium and low voltage networks in the Western Area.
- The distribution improvement project Phase I and II
- Emergency rehabilitation of the Western Area transmission and distribution funded by NPA for the repair of critical inter connectors and the replacement of faulty transformers, undersized conductors/cables.
- Large scale Diamond Mining operated by the Koidu holings Ltd. at Koidu, Tankor, Yengema and Tongo in the Kono district.
- Small Scale Diamond Mining operated by the Milestone Sierra Leone Ltd at Tefeya, Sandor Chiefdom in the Kono District.
- The reconstruction of the Kenema and Pendembu road for the transportation of Goods and Services from the Kailahun district to the rest of the Country.(86 km)
- Construction of railway for the transportation of iron ore

- Section : Bumbuna ~ Pepel (94km)
- The railway crosses the line route of the proposed Project between AP 185 and AP 186
- Client : African Mineral, Construction company : CCECC
- First shipment of iron ore is expected on 1st of September, 2011

Because of the nature of a transmission line project, the changes will be much localized. The project will allow electric power to be transmitted from distances far away, and the biggest impacts will come from the change of lifestyle resulting from social development.

Considering that surrounding circumstances of the selected line route is mostly out of town area and is going along the existing road, cumulative impacts causing from the project is minimal.

The Mining will usually include clearing of vegetation, removal of overburden, excavation for ore recovery (also by suction), Mineral Processing. These mining operations will result in the removal of the soil and rock present at the site. The mining will therefore result in changes in the topographic height, slope relief intensity, degree of shaping and exposure of the area. Water management during operations is done by pumping from existing rivers, streams and also surface streams. Discharge of wastewater into surface water may impair surface water quality by causing changes to its physical, chemical and biological properties. To use ground water will interfere with the existing groundwater flow regime and will result in the temporary reversal of groundwater flow directions. Clearing of the area for mining will change the vegetation cover and will alter ground water recharge and runoffs conditions. Surface runoff from mining and mineral processing waste containing large amounts of water – soluble substances or heavy metals can result in degradation of surface water quality.

Key potentially beneficial impacts associated with the road reconstruction project are related to both construction and post-construction phase. These include employment possibilities during the construction when it is expected that apart from recruitment of qualified engineers from within the country, local labour would also be recruited from the particular locality of the projects for both unskilled and skilled labour.

The opening up of the road would render communities of the area to be more accessible, considering that the Kenema, Pendembu and its environs is an area mainly accessible only by footpaths. Transport facilities would be much more diversified as opposed to covering all distances within the area either on foot or by using motorbikes (which are generally dangerous). A better travel condition for vehicles and passengers is thus created.

But in a view of adverse impacts, traffic levels will be high as a large number of vehicles on a daily basis during the operational phase. Such high level of traffic will give rise to problems of noise and air pollution and there is also a concern for the safety of pedestrians and even livestocks. A potential adverse impact relates to the land acquisition requirement.

The increase in regional growth in the Project Area Subregion may indirectly contribute to potential cumulative impacts in the proposed Project area. An increase in population growth directly affects the demand for jobs and housing, which may increase the number of planned development and improvement projects, such as public service facilities or transportation system expansions, in the Project Area. Substantial population or employment increases near the area of the proposed Project also substantially increase the population potentially exposed to an accident or other hazard.

However, if the mitigation and benefit enhancement measures recommended in this ESIA report are implemented properly, there are no environmental grounds for not proceeding with implementation of the project in the form in which it is presently envisaged, since its long-term benefits generally outweigh the largely short-term adverse impacts associated with the construction, all of which can be mitigated satisfactorily.

5 MITIGATION MEASURES

This section of the ESIA presents the mitigation measures that have been proposed to minimize the potential adverse environmental impacts and maximize beneficial impacts that are associated with the implementation of the project. To ensure that environmentally sound practices are adhered to and in order to safeguard the safety and health of persons or any group of persons working on the project during implementation, the following mitigative measures are proposed for significant potential impacts at the pre-constructional, constructional and operational phases.

5.1 Pre-constructional phase

5.1.1 Potential Sensitive ecological and inhabited area

The Consultant carried out desk study and field investigation to identify environmentally sensitive area. An effort was made to avoid these areas as much as possible when the line route was proposed.

However, there is a possibility that further ecological sensitive areas will be found during the construction stage. To prevent and minimize adverse impact on this potential sensitive area, during the design stage, line route survey should be carried out by the Contractor and relevant authorities to verify whether there is sensitive areas or not inside RoW and to ensure the adequate line route selection by avoiding this area if it is found.

5.1.2 Loss of buildings and land ownership issues

The proposed project cuts right across the country from the south-east to the north and runs for about 530 km with about five new substations to be constructed. This means land ownership structures and land-use characteristics will have to change within the affected area. The NPA Safety Rule prohibits some activities such as mining, construction of buildings, permanent crops cultivation and permanent farming in the RoW. However, according to the World Bank Transmission Line RoW Guidelines, minimal farming and vegetable gardening may be permitted along the RoW except for the area occupied by tower foundations and 3.0 m RoW maintenance track as this will help reduce maintenance cost of the RoW.

In order to minimize the adverse effects of the acquisition of the substation sites/lands and RoW areas on individuals, families, communities lands, a detailed survey of affected communities and land owning families was carried out as part of this ESIA for the purposes of compensation payment. Prompt, adequate and fair compensation will be paid to all project-affected land owning families before the commencement of the constructional activities.

5.2 Constructional phase

The constructional phase of the project involves activities that have the potential to impact significantly on the physical, biological and socio-cultural/socio-economic environments within the project's area of environmental influence. The following mitigation measures have been proposed for the significant potential impacts.

5.2.1 Noise impacts

Noise impacts from constructional activities will be temporary-limited only to the constructional phase of the project. All construction machinery and equipment will be maintained regularly, paying attention to all noise-reducing devices, silencers or mufflers to ensure that they are in good working condition to minimize noise generation.

The unnecessary hooting of horns during transportation of equipment and materials through settlements will be avoided as much as possible. Construction site workers will also be advised to avoid unnecessary noise making. In addition, night time work especially near communities will be avoided as much as possible to prevent undue noise impacts on local communities. Construction crew near noisy machinery and power tools will be provided with earmuffs to protect them from hearing loss damage.

In addition, the substations locations are so remote that actual construction-related noise will most likely not be heard by any area residents. However, trees native to the area shall be planted at the frontage of the substations to act as noise buffers. It is expected that full implementation of the measures outlined above will minimize the potential noise impacts on local communities.

5.2.2 Impacts on air quality

Wind pick up of dust from exposed unprotected land surfaces will be minimized by limiting land clearance to minimum area requirements for the constructional activities. For instance, excavation of the tower base areas will be restricted to the required dimensions of 9.0 m x 9.0 m. To further reduce dust pollution, regular watering of the sites will be carried out during construction to reduce the effect of wind pick-up of dust particles. This potential impact will be short-lived or temporary since it is expected that the exposed areas will be covered quickly by vegetative re-growth. The vegetative cover will however be so maintained as to allow the passage of vehicles.

In addition, the construction machinery and equipment will be maintained regularly to minimize the release of soot in the exhaust fumes.

Furthermore, trucks that supply sand, gravel and stone aggregates will have their buckets properly covered with tarpaulin during transit to prevent wind pick-up of dust, spill of materials and the release of dust into the atmosphere.

These measures, when fully implemented, are expected to minimize the potential impact of dust pollution on local communities.

5.2.3 Erosion

Activities during the construction phase will expose the disturbed ground surface, which is at least temporarily unprotected, to the agents of soil erosion such as heat, wind and rain. Erosion of soil from exposed unprotected land surfaces will be minimized by limiting land clearance to minimum area requirements for the constructional activities. For example, excavation of the tower base areas will be restricted to the required dimensions of 7 m x 7 m. Also, the erection of towers/tower footings on steep slopes will be avoided as much as possible to prevent slip erosion. This potential impact will, however, be short lived or temporary since it is expected that the exposed areas will be covered quickly by vegetative re-growth to stabilize the soil and minimize erosion.

5.2.4 Public safety

The transportation of heavy plant and equipment through settlements will be done in a manner not to jeopardize the safety of the local people. Equipment and materials will be properly secured when being transported to prevent them from falling and posing potential danger to people. It is important to note that it is not the constructed towers that will be transported to tower locations but rather the tower components or parts. Legally mandated speed limits on the roads and highways shall be strictly observed in all settlements. Also, tower base excavations in or near settlements and farms will be protected or clearly marked to prevent people from inadvertently falling into these excavations. For areas with animal populations, these excavations will be guarded with boards to ensure no animals fall into the pits.

Tree felling will be done by a certified timber contractor with competent workers. Adequate warning will be given to ensure that public safety is not compromised during this activity. In situations where wildlife goes berserk, the game wardens should be notified immediately for necessary action to be taken.

5.2.5 Flora and fauna

Care will be taken to minimize the area that will be cleared and the number of trees that will have to be cut along the RoW. Construction workers will be closely supervised to ensure that

only the minimum area requirement, as given earlier, for access tracks, tower corridor track and tower base area are cleared of vegetation to minimize potential impacts on flora and fauna.

Felling of trees will be properly supervised to ensure that only trees of necessity will be felled.

The intrusion of invasive and alien species will only be possible during import of transmission and construction materials. The Government of Sierra Leone quarantine inspection and procedures will be followed to ensure that invasive or alien species do not enter the country.

It is expected that impacts on flora and fauna will be temporary in the proje area and will not be very significant. In addition, fauna that will be scared away during this phase will quickly return to the vicinities of the RoW once construction ceases. No further mitigation is proposed for potential impact on fauna.

5.2.6 Occupational safety and health

Prior to the commencement of construction works, all contractors should be required to prepare their own ESMPs. 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 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

The SPC will ensure that the contractor for the project carries out the work in compliance with the relevant provisions of the Factories Act, 1974, the NPA Corporate Rules and the World Bank Environmental, Health and Safety Guidelines of April, 2007 to minimize the potential occupational safety and health hazards and prevent or minimize accidents. To further minimize the potential safety and health hazards, the SPC will ensure that the contractor employs properly trained and experienced operatives and adheres to all technical specifications relevant to safety measures in the execution of the works. In addition, the contractor will be expected to provide an "All Risk Insurance" cover for the contractor, subcontractors, project management staff and all other employees. The specific issues considered are discussed below.

5.2.6.1 Occupational noise

Construction workers working with or near noisy equipment like pumps and power tools will be provided with earmuffs to protect them against noise-induced hearing loss damage.

5.2.6.2 Machine safety

All potentially hazardous machinery such as lifting appliances (crane, forklifts, etc) and unfired pressure vessels (compressors, etc) will undergo statutory examination by a certified engineer.

This will ensure that accidents due to material failure are pre-examined. All electrical cables of mobile or hand-held machines (electric hand drills, temporary lights) will be examined for flaws in insulation and when flaws are detected the cables will be promptly replaced.

5.2.6.3 Sanitary/welfare facilities

Mobile toilet facilities will be provided for construction workers. This is to ensure that decent and comfortable places of convenience are provided for the workers and also to prevent environmental pollution with human waste.

In addition, lifting of excessive weights at the workplace will be prohibited. Lifting appliances (e.g. cranes and forklifts) will be provided for lifting heavy objects. First aid facilities and good drinking water will be made available for the use of workers in accordance with the Factories Act, 1974.

A first aid box stocked with all items prescribed by the Factories Act, 1974 will be provided and maintained. In addition, a vehicle will constantly be on standby for use as an ambulance and a clinic and a doctor as well at the work camp for the conveyance of all persons who may sustain major injuries during the course of the implementation of the project to the nearest Health Centre. Raincoats, Wellington boots, etc will be provided for construction workers who will be working in rainy or wet conditions.

5.2.6.4 Injuries from falling/swinging objects

Protective clothing such as helmets and safety boots will be provided for all employees at the proposed project sites for protection against falling and/or swinging objects. Tree felling will be done by competent and adequately trained workers. Adequate warning will be given to ensure that safety of workers is not compromised.

5.2.6.5 Accidental falls from height

Due to the hazard of potential accidental falls from heights during construction works all workers who will be required to climb and work on the towers will be provided with the necessary safety equipment such as body harnesses, (climbing belts). In fact, experience gained from projects carried out by contractors of the SPC show that the use of safety equipment to mitigate height

hazards are strictly enforced. The SPC will, in addition, ensure that only well-trained and experienced personnel work at heights on the towers.

5.2.6.6 Snakebites

Construction workers will be protected from the potential hazard of snakebites by providing them with safety boots long enough to cover the leg up to the knee. Workers will be required to wear these boots at all times during working hours. Snake bite boxes to treat snake bites also need to be present in the work camp.

5.2.7 Socio-economic/cultural issues

The relevant socio-economic issues are:

5.2.7.1 Land ownership (including compensation issues)

The proposed project cuts right across the country from south-east to the north for about 530 km. Land ownership issues, especially for the substations will have to change within the project area. The NPA Regulations prohibits some activities such as mining, construction of buildings, permanent crops cultivation and farming in the RoW, although some minimal farming and vegetable gardening up to a height of 1.25 m may be allowed as this reduces maintenance cost.

