ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY

on the MAN (Côte d’Ivoire) - SANNEQUILLE (LIBERIA) - NZÉRÉKORE (GUINEA) - BUCHANAN (LIBERIA) - MONROVIA (LIBERIA) - BUMBUNA (SIERRA LEONE) - LINSAN (GUINEA) INTERCONNECTION PROJECT

FINAL ESMP REPORT (LIBERIA SECTION)

December 2011
**Environmental and Social Impact 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 development 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.
1
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Years with firm: 15 Years

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Years with firm: 10 Years
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<th>Description</th>
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<tbody>
<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
</tr>
<tr>
<td>EMF</td>
<td>Electromagnetic Field</td>
</tr>
<tr>
<td>EMU</td>
<td>Environmental Monitoring Unit</td>
</tr>
<tr>
<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
</tr>
<tr>
<td>EMS</td>
<td>Environmental Management System</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>ESIA</td>
<td>Environmental and Social Impacts Assessment</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information Systems</td>
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<tr>
<td>KEPCO</td>
<td>Korea Electric Power Corporation</td>
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<tr>
<td>HIV</td>
<td>Human Immune Deficiency Virus</td>
</tr>
<tr>
<td>IBA</td>
<td>Important Birds Area</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electronic Technical Commission</td>
</tr>
<tr>
<td>LEC</td>
<td>Liberia Electricity Corporation</td>
</tr>
<tr>
<td>MEA</td>
<td>Multilateral Environmental Agreements</td>
</tr>
<tr>
<td>MOA</td>
<td>Ministry of Agriculture</td>
</tr>
<tr>
<td>MOU</td>
<td>Memorandum of Understanding</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
</tr>
<tr>
<td>PAP</td>
<td>Project Affected Person</td>
</tr>
<tr>
<td>PCBs</td>
<td>Polychloro biphenyls</td>
</tr>
<tr>
<td>PEC</td>
<td>Project Environmental Coordinator</td>
</tr>
<tr>
<td>PEMP</td>
<td>Provisional Environmental Management Plan</td>
</tr>
<tr>
<td>PIU</td>
<td>Project Implementation Unit</td>
</tr>
<tr>
<td>ROW</td>
<td>Right of Way</td>
</tr>
<tr>
<td>STD</td>
<td>Sexually Transmitted Disease</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Project</td>
</tr>
<tr>
<td>WAPP</td>
<td>West African Power Pool</td>
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<td>WB</td>
<td>World Bank</td>
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EXECUTIVE SUMMARY

1. Project Description

Members of the Economic Community of West African States (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 development and realization of key priority infrastructures that will permit accessibility to economic energy resources, to all member states of the 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) and the WAPP Members have commenced preparatory works towards the implementation of the following priority interconnection projects:

- 330 kV Volta (Ghana)-Mome Hago (Togo)-Sakete (Benin) interconnection Project;
- 330 kV Aboadze (Ghana)-Volta (Ghana) Transmission Project;
- 225 kV OMVG Interconnection Project (Guinea, Gambia and Guinea Bissau, Senegal) including development of hydropower sites at Kaleta (Guinea) and Sambangalou (Senegal);
- Man (Ivory Cost-Yekepa (Liberia)-Nzerekore (Guinea)-Buchanan (Liberia)-Monrovia (Liberia)-Bumbuna (Sierra Leone)-Linsan (Guinea) interconnection project.

The West African Power Pool (WAPP) therefore will help the Liberian economy by providing much needed power at a critical time when the major users of electric power are investing in the Liberian economy.

The project comprises the construction of (4) four substations and 532km of 225kV transmission lines in Liberia. One substation in Yekepa, one in Buchanan one to be located at Mount Coffee in Monrovia and the other one to be located near Mambo Town in Grand Cape Mount County. The construction of the substations and high tension electric transmission lines from Yekepa to Mano River runs across the entire length and breadth of Liberia. The line passes through seven important political subdivisions in Liberia (Nimba, Bong, Bassa, Margibi, Montserrado, Bomi and Grand Cape Mount Counties).
2. **Outline of ESMP**

The proposed Project has to meet the environmental requirements of the rules and regulations governing the protection of the environment in Liberia. This ESMP (Environmental & Social Management Plan) outlines how these requirements and regulations to be met. It provides the basis for the coordination and implementation of the proposed Project activities in Liberia. The issues of health and safety and environmental management are discussed in detail to ensure the smooth operation of the project.

Specific project activities identified to have impacts on the environment three phases which require specific mitigation actions include the following:

- Acquisition of Right of Way;
- Storage and transportation of equipment and materials;
- Clearing of Right of Way,;
- Tower spotting;
- Construction of Access & Tower Corridor Tracks;
- Clearing and excavation of tower base and foundation;
- Erection of Towers & Conductors,;
- Construction of Substation;
- Line Maintenance and Repairs and Substation Operations

The ESMP includes a Vegetation Management Plan, a plan for the Management of Archaeological and Cultural Property and a Monitoring programme to determine impacts on the physical, biological and human environments, and detect unforeseen impacts at an early stage. This will allow corrective measures to be implemented before significant damage takes place. The areas covered by these include:

- Destruction of vegetation, food and cash crops
- Loss of land ownership or use of land
- Air and water quality
- Use of water and increased evaporation from water bodies
- Noise, dust and soil erosion/compaction from heavy plants and machinery.
- Loss of secondary forest and a reduction in the number of tree species.
- Illegal activities such as tree felling and cottage mining
- Waste management
Côte d’Ivoire - Liberia - Sierra Leone - Guinea Interconnection Project (Liberia ESMP)

- Substations-oily wastes
- Occupational hazards and accidents
- Accidents affecting public safety
- Impacts on public health
- Spread of STDs
- Jobless during and after construction due to project activities
- Migration from rural and urban areas
- Women, children and education
- Different tribal groups and traditional practices
- Scared sites and artifacts

Control over the implementation of the project is needed to ensure that the environmental compliance commitments made in this ESMP are fully implemented in order to achieve its intended goals and objectives. An SPC (Special Purpose Company) will be set to ensure that applicable laws are adhered to, and the procedures in the ESMP are followed.
3. 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 (CESMP), also 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 (CESMP) 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.

The ESMP provides comprehensive, planned and in some cases, emergency programs that SPC will have to undertake during the pre-construction, construction, operation and maintenance phases for its existing transmission lines. Strict documented procedures are in place for the various technical operations involving: line construction, line maintenance, line operations, operations at substations, socio-economic issues including grievance procedures, environmental management issues regards disturbance to flora and fauna along the proposed transmission line, vegetation management, and management of
archaeological/cultural finds. The technical procedures incorporate environmental, health and safety safeguard measures.

Activities under the transmission line construction project have been grouped under pre-constructional, constructional, operational and maintenance phases. The pre-construction activities of the project include line the route line survey, the ESIA process and acquisition of the necessary RoW. The construction activities involve various levels of vegetation clearing to standards prescribed by LEC. Other activities will be tower spotting, excavation of tower foundations, erection of towers and stringing of lines and substation construction works. The main operational phase activities will be mostly those related to the maintenance of the lines, towers, accessories and the RoW as well as substation operations.

An emergency preparedness response plan has been provided to ensure that unforeseen accidents such as major spills of any hazardous materials during routine operations are safely and promptly dealt with without harm to the environment. A training program has been provided in the ESMP to ensure capacity building in the implementation of various environmental measures. The role of external institutions such as the Environmental Protection Agency, Prosperity Valuation Section, the County Development Committees, Forestry and Wildlife Department through its County Offices and the Department of Museums are clearly outlined. Reporting on various environmental issues/measures is to be done annually in the form of Project Annual Environmental Reports.
4. **Cut-off Date**

Cut-off date for the compensation was officially announced to PAPs and community leaders during the census and identification process. A signed agreement between the PAP household, community elder or leader, and LEC/Consultant representative was completed for each property or parcel. The signed agreement contained the date in which the asset was identified for compensation. Another notification will take place to announce the period (time for payment of compensations and others) for compensation payments and which should be done 2 to 3 months prior to the commencement of construction. This time will make it possible for all those who have claims against the administration of the project to be settled and other complains thereto and solution found before the construction begins. The public consultation has been held since November 2009 and the PAP inventory list was verified by the Consultant, LEC, MLME (Ministry of Lands, Mines and Energy), MIA (Ministry of Internal Affairs) 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.
5. 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, the Consultant held several interviews with local authorities and it was found that the superintendents took the complaints of mediation during the PAPs investigations. Therefore 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.

In order to set up the Grievance Redress Committee (GRC) responsible for handling grievance arising from resettlement of the Project, KEPCO team accompanied with the representatives of MIA (Ministry of Internal Affairs), MLME (Ministry of Lands, Mines and Energy) and LEC were organized and carried out meaningful consultation meetings with the superintendents of seven affected counties. During the meetings, details of the Project, environmental and social impacts, compensation process were briefed. KEPCO requested the superintendents to give a written acceptance of the position for the GRC member as required by the Funding Agencies. In response to the request from 1st to 5th of December 2011, all superintendents of seven affected counties gave their consent to KEPCO’s request.

The list of the chairs of the GRC established in the seven affected counties is in the table below.

Table ES-1: Chairs of the Grievance Redress Committees

<table>
<thead>
<tr>
<th>County</th>
<th>Chair of GRC</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nimba</td>
<td>Christina Dagadu</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Bong</td>
<td>Lucia F. Herbert</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Bomi</td>
<td>Samuel F. Brown</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Margibi</td>
<td>Levi Z. Piah</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Montserrado</td>
<td>Grace Tee-Kpaan</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Grand Bassa</td>
<td>Julia Duncan-Cassell</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Grand Cape Mount</td>
<td>Catherine N. Watson-Khasu</td>
<td>Superintendent</td>
</tr>
</tbody>
</table>
6. 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 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.
7. **Budget of ESMP**

Budgetary provision through SPC Annual Budget for environmental and social management activities for the project has been provided. The estimated total budget for environmental and compensation management is US$ 2,191,707.
1. INTRODUCTION

1.1 Background

Members of the Economic Community of West African States (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 the ECOWAS.