In order to minimize the adverse effects of the acquisition of the substation sites, SPC will pay adequate compensation to the land-owning families. Customary land ownership systems prevail in the rural districts of Sierra Leone. The Paramount Chief is the custodian of the land and from the visits of the ESIA Team, all the Paramount Chiefs consented to provide land for the proposed project. Mention was only made by the Paramount Chiefs that compensation should be paid to the land owning families, not at the private market rate of the land sales but on negotiated rates that will be at agreed on at Chiefdom Level. The total foot print of the proposed project for one substation construction is 200 m x 200 m. Thus with a total of five substations, the total footprint of the proposed five substations is approximately 200m x 200m x 5. The current private market value for one town lot ranges from Le 2,500, 000 – 3,000,000. No permanent economic crops were found to be on the identified substation sites. The Valuation List found on the First Schedule of the Local Government Act, 2004 shall be used as basis to value lands to be acquired by SPC for the substation sites.

In the case of the RoW, lands will be taken permanently only for the tower spots (approximately 5m X 5m). As towers will be put approximately every 400m along the 530km RoW, total number of towers to be erected in Sierra Leone is approximately 1,325. Considering that each tower base will occupy approxiamately 25m^2 (5m X 5m per tower), total area of 33,125m^2 will be taken for the RoW.

Those eligible for compensation for loss of their crops along the RoW are persons whose crops on lands will be selected by the construction firm for the 40 m RoW corridor including 1,325 tower bases. Such crops will be fully negotiated for by the proponent. Compensation will be determined by the criterion that only those whose crops/properties are affected or situated in the RoW are eligible.

The legal framework for land transaction between the buyer and the seller is strictly in accordance with the provisions of the Land Commission Act, 2005. The legal framework provides the principal means by which the property is to be legally or lawfully transferred or conveyed to the MEWR/NPA which is the client/buyer. This process will require a change of name from the seller to the buyer of the property. It must also be ensured that the property conveyed to the buyer is actually registered at the Registrar General's Office in the Ministry of Justice and the Attorney General's Office and a conveyance between the parties is signed. It is by this means that ownership of the property by the buyer is established by law.

In theory, the total land area to be taken up by the RoW will be approximately a 40 m wide strip running along the entire proposed 530 km route, i.e. 21,200,000 m2 (40 m x 530 km) of land area.

The land system in Sierra Leone is categorized into the following:

- State land
- Private land
- Communal land
- Family land

In the provinces, where the line route traverses, communal and family categories are predominant. Here the Paramount Chief is the custodian of all lands with considerable influence over the process of land transaction particularly that relating to communal land. The survey team noted that much as the transmission line passes through communal lands, about 300-400 km follows the existing road infrastructure.

The survey also noted that the current market price per town lot (50 m²) is Le 1,000,000 ($250). Therefore, the unit price of l m² would cost Le 20,000 ($5). Considering that in case of land , compensation will be made only areas to be occupied by each tower base, total areas to be taken for the RoW (Tower base) will be approximately 33,125 m² (25 m² / tower x 1,325 towers) and it will cost Le 662,500,000 equivalent to $165,625.

In line with NPA's desire to ensure the sustainability of the environment within which it operates, SPC will avoid intruding into or interfering with cultural properties of the local communities as much as possible.

5.2.7.2 Impacts on population and demography

The project is not expected to have significant impact on the population and demography within the local communities. Only about 25% of the construction workforce is expected to be skilled. Labor may be recruited from outside the local communities. This may only be done if such skill labor is unavailable in the local communities. To further minimize potential impacts on the population and demography of the local communities, skilled workers from outside the communities will be accommodated at the work camps that will be established. It is therefore not expected that there will be any significant impact on population, demography and gender within the local communities during the duration of the project.

It is necessary to make a work quota for local residence to maximize the beneficial impact on communities. Due to the specialty of their work, the professional workers cannot be replaced by locals. However, some local staff may be hired to take up foundation excavation, transportation of cubic meter of earth and stone, conveyance of building materials and road building and repair etc. That can offer locals some temporary work opportunities. Also, because it is expected that there will be a huge demand on building and constructing materials for the Project implementation, the Constractor is encouraged to use the materials produced in local market to promote development of local building material, industry, initiate direct or indirect employment opportunities for the locals and forward the development of local economy and enhancement of living standard of local people. Moreover during the operation period, the properly trained local residences may be hired to maintain the transmission line RoW and monitor the towers regularly. By creating regular employment opportunities like this, the Project will contribute to local villages's income increase and development.

5.2.7.3 Job creation and incomes

Some job opportunity may be created for the local people. Those local people who may be employed will benefit from payment of salaries/wages. This is expected to lead to improvement in local incomes. This is projected in the Section 4.8 which is a benefits arising from the proposed project. On the other hand, there will be loss of income resulting from loss of land. Mitigation for this impact is provided for in Section 5.2.7.1 of this report.

5.2.7.4 Potential impacts on public health

With the introduction of migrant workers into the communities along the proposed line route, mitigation measures will be required to minimize the potential danger of the spread of sexually transmitted diseases (STDs) including HIV/AIDS.

The Environment & Community Relations Unit (ECRU) or other responsible department of the SPC shall undertake HIV/AIDS education for the workforces of the contractors and consultants.

The measures shall include the distribution of IEC materials and sufficient quantities of good quality free condoms to the workforce. The workers will also be continually educated about the dangers of indulging in casual unprotected sex.

Also, doctor's regular checkup for the contsruction workers should be arranged.

5.2.7.5 Visual intrusion

Visual impairment of the landscape by the presence of the transmission towers, lines and the substations is unavoidable and could be regarded as a residual impact. The galvanized towers tone down after two to five years of operation to a dark grey color. In addition, the line route was selected such that the lines blend with the natural landscape and mostly away from settlements. The glare effect will therefore be minimal and unnoticeable.

Trees native to the area around the substations shall be planted at the frontage of the substations to act as windbreaks, noise buffer and to reduce the visual effect of having a substation located at the site.

5.2.7.6 Traffic impacts

Equipment and materials will be properly secured while being transported to avoid the falling of such items on public roads to create potential hazards or safety problems for the public. Also, trucks and vehicles conveying such materials will display appropriate road safety signals – red flag and flashing amber lights. The SPC will ensure that deliverables are only made during daylight hours. Existing speed regulations shall be observed within settlements to minimize the potential for accidents.

To minimize traffic conflicts at the junctions where the access tracks join public roads the SPC will ensure that road signs are erected at appropriate distances on either side of the junction to warn motorists of the potential danger of heavy-duty trucks turning into and off the main road. Obstructing vegetation at the junctions will be cleared to allow drivers to properly view and assess situations before joining main roads. Also warning notices like "NO ENTRY" or 'NO TRESPASSING ALLOWED" will be placed at entry to access tracks. In addition, random security patrols will be carried out to ensure that the local people do not unduly endanger their safety.

Prior to the start of construction, the Contractor shall submit Traffic Control Plans (TCP) to SPC and all agencies with jurisdiction over public roads that would be affected by overhead construction activities as part of the required traffic encroachment permits of each country. TCP shall define the locations of all roads that would need to be temporarily closed due to construction activities, including aerial hauling by helicopter and conductor stringing activities.

The TCPs shall define the speed limit, use of flag persons, warning signs, lights, barricades, cones, etc. to provide safe work areas and to warn, control, protect, and expedite vehicular and pedestrian traffic. The measures included in the TCP shall be consistent with the standard guidelines of Sierra Leone as well as the World Bank Group EHS Guidelines of 2007 (General and Electric transmission and Distribution). TCP shall also include measures to avoid disruptions or delays in access for emergency service vehicles and to keep emergency service agencies fully informed of road closures, detours, and delays. Police departments, fire departments, ambulance services, and paramedic services shall be notified at least two weeks advance by the Contractor of the proposed locations, nature, timing, and duration of any construction activities and advised of any access restrictions that could impact their effectiveness. Provisions shall be ready at all times to accommodate emergency vehicles, such as immediately stoppingwork for emergency vehicle passage, short detours, and alternate routes developed in conjunction with local agencies. TCP shall also identify all emergency service agencies, include contact information for those agencies, assign responsibility for notifying the service providers, and specify coordination procedures. Copies of the TCP shall be provided to all affected police departments, fire departments, ambulance and paramedic services

Furthermore, certain constructional activities like the stringing of transmission lines across public roads will cause temporary traffic disruptions. Traffic wardens will be employed or contracted during such times to avoid confusion and prevent accidents. In addition, in all cases where line stringing will cross public roads due notification to the general public and appropriate authorities will be given (e.g. District Councils, Chiefdom Authorities) as required.

5.2.7.7 Potential pollution of water bodies

Clearing and grading of access tower corridor tracks and the excavation of tower base areas will be limited to the minimum area requirements. Other measures proposed in other sections of this report for minimizing erosion and managing excavated materials, wastewater from excavations and accidental spillage of oil, fuel and paints are valid for the prevention of pollution of water bodies.

The SPC will not employ herbicides/weedicides for weed control or vegetation clearing; hence any potential pollution from this source is eliminated.

The measures outlined above are expected to minimize the possibility of water pollution and also minimize the effects on downstream water usage of the streams/rivers.

5.2.7.8 Work camp management

First and foremost, the SPC will ensure that contractors do not establish work camps close to any water body to avoid water pollution problems. The camp will also be established at least 500 m from the closest settlement to minimize noise impacts on the community. The SPC will also ensure that employees from the local communities are not accommodated at the camp.

During maintenance of construction machinery/equipment and vehicles care will be taken to avoid accidental oil spills, which could lead to soil contamination. Accidental spillage of oil, fuel and paints will be avoided as much as possible. Any spilt materials will be quickly mopped up with rags and/or sawdust. The used sawdust and rags will be collected, put in polythene bags and disposed of at appropriate public waste dumpsites. Waste oil will be drained into impermeable sumps at the work camp for collection and disposal.

Metal wastes will be collected and sold as scrap to dealers who will in turn sell them for recycling.

Other solid wastes such as damaged cables and conductors, rags, paper cartons and domestic wastes will be collected and disposed of at appropriate public waste dumping sites. The use of empty paint and oil containers for storage of water will be prohibited.

Mobile toilet facilities will be provided at the work camp to avoid the pollution of the environment with human waste. The holding tanks of the mobile toilets will be emptied as and when required for disposal at appropriate sites. Mobile toilet facilities will be provided at the work camp to avoid the pollution of the environment with human waste. The holding tanks of the mobile toilets will be emptied as and when required for disposal at appropriate sites. Also, a clinic, ambulance and doctor should be provided in the work camp for emergency as a part of the Contractor's responsibilities.

5.2.7.9 Access Road

In order to minimize the adverse impact of opening access road, mitigation measures were suggested as below.

- Environmental aspects

An effort should be made not to use any environmental sensitive areas or wetland during the design stage. Wherever practical, existing roads and tracks shall be used to gain access to the proposed line to the utmost to minimize further vegetation clearing. Access road to each construction site shall be developed to minimize unpaved road travel. However, in case that new access roads should be developed, access roads should be removed after construction and wetlands need to be rehabilitated to its original state. It is also required to establish a vegetative ground cover (in compliance with biological resources impact mitigation measures) or

otherwise create stabilized surfaces on all unpaved areas at each of the construction sites within 21 days after active construction operations have ceased.

- Technical aspects

Legally mandated capacity of each road shall be strictly observed. Traffic Control Plan to be prepared by the Contractor shall specify the location of access load to be used, period of usage and be agreed with SPC and local authorities. Any damaged road due to the Project shall be rehabilitated immediately in order not to disturb the road users. Stabilizing unpaved access road surfaces, using water to bind active soil and handling activities among other measures are necessary to reduce fugitive dust. Watering on the disturbed areas of the active construction sites are required at least three times per day and more often if uncontrolled fugitive dust is noted. Maintain unpaved road vehicle travel to the lowest practical speeds, and no greater than 15 mph, to reduce fugitive dust emissions.

- Compensation aspects

It is necessary that the compensation amount negotiated between the Contractor and the owner of property inside access road is adequate and paid timely. Also, in case that the owner's access to his asset is disrupted for longer that what he/she has been compensate for, then the additional loss of crops shall be compensated at the same rate.

5.2.7.10 Waste management

To handle the vegetation waste generated during the clearing of RoW, Waste Hierarchy should be considered at first.

Using the 'Waste Hierarchy' – a series of options for managing waste – will help to manage our waste more sustainably by reducing the amount produced and recovering maximum value from waste that is produced. The waste hierarchy is intended to guide choices about waste management options.

Prevention - in descending order of preference: strict avoidance of waste, reduction at source and product reuse.

Reuse - the multiple use of a product in its original form, for its original purpose or for an alternative, with or without reconditioning.

Recycling - using waste materials in manufacturing other products of an identical or similar nature.

Composting - a natural process that breaks down materials such as garden and kitchen waste

Energy Recovery - energy from waste is the recovery of energy value from waste by burning the waste directly or by burning a fuel produced from the waste.

Disposal - generally involves burying the waste in a landfill or burning it at high temperatures in an incinerator to destroy it.

Figure 30 Waste Hierarchy

The large volumes of biomass cleared from the RoW could become nuisance and an eyesore and a fire hazard if left unattended. The contractor must ensure that the biomass is stockpiled and appropriately disposed of by allowing villagers to scavenge on the useful wood and burning is the least favored option.

In order to minimize the environmental impact on natural vegetation, it is recommended that clearing be done manually as much as possible with no burning of the cleared vegetation.

The vegetation, in case of solid wastes in the form of trees, tree stumps cleared from site will also be shared with local communities as firewood. But wooden containers which may be treated by chemical elements will be gathered together disposed of in consultation with relevant government ministries and agencies.

Metal wastes will be collected and disposed of appropriately and/or recycled. Wastewater from tower base excavations is not expected to be significant. No towers will be sited in permanently wet locations requiring the extraction of large volumes of wastewater. At worse, towers will only be allowed to be sited at seasonally wet locations. The required dewatering will therefore be

temporary, limited and localized. Hence only small quantities of waste water will be pumped and discharged through sediment traps or silt screens into surrounding marshlands. The effects of discharging the wastewater into the surrounding marshlands will be insignificant and short-lived.

Accidental spillage of oil, fuel and paints will be avoided as much as possible. Any spilt materials will be quickly mopped up with rags and/or sawdust. The used sawdust and rags will be disposed of at appropriate public waste dumping sites.

5.2.7.11 Potential dewatering operations

It has been ensured that the proposed RoW has avoided permanently wet areas as much as possible. In addition, tower spotting shall be done in such a way that swamps/marshy areas are avoided during tower installations.

Places where the towers will be located will therefore not be permanently flooded areas. In places where dewatering is unavoidable, such as seasonally wet areas, waste water to be generated from such dewatering operations are therefore expected to be in small volumes. Waste water will be pumped into existing natural water courses. Measures to be taken prior to discharge to water courses will include the installation of silt traps and ramps to ensure that suspended particulate content of waste water is reduced prior to discharge.

5.2.7.12 Temporary workers

Measures to manage potential effects by the temporary workers will be put in place through a combination of public consultations, policies and planning. These measures will include:

- A hiring policy giving priority to local residents.
- A procurement policy that gives preference to locally produced goods and services.
- Accommodation of non-local workers in a dedicated construction camp with independent water and waste treatment facilities.
- A code of conduct for project workers that establishes rules for interaction between the project, its workers and the local community.
- Developing a workforce HIV/AIDS management and awareness program.
- Voluntary and free-of-charge HIV testing and counseling for project workers.
- Additional policing should be arranged for the safety of local residents, in particular women.
- Adequate medical faculties need to be secured so as not to burden local hospitals, local

residents should also be able to benefit from them.

- Measures should be put in place to ensure that no conflicts will arise as a result of different ethnic or racial groups meeting.

5.2.7.13 Providing alternative land or other productive resources

Usually, fertile land is already being used or claimed - yet existing land uses and claims go unrecognized because land users are marginalized from formal land rights and access to the law and institutions. Therefore, mitigation measure for potential for conflicts on availability of alternative productive land or access to other resources in minor resettlement should be prepared.

To mitigate potential for conflict s between PAPs and existing owners, any shift in land use can only take place with the free, prior and informed consent of the local communities concerned.

And adequate compensation and alternative resettlement or access to productive land should be planned and provided before resettlement with prior consultation.

Prior to carrying out any resettlement or shift in land use which could result in depriving individuals of access to their productive resources, relevant authorities such as EPA should ensure that all feasible alternatives are explored in consultation with the affected persons, with a view to avoiding, or at least minimizing, the need to resort to resettlement.

In all cases, effective legal remedies or procedures should be provided to those who are affected by the project.

5.2.7.14 Use of dust suppression water

There is a slight possibility that the impact of abstracting the dust suppression water from the water courses such as the water shortage near the existing village might be occurred. So, dust control near the area where water shortage is projected should take appropriate alternatives described as below:

- Control of vehicle access (adopt a freeboard to haul vehicles and covering loose material on haul vehicles)
- Vehicle speed restrictions
- Use of gravel and/or rattle plates at site exit points to remove carry on dirt from tires and tracks
- Washing of equipment prior to site removal

- Work stoppage under certain conditions (e.g., such as prohibiting construction grading when wind gusts exceed 25 mph).
- Using chemical stabilizers during construction.

Considering that the Project right of way (ROW) traverses mostly unpopulated areas and most construction activities will be undertaken remote from residential areas, the impact is not expected to be major.

5.3 Operational phase

This section of the report presents the proposed mitigation measures put forward to minimize the significant potential environmental impacts that are expected to be associated with the operational or maintenance phase of the proposed Project.

5.3.1 Vegetation clearing

The method that will be used for vegetation control to manage vegetative growth within the RoW will be physical or mechanical clearing. Tree stumps will be uprooted to prevent re-growth. Threatening trees outside the RoW will be cut only to a height of 1.25 m. Chemicals such as weedicides or herbicides shall not be used. This is to eliminate the potential harmful effects of these often-persistent chemicals on the environment. In addition, physical clearing will enable the management of vegetative growth within the RoW to be done in a more controlled manner – limiting the clearance strictly to the tower corridor track. This is expected to have a limited effect on vegetation.

In addition, the non-use of chemicals will eliminate issues of potential pollution of nearby surface water bodies and possible seepage of chemicals into ground water. In addition, all potential risks to workers arising from improper handling of these chemicals will be eliminated. The potential opening-up effects are not significant since most of the affected area is already extensively farmed and opened. Any limited effect could only be regarded as a residual impact.

5.3.2 Effects of rust treatment and painting of towers

Accidental spillage of paints will be avoided as much as possible. Any spilt paints will be quickly mopped up with rags and/or saw dust. The used saw dust and rags will be disposed of at appropriate public waste dumping sites. Painting will be done as frequently as necessary to

prevent towers and tower members from rusting. The SPC will ensure that situations of extensive rusting of towers and tower members are avoided to pre-empt difficult rust treatment.

5.3.3 Waste management

During the maintenance phase, solid wastes in the form of trees, tree stumps and wooden containers will be gathered together and made available to the local communities as fuel wood.

Metal wastes will be collected and disposed of appropriately and/or recycled. Other solid wastes such as damaged cables, conductors and insulators, rags and paper cartons will be collected and disposed of at appropriate public waste dumping sites.

Accidental spillage of oil, fuel and paints will be avoided as much as possible. Any spilt materials will be quickly mopped up with rags and/or sawdust. The used sawdust and rags will be disposed of at appropriate public waste dumping sites.

5.3.4 Occupational safety and health issues

The SPC will carry out operation and maintenance of the proposed transmission line based on accepted international standards, such as those of the International Electronicnical Commission (IEC), the World Bank Group EHS Guidelines of 2007 (General and Electric transmission and Distribution) and the SPC's related regulations. However some specific potential occupational safety and health hazards expected during the operational phase of the proposed Project are dealt with below:

5.3.4.1 Potential collapse of towers

As stated earlier, collapse of towers occurs only rarely. Since the hazardous effects (e.g. falling of towers on people and electrocution) of the collapse are normally expected only within the RoW, public safety will be ensured by restricting public access to the RoW. In line with existing NPA practice, all towers will be clearly marked with a red inscription on white background – "DANGER – 225,000 Volts" to ward off trespassers and prevent them from exposing themselves to the potential dangers of electrocution.

Regular maintenance will minimize corrosion and wearing out of parts of the towers and their accessories. The NPA already has a comprehensive, planned and emergency maintenance program for the existing transmission lines for the Bumbuna and Dodo HEP. SPC shall apply the same level of care to the new transmission lines to be constructed.

In addition, tower members will be secured and improved anti-theft fasteners to check acts of vandalism and its harmful consequences on the towers. Security patrol will be conducted on sections of the transmission line especially the outskirts of urban areas and towns, which are more prone to acts of vandalism. It is expected that the patrols will ensure early detection of any acts of vandalism and signs of tower corrosion. Prompt and necessary remedial actions will be taken to repair the structures to forestall the possible collapse of towers.

5.3.4.2 Falling and/or swinging objects

The measures proposed earlier to minimize the potential hazards posed by falling and swinging objects are valid for the maintenance phase of the project and will be fully implemented.

5.3.4.3 Falls from heights

Potential accidental falls from heights during the operational or maintenance phase of the proposed project will be minimized through the provision of appropriate personal protective equipment such as body harness, climbing belts, etc. The SPC will insist that only well trained and experienced personnel work at heights on the towers.

5.3.4.4 Machine safety

All potentially hazardous machinery such as lifting appliances (cranes, forklifts, etc) and unfired pressure vessels (compressors, etc) will undergo statutory examination by certified engineers. This will ensure that accidents due to material failure are pre-empted. All electrical cables of mobile or hand-held machines (electric hand drills, temporary lights) will be promptly replaced to forestall the hazards of electrical burns and electrocution of employees. In addition, employees will be required to wear protective clothing in the course of work to protect them from undue exposure to electrical power.

5.3.4.5 Snakebites

The measures proposed earlier to minimize the potential danger of snakebites will also be implemented during the maintenance phase of the project to safeguard the safety of employees. Snake bite boxes (Black stones) should always be available for emergency aid/treatment.

5.3.5 Public safety

Tower members will be secured and improved by anti-theft fasteners to check acts of vandalism and its harmful consequences on towers. Furthermore, anti-climbing guards will be installed to discourage adventurous individuals from endangering their lives and limbs.

The shattering of insulators, which could pose potential danger to passers-by, will be minimized by the use of quality insulators as well as the periodic checking of the insulators. Measures proposed earlier to minimize public safety hazards relating to transportation and potential tower collapse are valid for ensuring public safety. These measures will be fully implemented to enhance public safety. Other public safety issues of potential health and other implications of electromagnetic field (EMF) effects are dealt with below. Threatening trees will be felled as stated earlier in the report to prevent them from falling onto the transmission lines during stormy weather conditions. This will minimize the potential of the fall of live electrical conductors, which could pose safety hazards to the public. Insulator pins will also be checked regularly for signs of rusting and any defective pins found will be promptly replaced to prevent live electrical conductors from falling from towers.

A potential positive public safety impact is the possible use of transmission lines and towers as landmarks to aid in "navigating" when driving through countryside since they will eventually be clearly marked on Sierra Leone's topographical maps.

In situations where wildlife goes berserk, the game wardens should be notified immediately for necessary action to be taken.

5.3.5.1 Electromagnetic field (EMF) effects

According to the World Environmental Library, WEL 1.1, information derived from prolonged observations and experiments in numerous countries indicate that the electric and magnetic fields around power transmission and distribution facilities exhibiting frequencies between 50 and 60 Hz have no harmful effects on human health. Magnetic field strengths below 0.4.mT at 50 – 60 Hz induce no detectable biological reaction in humans; the magnetic fields acting on the ground below overhead lines develop maximum field strength of only 0.055mT for frequencies between 50 and 60 Hz. Hence the potential effects of EMFs on human health are non-existent according to current knowledge.

However, an electrically grounded person touching an ungrounded metallic object or a conductor in a static or oscillating field may draw electric current from the object and may experience a micro shock from a spark discharge. The potential effect will be minimized by the consultants/contractors, as usual, by multiple earthings. Protective multiple earthings minimize the chances of people getting electric shocks and the chances of such shocks being fatal.

In order to debunk the misconception that EMFs may cause cancer or harm children and minimize fear and avoid panic among the local populations, SPC will undertake public education and create awareness in the local communities wherever such concerns are expressed. The SPC will also ensure that dwelling houses and other structures are not built within the RoW in contravention of existing regulations.

5.3.6 Socio-economic/cultural issues

5.3.6.1 Land ownership/land-use issues

Land ownership issues are expected to persist during the operational phase of the project. In cases where property owners, if validated by the Topographic Team, could not be traced after all efforts have been made during the constructional phase, additional efforts will be made during the operational phase to locate such people. Prompt compensation will then be effected.

It is essential that the proponent considers some other benefits in settlements in the influence of the transmission line such as shield wires to provide street lighting, providing schools, health centers, public buildings, solar systems for street lighting. This is proposed to reduce vandalism on the transmission and distribuition system as well as to prevent conflicts.

5.3.6.2 Legislative in connection with Land Ownership

The National Power Authority which was established in 1982 has the responsibility for the reorganization and regulation of the generation, transmission, distribution and supply of electricity throughout Sierra Leone. Part X, Section 72 of the NPA Act mandates the Authority to prescribe standards, rules, procedures and grant licenses for the transmission, wholesale supply, distribution and sale of electricity and other services in the energy sector.

The provisions of the Ministry of Energy and Water Resources, the supervising Ministry of the Authority require NPA to register the proposed project with the Environment Protection Agency and to obtain an ESIA Licence prior to the commencement of the proposed project.