In order to further advance the implementation of the priority projects of the West African Power Pool (WAPP), the WAPP Secretariat 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) interconnection Project;
- 330 kV Aboadze (Ghana)-Volta (Ghana) Transmission Project;
- 225 kV OMVG Interconnection Project (Guinea, the Gambia and Guinea Bissau, Senegal) including development of hydropower sites at Kaleta (Guinea) and Sambangalou (Senegal);
- Man (Ivory Coast)-Yekepa (Liberia)-Nzerekore (Guinea)-Buchanan (Liberia)-Monrovia (Liberia)-Bumbuna (Sierra Leone)-Linsan (Guinea) interconnection project.

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. Employment during construction stage will be created and the country will benefit from technology transfer. The downstream benefits will include capacity building of LEC 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. 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.
The Electric Power situation in Sierra Leone, Guinea, Côte d’Ivoire and Liberia is currently posing serious developmental problem in the region. There is an urgent need for the energy supply capacities to be urgently augmented and reinforced.

The development of the Bumbuna hydro power plant in Sierra Leone, the re-development of the Mount Coffee hydro power plant in Liberia, the future development of potential hydro resources of regional interest in Guinea, Sierra Leone and Liberia in addition to utilization of gas-generated electricity from Côte d’Ivoire will permit the exchange of low power between Ivory Coast, Liberia, Sierra Leone and Guinea through a high voltage interconnection line from Ma (Côte d’Ivoire) to Linson (Guinea) through Yekepa (Liberia), Nzerekore (Guinea), Buchanan (Liberia), Monrovia (Liberia) and Bumbuna ((Sierra Leone). With the implementation of West African Power Pool (WAPP), which is expected to foster power exchanges among the countries in West African sub-region, a high capacity transmission interconnection from Côte d’Ivoire to Guinea through Sierra Leone and Liberia will be required, which also be in line with adopted WAPP Master plan. The Implementation of the Monrovia-Yekepa-Nzerekore-Bumbuna-Monrovia-Bumbuna-Linsan interconnection project will also further reinforce the interconnection of “Zone A” and “Zone B” of the WAPP through Côte d’Ivoire there by increasing opportunities for trade and the establishment of a regional power market.

The West African Power Pool (WAPP) therefore brings glory in this direction of the Liberian economy by providing power which is needed at the time major users of electric power are presently investing in the Liberian economy.

This Environmental and Social Management Plan is therefore prepared in line with the above WAPP power development objectives strictly adherence to the regulations of the Republic of Liberia.

The ESMP is an integral part of the project implementation process to be applied during project construction, operation and maintenance phases of the project. Its main objective is to minimize the project’s adverse environmental impacts and to provide full cost effective compliance with the relevant environmental laws and regulations as stipulated by the Environmental Protection Agency of Liberia (EPA) authority and project financiers. This plan
also follows the concept of continual development, in corporatizing systematic monitoring, reporting and corrective action as integral part of environmental management.

### 1.2 Scope and Purpose of the Environmental and Social Management Plan

Environmental management will be an integral part of the project implementation during construction and operation. The objectives of environmental management are to minimize the Project’s adverse environmental impacts and provide full and cost-effective compliance with relevant environmental laws and regulations as stipulated by EPA authority and project financiers. A Contractor ESMP (CESMP) will be prepared prior to the commencement of construction that will be aligned with LEC corporate environmental management regulations. The project’s ESMP will follow the concept of continual development, incorporating systematic monitoring, reporting and corrective action as an integral part of environmental management. Staff will be adequately trained and the project will seek accreditation from a recognized international certification body to constantly improve the project’s safety, health, and environmental performance.

During construction and operation phases, contractors will be liable for implementing specific impact mitigation measures as prescribed in the ESMP and the construction contracts. SPC will monitor and audit the environmental performance of contractors as part of its project implementation role. SPC will prescribe effective corrective actions to be implemented by each contractor as required to ensure full compliance with relevant environmental standards. During substation operation, environmental management measures will be implemented by SPC.
2. PROJECT DESCRIPTION

2.1. Engagement of Project Contractors & Owner’s Engineer

The SPC, as an implementing body, shall engage contractors for the construction of substations and transmission line. An Owner’s Engineer shall also be engaged to assist in project supervision and management. The firms shall be responsible for identifying and establishing site offices for project implementation purposes.

Each contractor shall also submit a construction environmental management plan for approval by SPC prior to commencement of constructional activities in order to ensure that environmental mitigation measures outlined in this ESMP and the ESIA for the project are strictly adhered to.

Also, it is recommended that the Owner’s Engineer be given the responsibility, by contractual arrangement in order to monitor the adequate implementation of the CEMP.

2.2. Pre-constructional Activities

2.2.1. Line Route Survey

This involves establishing the Right of Way (ROW) for the entire length of the line in accordance with ROW requirements of Liberia. This activity was carried out on behalf of the LEC by Korean Electric Power Corporation (KEPCO). In addition to politico-administrative considerations, the choice of the line corridor also took into account the following constraints and general considerations, which have implications on the feasibility and cost of project implementation.

- To be as short and as direct as possible, to minimize costs
- To avoid crossing identified problem zones, requiring non-standard and more costly technical solutions
- To stay a reasonable distance for urbanized areas
- To avoid crossing protected areas, such as parks, nature reserve, etc
- To avoid crossing tourist areas or important panoramic sites
- To avoid sterilizing fertile land with commercial agricultural potentials.

LEC 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 the Ministry of Lands, Mines and Energy (MLME). During the meeting, the Assistant Minister of MLME indicated that there are not national regulations in MLME or LEC 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.

Subsequently, 532 km line has been selected passing but avoiding settlements along its route in seven counties – Nimba, Bassa, Margibi, Montserrado, Bomi, Grand Cape Mount and Bong Counties. Four sites have been provisionally selected in Sannequille, Buchanan, Monrovia and Mano for the location of substations.

2.2.2. Acquisition of Right of Way
A 40m Right of Way (RoW) of total length of 532 km in seven counties – Nimba, Bong, Bassa, Margibi, Montserrado, Bomi and Grand Cape Mount Counties shall be acquired for the entire length of the proposed line and this will comprise of a 20m wide corridor on either side of the power line in order to allow for entry. Subsequently a “Notice of Entry” to site construction informing the general public shall be published in the national dailies, following which all assets within this corridor shall be valued for compensation purposes.

2.3. Constructional Activities
2.3.1. Storage and transportation of equipment and materials
Majority of 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 to be procured locally shall include aggregates, cement, sand, stone and other miscellaneous supplies and services.

2.3.2. Clearing of Right-of-Way
The construction and operation of the proposed line will require a right of way of 20m width on each side of the centre line of the transmission line. The right of way will therefore be width of 40 m. The 40 m wide corridor, which will run the 532 km total length of the transmission line from Yekepa to Monrovia of the project, shall be cleared of vegetation to a height of about 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 centerline of the transmission line will also 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 extend such that they could damage the lines. All vegetation clearance will be done by physical means.

2.3.3. Tower Spotting

Tower spotting shall be done to determine the sites for the installation of the towers. This activity shall be carried out over the whole length of the transmission line.

2.3.4. Construction of Access Road & Tower Corridor Tracks

The contractor shall construct a tower corridor track of approximately 3 m width almost continuously along the centerline of the line route for the transportation of men and material to the line route for the installation of towers and the stringing of the lines.

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. 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. Also, 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. 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.

In order to minimize the adverse impact of opening access road, 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
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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. 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 is 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.

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.

Where there are no such tracks, SPC shall construct access tracks from the closest public roads to the RoW at intervals along the proposed line route. New access tracks shall also be constructed during the constructional phase. In addition to the tracks constructed during the line route survey these will be retained for the maintenance of the line during operations.

The tracks will be cleared of tree stumps, shrubs and other vegetation likely to obstruct the transport of construction machinery, equipment, operational and maintenance staff to the tower corridor. Cut trees shall be made available for use by the communities close to the site of clearance.

2.3.5. **Clearing and excavation of tower base and foundation**

Sites identified for tower spotting shall be cleared for tower mounting purposes. Tower base shall be dug to construct the tower foundation. 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) with an additional buffer of 2 m on two sides of the base. Tower foundations will vary according to the prevailing geology.
The ground surface 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.

With a total of about 1,330 towers to be constructed, a total tower base area of about 33,250 m² will be cleared for the purposes of the construction of the transmission line. This total area to be cleared includes the total area to be cleared for the RoW.

2.3.6. Erection of Towers & Conductors
Following transportation of the steelwork and its components to the site, erection of the transmission towers will proceed. Typically for the SPC, the average span between towers is about 400 m giving a maximum 1,330 of towers for this project. The towers will have concrete footings with foundation depths 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 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 conductor to ensure that the line does not cause hazards and nuisances to the public 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 clearances 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 are assessed for such problems as compaction and erosion and mitigative action taken as appropriate.

2.3.7. Construction of Substations
The line will require the construction of four substations. The proposed sites for these substations are at Sannequille, Buchanan, Monrovia and Mano. However, for the other socio-economic reasons such as availability of social facilities, are also under consideration.
Allowance will be made for another bay similar to that proposed, to allow for future expansion of the sub-station to cater for other new transmission lines.

A total land area of about 160,000 m² (each requiring approximately 40,000 m²) shall be required for the construction and operation of the four proposed substations. Areas of land required for the construction of facilities shall be cleared of all vegetation in order to afford access to construction sites. Site shall be graded and landscaped. Construction shall involve the casting of all the necessary concrete foundation required to support the new equipment. Once these have achieved a suitable strength the electric equipment will be delivered and mounted. This involves use of heavy lifting equipment to position the plant followed by wiring and connection.

2.4. Operational Activities

2.4.1. Right of Way Management
During the operational phase of the project the RoW will be maintained in such a condition as to ensure that the transmission line function, or safety of person within the vicinity of the line, is not compromised. This involves both the control of land uses undertaken within the RoW and the management of the vegetation.