The NPA Act, 1982 empowers the Authority to acquire the RoW for constructing and operating power transmission systems. The provisions of the Town Planning Act 1946, Town Planning Declaration, 2001 provide the framework for the acquisition of the RoW. This activity could only be carried out with due consultations with the settlements, communities and District Councils considering the issue of proper environmental planning within the projects sphere of influence. All the related institutional framework are shown in the RAP

5.3.6.3 Grievance resolution

Grievances are sometimes raised by some Project-Affected Persons (PAPs) during this phase of the project. Grievance resolution procedures have therefore been put in place with the sole objective of minimizing disputes that may arise in relation to the compensation payments. The grievance /dispute processing and settlement mechanism will be based on the following:

- **Traditional dispute resolution**

Dissatisfied claimants would be invited for negotiation together with the chiefdom authorities of the area in order to arrive at acceptable figures. This process would also be employed at the survey stage in cases of joint ownership. Mediation would take place with the participation of the chiefdom authorities in order to amicably settle the dispute to the satisfaction of all.

- **Submission of counter proposals**

The second stage of the mechanism is to resort to request the claimant to submit counter proposals supported by valuation opinion prepared by private valuers of their choice. The private reports will be considered by SPC in conjunction with the Surveys and Lands Valuation Committee of the District Councils and Chiefdom Development Committees (with his/her counsel, if any) to ensure that claimants are treated fairly.

At such meetings, efforts will be made to arrive at amicable settlements in order to ensure that the third stage of the dispute resolution is not triggered.

- **Resort to legal action**

PAPs may, in the event of dissatisfaction with the decisions taken in the instances discussed above or without resort to any of the instances above resort to legal action to have the dissatisfaction resolved. Given the mechanism described above, it is unlikely that disputes will end up in the law courts.

5.3.7 Effects on birds/animals

Mitigation techniques have generally focused on making the line more visible to birds. Many marking devices have been used worldwide, showing varying degrees of effectiveness. The two types that are commonly used are Bird Flight Diverters and Bird Flappers. A special device for night-time collisions is the Mace Bird Lite. In areas of known bird flight paths, those will be placed on the OHTL. Appropriate/standard cable spacing and Installation of making devices should be done.

The recommendation proposed by the World Band was to ensure that the lines passing through the Important Bird Area (IBA). Making devices will make them more visible and reduce collisions.

- **Bird Flight Diverters**

Bird Flight Diverters (BFD's) were developed in Europe. Various studies have proven that the attachment of these devices onto powerline conductors can significantly reduce the collision rate of birds, by increasing the visibility of the powerline.

- **Bird Flapper**

Bird Flappers are a South African invention and have been used in South Africa since 1995, but only since 2001 has a mechanically acceptable product been commercially available. The Bird Flappers, if applied correctly, have proven to be more effective than the Bird Flight Diverter in comparative experiments. The Bird Flapper is available from Preformed Line Products in Pietermaritzburg.

- **Mace Bird Lite**

The Mace Bird Lite is a Perspex tube with a fluorescent tube inside. It is mounted on the overhead ground wire and the light is energized by the ambient electrical field generated by the conductors. It is reported to have worked well for curbing flamingo mortality on powerlines. No scientific data is available on the effectiveness but it is generally claimed to be effective.

Adequate grounding of towers to cater for 'step effect' on animals in the forest reserves will be provided.

5.3.8 Fire hazards

Potential fire hazards that may result from electrical faults will be minimized by adhering to technical specifications relevant to electrical safety. The use of low quality components, inadequate sizing of cables, negligent execution of works and general non-observance of safety rules will be avoided to minimize the potential hazard of electrical fires. Also, the operating personnel will be sufficiently trained in connection with electrical safety measures and their observance. Proper and sufficient supervision of workers will be undertaken.

In addition, the MEWR/NPA will not allow the use of fire for the maintenance of vegetative growth within the RoW. Bush fires originating from the activities of farmers, hunters and palm wine tappers will be minimized through public education.

It is expected that the full implementation of the measures above will minimize the occurrence of fires.

5.3.9 Impact on telecommunications

A mitigating factor for this potential impact is the fact that the proposed transmission line route traverses mainly farmlands and potential agricultural lands. Efforts have been made to avoid built up areas and therefore the possibility of the transmission line passing close to Sierra Leone National Telecommunication Company (NATCOM) facilities.

In addition, the telephone lines normally run within road reservations, whereas the proposed transmission lines have been routed outside road reservations. Even when the transmission line crosses over telephone lines, the vertical distance between two lines will ensure that interference is non-existent or minimal.

5.3.10 Substation

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.

5.3.10.1 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.

5.3.10.2 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.

5.3.10.3 Earthing of equipment

There will be adequate earthing of equipment to prevent shocks and malfunctioning of protection equipment.

6 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.

6.1 General

6.1.1 Noise pollution

Noise pollution levels will be measured once every month close to the areas where construction activities are being carried out including settlements such as indicated earlier.

6.1.2 Water quality of rivers/streams

At any point during the construction the rivers and streams close to the site(s) where constructional activities are being carried out will be sampled and analyzed monthly at locations just before and just after the river or stream crosses the RoW. During the maintenance phase monitoring will be carried out twice yearly. The relevant parameters that will be considered for analysis are:

- BOD
- pH
- Do
- Turbidity
- Total suspended solids
- Conductivity
- Total coliform

6.1.3 Vegetation clearing

During the constructional phase, clearing of vegetation cover within the tower corridor and access tracks and the tower base areas will be monitored carefully to ensure that the minimum area requirements are not exceeded. Individual tree felling activities will be monitored to ensure that environmental and safety measures proposed under mitigation are fully implemented. Clearing of vegetation and cutting of trees within the RoW, but outside the tower corridor track will be monitored to ensure that the specified height of 1.25 m is complied with.

Monitoring will also ensure that fire is not used for vegetation clearing. These measures, apart from the clearing of tower base areas, are also relevant for vegetation maintenance during the operational phase.

6.1.4 Transportation effects

The following parameters/activities will be monitored:

- Speed limits of vehicles especially within the settlements. Random checks on speed limits of vehicles will be carried out daily;
- Loading of vehicles. Vehicles loading procedures will be monitored at all loading points to ensure that materials and equipment are properly secured in truck/vehicles;
- Covering of vehicles conveying dust-generated materials. Random checks will be carried out daily on vehicles;

- Trucks/vehicle conditions and maintenance (i.e. road worthiness of vehicles). Daily checks on conditions of vehicles. A monthly check will also be conducted on vehicles to ensure that maintenance schedules are adhered to;
- Vehicular accident records. All vehicular accidents or dangerous occurrences relating to vehicles will be recorded in the accidents record book or register.

6.1.5 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.

6.1.6 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, negligent execution of works and general non-observance of safety rules will be monitored regularly. Proper and sufficient supervision of workers will be monitored.

6.1.7 Dewatering operations

Dewatering of tower base excavations will be monitored to ensure that de-silting of the waste water is achieved to minimize the potential impact of polluting water bodies with suspended earth matter.

6.1.8 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.

6.2 Transmission lines

Transmission lines will be monitored annually through foot patrols and inspections for signs of damages and/or deterioration of insulators and accessories. Replacement of any such damaged parts will be promptly carried out.

6.2.1 Public/Worker safety

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.

6.2.2 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.

6.2.3 Protection of Biodiversity of the project area

During constructional phase biodiversity of the project area may be affected, albeit minimnally. Records of flora and fauna disturbances will however, be maintained and monitored on a quarterly basis to ensure that their environment is protected and preserved.

6.3 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:

6.3.1 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.

6.3.2 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

6.3.3 Noise

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

6.4 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:

6.4.1 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.

6.4.2 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.

6.4.3 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.

6.5 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 relavant 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 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.

6.6 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.

6.6.1 Contractor's obligation and legal requirement for the protection of animals in the project area

Prior to the commencement of construction works all contractors should be required to prepare their own EMPs. The plan shall spell out environmental targets and objectives in so far as the protection of animals is concerned in the project area. The Contractors EMP shall include, to the extent practicable, all steps to be taken by the Contractor to protect the animals in the project area in accordance with the current provisions of Forestry Act, 1988, its Regulations, 1989, Wildlife Act, 1972 and the Environment Protection Agency Act, 2008.

Notwithstanding the Contractor's obligation spelt out above, the contractor shall, in addition, endeavour to:

(a) Ensure that the animals, especially those detailed in Table 11 and 12, be preserved and protected. In situations where construction phase of the project disturbs these animals, the Contractor shall ensure that requirements of the C.B.D., CITES, Forestry and Wildlife Acts and Regulations are applied;

(b) Prevent and minimize the disturbance to the specific habitats of mammals, birds, amphibians, snakes and insects that are considered vulnerable and endangered.

(c) Ensure re-afforestation, limit of 1.25 m cutting of grass, and caution in cutting down of trees;

6.7 Measurable Performance Indicator

Air, water and noise pollution are not yet a serious environmental problem in the related four countries but there is some concern about the effects related from new development projects.

According to the Environmental, Health, and Safety Guidelines for the Electric Power Transmission and Distribution by the International Finance Corporation (IFC), World Bank Group dated April 30, 2007, the power transmission and distribution sector does not typically give rise to significant air emissions or effluents. Thus potential air and water pollution caused by the transmission line project is expected to be negligible.

The specific guidelines regarding air and water pollution restriction at the Environmental, Health, and Safety Guidelines of the IFC are only relevant for power generation. Therefore, control of the noise level is the only suitable for the measurable performance indicator during the construction of this project.

The measurable performance indicator for noise level is shown below:

Receptor	One Hour L_{Aeq} (dBA)

	Daytime 07:00 - 22:00	Nighttime 22:00 – 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Table 23 Summary of Impacts, mitigation, net effect analysis and monitoring

Project Activity	Potential Impacts	Location	Proposed Mitigation	Net Effects	Monitoring
Line route survey & Design stage	Impact on potential sensitive ecological and inhabited area	Entire RoW	Adequate selection of RoW by avoiding these areas with detailed line route survey during the design stage	Negligible	Monitoring and Identifying the potential sensitive ecological or inhabited areas located along the RoW
Line route survey & Construction	Loss of crops	Almost entire RoW & access tracks	Prompt, fair compensation payment	Negligible	During construction & operation
Construction	Loss of structures	Certain parts of line route	Prompt, fair compensation payment for resettlement	Removal from historical/ancestral roots	Monitoring during construction & operation to ensure all PAPs are adequately and fairly catered for
Construction	Loss of land	Entire RoW & access tracks	Prompt, fair compensation payment	Removal from historical/ancestral roots	Monitoring during construction & operation to ensure all PAPs are adequately and fairly catered for
Construction	Noise impacts	Communities and settlements close to RoW	Avoidance (as much as possible) of work at night	Minor disturbance during daytime	Ambient noise levels shall be measured once every week in communities close to RoW
Construction	Air quality	Communities and settlements close to RoW	Spray the exposed soil surfaces of the tower corridor track as and when needed	Negligible	Monitoring – none
Construction	Potential soil erosion	Entire RoW & access tracks	Limit land clearance to minimum area required and early revegetation	Negligible	Monitor land clearance
Construction & operation	Public safety 1. Open excavations 2. Potential electrocution 3. Potential collapse of towers	Entire RoW & access tracks	Tower base excavations in or near settlements or farms will be clearly marked and made inaccessible to the public. All towers will be clearly marked with a red inscription on white background - **"DANGER – 225,000 Volts"** to warn off trespassers, etc.	Negligible	Routine inspections of towers during operational phase

Project Activity	Potential Impacts	Location	Proposed Mitigation	Net Effects	Monitoring
	4. Others				
Construction & operation	Flora and Fauna	Entire RoW & access tracks	Limit clearance of vegetation	Negligible	Monitored carefully to ensure that the minimum area requirements are not exceeded
Construction & operation	Occupational safety and health	Entire RoW & access tracks	Provision of personal protective equipment at construction All work to be done according to Safety Rules and Regulations of NPA as well as the World Bank Group EHS Guidelines of 2007 (General and Electric transmission and Distribution), NPA Safety Rules (Electrical and Me chanical)	Negligible	Availability and use of protective equipment
Construction	Impacts on cultural and historical/archaeological sites/items	Cultural/historical/archaeological chance finds	Chance finds to be reported to appropriate authorities as a part of the contractor's contract	Negligible	Areas of chance finds will be monitored and secured in order to be handed over to Museums and Monuments Board.
Construction	Public health- STDs/HIV AIDS	Mainly settlements along RoW	Education of workers to avoid casual sex Supply sufficient quantities of good quality free condoms to workers	Potential single mothers, transmission of STDs/AIDS	Keep close contact with communities during construction to detect incidences of STDs/AIDS
Construction	Traffic impacts	Relevant roads indicated in report	Use of traffic wardens to control traffic at road crossings Development of Traffic Control Plan	Negligible	Presence of traffic wardens at all times during construction. Review the contractor's Traffic Control Plan
Construction	Water pollution	Rivers indicated in the report	Minimize erosion and manage excavated materials, wastewater from excavations and accidental spillage of oil, fuel and paints	Negligible	Streams close to the site(s) of construction to be sampled and analyzed weekly. During the maintenance phase monitoring will be carried out twice yearly.
Construction	Work camp management	Work camp sites	Establish far away from water bodies and settlements Provision of mobile toilet, clinic, doctor and ambulance	Negligible	Distance from each work camp site to nearest water body and settlement. Availability of mobile toilet,

Project Activity	Potential Impacts	Location	Proposed Mitigation	Net Effects	Monitoring
			at work camp sites		clinic, doctor and ambulance;
Construction & operation	Solid Waste generation	Entire RoW & access tracks	Trees, tree stumps and wooden containers not to be given out to the local communities as fuel wood . Usable trees and wood from the RoW clearing should be given out to the local communities. Metal wastes to be collected and disposed of appropriately and/or recycled in consultation with relevant government agencies	Negligible	Collection and disposal of solid waste to be monitored
Operation	Effects of rust treatment and painting of towers	Tower locations	Spilt paint to be quickly mopped up with rags and/or sawdust. The used sawdust and rags will be disposed of at appropriate public waste dumping sites.	Negligible	No monitoring
Operation	Micro shock from a spark discharge	RoW	Minimized by multiple earthlings	Negligible	Monitor earthing cables
Operation	Fire hazards	RoW	Public education on hazards of bush burning	Negligible	Routine patrols to discourage bush burning
Construction & operation	Employment generation and incomes	Settlements along RoW	Encourage contractors to engage local labour	Standard of living improved	None

7 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.

7.1 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 decision-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. Protect the biodiversity of the project area;
8. Assist in improving the standard of living of communities in the Authority's areas of operations.

7.2 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.

7.2.1 Environmental management structure

The Authority of ECOWAS Heads of State and Government in January 2008 enacted the WAPP Transmission Line Implementation Strategy (TLIS), which gave authority to the WAPP Organization to use SPCs (Special Purpose Companies) as means to accelerate the implementation of a number of cross-border transmission projects among its member power utilities, in particular the WAPP CLSG Power System Re-Development Sub-program.

Although the WAPP-SPC Establishment Study has been initiated it is certain that the formation of the actual WAPP-SPC would take some time. 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 WAPP CLSG 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

7.2.1.1 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 Pre-award 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.

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

Owner's Engineer

The Owners Engineer shall have full technical responsibility for the Pre-Award tasks; ie., 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 (eg. 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

7.2.1.2 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, WAPP-JIC, 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 co operation 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.

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 crop and 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 crops and 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 and supervises all field environmental officers.

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.

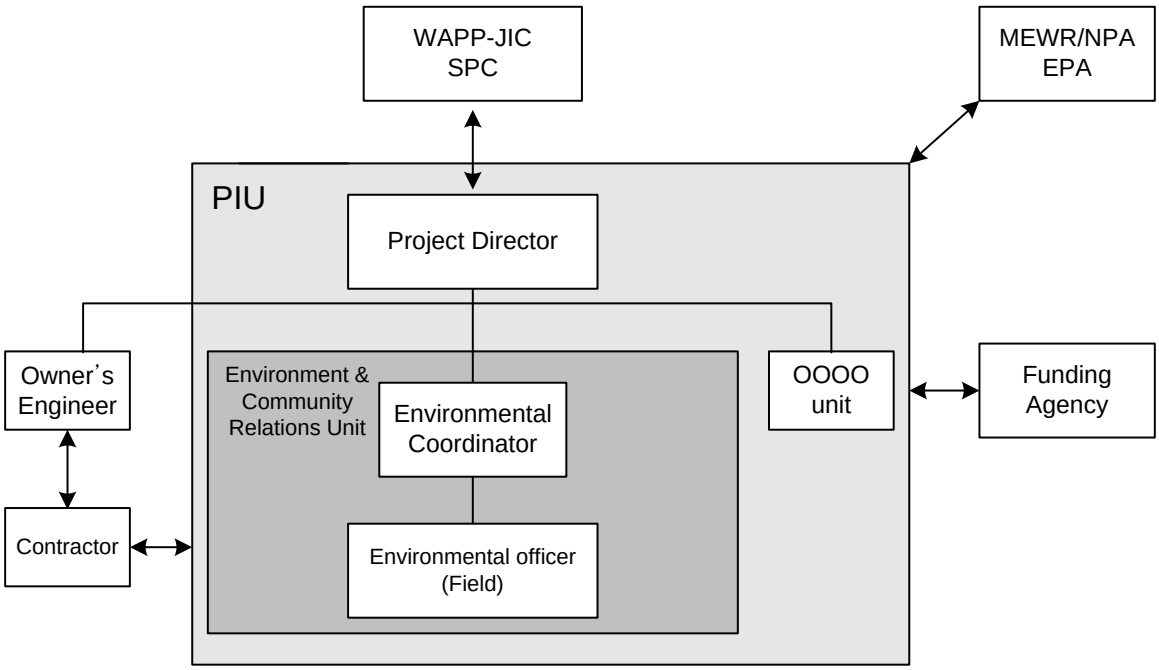
Environmental officers are responsible for:

- Monitoring all environmental and social programs for pre-construction, construction and operational phases of the project, including those related to bio-physical and socio-economic/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 Liason Officer. Also he will work closely with the member of Owner's Engineer.

Figure 31 Organizational Chart-Project Environment Management



7.2.1.3 Inter-relationships between the PIU and others

The primary role or mandate of the PIU, as defined earlier, is to oversee and supervise the field implementation of the project to ensure that it is constructed in accordance with the contract specifications and terms. The PIU would therefore assume its full mandate after the construction contract has been signed. The PIU would be expected thereafter to respect and enforce the provisions of the written contract agreement without undue interference.

From the above, the functions of the PIU are fundamentally technical in nature and apart from continuous communication with the Owners Engineer and regular progress reporting to the funding agencies and the SPC, the other significant form of interaction that is anticipated are those with the environmental protection agencies as well as the Project Affected Persons (PAP). Minimal other interactions are foreseen with other entities. This is considered as an advantage

since it would enable the PIU to focus its attention on the technical work of constructing the CLSG infrastructure without too many distractions.

7.3 General Health and Safety Procedures

Procedures relating to occupational safety and health will be guided by the NPA "Corporate Safety Rules" and the Factories Act, 1974 which are reinforced by the occupational safety and health recommendations in the ESIA.

The relevant environmental and occupational safety and health issues to be considered in SPC's corporate responsibility include:

- Manual lifting
- Hearing protection
- Protective equipment
- Good housekeeping
- Fire prevention
- Prevention of falls from heights
- Electrical hazards
- Machine safety
- Welding safety
- Head protection
- Feet protection
- Provision of first aid items

All occupational safety and health provisions in the Factories Act, 1974 shall be complied with during the implementation of the project.

The mitigation measures recommended in the ESIA will also be fully implemented. The areas covered include:

- Hearing loss protection
- Protection against falling/swinging objects
- Snakebites
- Electrical protection
- Accidental falls from height

- Manual lifting
- Fire hazards
- Protection against dangerous machinery
- Provision of sanitary/welfare facilities

7.4 Fire Prevention System

The general fire precautions to be taken include:

- The posting of 'no smoking' signs at fire sensitive areas (e.g. fuel storage areas at the work camp, etc);
- Provision of appropriate and adequate number of fire extinguishers;
- Proper storage of rags used in cleaning hands and containing flammable liquids (e.g. in metal containers for safe disposal);
- Handling of flammable materials by competent persons only;
- Provision of emergency fire alarm systems.

In addition, fire prevention training would be carried out for selected project employees. At the end of the training, the personnel would have adequate knowledge of all fire prevention systems recommended in the ESIA.

7.5 Pollution Prevention

Proper management of waste oils/lubricants, excavated earth materials and paint as recommended in the ESIA will be enforced. Measures to be adopted will include:

- Collection, storage and disposal of waste oils and lubricants;
- Proper management of excavated materials;
- Prevention and management of oil, fuel and paint spills.

To ensure the success of pollution prevention, the environmental team will be trained to identify and appreciate what hazards there are in relation to improper storage and disposal of polluting substances.

7.6 Vegetation Management Plan

Vegetation Management Plan is needed to improve the reliability of the electric transmission systems by preventing outages from vegetation located on transmission rights-of-way (RoW) and minimizing outages from vegetation located adjacent to RoW, maintaining clearances between transmission lines and vegetation on and along transmission RoW.

Vegetation control shall be practiced periodically throughout the life of a transmission line to prevent vegetations become a threat to line operation and maintenance.

Mechanical method such as Mowing (Brush Bulls) using rubber tired or tracked tractor units equipped with a special mower head or flail type cutting head or hand cutting to clear new rights-of-way (RoW) before building the lines and to maintain the existing RoW instead of using herbicides.

Vegetation Management Plan is also necessary to promote sustainable plant communities that are compatible with the intended use of the site. Except for the area which might cause outages to transmission line, other area is recommended to be revegetated.

It is recommended to develop the Vegetation Management Plan considering aspects described as below:

- Selective removal of trees favoring crown closure;
- Removing cut material or cutting up small enough so as not to interfere with animal
- Movement in the travel lane;
- Promoting compatible species of trees and shrubs;
- Favoring the continued growth and reproduction of broad-leaved forest.
- Detection of alien species
- Identification and protection of endangered and protected species;
- Revegetation of residual construction footprints
- Erosion control

7.6.1 Mitigation Measures

Measures to be employed to ensure a reduction of erosion, loss of cover for agricultural purposes, restoration of embankments, re-vegetation include:

- Construction of new tracks will be kept to the barest minimum. Track routes will be selected in such a way as to minimize any damage to farms and crops;
- Mechanical control will be used for all vegetation clearing;

- The access tracks will be selected so as to avoid crossing streams and other water bodies;
- Where stream crossings are unavoidable, suitable culverts will be constructed over them. Under no circumstances will water bodies be blocked to provide for construction access;
- Removal of stream bank vegetation (especially bamboo/mangrove) will be avoided as much as possible;
- Compaction of soils along the graded tracks will be reduced by regulating the number of passes of heavy trucks to and from the sites;
- The ground surface at each tower site will be graded to provide drainage away from the tower legs. Where necessary (particularly on hillsides), terracing, cribbing or riprap may be used to provide protection for tower foundations;
- Tree cutting will be done by a certified timber contractor, and strictly in line with the prescribed safety guidelines. The landing area of falling trees will be carefully selected to minimize damage to farms. Adequate warning will be given to ensure that public safety is not compromised;
- The contractor will place warning notices ("NO ENTRY", NO TRESPASSING ALLOWED", etc) at entry to access roads. In addition, random security patrols shall be carried out. The public in construction active areas shall be continuously educated through the beating of gong-gong to avoid the construction areas as much as possible.

7.6.2 Invasive Species Control

In order to prevent damage to the ecosystem native species of plant and animal need to be protected; and alien species need to be prevented from gaining a foothold in the locality.

Invasive species are defined as "an alien (or non-native) species whose introduction does, or is likely to cause economic or environmental harm or harm to human health". Some invasive species may be too widespread to contain and/or eradicate. However, control and management efforts slow and/or reduce their impacts.

Prevention is the first line of defense against invasive species. While prevention is the first line of defense, even the best prevention efforts will not stop all invasive species. Early Detection and Rapid Response (EDRR) efforts increase the likelihood that invasions will be halted and eradicated.

According to the National Invasive Species Council of America, these are the EDRR actions categorized by three groups:

1. **Early Detection;**

   Early detection can be achieved by "active detection networks" comprised of individuals that have a specific job responsibility to find invasive species. They typically focus on species of concern, high-risk pathways, and locations. The identification of species is essential to early detection efforts.

2. **Rapid Assessment;**

   The detection of an invasive species initiates the Rapid Assessment process. Rapid assessment may recommend that a response be initiated. In addition, assessments of potential invasions can be conducted in advance of their detection. The rapid assessment process is an essential aspect of timely EDRR.

3. **Rapid Response**

   Rapid Response efforts contain, and where possible, eradicate invasive populations.

As a final step, control and management of invasive species is accomplished using modern resource management methods. Several complementary methods may be implemented in an overall strategy to protect ecosystems and aid in their recovery.

Taking the above into account, methods to prevent invasion of alien species need to be implemented particularly during construction of the power system. Possible methods could include: cleaning of mud off vehicles before traveling long distances; care taken to ensure that any imported materials do not come into contact with local watercourses either directly or indirectly; imported products must be treated to ensure that fungus, plant life, rodents, insects, spiders etc. are not carried to the site; prohibit the keeping of domestic pets by site workers; use local products, especially timber, wherever possible.

Encourage local residents to report any unusual [deaths of] animals, water-life or plant-life.

During ROW maintenance the crew should trained and vigilant to spot any unusual [deaths of] animals, water-life or plant-life.

If alien an alien species is spotted swift action must be taken to prevent its spread and if possible eliminate it.

7.6.3 Budget

Budgetary provision for vegetation management during construction will be part of the contractor's cost. The estimated budget for vegetation management is shown in the table 27

7.7 Archaeological and Historical site Management

In line with current international practice and the desire to ensure the sustainability of the environment within which the Authority operates, the SPC will avoid intruding into or interfering with cultural properties of the local communities as much as possible.