2.4.2. Line Maintenance and Repair
To allow access to the RoW for maintenance, vegetation clearance and emergency repair, a network of access tracks will be maintained. These will be graded, un-surfaced tracks and will be maintained on a regular basis to ensure they provide suitably clear access to the RoW. In addition to this a 3m wide access road will be maintained running the full length of the RoW. This will not be graded but will consist of cleared tire tracks with vegetation between these tracks kept cut. This track will not cross any large streams or swamps areas and where these are encountered there will be a requirement to leave the RoW, travel on the existing road networks to cross the watercourse before tracking back along the graded access roads to the RoW.

2.4.3. Substation operations
The proposed substations shall comprise of a Control Room, Battery Room, Communication Room and a Relay Room. The substation shall be fenced with iron mesh and provided with technical and security personnel for operation and security purposes.
3. POLICY ON ENVIRONMENT, HEALTH & SAFETY

3.1. Institutional Legal Framework

The MEWR/LEC is committed to providing exemplary levels of care and safety for the employees on projects, the local populations and the environment in general. Subsequently, the LEC has adopted the policy objective of conducting its operations in such a way and manner that the safety, health and welfare of its workers and the integrity of the environment will be safeguarded at all times. In view of this, WAPP as its contribution to efforts at arresting the continued pollution of the environment has prepared corporate policies on Environment, Safety and Health to ensure incorporation of occupational safety, health and environmental management (OSHEM) issues in its operations.

These policies are without prejudice to all other existing regulations. Thus, with regard to safety, health and welfare, SPC shall carefully coordinate its activities with the National Environmental Policy Act of 2003 of Liberia also it should be in accordance with World Bank Groups Environmental Health and Safety General Guidelines and the Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution, 2007.

3.1.1. Corporate Environmental Policy

LEC currently does not have Corporate Environmental Policy; therefore, the SPC should formulate Environmental Policy that will commit the organization to ensure continuous improvement of environmental performance to minimize the impacts of all its operations on the environment, in line with the principles of sustainable development, in addition to complying with national and international environmental protection regulations. The SPC will implement all projects in compliance with the Environmental Protection Agency Act of 2002.

3.1.2. Corporate Safety Policy

The SPC will establish Rules and Regulations related to Safety which will commit the organization to making safety a primary concern throughout the organization. It also seeks to achieve an acceptable standard of safety for its employees by effectively managing all risks resulting from or associated with its activities and operations. The SPC Safety Policy assures that measures shall be taken to secure and maintain compliance with all relevant legislation on environmental protection and safety, health and welfare of all its employees.
Safety Rules, Protection Code & Safe Working Practice documents have subsequently been prepared by WAPP to inform, educate and ensure adherence. The SPC’s Safety Rules provides information on major safety areas as follows.

General safety rules for workers engaged in construction, operation or maintenance work include:

- Safety guidelines related to the use of tools and equipment;
- Safety procedures associated with the transportation and of personnel and materials;
- Safety procedures in relation to Forestry work;
- Safety procedures relating to Transmission line work;
- Safety procedures for materials handling, storage and disposal.

3.1.3. Corporate Health Policy
The SPC in compliance with the Environmental Health Policy of Liberia as well as the World Bank Groups Environmental Health and Safety General Guidelines and the Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution, 2007 and other concerned Funding Agencies’ standards shall establish and maintain health standards, facilities and services to promote and safeguard the health, well-being and safety of the organization’s employees, their families and dependants as well as others who may be affected by its operations.

3.2. Legal & Regulatory Requirements
The various environmental legislations and regulatory requirement that are to be adhered to in the implementation of this ESMP are:

- Conservation of the forest of Liberia Act of 1953
- Supplementary Act for the Conservation of Forests of 1957
- Forestry Development Authority Act of 1976
- National Resources Laws of 1979
- Wildlife and Natural Parks Act of 1988
- New Mineral and Mining Laws of April 2000
- Enactment of the Forestry Law
- Public Health Act
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- Environmental Protection Agency Act of 2002 and Environment Protection and Management Law
- Land Act 1856
- County Act 1969
- Land Acquisition Act 1929
- Protected Forest Area Network Law, the Sapo National Park Act of 2003
- National Environmental Policy of Liberia of 2002
- National Environmental Policy Act of 2003
- European Investment Bank Social guidelines on involuntary resettlement
- World Bank Operational Policy 4.01, Environmental Assessment
- World Bank Operational Policy 4.11, Physical Cultural Resources
- World Bank Operational Policy 4.12, Involuntary Resettlement*
- World Bank Operational Policy 4.36, Forests
- African Development Bank (AfDB) Involuntary Resettlement Policy, November 2003
- African Development Bank (AfDB) Environmental and Social Assessment Procedures, June 2001
- KfW Sustainability Guidelines
- International Finance Corporation, Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution

**AfDB Involuntary Resettlement Policy**

- This policy covers economic and social impacts associated with Bank financed projects involving involuntary acquisition of land or other assets which results in:
  - Relocation or loss of shelter by the persons residing in the project area.
  - Loss of assets or involuntary restriction of access to assets including national parks, protected areas or natural resources, or
  - Loss of income sources or means of livelihood as a result of the project.
- Whether or not the affected persons are required to move.
Displaced persons in the following two groups are entitled to compensation for loss of land or other assets taken for the project purposes:

- Those who have formal legal rights to land or other assets recognized under the laws of the country. This category will generally include people who are physically residing at the project site and those who will be displaced or may lose access or suffer a loss in their livelihood as a result of the project activities: and

- Those who may not have formal legal rights to land or other assets at the time of the census but can prove that they have a claim such as land or assets that would be recognized under the customary laws of the country. This category may also include those people who may not be physically residing at the project site or persons who may not have any assets or direct sources of livelihood derived from the project site, but who have spiritual and/or ancestral ties with the land (e.g., graveyards, sacred forests, places of worship). This category may also include sharecroppers or tenant farmers, seasonal migrants or nomadic families losing user rights, depending on the country’s customary land use rights. Additionally, where resettled persons lose access to resources such as forests, waterways, or grazing lands, they would be provided with replacements in kind.

- A third group of displaced persons are those who have no recognizable legal right or claim to the land they are occupying in the project area and who do not fall in any of the two categories described above. This category of displaced persons will be entitled to resettlement assistance in lieu of compensation for land to improve their former living standards (compensation for loss of livelihood activities, common property resources, structures and crops, etc.). Provided they occupied the project area prior to a cut-off date established by the borrower and acceptable to the Bank. At the minimum, under the Bank’s policy (with no contradiction to the borrower’s legislation), land, housing, and infrastructure should be provided to the adversely affected population. Including indigenous group, ethnic, linguistic and religious minorities, and pastoralists who may have rights to the land or other resources taken for the project.
4. SUMMARY OF IMPACTS
Several activities of the project may cause impacts to the environment and therefore they may require some mitigative measures by the SPC.

4.1. Pre-Construction
4.1.1. Line Route Survey
- Destruction of vegetation, food and cash crops
- Loss of income for the affected farmers
- Occupational/public safety risks to workers and farmers.

4.1.2. Acquisition of Right of Way
- Loss of income by landowners/farmers
- Loss of future land use of the land

4.2. Construction
4.2.1. Construction of access road
   I. Environmental aspect: Impact on neighboring environment
   II. Technical aspects: damage on existing road
   III. Disturbance of access of property owner

4.2.2. Storage and transportation of equipment and materials
- Road safety problems
- Vehicular-vehicular conflicts, vehicular-pedestrian conflicts and falling of improperly secured equipment and materials on road.
- Disruption and risks associated with transporting of heavy machinery through the relatively narrow roads.
- Compaction of soil under the weight of the heavy machinery and the subsequent exposure resulting in erosion.

4.2.3. Clearing of Right of Way
- Destruction of vegetation, food and cash crops
- Loss of income for the affected farmers
- Loss of closed secondary forest and a reduction in the number of tree species
- Occupational/public safety risks to workers and farmers.
4.2.4. **Tower spotting**

- The graded surfaces could be prone to erosion
- Grading will generate dust which could contaminate nearby water resources.

4.2.5. **Construction of Access & tower Corridor Tracks**

- Clearing of access tracks would lead to loss of crops, land use and attendant loss of income.
- Loss of vegetation cover would also expose some streams, increasing the rate of evaporation
- Clearing of vegetation and compaction of soils could lead to death and displacement of some faunal species
- Soils within the project area would be prone to erosion when cleared at high spots and when subjected to the weight of heavy plants and machinery
- Noise and dust would be generated from the use of machinery. The latter could be significant in place near stream or water bodies, where it could cause silt contamination and possible blockade from increased sediment loading
- Access roads open up to closed areas and could enable unscrupulous person to enter and carry out illegal activities such as tree felling and cottage mining.

4.2.6. **Clearing and excavation of tower base and foundation**

- Soil structure would be altered as well as exposure of soil to erosion.
- Water pumped from excavation in swampy areas would further increase erosion from surface runoff and sediment flow into nearby water bodies.

4.2.7. **Erection of Towers & Conductors**

- Vegetation/crops in landing area could also be extensively damaged
- Increased evaporation from small streams and water bodies could result from felling of trees.
- Working at heights could present hazards to climbers and risks of falling objects on ground workers.
- Working with cranes and other lifting equipment also present potential injury from broken wires, lifting tackle and swinging objects.
- Stringing of lines create impacts on occupational health and safety.
- Temporary disruption to traffic across public roads could result.
4.2.8. **Construction of Substation**

- Ground and aerial movement within the vicinity could be limited during stringing, as well as possible collision to birds, low flying aircraft and obstruction of road haulage of tall structures.
- Occupation and Health risks will be associated with this activity.
- Dust generation during demolition could be significant,
- Waste (both solid and liquid) generation and disposal during rehabilitation works could present pollution.

4.3. **Operational & Maintenance Activities**

4.3.1. **Right of Way Management**

- Destruction of vegetation, food and cash crops
- Loss of income for the affected farmers
- Loss of closed secondary forest and a reduction in the number of trees species
- Occupational/public safety risks to workers and farmers.

4.3.2. **Line Maintenance and Repairs**

- Any object on which a live conductor falls could sustain severe burns.
- Shattering of insulator units, especially porcelain type of insulators is a potential hazard to passers-by.
- The collapse of tower(s) would have the same effect as dropping of conductors since the collapse tower would normally fall within the RoW.
- Use of chemical raises concerns of potential pollution of nearby water bodies and possible seepage into the ground water.
- Improper handling of chemical by workers also poses health risks
- Rust treatment and painting of towers also pose potential pollution of nearby water bodies.
- Line maintenance has occupational health and safety implication for the staff.

4.3.3. **Substation Operations**

- The presence of oil in transformers and any other oil storage facility can lead to fire hazards.
- Birds and other animals build their shelters within various structures at the substations and their existence there can pose treat to their lives.
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- Cable trenches and drains at the Site & Switch Yard can pose health and safety hazards to both workers and visitors.
- Stone carpet can result in weed growth which can harbor snakes and other pests that can also pose hazard to the health and safety of both workers and visitors.
- Switch light lightening and station fence if not maintained properly can pose security treat.
- Operations within the Control and room and other areas can result in poor housekeeping and increased noise levels.
- Soil contamination by transformer oil leakage(Polychlorobiphenyls_ PCBs)

4.4. Pre-constructional to Operational & Maintenance

- All aspects of the construction and operational phases would result in the generation of waste (both solid and liquid), which would have to be disposed off appropriately. Solid waste generated would include:
  - Vegetation: felled trees, stumps, shrubs, etc
  - Packaging Material: Conductor drums, wood, plastics.
  - Others: Damaged conductor cables, broken insulators, metal parts, empty chemical, oil and solvent containers.

- Spread of HIV/AIDS and other communicable and sexually transmitted diseases.
5. CURRENT ENVIRONMENTAL AND SOCIAL MANAGEMENT PRACTICES

5.1. Corporate Structure
As indicated by WAPP, a Special Purpose Company (SPC) which could have equity participation from the concerned participating utilities and countries is expected to be established to manage, own and operate the entire Project. In order to ensure the Project to be carried out efficiently, a Project Implementation Unit (PIU) serving as a substructure of the Special Purpose Company (SPC), will be set up for the administration and execution of the Project, and will be responsible for overall coordination to ensure a successful and efficient completion of the Project.

5.2. Environmental, Health & Safety Management

5.2.1. Environmental Management

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.

5.2.1.1. 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

5.2.1.2. 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; i.e. 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 Owner’s 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 Owner’s Engineer and others, the Project Director of the PIU (e.g. 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 LEC 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; i.e. preparation, issuance and clarification of bidding documents; as well as serve as the technical expert for the Evaluation of Bids, Negotiation and Award of construction contracts.

They need to be made responsible, by contractual arrangement, for the adequate implementation of the ESMP of the Project.

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

- Undertake the review and approval of detailed designs by experts at its Home Office while supporting with occasional site advisory visits as needed.
- Provide a Resident Team in the field (e.g. comprising Project Engineer and one other expert) to provide technical direction for works supervision.
- Review, approve and monitor the Implementation of the Contractor’s EMP (CEMP)
- Request the Contractor to submit the Traffic Control Plan and specific Method of Statement for complex environmental management aspects if necessary.
5.2.1.3. 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 detailed costs and expenditure for the period, forecast for completion of the project with an aim of minimizing the variance.

Promote team work and a spirit of cooperation among PIU employees and guide, drive and motivate the team to achieve project goals.

The Project Director will supervise and control all PIU staff and will be answerable and subject to the authority of the SPC for the performance of the PIU. The Director would have to coordinate the work of the Owners' Engineer.

**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 Liaison Officer. Also he will work closely with the member of Owner's Engineer.

5.2.1.4. Other relevant stakeholders

Major stakeholders near the line route corridor that could be impacted include Arcelor Mittal Iron Ores Extracting Company, Buchanan Renewable, Firestone Rubber Plantation Company, B.F. Goderick Rubber Plantation Company, etc. These companies will have the opportunities to utilize continuous/constant reliable, reasonable and cheap power supplies to be provided by the WAPP project. They can also share social facilities such as health, education, roads and also joint functional training facilities that all of the aforementioned companies including SPC could utilize sufficiently.

In order to incorporate the various companies operating within the line route corridor areas, SPC should:

- Request the companies to join meetings to jointly discuss the role of SPC and the opportunities that are to be opened to them in terms of cheap, reliable and constant power for smooth operation of their respective entities;
- View the individual corporate plans of these companies in order to integrate their plans with the corporate plan of SPC. This will reduce the cost of each facility if
costs are jointly shared. If in case any of the companies is to construct a clinic in a town which is within the corridor of WAPP project, then that company and SPC can share the cost of construction including management and maintenance of the social project for the people. Such would be more economical in case of road project that both the SPC and that company will utilize jointly;

- If an environmental disaster within the line route corridor area occurs that would also be within the operational area of a particular company, SPC and the company should share the responsibilities to protect the area of disaster;
- Share security information in order to speedily react within their joint operational area;
- Provide joint training services for both skilled and unskilled workers for their respective entities including rendering free training services to villagers who would like to benefit from such services to enhance productivities and efficiencies.

5.2.2. Occupational Health & Safety Management

With regard to occupational health and safety, it is recommended that the following committees should be established by SPC:

- A central Safety Committee should be formed.
- SPC Work Area Safety Committees should also be created.

Main role of the central Safety Committee is to mediate issues such as conflicts on the accidents causing from facilities to civilians. And the Work Area Safety Committees is in charge of the mediation of conflicts for the employee.

5.2.3. Environmental Auditing

The environmental auditing for the ESIA, ESMP and RAP should be done by a specialist consultant. It is recommended that the auditing should be done one or two months before actual construction work of the line corridor begins. This should be monitored by the SPC.

5.3. Construction Activities

5.3.1. Contractual obligations

For this project, SPC shall engage contractors through international competitive bidding (ICB) to undertake the construction of the transmission line and substation. As part of the contractual arrangements in the bidding documents, the contractors are required to submit
Construction Environmental Management Plans. 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 and/or the ESIA/ESMP for the project.

The contractor needs to prepare and implement his own Contractor Environmental Management Plan (CEMP). This needs to be included in the bidding document and in the contractor’s contract. The CEMP needs to be in compliance with World Bank Group General Environmental, Health and Safety Guidelines and the Guidelines on Electric Transmission and Distribution.

The Contractor’s obligation should be spelt out, the Contractor in order for the contractor to endeavor 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 objective during execution or upon completion of any works. These measures shall include but not limited to the following:

- Minimizing the effect of dust on the surrounding environment resulting from concrete mixing sites, asphalt mixing sites, vibrating equipment, temporary access roads, etc. to ensure safety, health and the protection of workers and communities living downwind of dust generating activities.
- 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.
- Ensuring that existing water flow regimes in rivers, streams and other natural or channels is maintained and/or is established where they are disrupted due to civil works being carried out.
- 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.
• 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.

• Ensuring that discovery of ancient heritage, relics or anything that might or believed to be of archaeological or historical importance during the execution of works is reported to the by the governmental authority in fulfillment of measures aimed at protecting such historical or archaeological resources.

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

• Implementing soil erosion control measures in order to avoid surface run off and prevents siltation etc.

• Ensuring that garbage, sanitation and drinking water facilities are provided in construction workers camps.

• Ensuring that in as much as possible, local materials are utilized to avoid importation of foreign material and long distance transportation.

• Ensuring public safety and meeting traffic safety requirements for the operation of moving machinery in order to avoid accidents.

• Discouraging the use of foul or infuriating words on project affected persons (PAPs) or any other persons seeking information on the project by construction workers. All such persons and grievances should be politely referred to the appropriated authority for redress.

5.3.2. 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.

Plants within the corridor especially those endangered species will be protected by avoiding them and those that cannot be avoided special care will be given for their re-growth. Vegetations that will be destroyed during construction will be re-vegetated by trained horticulturists well trained to take care of the vegetation. Vegetation re-growth will be controlled, by constant careful weeding of vegetation, at about one meter from the ground.

According to the LEC’s RoW regulations, the RoW will be remained un-vegetated for the O&M and the security purpose. However, if there’s an influence of residual construction footprints beside the RoW, it should be re-vegetated to the original status with allied plants.

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 (invasive) species;
- Identification and protection of endangered and protected species;
- Revegetation of residual construction footprints
- Erosion control

5.3.2.1. Some effects of vegetation loss include:
Côte d’Ivoire - Liberia - Sierra Leone - Guinea Interconnection Project (Liberia ESMP)

- Exposure of some streams thus increasing the rate of evaporation as well as compaction of soils could lead to death and displacement of some faunal species.
- Soils within the project area would be prone to erosion when cleared at high spots and when subjected to the weight of heavy plants and machinery.
- Loss of closed secondary forest and reduction in the number of tree species resulting in increased evaporation particularly of small stream/water bodies.
- Falling trees (especially tall trees beyond the RoW) may cause extensive damage to vegetation/crops in the landing area.
- Excavations for tower foundations may destabilize the soil structure and expose the soils to erosion.
- In swampy areas, there may be the need to pump out water from the excavations and this would further increase erosion from surface runoff and increase sediment flow into nearby water bodies.

5.3.2.2. Mitigation Measures

Measures to be employed to ensure a reduction of erosion, loss of cover for agricultural purposes, restoration of embankments, re-vegetation includes:

- Construction of new tracks to 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/mangroves) 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.
- Cutting of trees will be done by a certified timber contractor, and strictly in line with 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 patrol shall be carried out.

The public in construction active areas shall be continuously educated in order avoid the construction areas as much as possible.