Archaeological chance finds

Prior consultations with the Museums and Monuments Authority have been carried out in connection with any historical or archaeological 'chance finds'. The following procedure, for dealing with all such finds will be followed:

Upon the discovery of any such chance finds:

- Notified immediately in writing, stating the exact site or location of the item.
- Preserve the finds with no alteration, damage, destroy or remove any antiquity from its original site without the consent of the Museums and Monuments Authority. If removal of the item becomes immediately necessary for safety or security reasons, the exact location shall be noted and the retrieved artifacts shall be sent to the custody of the Museums and Monuments Authority.
- Through liaising with the relevant authorities, the lawful owners of the land shall be duly informed and where necessary, payment shall be made by the responsible agencies after due assessment.

Further decisions with respect to site sampling or further excavation will be under the jurisdiction of the Museums and Monuments Authority. The above will ensure that issues relating to archaeological/cultural 'chance finds' are properly handled.

- Cultural "chance finds" - sites of cultural significance such as sacred woods or trees or rock outcrops which the local residents may have not mentioned at the survey stage – will be properly managed to the satisfaction of both the local communities, the EPA and the Funding Agencies. Where possible, such cultural properties will be left undisturbed or avoided. In cases where complete avoidance of such sites is impossible, every necessary step will be taken to minimize the potential impact of intruding into the site.

This will be done in consultation with and to the satisfaction of the chiefs, elders and opinion leaders of the local communities.

7.8 Environmental and Social Management Monitoring

The monitoring parameters and the recommended frequency proposed in the ESIA will be strictly adhered to. The parameters to be monitored will be:

- Public safety and health
- Fire prevention system
- Pollution prevention
- Vegetation management
- Noise
- Erosion
- Waste management
- Air Quality
- Water Quality
- Accidents and dangerous occurrences
- Socio economic/cultural issues
- Training and development

7.8.1 Air Quality

The relevant parameters for air quality to be monitored on monthly basis, in spite of measures to be carried out to suppress dust uptake by air currents, shall include:

- Total Suspended Particulates (TSP)
- PM10

The EPA has specifically asked that it be furnished with results of all monthly measurements of these parameters. This shall be done during the constructional phase of the project cycle.

7.8.2 Water Quality

The relevant parameters that will be considered for analysis are:

- BOD

- pH
- DO
- Turbidity
- Total suspended solids

The frequency of monitoring of the above mentioned parameters has been indicated in Table 25.

It must be noted that the baseline established by ESIA team will enable the proponent to indicate the thresholds that will signal the need for corrective actions and the detection limits. The Environmental Team Members will be trained adequately to understand and appreciate the choice of parameters, sampling sites, methods of sampling/measuring and analysis and frequency of monitoring.

7.8.2.1 Method for Water Quality Analyses

Temperature should be measured in situ with a portable temperature probe. Turbidity, pH and colour determinations may also be measured in situ. Methods of analysis should be based on those outlined in "Standard Methods for the Examination of Water and Wastewater" (APHA-AWWA-WEF 1998). The parameters and the methods normally used for analysis are summarized in the Table below.

Sampling sites shall be determined based on selected sites in the opinion of the Director and the PIU.

Table 24 Method of analysis of selected parameters

Parameters	Method	APHA Method Number
Color	Visual comparison method	2120 B
pH	Direct measurement with a pH meter	-
Turbidity	Direct measurement with a turbidity meter	-
Total Dissolved Solids, TDS	Filtration and drying at 180ºC in an oven	2540 C
Suspended Solids, SS	Filtration and drying at 105º C in an	2540 D

	oven	
Dissolved Oxygen, DO	Winkler's method with Azide modification	4500-0.C
Biological Oxygen Demand, (BOD)	Determination of DO before and after 5 days incubation at 20ºC	4500-0.C

7.9 Training and development

To ensure the successful implementation of all the environmental management programs, a training program is recommended for the SPC, personnel of the contractor and other relevant authorities. The program will cover the creation of environmental awareness and occupational safety and health issues. The main issues of concern will be:

7.9.1 Environmental Awareness

The areas earmarked for environmental awareness creation include:

- Proper usage and definitions of basic environmental terminologies;
- Sierra Leone ESIA Procedures, and Provisions of EPA Act, 2008;
- Environmental Laws, Regulations and Environmental Compliance in Sierra Leone;
- General environmental policies;
- Introduction to environmental management planning;
- Environmental impact assessment;
- Mitigation measures
- Monitoring plans;
- Environmental audit;
- ESIA case studies.

7.9.2 Occupational Safety and Health

The relevant areas for consideration are:

- The Factories Act, 1974;
- The provisions for safety, health and welfare;
- Fire prevention and fighting methods.

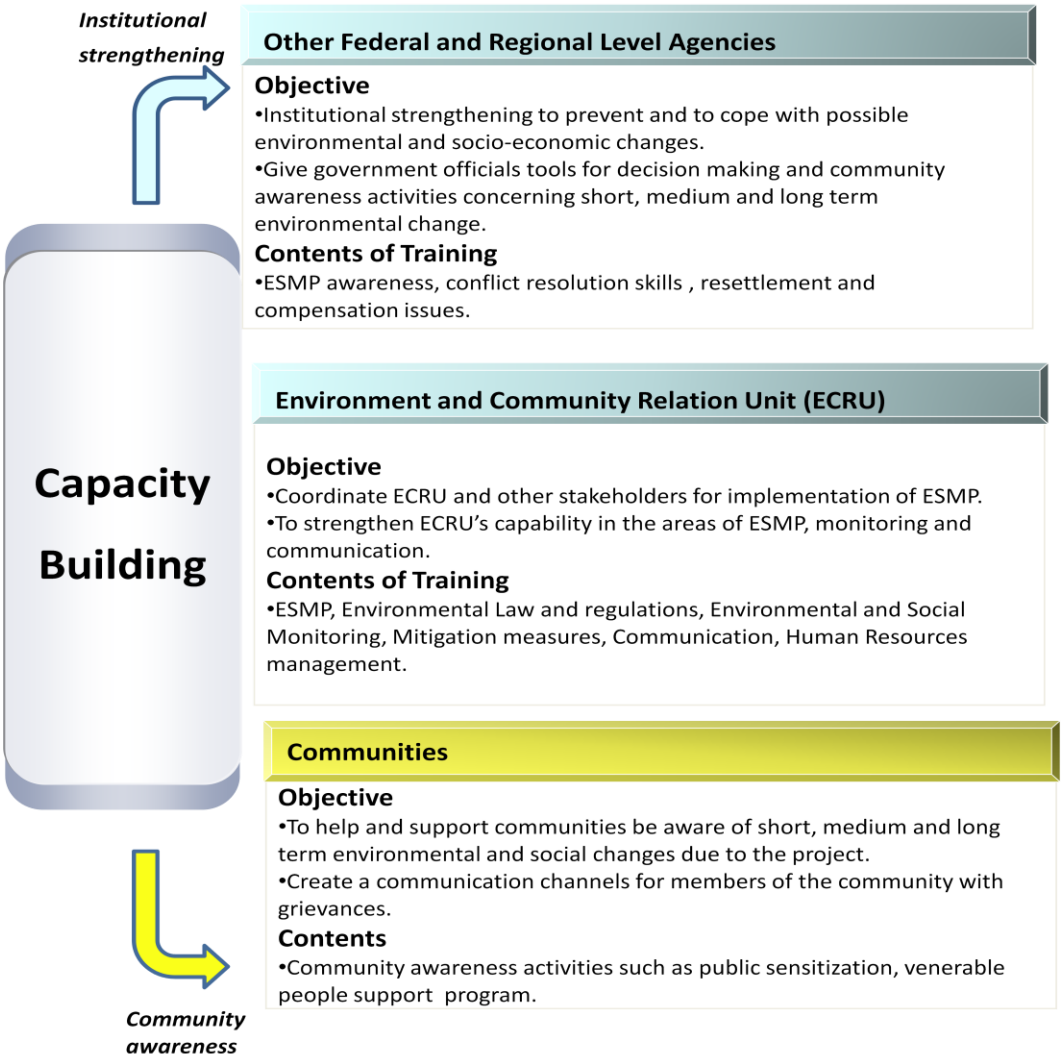
7.9.3 Capacity Building

The SPC (Special Purpose Company) will be set up for the implementation of the proposed Project. The SPC, the governmental agencies involved by the project will all need to be endowed with satisfactory environmental and social safeguards. The SPCs will need to have a special Environmental and Community Relations Unit (ECRU) which will be responsible for implementing the ESMP.

In order for thisese units to work effectively, proper capacity building will be needed. There are two aspects to the Capacity building- 'Institutional Strengthening' for SPCs, the governmental agencies, and 'Community Awareness' to publicize the project.

The proposed capacity building program strategy is shown in the diagram below.

Figure 32 Proposed capacity building program strategy



For the successful implementation of Environmental management and monitoring program, it is essential for a range of training to start as soon as possible.

Capacity building of the Environmental and Community Relation Unit (ECRU) in SPC

In general, training can be composed of workshops, in-service training & technical assistance, in-service formal courses, and to a certain degree, awarding of scholarship for university degree and certificate studies.

Considering the efficiency, In-service Training & Technical Assistance will facilitate adequate on-the-job training and technology transfer, enabling the ECRU staff in SPC to undertake their monitoring activities during the Construction and Operation Phases of the proposed Project.

Capacity building of Other Federal and Regional Level Agencies

Several government agencies at both Regional and Federal levels will be responsible for ongoing monitoring of construction and operational conditions and activities. All stakeholders involved in the project must receive support through capacity building programs. This capacity building needs to be designed for the different target groups by specific institutes, universities or consultancy companies specialized in environment, training, human resources management and change management.

It is recommended that further detail assessment of involved agencies for developing the customized training in line with the current status in Sierra Leone.

In addition to the daily interactions with the Contractor, the PIU will also communicate with i) the SPC on Progress of work, Cost review, Project challenges and issues; ii)) the OE on Technical issues, Specifications, Design reviews and approvals; iii) MEWR/NPA/EPA on Project impact and Mitigation arrangements; and, iv) the Funding Agencies on Payment requests, Cost review, Progress of Work, Challenges and Issues

7.9.4 Information, Education and Communication (IEC)

In addition to the provisions made in Section 7.9 for continuous public education during the construction phase and subsequent posting of "Warning Signs", sustained Information, Education and Communication (IEC) programs to ensure overall community safety shall be implemented on yearly basis. The purpose of the IEC program is to remind community members about project related risks and activities that will endanger their lives such as uncontrolled bush burning, climbing of towers, especially by children as well as the need to adhere to warning signs and all rules governing the RoW.

7.10 Proper and Adequate Records Keeping

The SPC will keep a General Register in the prescribed form. Records that will be kept as prescribed by the above mentioned law will include, inter alia:

7.10.1 Accidents and Dangerous Occurrences

Particulars to be entered in the Register will include the following:

- Date of mishap;
- Name(s) of employees involved;
- Sex and Age;

- Usual Employment;
- Precise occupation at the time of mishap;
- How mishap was caused;
- Period of disablement.

7.10.2 Testing and Examination of Fire Warning Systems

Particulars to be entered in the Register will include the following:

- Description of fire warning system;
- Date of test or examination;
- Particulars of defects found;
- Particulars of action taken and date.

7.10.3 Particulars of Pressure Vessels and Lifting Appliances

Particulars to be entered in the Register will include the following:

- Date of last thorough examination;
- Maximum safe working pressure;
- Particulars of defects (if any) reported by the certified engineer/supervisor;
- Particulars of action taken to remedy defect indicated in iii if applicable;
- Name and other particulars of engineer/supervisor or including signature.