5.3.3. Resettlement Planning
Socio-economic impact such as land ownership, land-use conflicts and compensation issues are important under the project construction phase. Issues to mitigate socio-economic impacts, especially resettlement, will be documented in a Resettlement Action Plan (RAP). Report prepared for the project. General measures outlined for dealing with resettlement issues are provided as the chapters below. It should be noted that 791 PAPs are scattered along the line corridor of approximately 532 Km; therefore, resettlement is not practicable, rather compensation is recommended.

5.3.3.1. Resettlement Procedures
SPC should ensure that all persons affected by the proposed transmission line project are catered for. In this light of the concerns raised by the communities, and considering the current developments in participatory approach to resolving social conflicts, the following shall apply:

- The procedure for payment of compensation for affected persons shall be reviewed to ensure that “Fair” compensation covers loss of future land use and that prices shall reflect the prevailing market values (economic rate).
- Since most of the farmers are illiterates, special committee and other community-based organizations shall be involved in the whole process to safeguard their interests.
- Compensation payments shall be handled promptly to avoid imposing undue hardship on the rural farmers and also avoid any conflicts with the communities.

5.3.3.2. Grievance procedures for compensation issues
There are three ways in which grievances shall be resolved. These are:
Grievance Redress Committee: There shall be a grievance redress committee made up of representatives from the counties (the county Development Committee), the County committees and the project implementers. This committee shall hear disputes regarding displacements and cases and shall only be referred to arbitration or courts of law when the grievance redress committee is unable to resolve an issue. Arbitration shall be an option for grievance redress where the parties involved in agree to resolve their dispute through arbitration.

Arbitration: The parties are at liberty whether or not to name an arbitrator in the agreement. Where an arbitrator is not named in the agreement, the agreement should designate a person who would be appointed as an arbitrator.

Courts of Law: It should be noted that arbitration only works where the parties to a dispute agree to resolve a difference through arbitration. Where there is no consent, then a court of jurisdiction may be used to resolve a dispute.

Grievance resolution usually starts with the SPC having personal interactions with the Environmental Coordinator or other responsible staff of the Project Implementation Unit in the SPC. Most concerns are handled quickly and easily. For complex issues, complainants are invited for a sit-down discussion with one or more responsible persons (local authorities, councilors), typically in the presence of family members or “witnesses” of one sort and another. These grievances are logged on a form, which provides for tracking the process of resolution. For especially sensitive or potentially serious complaints, the responsible officer takes notes and sometimes writes a note for the record. If the complaints have to do with irregularities in measurements/tree counts or disputes in compensation payments, the grievance committee notes such complaints and conduct a verification exercise in the first instance to confirm the allegation or otherwise.

Agreement is “proved” by the complainant’s continued participation in the resettlement planning and implementation process and / or not taking the issue further. If the informal process is not resolving an issue, complainants are urged to make their complaint in writing. Even non-literate persons do prepare letters using professional letter-writers. A detailed record of each written complaint and response/resolution thereof will be kept as part of the grievance resolution records.

In more complex cases, the SPC routinely seeks the advice, and, where appropriate, intervention, of traditional authorities and members of the Resettlement Negotiation
Committee to help resolve disputes. Liberia is a “mediation” society, and the SPC makes use of these and other mediation models to help resolve disputes. Impacted persons / households have the right under Liberian law to take their grievances for resolution in the court system.

For the sake of transparency and to ensure that the PAPs have confidence in the grievance resolution mechanism, The members of the GRC include representatives from counties such as CLOs (Community Liaison Officer), representatives of PAPs and Project Manager of SPC as mentioned in the table below

**Figure 1 Structure of Grievance Redress Committees**

- To witness the collation of the field data during the survey and crop count exercise
- To take stock of all count trees on the field
- To sign the SPC tree count forms indicating that the tree counts recorded are a true representation of the counts
- To investigate any anomalies/complaints brought by any PAP’s and report to the project officials for verification, if their findings confirm the grievance of the PAP.
- To have in their possession copies of the government rates adopted in the valuation and cross-check figures on any disputes presented to the committee
- Report formally any anomaly detected during the RAP implementation period for early resolution.

- Some of the mechanisms put in place during the project implementation period are:
- Inclusion of chiefdom opinion leaders in the survey and valuation stages to serve as witnesses in terms of disputes on plot limits, ownership and tree counts/measurements
- A project officer is always at hand to take note of all disputes
- Some of the PAP’s including local authorities have been selected by the PAP’s as their Grievance committee members who are readily available to investigate any dispute as and when they arise
- Petitioning the company in charge of the project for redress
- The Liberia Constitution allows for the right of access to the court of law by any person who has an interest or right over an affected property. In practice going to court has been a rare occurrence. In most cases PAPs, represented by the consultants are able to negotiate acceptable awards. The fees of such consultants are paid by the acquiring authorities.

**Set-up of Grievance Redress Committees**

During the PAPs investigations, the Consultant held several interviews, the Consultant held several interviews with local authorities and it was founded that the superintendents took the complaints of mediation during the PAPs investigations. Therefore 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.

In order to set up the Grievance Redress Committee (GRC) responsible for handling grievance arising from resettlement of the Project, KEPCO team accompanied with the representatives of MIA (Ministry of Internal Affairs), MLME (Ministry of Lands, Mines and Energy) and LEC were organized and carried out meaningful consultation meetings with the superintendents of seven affected counties. During the meetings, details of the Project, environmental and social impacts, compensation process were briefed. KEPCO requested the superintendents to give a written acceptance of the position for the GRC member as required by the Funding Agencies. In response to the request from 1st to 5th of December 2011, all superintendents of seven affected counties gave their consent to KEPCO’s request.

The list of the chairs of the GRC established in the seven affected counties is in the table below.
### Table 1 Chairs of the Grievance Redress Committees

<table>
<thead>
<tr>
<th>County</th>
<th>Chair of GRC</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nimba</td>
<td>Christina Dagadu</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Bong</td>
<td>Lucia F. Herbert</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Bomi</td>
<td>Samuel F. Brown</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Margibi</td>
<td>Levi Z. Piah</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Montserrado</td>
<td>Grace Tee-Kpaan</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Grand Bassa</td>
<td>Julia Duncan-Cassell</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Grand Cape Mount</td>
<td>Catherine N. Watson-Khasu</td>
<td>Superintendent</td>
</tr>
</tbody>
</table>

#### 5.3.4. Management of Cultural Property

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. Consultations with the Museums Board have been carried out in connection with any historical or archaeological ‘chance finds’. No valuable archeological sites were identified during the pre-construction stage. However, to deal with further chance finds of cultural properties, the following procedures have been developed.

**Upon the discovery of any such chance finds:**

- The relevant officer shall be notified immediately in writing, stating the exact site or location of the item. The letter shall include adequate photographs of the antiquity.
- SPC shall permit and facilitate such access to, and inspection of the site of discovery as the Director may so require. SPC shall also permit to be affixed or applied thereto, any seal or identification mark of the board.
- SPC shall not alter, damage, destroy or remove any antiquity from its original site without the consent of the Director and District Councils. If removal of the item becomes immediately necessary for safety or security reasons, the exact location shall be noted and the retrieved artefacts shall be sent to the custody of the District Councils.

Through liaising with the relevant agencies, the lawful owners of the land shall be duly informed and where necessary, payment shall be made by SPC after due assessment.
Further decisions with respect to site sampling or further excavation will be under the jurisdiction of the Board. The above will ensure that issues relating to cultural ‘chance finds’ are properly handled.

5.3.5. **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:

<table>
<thead>
<tr>
<th>Receptor</th>
<th>One Hour L_{Aeq} (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daytime</td>
</tr>
<tr>
<td>Residential; institutional; educational</td>
<td>55</td>
</tr>
<tr>
<td>Industrial; commercial</td>
<td>70</td>
</tr>
</tbody>
</table>

*Source: Environmental, Health, and Safety Guidelines of the IFC (2007)*

5.4. **Line Maintenance & Operations**

The SPC has to develop comprehensive emergency programs through its technical operations for the duration of the operational and maintenance phases for its existing and planned transmission lines.

5.4.1. **Transmission line Patrol**
5.4.1.1. Foot/ground patrol

Foot/ground patrols are to be carried out on a regular basis to closely inspect the various elements of the transmission system. This is because an early detection of a developing problem can result in considerable economic savings, reduce hazard to personnel and the public and ensure system security.

The patrols are out for the following reasons:

- To identify conditions which have caused or which if not corrected, could cause an outage to the line.
- To detect any deteriorated components in the transmission system.
- To locate any unauthorized attachments to the transmission structures; unauthorized under builds or any unauthorized uses of the RoW that may interfere with the safe and reliable operation of the lines.
- To detect any acts of vandalism to any facilities.
- To detect any conditions which could adversely affected public safety.

A minimum of two persons are normally involved in performing foot patrols. Off road right-of-ways are patrolled in a leapfrog style. One person walks a section while the second takes the vehicle ahead to the next access road. The second person then patrols the next section. The process is repeated as often as necessary. Before starting the process, it is clearly established at which access points the vehicle will be waiting and at what point the patrol will finish for the day.

Sections of line longer than five kilometers without vehicle access are patrolled by a minimum of two persons walking together. Local conditions usually determine if they have to retrace their route to a vehicle or are to be picked by another party at a predetermined point.

Ground/foot patrols are done twice a year and the preferred periods are from January to March and October to December. From January to March, when the dry season is at its peak, a greater proportion of the line can be accessed including semi-swampy areas. From October – December, the patrols can identify defects that may have been caused by rainstorms and flood.

Items and characteristics verified during the line patrols include towers, insulators, conductors and sky wires, right-of-way, signs and markers, unauthorized attachments, fire
hazards, general condition of access to right-of-way and any unusual circumstance affecting line security.

5.4.1.2. Climbing Maintenance

Climbing for tower inspection are also carried out once a year on the transmission line and provides a means of closely examining towers and line hardware to analyze their ageing process. It involves examining “suspension towers” and all “Dead-end towers” with regards to all topographic and environmental conditions affecting the line. Defects are recorded and necessary maintenance works are then carried out.

5.4.1.3. Securing tower bolts & nuts against unauthorized removal

There have been occasions of unauthorized removal of tower members, bolts and nuts which has caused the toppling of transmission towers, resulting in not only unplanned power outages, additional costs and power interruptions, but also increased hazards to the public. Therefore in order to safeguard against failures of transmission towers due to the removal of tower member, bolts and nuts by unauthorized personnel, tower bolts and nuts are tack welded, in accordance with the following specifications:

On new and on existing lines, priority will be given to locations where a tower failure would cause a significant public safety hazard, such as transmission line crossings (roads, railways line, school compounds, etc.) and transmission line with right of way parallel and or close to main road intersections, sports facilities, recreations and resort centers.

5.4.1.4. An identified or potential vandalism problem

At least, 50% of the tower bolts in the lower section of the tower are tack welded. The welding technique applied is the shielded metal-arc welding. After welding, the welded area is covered with approved protective coating. All surfaces that are painted are lightly wire brushed to remove loose rust and dirt deposits. Paints used for this purpose are Chesterton Cold Galvanizing Compound and Micaceous Iron Oxide and the color is always silver grey.

5.4.2. Right of Way and Access Road Maintenance

Right of Way and access road maintenance is aimed at eliminating hazards and reduce travelling required to access transmission lines. Based on report on ground patrol observations, access roads/line tracks are maintained at regular intervals. It includes
erosions, culverts, bridges, or any obstacle/work nearby which will endanger the lines or public e.g. blasting, excavation, fire hazards, harmful insects.

5.4.3. Vegetation Control and Vegetation Management Plan

In forested, safe operation of the overhead power lines will necessitate the maintenance of unobstructed lanes. Vegetation control measures are applied during the operational phase of the project to manage vegetable growth within the RoW, access tracks and under the towers.

The objective is to prevent interruption of power supply due to tree bushing and/or falling of danger trees on the line. It is also to facilitate ease of access for line maintenance activities. Vegetation clearing is carried out up to twice a year on every line.

Clearing of vegetation is usually done through physical or mechanical means and is done by the use of contractors. Cutting of trees are done by a certified contractor, and strictly in line with the prescribed safety guidelines; those involved shall be competent workers supervised by the Forestry Services staff. The landing areas of falling trees are carefully selected to minimize damage to farms. Adequate warnings are given to ensure that public safety is not compromised.

Vegetation Management Plan is also necessary to promote sustainable plant communities that are compatible with the intended use of the site.

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

5.4.4. Other Line Maintenance Activities
Corrosion surveys will be undertaken to ensure that the towers and associated parts are protected from atmosphere, chemical or electrolytic corrosion. Corroded towers are re-galvanized.

Infrared surveys will also be done to help identify overheated connectors, clamps, etc. Such line hardware will then be replaced before any failure can occur.

Insulator washing is done to avoid the building up of contaminants on the line insulators, which can cause flashovers. This is carried out using insulator washing machines and a high pressure stream of water.

Security patrols are carried out to stop vandalism of towers and other illegal activities along the RoW. Perpetrators will be arrested for prosecution.

5.4.5. Public Safety

The transmission line poses potential public health and safety hazards when the local populace has not been properly educated with regard to the potential hazards, such as collapse of towers, which actually occurs only rarely. 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 exists. These potential hazards require mitigation to ensure the safety of the public.

Since the hazardous effects (e.g. falling on people and electrocution) of the collapse are normally felt only within the RoW public safety will be ensured by monitoring the tower shape and educate the people living in the influence of potential collapse of the tower about the potential hazard. Also, In line with existing LEC practice, all towers will be clearly marked with a red inscription on white background - “DANGER – 225,000 Volts” written in official or adequate regional language to ward off trespassers and prevent them from exposing themselves to the potential dangers of electrocution.

Tower members will be secured and improved by anti-theft fasteners to check acts of vandalism and its harmful consequences on the 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 washing 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 have been 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 the live electrical conductors from falling from the towers.

In order to debunk the misconception that EMFs may cause cancer or harm children and minimize fear and avoid panic among the local populations, the 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.

5.4.6. Waste Management
To handle the vegetation waste generated during the clearing of RoW, waste hierarchy should be considered at first.

**Figure 2 Waste Hierarchy**
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.

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 favoured option. However if it is inevitable, burning the vegetal waste should be done at selected strategic sites away from human settlements.

Solid and liquid wastes are generated as part of the day to day activities at the substations. Solid wastes in the form of paper, food material, etc. will be disposed of in dustbins that are provided at the various substations. Provision should be made for the disposal of chemicals / hazardous wastes as the local facilities do not exist for hazardous wastes disposal.

Toilet facilities will be provided at the substations for the 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.

5.4.7. **Fire Hazards**
Potential fire hazards as a result of operation at the substation might exist. There is therefore the need to adhere to technical specification relevant to electrical safety. The use of low quantity components, inadequate sizing of cables, negligent execution of works and general and non observance of safety rules are avoided to minimize the potential hazard of electrical fires. Also, the operating/security personnel are trained in connection with electrical safety measures and their observance.

Various fire extinguishers will be provided at the substations for use in the event of fire. Fire extinguisher notices will therefore be placed at the relevant places for information purposes. First aid facilities and good drinking water should be available for the use of workers. Information on first aid treatments for electrical accidents should be provided at key places for the information of workers.
6. ENVIRONMENTAL ACTION PLAN

6.1. Description of Mitigation Measures

Table 3 Description of Mitigation Measures

<table>
<thead>
<tr>
<th>Project Activity</th>
<th>Parameters to be monitored</th>
<th>Location</th>
<th>Measurement</th>
<th>Frequency of measurement</th>
<th>Institutional Responsibilities [incl. Enforcement &amp; coordination]</th>
</tr>
</thead>
</table>
| **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 Line | Disclosure in the National Dailies Disclosure to members of the public | As and when required | LEC / EPA |
| **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 | | Daily  
Km/hr  
No. of Preventive Maintenance.  
Number  
Number  
Number  
Number  
Number  
Quantity  
Daily  
Monthly  
Daily  
Daily  
Daily  
Daily  
Monthly  | Contractor/SPC (Project Progress 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  
mg/l  
Kg.  | Daily  
Weekly  
Daily  | Contractor/SPC (Project Progress Report) |
### Project Activity

#### Parameters to be monitored

- **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)

  **Location**
  - Entire Project location

  **Measurement**
  - No. of trees
  - Hectares

  **Frequency of measurement**
  - Daily

  **Institutional Responsibilities**
  - Contractor/SPC (Project Progress Report)

#### 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

  **Location**
  - Relevant water bodies in the way of the proposed RoW

  **Measurement**
  - mg/l
  - Number
  - mg/l
  - µS/cm
  - MPN/100ml
  - N.T.U
  - dB(A)

  **Frequency of measurement**
  - Every week during construction phase and once a year during operational phase after maintenance operations

  **Institutional Responsibilities**
  - Contractor/SPC (Project Progress Report)

#### Waste Management

- Waste bush handling
- Waste water handling
- Waste segregation
- Disposal of conductor drums
- Disposal of metallic waste
- Disposal of empty chemical containers

  **Location**
  - Entire Project location

  **Measurement**
  - Kgs.
  - Cm3
  - Kgs.
  - Number
  - Kgs.
  - Number

  **Frequency of measurement**
  - Daily

  **Institutional Responsibilities**
  - Contractor/SPC (Project Progress Report)

#### Socio-economic/cultural issues

- Shrines
- Sacred Grove
- Identifying all affected persons
- Assessment of compensation
- Payment of compensation (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

  **Location**
  - Entire Project location

  **Measurement**
  - Number
  - Number

  **Frequency of measurement**
  - Daily
  - Annually

  **Institutional Responsibilities**
  - Contractor/SPC (Project Progress Report)
**Côte d’Ivoire - Liberia - Sierra Leone - Guinea Interconnection Project (Liberia ESMP)**

<table>
<thead>
<tr>
<th>Project Activity</th>
<th>Parameters to be monitored</th>
<th>Location</th>
<th>Measurement</th>
<th>Frequency of measurement</th>
<th>Institutional Responsibilities [incl. Enforcement &amp; coordination]</th>
</tr>
</thead>
</table>
| 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 |  
| 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 Line | Disclosure in the National Dailies Disclosure to members of the public | As and when required | LEC / EPA |

### 6.2. Monitoring

The monitoring parameters and the recommended frequency proposed in the ESIA will be strictly adhered to. The parameters to be monitored will be:

- Noise pollution
- Air quality

  The relevant parameters 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)

  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.

- Water quality

  The relevant parameters that will be considered for analysis are:
  - BOD
  - pH
  - DO
  - Turbidity
  - Total suspended solids
Côte d’Ivoire - Liberia - Sierra Leone - Guinea Interconnection Project (Liberia ESMP)

- Conductivity
- Availability and use of personal protective equipment
- Fire safety
- Management of solid and liquid wastes

The frequency of monitoring of the abovementioned parameters has been indicated in the Table of the section. 6.5.

The ECRU members in SPC will be trained adequately to understand and appreciate the choice of parameters, sampling sites, methods of sampling/measuring and analysis and frequency of monitoring.