Table 25 Environmental Monitoring Activities

Project Activity	Parameters to be monitored	Location	Measurement	Frequency of measurement	Institutional Responsibilities [incl. Enforcement & coordination]	Comments
Pre-construction	**Line Route Survey** Clearing of vegetation cover during line route survey. • Clearing of farms lands • Tree felling (forest reserves)	Entire proposed route of the Transmission Line	Hectares (area cleared in project area)	Throughout line route survey	SPC/Surveyors	
	Public Information Disclosure of Environmental Impact Statement Document	Entire proposed route of the Transmission	Disclosure in the National Dailies	As and when required	NPA / EPA	

Project Activity	Parameters to be monitored	Location	Measurement	Frequency of measurement	Institutional Responsibilities [incl. Enforcement & coordination]	Comments
		Line	Disclosure to members of the public			
Construction	**Transportation** Guidelines provided under section IV of the SPC Safety Rules and regulations concerning equipment, motor vehicles and transportation of personnel and materials should be applied and closely monitored and recorded. These should include monitoring the following activities: • Speed Limits of vehicles, traffic congestion on main roads (near project sites) • Trucks conditions and maintenance • Vehicular accident records • Vehicle safety signals (flares, warning lights, reflectors etc) • Vehicle fuelling procedures • Vehicle loading/off loading procedures • Vehicle daily check outs • Driving licenses and permit to drive • First Aid and Fire Extinguishing kit	Entire Project location	Km/hr No. of Preventive Maintenance. Number Number Number Number Number Number Quantity	Daily Monthly Daily Daily Daily Daily Monthly Daily Monthly	Contractor/SPC (Project Prograss Report)	
Construction	**Civil Works** Activities to be monitored under civil works should cover safe working practices in accordance with SPC Safety Rules and Regulations. Monitoring criteria would include: • Protective clothing and working gear • Plant and equipment maintenance • Safety Test - lifting plant gears (wires, hoisting blocks etc,) • Dewatering operations • Concrete works • Fire patrols (site camps) • Dust levels (settlements/watercourses) • Waste Management and Disposal	Entire Project location	Quantity Number Number Number Number Number mg/l Kg.	Daily Weekly Daily Daily Weekly Weekly Weekly Daily	Contractor/SPC (Project Prograss Report)	

Project Activity	Parameters to be monitored	Location	Measurement	Frequency of measurement	Institutional Responsibilities [incl. Enforcement & coordination]	Comments
Construction	**Vegetation Clearing** Clearing of vegetation cover at tower tracks, construction accesses, and right-of-way should be monitored under the following activities: • Tree felling • Clearing of farms lands • Clearing of right of way (vegetation cut only to 1.25m height) • Clearing of tower track (graded width 2.5m-3m) • Clearing access tracks (graded width 3.5m)	Entire Project location	No. of trees Hectares Hectares Hectares Hectares	Daily Daily Daily Daily Daily	Contractor/SPC (Project Prograss Report)	
Construction	**Water quality** Selected rivers, streams, and other water bodies in the project areas of environmental influence shall be sampled and analyzed for establishment of baseline water quality conditions. These same water bodies shall be monitored during construction phase to ensure compliance with anti-pollution legislation. The following parameters shall be monitored: • Biological oxygen demand (BOD5) • pH • Oil and grease • Total suspended solids • Conductivity • Total coliform • Turbidity **Noise** Noise levels shall be measured at the same positions as those for the ESIA in communities close to the proposed line.	Relevant water bodies in the way of the proposed RoW Communities close to the line route and having been identified as likely to undergo noise disturbance	mg/l Number mg/l mg/l µS/cm MPN/100ml N.T.U dB(A)	Every week during construction phase and once a year during operational phase after maintenance operations	Contractor/SPC (Project Prograss Report)	
Construction	**Waste Management** • Waste bush handling • Waste water handling • Waste segregation • Disposal of conductor drums • Disposal of metallic waste • Disposal of empty chemical containers **Socio-economic/cultural issues** • Shrines • Sacred Grove • Identifying all affected persons • Assessment of compensation • Payment of compensation	Entire Project location " " " " " Entire Project location " " "	Kgs. Cm3 Kgs. Number Kgs. Number Number Number Number Amount Amount	Daily Daily	Contractor/SPC (Project Prograss Report)	

Project Activity	Parameters to be monitored	Location	Measurement	Frequency of measurement	Institutional Responsibilities [incl. Enforcement & coordination]	Comments
	(adequate amounts, timely payments); • Archaeological chance finds • Conflicts over land • Identification of interested stakeholder • Employment equity (community vs. labour from outside); • Employment and job creation • HIV/AIDS Education program	" "	Number Number Number Share amount Share amount Number of programs	Daily Annually Annually Annually Annually Annually		
Operational and Maintenance Phase	**Routine ground/aerial inspection of lines** • Towers (vandalism, corrosion) • Insulators and accessories (damages, Replacements) • Accidents involving lines and structures • Occupational hazards and accidents • Accidents affecting public safety • Substations – oily wastes, transformer oil (PCBs)	Substations & Entire Project Area	Number Number Number Number Number Cm3	As and when necessary during operational phase of the project cycle		Transmission Systems Dept of SPC (Department Progress Report)

7.11 Scheduling & Reporting

The monitoring program shall include a documented monitoring plan, which shall detail all data handling, storage and analyses required. SPC shall identify the location where all data is to be stored, staff responsibilities for data handling and analysis and appropriate reporting lines for ensuring that management are aware of the current status of site operations. This is particularly important with respect to resettlement negotiation, compensation payment and monitoring of implementation of these activities. Compensation schemes can suffer post construction claims from unsatisfied project-affected persons and detailed records keeping of all actions are essential to try to resolve any such issues.

Results of environmental monitoring activities will be reported to allow for identification of mitigation measures that need corrective action. From pre-construction to operation/maintenance phases, the SPC will carry the ultimate responsibility of ensuring that environmental reporting procedures are undertaken. The Project Management Unit will carry out monthly discussions on the project which will form a forum for discussions on environmental issues, and decision making with regard to further mitigation, monitoring, or changes to construction practices.

The Environmental Coordinator will report through the Project Director on all environmental activities for inclusion in the monthly reports. The Environmental Coordinator will use these

monthly reports as the basis for the preparation of an annual environmental report (as a requirement of the Environment Protection Agency and relevant international agencies).

All monitoring reporting documents will be kept on file, as part of the SPC documentation procedures. The project-reporting schedule is presented in Table 26.

Table 26 Project Reporting Schedule

Activities in Mitigation Measure	2012				2013			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pre-construction								
- Line route survey								
- Acquisition of right of way								
- Line Route Survey Report/ ESIA Report								
Construction								
- Access tracks					x	x	x	x
- Transportation of Machinery					x	x	x	x
- Full grading of tower tracks					x	x	x	x
- Clearing of RoW					x	x	x	x
- Erection of towers					x	x	x	x
- Erection of conductors, Shield wires					x	x	x	x
- and accessories					x	x	x	x
- Modification works at substations					x	x	x	x
- Acquisition of right of way					x	x	x	x
- Compensation					x	x	x	x
- Project Monthly Progress Reports					x	x	x	x
Operation								
- Dropping of conductor					x	x	x	x
- Shattering of insulator units					x	x	x	x
- Project Monthly Progress Reports								x
Maintenance Phase								
- Control of vegetation re-growth	x	x			x	x	x	x
- Rust treatment	x				x	x	x	x
- Replacing faulty components		x			x	x	x	x
- Quarterly Reports								
Construction – Maintenance Phases								
- Management of liquid and solid waste					x	x	x	x
- HIV/AIDS Outreach program					x	x	x	x
- Project Monthly Progress Reports					x	x	x	x

Activities in Environmental Monitoring	2012				2013			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Activities in Environmental Monitoring	2012				2013			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pre-construction								
- Line route survey				x	x			
- Public information				x	x	x	x	
- Project Monthly Progress Reports				x	x	x	x	
Construction						x	x	
- Transportation of Machinery						x	x	
- Civil Works						x	x	
- Vegetation clearing						x	x	
- Waste Management						x	x	
- Socio-economic/Cultural issues						x	x	
- Compensation						x	x	
- Project Monthly Progress Reports				x	x	x	x	
Operation - Maintenance								
- Dropping of conductor							x	
- EMF Levels							x	
- Quarterly Reports							x	
Institutional strengthening								
- National Power Authority	x	x	x	x	x	x	x	x
- Contractor			x	x	x	x	x	x
- PIU	x	x	x	x	x	x	x	x
- EPA	x	x	x	x	x	x	x	x
- Dept. of Museum	x	x	x	x	x	x	x	x
- Land Valuation Board	x	x	x	x	x	x	x	x
- District Councils	x	x	x	x	x	x	x	x
- Project Monthly Progress Reports	x	x	x	x	x	x	x	x
Training								
- EMP Implementation, Redesign, Conflict	x	x	x	x	x	x	x	x
- Resolution, etc.	x	x	x	x	x	x	x	x
- Environmental Processes, Methods & Equipment	x	x	x	x	x	x	x	x

7.12 Cost of Environmental Management

The proponent will make human resources available for environmental management and enhancement. In addition, financial provision shall be made to ensure that mitigation measures (including compensation), monitoring programs are effectively implemented. The proponent will make the necessary budgetary provisions to cover all commitments for the Transmission Line Project.

The estimated total budget for Environment and Social Management & Resettlement Action Plan cost, as shown in Table 27 below, shall be $3,400,281

Table 27 Environmental and Social Management & Resettlement Action Plan Cost

ACTIVITY	No	ITEM	Cost (SLL)	Cost(USD)
Activities for ESMP	**1**	Review & Disclosure of Environmental Impact Assessment Report	272,160,000	68,040
	2	Audit for RAP and ESMP	212,000,000	53,000
	3	Environmental Monitoring	1,765,920,000	441,480
	4	Training of environmental management team in house	129,600,000	32,400
	5	Public Health & Safety (including HIV/AIDS Programmes)	864,960,000	216,240
	6	Measuring device for air/water/soil pollution and vehicle, laptop etc.	324,000,000	81,000
	Total ESMP cost		3,568,640,000	892,160

○ **RAP Cost**

Compensation	**1**	Compensation for lands	4,670,100,000	1,167,525
	2	Compensation for trees	971,722,432	242,930
	3	Compensation for food crops	335,340,802	83,835
	4	Building/Structures, Houses	873,408,750	218,352
	5	Constructional damage for plants outside of the ROW, inside access road (=(2+3)*10%)	130,706,323	32,676
	6	Compensation for losses of income ((1+2+4)*10%)	325,761,559	81,440
	7	Add-on amounts for vulnerable project affected persons (=(1+2+3+4)*5%)	342,528,599	85,632
	8	Professional fees, reimbursement for permits etc (=(1+2+3+4)*10%)	685,057,198	171,264
	9	Contingency allowances to cater for the effect of probable increases in property values (=(1+2+3+4)*10%)	685,057,198	171,264
	Subtotal		9,019,682,861	2,254,918
Activities for RAP	**10**	Social action plan, community support	230,636,000	57,659
	11	Livelihood restoration program	213,576,000	53,394
	12	Community infrastructure Program (=(1+2+3+4)*5%)	342,528,599	85,632
	13	External monitoring and Evaluation	106,000,000	26,500
	14	Purification rites / ceremonies	28,000,000	7,000
	15	Indirect cost(=(10+11+12+13+14)*10%)	92,074,059	23,018
	Subtotal		1,012,814,658	253,203
Total RAP cost			10,032,497,519	2,508,121

○ **Total ESMP & RAP Cost**

Total ESM P& RAP Cost	**13,601,137,519**	**3,400,281**

7.12.1 Basis of Lands Compensation Cost

The survey noted that the current market price per town lot (50m²) in Western Area is approximately Le 1,000,000 ($250). Therefore, the unit price of l m² would cost Le 20,000 ($5).

Permanent land take approximately 0.23km^2 will take place in due to the tower election (25m^2 per tower) and the placement of substations (40,000m^2 per substation)

Tower Base. The area to be cleared for a single tower will be made up of the dimensions of the tower base (5 m x 5 m). So the total tower base area will be approximately 25 m² per tower. The average span between towers is about 400 m and total line length of Sierra Leone section is 530km. Thus, approximately 1,325 towers/units and 33,125 m^2 will be needed for the purposes of the construction of the transmission tower base.

Substations. There are five substations in Sierra Leone and the land for all of them will be purchased based on market value in Sierra Leone. There is no fixed price for land in Sierra Leone, and Government does not have much control over the various prices of land both in urban and rural areas.

The entire five (5) substations will cover approximately 200X000 square meters which is 40,000 square meters per substation.

Mining area. Small scale mining areas were identified insided RoW in Kono disctric. 50 Leone per square meter was suggestedfor the compensation.

See below for the cost of land compensation.

Location	Unit Area (m^2)	Number	Unit Cost (SLL/m^2)	Total Cost (SLL)
Tower Bases	25	1,325	20,000	662,500,000
Substations	40,000	5	20,000	4,000,000,000
Mining Area	-	152,000	50	7,600,000
Total				4,670,100,000

7.12.2 Basis of Trees and Crops Compensation

Landowners who cultivate the crops within the RoW of the proposed Project before the official announcement of the cut-off day are entitled to receive compensation for the entire crops or economic trees whether or not the their plantations are cleared as far as they are registered in PAP inventory list. However, In general, farming method in the project area is slash and burn shifting cultivation carrying out petty trading of surplus crops and small businesses to provide monetary income, there is a possibility that cultivation is changed after the Consultant complete the PAP investigation. Therefore, joint site visit with the EPA, the NPA and other responsible agencies should be made to verify the draft PAP inventory list along with their ownership in the field before issuing the Environmental Permit.

As shown in Appendix 3, compensation for trees and crops to be affected will be 971,722,432 LE(equivalent to 242,930USD) and 335,340,802 (Euivalent to 83,835 USD) respectively. In order to evaluate the compensation cost, normal market prices for each crop and tree was investigated during the Study as below.

The Consultant measured the dimensions of each property in the field and then use the following table indicating how many trees are normally cultivated in unit area which was received from Ministry of Agriculture, Foresty and Food Security in order to calculate the total number of trees for each affected crops.