**Method for water quality analyses**

Temperature should be measured in situ with a portable temperature probe. Turbidity, pH and color 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) and the methods normally used for analyses are summarized in Table 3,

**Table 4 Methods of analyses of selected parameters**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Method</th>
<th>APHA Method Number</th>
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<tbody>
<tr>
<td>Color</td>
<td>Visual comparison method</td>
<td>2120 B</td>
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<tr>
<td>pH</td>
<td>Direct measurement with a pH meter</td>
<td>-</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Direct measurement with a turbidity meter</td>
<td>-</td>
</tr>
<tr>
<td>Total Dissolved solids, TDS</td>
<td>Filtration and drying at 180°C in an oven</td>
<td>2540 C</td>
</tr>
<tr>
<td>Suspended solids, SS</td>
<td>Filtration and drying at 105°C in an oven</td>
<td>2540 D</td>
</tr>
<tr>
<td>Dissolved Oxygen, DO</td>
<td>Winkler’s method with Azide modification</td>
<td>4500-O.C</td>
</tr>
<tr>
<td>Biochemical Oxygen Demand (BOD)</td>
<td>Determination of DO before and after 5 days incubation at 20°C</td>
<td>4500-0.C</td>
</tr>
</tbody>
</table>
Table 5 Description of Environmental Monitoring Activities

<table>
<thead>
<tr>
<th>Proposed Mitigation Measure</th>
<th>Parameters to be Monitored</th>
<th>Location</th>
<th>Measurement</th>
<th>Frequency of Measurement</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Construction Phase</strong></td>
<td>Line Route Survey</td>
<td>Entire proposed route of the Transmission Line</td>
<td>Hectares (area cleared in project area)</td>
<td>Throughout line route survey</td>
<td>SPC/Surveyors</td>
</tr>
<tr>
<td></td>
<td>Clearing of vegetation cover during line route survey</td>
<td>Disclosure in the National Dailies Disclosure to members of the public</td>
<td>As and when required</td>
<td>SPC/EPA</td>
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<tr>
<td></td>
<td>• Clearing of farms lands</td>
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<td></td>
<td>• Tree felling (forest reserves)</td>
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<td>Public Information Disclosure of Environmental impact Statement Document</td>
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<tr>
<td><strong>Construction Phase</strong></td>
<td>Transportation</td>
<td>Entire Project location</td>
<td>Km/hr</td>
<td>Weekly</td>
<td>Contractors/SPC Project</td>
</tr>
<tr>
<td></td>
<td>Motor vehicles and transportation of personnel and materials should be closely monitored and recorded. These should include monitoring the following activities:</td>
<td></td>
<td>N0. of Preventive Maintenance Number</td>
<td>Monthly</td>
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<tr>
<td></td>
<td>• Speed Limits of vehicles, traffic congestion on main roads (near project sites)</td>
<td></td>
<td>Number</td>
<td>Daily</td>
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<tr>
<td></td>
<td>• Trucks conditions and maintenance.</td>
<td></td>
<td>Number</td>
<td>Daily</td>
<td></td>
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<tr>
<td></td>
<td>• Vehicular accident records</td>
<td></td>
<td>number</td>
<td>Monthly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Vehicle safety signals (flares, warning lights, reflectors etc)</td>
<td></td>
<td>number</td>
<td>Daily</td>
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</tr>
<tr>
<td></td>
<td>• Vehicle fueling procedures</td>
<td></td>
<td>Quantity</td>
<td>Monthly</td>
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<td></td>
<td>• Vehicle loading/off loading procedures</td>
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<td></td>
<td>• Vehicle daily check outs</td>
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<td></td>
<td>• Driving licenses and permit to drive</td>
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<td></td>
<td>• First Aid and Fire Extinguishers kit</td>
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<tr>
<td></td>
<td>Waste Management</td>
<td></td>
<td>Number</td>
<td>Daily</td>
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<tr>
<td></td>
<td>Waste water handling</td>
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<td>Kgs.</td>
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<td></td>
<td>Waste segregation</td>
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<td>Number</td>
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<td></td>
<td>Disposal of conductor drums</td>
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<td>Kgs</td>
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<td></td>
<td>Disposal of metallic waste</td>
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<td>Number</td>
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<td></td>
<td>Disposal of empty chemical</td>
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<td>Number</td>
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</tr>
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</table>

WAPP/LEC/KEPCO-CEDA Consult 61
### Proposed Mitigation Measure

<table>
<thead>
<tr>
<th>Parameters to be Monitored</th>
<th>Location</th>
<th>Measurement</th>
<th>Frequency of Measurement</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Socio-economic/cultural issues</strong></td>
<td>Affected Communities</td>
<td>Number</td>
<td>Monthly</td>
<td></td>
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<tr>
<td>• Shrines</td>
<td></td>
<td>Amount</td>
<td></td>
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<tr>
<td>• Scared Grove</td>
<td></td>
<td>Amount</td>
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<td></td>
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<tr>
<td>• Identifying all affected persons</td>
<td></td>
<td>Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Assessment of compensation</td>
<td></td>
<td>Number of programs</td>
<td>Daily</td>
<td></td>
</tr>
<tr>
<td><strong>Payment of compensation</strong></td>
<td></td>
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<td>(adequate amounts, timely payments).</td>
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<tr>
<td>• Archaeological Chance finds</td>
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<tr>
<td><strong>Employment and job creation</strong></td>
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<tr>
<td>• HIV/AIDS Education program</td>
<td></td>
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</tr>
<tr>
<td><strong>Operation and Maintenance Phase</strong></td>
<td>Substation s &amp; RoW</td>
<td>Cm³</td>
<td>Daily</td>
<td>Transmission Systems Dept of SPC (Departm Progress Report)</td>
</tr>
<tr>
<td></td>
<td>Entire Project Area</td>
<td>Hectares</td>
<td></td>
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<td>Number</td>
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<td>Number</td>
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</tr>
<tr>
<td><strong>Pre-construction</strong></td>
<td>Entire proposed route of the Transmission Line</td>
<td>Hectares (area cleared in project area)</td>
<td>Throughout line route survey</td>
<td>SPC/Surveyors/FSD (Report on survey by Contracted surveyors)</td>
</tr>
<tr>
<td><strong>Public Information</strong></td>
<td>Disclosure in the National Dailies</td>
<td></td>
<td>Once Disclosure As and when required</td>
<td>LEC/EPA</td>
</tr>
<tr>
<td>• Disclosure of Environmental Impact Statement Document</td>
<td></td>
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</tr>
<tr>
<td><strong>Civil Works</strong></td>
<td>Entire Project location</td>
<td>Quantity</td>
<td>Daily</td>
<td>Contract or / SPC (Project Progress Report)</td>
</tr>
<tr>
<td>Activities to be monitored under civil works should cover safe working practices in accordance with SPC Safety Rules and Regulations. Monitoring criteria would include:</td>
<td></td>
<td>Number</td>
<td>Weekly</td>
<td></td>
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<tr>
<td>• Protective clothing and working gear</td>
<td></td>
<td>Number</td>
<td>Daily</td>
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<tr>
<td>• Plant and equipment maintenance</td>
<td></td>
<td>Number</td>
<td>Daily</td>
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<tr>
<td>• Safety Test - lifting plant gears (wires, hoisting blocks etc,)</td>
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<td>Number</td>
<td>Daily</td>
<td></td>
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<tr>
<td>• Dewatering operations</td>
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<td>Number</td>
<td>Weekly</td>
<td></td>
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<tr>
<td>• Concrete works</td>
<td></td>
<td>Number</td>
<td>Weekly</td>
<td></td>
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<tr>
<td>• Fire patrols (site camps)</td>
<td></td>
<td>Number</td>
<td>Weekly</td>
<td>SPC monthly reports to EPA</td>
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<tr>
<td>• Dust levels (settlements/watercourses)</td>
<td></td>
<td>mg/l</td>
<td>Weekly</td>
<td></td>
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<tr>
<td>• Waste Management and Disposal</td>
<td></td>
<td>Kg.</td>
<td>Daily</td>
<td></td>
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<tr>
<td><strong>Vegetation Clearing</strong></td>
<td>Entire Project location</td>
<td></td>
<td></td>
<td>Contract or / SPC (Project Progress Report)</td>
</tr>
<tr>
<td>Clearing of vegetation cover at tower tracks, construction accesses, and right-of-way should be monitored under the following</td>
<td></td>
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<tr>
<td><strong>Construction Phase</strong></td>
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<tr>
<td>Proposed Mitigation Measure</td>
<td>Parameters to be Monitored</td>
<td>Location</td>
<td>Measurement</td>
<td>Frequency of Measurement</td>
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<tr>
<td>Construction Phase</td>
<td>activities:</td>
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<td></td>
<td>• Tree felling</td>
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<td>• Clearing of farms lands</td>
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<td>• Clearing of right of way</td>
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<td>(vegetation cut only to 1.25m height)</td>
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<td></td>
<td>• Clearing of tower track</td>
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<td>(graded width 2.5m-3m)</td>
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<td></td>
<td>• Clearing access tracks</td>
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<td>(graded width 3.5m)</td>
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<td></td>
<td><strong>Water quality</strong></td>
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<td></td>
<td>Selected rivers, streams,</td>
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<td></td>
<td>and other water bodies</td>
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<td>in the project areas of</td>
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<td></td>
<td>environmental influence</td>
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<td>shall be sampled and</td>
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<td>analyzed for</td>
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<td>establishment of</td>
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<td>baseline water</td>
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<td>quality conditions.</td>
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<td>These same water</td>
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<td></td>
<td>bodies shall be</td>
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<td>monitored during</td>
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<td></td>
<td>construction phase to</td>
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<td></td>
<td>ensure compliance with</td>
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<td></td>
<td>anti-pollution</td>
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<td></td>
<td>legislation.</td>
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<td>The following</td>
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<tr>
<td></td>
<td>parameters shall be</td>
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<td></td>
<td>monitored:</td>
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<tr>
<td></td>
<td>● Biological oxygen</td>
<td></td>
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<tr>
<td></td>
<td>demand (BOD₅)</td>
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<td></td>
<td>● pH</td>
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<td></td>
<td>● Oil and grease</td>
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<td></td>
<td>● Total suspended solids</td>
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<td></td>
<td>● Conductivity</td>
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<td>● Total coli form</td>
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<td></td>
<td>● Turbidity</td>
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<tr>
<td></td>
<td><strong>Noise</strong></td>
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<td>Noise levels shall be</td>
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<td>measured at the</td>
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<td>same positions as those</td>
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<td>for the ESIA in</td>
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<td>communities close to</td>
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<td></td>
<td><strong>Waste Management</strong></td>
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<td>Waste bush handling</td>
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<td>Waste water handling</td>
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<td>Waste segregation</td>
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<td></td>
<td>Disposal of conductor</td>
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<td>drums</td>
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<td>Disposal of metallic waste</td>
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<td>Disposal of empty chemical</td>
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<td>containers</td>
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<td><strong>Socio-economic/cultural</strong></td>
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<td>Shrines</td>
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<td>Sacred Grove</td>
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<td>Identifying all</td>
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<td></td>
<td>affected persons</td>
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<td></td>
<td>Assessment of</td>
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<td></td>
<td>compensation</td>
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<td>Payment of compensation</td>
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<td>timely payments)</td>
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<td></td>
<td>Archaeological chance</td>
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<tr>
<td></td>
<td>finds</td>
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</tr>
</tbody>
</table>

### Water quality

- Selected 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 coli form
  - Turbidity

### Noise

- Noise levels shall be measured at the same positions as those for the ESIA in communities close to the proposed line.