Type	No.of Trees/ Hectare	Type	No.of Trees/ Hectare	Type	No.of Trees/ Hectare
Cocoa	450	Oil Palm Tree	60	Guava	60
Kolanut	450	Coffee	450	Orange	60
Coffee	450	Cacao	450	Banana	60
Pea	60	Mango	60	Pea	60
Pineapple	60				

Also, provisional budget shall be provided as a contingency in case of damages on trees or crops might be happened outside of RoW during the construction

7.12.3 Basis of Houses and building Compensation

The Consultant surveyed the market price of houses and buildings in the project area and developed unit price according to their material cost (bricks, cement, ceilling, door, etc) and workmanship cost. Total 38 structures wil be affected and compensation will be be 873,480,750 LE(equivalent to 218,352USD)

8 CONSULTATIONS

Consultation is an essential element of the study. It gives a broad view of the concerns of the people who will be impacted by the project and others who may be directly and indirectly affected. In this light, communities within the range of 300 meters of the line route corridor were usually asked to assemble (elders, women, men, children, youths, etc.) in order to brief them on the objectives of the project and indeed what benefits they will received during construction, and the operation of the project. Our recording experts have recorded the methodology used to discuss issues related to the line route corridor with the community people, the concerns raised by the people, compensation issues for properties to be affected, social programmes to be implemented, etc

Consultations have been held with regulatory agencies, District Councils, Paramount Chiefs and local communities prior to the preparation of the Scoping Report and the Environmental Impacts Statement.

8.1 Methodology

The communities predicted to be affected by the proposed project were identified with the help of the relevant Paramount Chiefs, the Survey Consultants and from field work carried out to identify the communities. The survey instruments used were questionnaires prepared prior to the survey. A summary of the survey methodology is discussed below.

A Team comprising the NPA, the survey and environmental consultants carried out very useful initial consultations with the potential-affected chiefdoms and communities along the proposed RoW and substation sites. The outcomes of such consultations have been incorporated in this report.

Using maps of the proposed transmission line provided by KEPCO and the contractors, the Environmental Team and surveyors moved from community to community. At the end of each consultation, the names and directions to the substation sites and nearest villages were elicited from the community that had been consulted. This was compared with the list that had already been drawn up to ensure that the survey covered all the affected villages

The consultations started with the normal traditional greetings and exchanges. During these exchanges an interpreter was designated.

After the exchanges and greetings the NPA representative informed the gatherings about the proposed project and its objectives. All the details that were likely to inform their reactions were explained to the gatherings. A GIS Tracking Map of the proposed line route was presented to all the gatherings. This graphical presentation made it easy for the locals to understand the project. The Chiefs, invariably, were the first to react to the information. Thereafter with the permission

of the Chiefs, the meetings were thrown open for the various reactions of the elders and opinion of leaders.

The socio-economic survey team (SEST) took the gatherings through the details of potential environmental impacts that had not been covered by the people. Proposed mitigation measures were then put forward and explained. Alternate mitigation measures were discussed and the opinions of the communities sought on the appropriateness of such mitigation.

Majority of the local languages of the project area are verbal and not written; therefore, consultations with project affected people are done in English with an interpreter usually intepreted from English to local dialects. This method of communication is done because majority of the villagers do not understand nor speak English. Also, majority cannot read or write their local languages/dialects; they can only speak these dialects. This makes the public consultation process difficult. It is therefore recommended that signed communications be used intensively in order for more villagers to understand what is expected of them.

8.2 Communities along the proposed line route

Some communities living close to the line route stretching from Soro Gbema, Barri and Zimmi Makpele Chiefdoms in the Pujehun District, (border between Sierra Leone and Liberia), the proposed substation sites in Kenema, Jaiama Nimikoro Chiefdom, Bumbuna, Fadugu, Kasunko Chiefdom and Kamakwei (Sella Limba Chiefdom) (close to Tambaka Chiefdom – border chiefdom with Guinea) were consulted to discuss the general implications of the project on them, particularly their environment, safety, health and welfare.

Given below is a summary of some of the main concerns raised during the consultations.

Picture 2 Consultation with Paramount Chief in Barri Chiefdom

- Paramount Chief Vandi Kong Magona 11, and some of his elders in the Pujehun District

8.3 Outcome of Discussions

The dominant religion of the people along the line route is Islam followed by Christianity and other denominations. Concerns/issues raised in all the chiefdoms visited, regulatory agencies and District Councils are given below.

8.3.1 Communities/Elders along the line route

Community elders presented the following concerns/issues:

- Compensation for land and economic trees;
- Employment opportunities;
- Provision of electricity supply;
- Identification of Project Affected Persons;

- Payment of royalties;
- Time frame for payment of compensation;
- Settlement of disputes over ownership of land and economic trees;
- Commencement of project implementation;
- Provision of social services like schools, health centers and clinics;
- Adherence to the country's laws in implementing the project.

8.3.2 Consultations with District Councils

District Councils and Town Councils through whose jurisdiction the proposed line is expected to traverse were all identified and consulted on the project and its impacts on the communities in the area of environmental influence of the proposed project.

8.3.2.1 Pujehun District Council

Pujehun District, the starting point, on the Liberian border, of the Interconnection project, falls within this district. In a consultation meeting with the Chairman of Pujehun District Council, Mr. Sadique Sillah and his Chief Administrator, Mr. Philip Sama, they pledged their support for the project. They, however, expressed concern that Pujehun and its surrounding communities do not have access to power, and hoped that power from the interconnection transmission line would be made available to the communities. They proposed to assist in the provision of community lands for the establishment of the RoW. They also expressed happiness that NPA as a first step was undertaking the sensitization exercises and pledged the District Council's readiness to embrace the project and provide the necessary support for its speedy implementation, more especially due to its international flavor. The Chief Administrator reiterated that all compensation must be paid promptly and that if there is need for casual labor, then local labor must be used.

Officials consulted:	**Designation**
Mr. Sadique Sillah	Chairman, Pujehun District Council
Hon. Ansumana Kaikai	Member of Parliament
Hon. Aloysius M. K. Massaquoi	Member of Parliament
Mr. Philip Sama	Chief Administrator
Mr. Mohamed Puma	Councilor

8.3.2.2 Kenema Town Council

Consultations were held with the Chief Brima Kargbo, Mayor of Kenema Town Council and Mr. M. S. Conteh, Councilor and Board Member, Bo Kenema Power System. They also pledged their support to the project.

They were briefed on the project and informed them` that consultations were still ongoing. Local communities which will be affected and all other relevant organizations have been consulted. The outcome of the consultations as well as evidence of consultations has been included in this Report

Persons Contacted	**Designation**
Chief Brima Kargbo	Mayor, Kenema Town Council
M. S. Conteh	Councilor and Board Member, Bo-Kenema Power System (BKPS)

8.3.3 Institutional Consultations

8.3.3.1 National Telecommunications Company (NATCOM)

Prior consultations with the Chairman of the Board of Directors, National Telecommunications Company indicated that in principle overhead lines experience interferences due to 'induction' effect from high-tension lines when they run close to or parallel to such lines, and also in the event of any break-up of the overhead cables. In such cases, there is the need to avoid direct contact with the cables of service providers such as CELTEL, COMMIUM and AFRICEL. The Chairman, however, promised to liaise with the respective technical departments of the registered companies in the country to inform them of the proposed project and to facilitate assessment of potential risks to their facilities.

This impact has been duly identified under impact identification and mitigation measures put forward.

Contact Person	**Designation**
Mr. Seray Timbo	Chairman, Board of Directors, NATCOM

8.3.3.2 Department of Factories Inspectorate

The Department was consulted on issues relating to occupational safety and health of employees during the constructional and operational phases of the project. The Department asked that all the relevant provisions of the Factories Act, 1974 be complied with. It further

asked that the Regional Offices in the South, East and North be informed prior to commencement of construction to ensure that routine inspections are carried out by the Department.

Contact Person	**Designation**
Mr. Abu Bakarr Koroma	Chief Inspector of Factories

8.3.3.3 Environment Protection Agency (EPA)

The EPA advised on relevant consultations with stakeholders in order to address all concerns. The Agency also duly screened the Scoping Report and advised on some environmental issues that had been overlooked: impact on flora and fauna in the protected forests; land conflict/ownership issues, electromagnetic field effects, compensation issues. These were noticed in review comments of the Scoping Report.

This Report has been prepared by the proponent taking into consideration the issues and concerns raised by EPA, District Councils and the local communities referred to above.

8.3.3.4 Forestry and Wildlife Department, Ministry of Agriculture, Forestry and Food Security

The department was consulted on issues relating to impacts on flora and fauna during the constructional and operational phases of the proposed project on the 8.4 km line route which was proposed to traverse along the Gola National Forest Park and the 2.5 km which was proposed to traverse along the Nimini Forest (the alternatives of these previous line routes were studyed to avoid not to make significant adverse impacts on these protected area). The Department asked that the Regional Offices in the East and North as well as the Gola Forest Concession Management with headquarters in Kenema be informed prior to construction to ensure that routine inspections are carried out by the Department and the Gola Forest Concession Management Team.

Contact Person	**Designation**
Mr. Sheku Mansaray	Ag. Director
Mr. Daniel D. Siaffa	Director, CSSL

Each of the District Councils and agencies consulted registered their support for the project and advised on the adherence to the country/s environmental and forestry laws for the implementation of the project and to be given adequate notice for their input.

Detailed discussions held with communities, chiefdom elders, district councils, service providers, and Government Agencies are included in the report as Appendix 4.

8.4 Disclosure program

As part of the disclosure processes, the SPC shall disclose at various times to the general public, relevant documentation and activities for their attention and relevant action. The disclosure processes shall include, among others:

- In accordance with the Sierra Leone ESIA procedures, and through the EPA, a Scoping Notice was served on the proposed project to the six District Councils within the area of environmental influence of the proposed project. The District Councils were required to paste the notices on their notice boards and create awareness amongst the Council and Ward Committee members of the districts;
- Following the submission of this draft ESIA to the Sierra Leone EPA, this ESIA document shall be disclosed in the national dailies for comments;
- The NPA, upon the issuance of an Environmental Licence shall prepare an Environmental Management Plan (EMP) and Resettlement Action Plan (RAP) for the project. The final ESIA, ESMP and RAP shall be disclosed in national dailies, for information purposes and comments;
- Prior to the acquisition of land for the project, the NPA shall publish a Notice of Entry for the purpose of constructing and operating electrical works;

The NPA shall gazette the Notice of entry in the National Gazette.

9 DECOMMISSIONING

It is anticipated that the transmission line will be continuously maintained and repaired, and will be operated for several decades. The transmission line and other components may be upgraded based on cost/benefit analysis and the prevailing new technologies. Because of its long-life-span, the circumstances under which the transmission line might be ultimately decommissioned are difficult to foresee. However, if decommissioning becomes necessary and it is carried out, the following will be done:

- The conductors and shield wires will be lowered to the ground;
- All cables will be spooled and removed from the RoW and salvaged for re-use;
- Insulators will be collected for re-use or disposed of at approved refuse dumping sites in the districts;
- The towers will be removed from the RoW and salvaged for re-use or sold as scrap metals;
- The concrete tower foundations will be demolished, collected and dumped at approved refuse-dumping sites in the districts;
- The tower base areas will be seeded with local plant species to stabilize the soil and minimize erosion.

The work camps, on the other hand will be immediately decommissioned at the end of the constructional activities. The wooden structures, which will be raised as offices, workshops, accommodation and storage rooms will be dismantled and the planks of wood, doors and other materials will be carted away for re-use at other project sites of the contractor. The concrete floors will also be removed and disposed of at approved dumpsites in the districts. All mobile toilet facilities for the construction site workers will be removed from the sites on completion of constructional works. Constructional equipment will all be transferred to the contractor's premises. The work campsite will then be filled, leveled and re-vegetated.

10 CONCLUSIONS

This Environmental and Social Impact Report has identified potential impacts on the physical, biological and socio-economic/cultural environments, occupational safety, health and welfare of the employees as well as the communities through which the transmission line passes through. Mitigative and potential remedial measures have also been outlined. These will be actively pursued in order to minimize or, if possible, eliminate the identified negative impacts.

The transmission line project cannot be carried out without any impacts on the environment. Indeed, some of the impacts are unavoidable. However, the mitigative measures put forward are expected, as far as possible, to be able to minimize the impacts so as to make them pose no threats to the continued sustainability of the environment and welfare of the communities through which the line route passes.

It must be mentioned that the opening up of tower tracks and construction of tower base in the project area may cause temporary disturbance/impacts to flora and fauna. A review of identified impacts shows that there will be some significant adverse irreversible impacts on the environment (e.g. disturbance to flora and fauna, land ownership and land-use characteristics).This ESIA Report has identified the impacts, provided mitigative measures, and an environmental management plan. Other impacts will be minimal or temporary.

The benefits to be derived from the implementation of the 225 kV Man (Cote d'Ivoire) – Yekepa – (Liberia) – Nzérékore (Guinea) - Buchanan – (Liberia) - Bumbuna - (Sierra Leone) – Linsan (Guinea) Interconnection Project are immense, especially considering the projected energy demand forecast for Sierra Leone.

The Ministry of Energy and Water Resources/NPA believes that this ESIA has sufficiently dealt with the significant issues on the ground and will therefore meet the expectations of the EPA and request the issuance of an Environmental Licence to enable it proceed with the implementation of the project without further delay.

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APPENDIX