### 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 (adequate amounts, timely payments)
- Archaeological chance finds
Côte d’Ivoire - Liberia - Sierra Leone - Guinea Interconnection Project (Liberia ESMP)

<table>
<thead>
<tr>
<th>Proposed Mitigation Measure</th>
<th>Parameters to be Monitored</th>
<th>Location</th>
<th>Measurement</th>
<th>Frequency of Measurement</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment and job creation</td>
<td>HIV/AIDS Education program</td>
<td></td>
<td>Number of programs</td>
<td>Annually</td>
<td>/Museum, Monuments Board</td>
</tr>
<tr>
<td>Operation and Maintenance Phase</td>
<td>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)</td>
<td>Substation &amp; Entire Project Area</td>
<td>Number, Number, Number, Number, Number, Cm³</td>
<td>As and when necessary during operational phase of the project cycle</td>
<td>Transmission Systems Dept of SPC (Department Progress Report)</td>
</tr>
</tbody>
</table>

6.2.1. Arrangement for ESMP Monitoring

External monitoring will be carried out by concerned stakeholders such as MLME/LEC, EPA and it will be coordinated through the SPC. In order to ensure that effective monitoring is carried out according to the Environmental and Social Management Plan, it is recommended that those parties to be involved in the monitoring of the ESMP, necessary measuring device and equipment shall be purchased and kept as discussed during the training workshop of the study.

The necessary equipment and budget is as below.

Table 6 List of Equipment

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit Cost (USD)</th>
<th>Q'ty</th>
<th>Total Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water pollution Measuring Device</td>
<td>500</td>
<td>4</td>
<td>2,000</td>
</tr>
<tr>
<td>Soil pollution Measuring Device</td>
<td>900</td>
<td>4</td>
<td>3,600</td>
</tr>
<tr>
<td>Noise Measuring Device</td>
<td>1,100</td>
<td>4</td>
<td>4,400</td>
</tr>
<tr>
<td>Vehicle</td>
<td>30,000</td>
<td>2</td>
<td>60,000</td>
</tr>
<tr>
<td>Laptop Computer</td>
<td>2,000</td>
<td>2</td>
<td>4,000</td>
</tr>
<tr>
<td>Color Printer</td>
<td>1,000</td>
<td>2</td>
<td>2,000</td>
</tr>
<tr>
<td>Handheld GPS</td>
<td>2,000</td>
<td>2</td>
<td>4,000</td>
</tr>
<tr>
<td>Camera</td>
<td>500</td>
<td>2</td>
<td>1,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>81,000</td>
</tr>
</tbody>
</table>
## 6.3. Community Health Impact Assessment & Mitigation

### Table 7 Environmental Issues, impact and Mitigation Measure

<table>
<thead>
<tr>
<th>Issue</th>
<th>Impact</th>
<th>Mitigation</th>
</tr>
</thead>
</table>
| Importation of labour         | Spread of HIV/AIDS and other communicable & sexually transmitted diseases (STDs) | • HIV/AIDS Education will be given to the workers.  
• Employ local labour as much as possible  
• Provide a condom for workers |
| Community Health Electromagnetic fields | Exposure to high electric field which could result in one experiencing small spark discharges on touching other objects, producing a prickling sensation similar to that caused by the static discharges commonly experienced in dry atmospheric conditions  
The general public does not generally understand EMF and therefore potential fear can be considered to be the most significant impact perceived with power transmission lines. | • The electrical transmission line shall be designed and constructed to ensure that EMF levels are well below accepted guidelines for occupational and human health exposure limits.  
• Habitations and other permanent structure will be prohibited within the right-of-way.  
• Continue education on the general effects of EMF.  
• All the towers shall be clearly marked with “DANGER-225,000 VOLTS” signal and shall be provided with anti-climbing devices.  
• Quality insulators shall be installed.  
• Anti-theft fasteners shall be used to check vandalism and its harmful consequences.  
• Maintenance works shall be periodically carried out to eliminate dangers posed by corroded and worn out parts of towers and accessories |
| Air Quality                   | Construction activities can cause dust rise on access roads           | • Continuous spraying of exposed soils surface to prevent dust rise |
| Surface Water                 | Construction activities can cause erosion resulting in pollution of surface waters | • All waste shall be stored in areas, which are isolated from surface drain.  
• Only mechanical control methods shall be used for vegetation clearing  
• Pipes shall be installed to prevent pollution of streams and rivers.  
• Guidelines of Vegetation Management Plan shall be followed |
<table>
<thead>
<tr>
<th>Issue</th>
<th>Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise &amp; Traffic</td>
<td>Construction and traffic activity causing noise impacts increased safety risk from traffic on access roads</td>
<td>• Adequate warning should be given to ensure public safety is not compromised</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Appropriate road safety signals (red and flashing amber lights) should be displayed on truck and machinery.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Deliveries should be made during daylight hours and speed regulated to the prescribed safe levels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reducing the traffic flow of heavy machinery shall control soil compaction along the graded routes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use of traffic wardens to control traffic at road crossing</td>
</tr>
<tr>
<td>Production of Liquid and</td>
<td>All aspects of the construction and operational phases would result in the generation of waste (both solid and liquid), which would have to be disposed off appropriately</td>
<td>• Trees and trumps shall be gathered and made available to the communities.</td>
</tr>
<tr>
<td>Solid waste</td>
<td></td>
<td>• Other forms of vegetal waste should be gathered up at the sites and used for much or burnt depending on the situation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Non-metal solid waste shall be disposed off through the public waste collection system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The metal waste shall be collected and sold as scrap to dealers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Special wastes of hazardous nature shall be segregated and disposed off by total destruction in accordance with national regulations.</td>
</tr>
</tbody>
</table>
### Table 8 Socio-Economic Impact and Mitigation

<table>
<thead>
<tr>
<th>Issue</th>
<th>Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Land</td>
<td>Farmers who land will be lost for construction will suffer serious socio-economic consequences</td>
<td>• Measures will be taken to solve the numerous socio-economic problems, landless farmers will encounter. Negotiation for land will be made elsewhere and some credit would be provided to engage in petit trading.</td>
</tr>
<tr>
<td>Jobless Citizens</td>
<td>People like tapers and other day-workers are expected to be jobless during and after construction due to project activities in their respective areas</td>
<td>• The jobless citizens will be seriously considered to obtain related jobs with the project in order to economically sustain themselves.</td>
</tr>
<tr>
<td>Bright Light attraction to the Project</td>
<td>Migration from rural and urban areas to the project area to seek jobs and visit to relatives</td>
<td>• A well organized socio-economic mitigation system will be put into place to engage migrants and jobless citizens in the project areas to make them productive citizen.</td>
</tr>
<tr>
<td>Women and Children must be vulnerable to suppression by men and others</td>
<td>The majority of the women in the project area- mainly unlettered women might find it difficult to make their daily living. Children in the project area might not have educational opportunity to learn.</td>
<td>• Jobless women will be treated with much care. They will be provided with loan facilities/credits to undertake commercial activities that will provide income as well. School s will be constructed for school age children with the necessary learning facilities provided.</td>
</tr>
<tr>
<td>Cultural practices</td>
<td>The conglomeration of different tribal groups might disturb the traditional practices of the tribal groups in the project area.</td>
<td>• Traditional practices that are accepted by the national government will be allowed with protection of the minority tribal groups.</td>
</tr>
</tbody>
</table>

### 6.4. Legal Requirement & Bidding Contract Documents

Legal requirements and contract clauses provided to guide the operations of contractors/consultants/agencies are outlined below:

- **Minimization of Resettlement**: The Contractor shall avoid routing construction access roads through farmlands as much as possible. Existing and available farm tracks shall be used as much as possible. The Contractor shall supervise the re-growth of access roads to check erosion.
• **Resettlement**: SPC shall hold consultations with and the payment of compensation to project-affected persons. Persons whose properties such as buildings, farms and land will be affected in any way would be properly assessed and appropriate compensation paid to them. A log/record of such compensation payments will be kept.

• **Valuation of Crops**: Lands Valuation Board shall undertake valuation of affected properties for compensation purposes.

• **Loss of Vegetation**: The Contractor shall ensure that vegetation clearing is kept to the barest minimum.

• **Noise**: The Contractor shall ensure that equipment used are well maintained and operated so as not to exceed EPA Guidelines on ambient noise levels, and to avoid working at night.

• **Dust/Air Quality**: The Contractor shall ensure that work sites and sand heaps are watered down to observe the EPA Guidelines for ambient air quality for the particular working area.

• **Soil Erosion**: The Contractor shall ensure that selected access roads do not cross water bodies. Number of passes of trucks to and from construction sites shall be regulated to the least possible. Ground surface at tower sites shall be graded to drain runoff away from tower legs.

• **Occupational Health and Safety**: The Contractor shall be responsible for the occupational health and safety of all workers on the site at all times. Workers shall be provided with personnel protection equipment such as hand gloves, boots and nose masks. All machinery and equipment shall be operated and maintained in accordance with the original manufacturer’s specifications to minimize accidents. The Contractor shall ensure strict adherence to regulatory safety standards and precautions.

• **Public Health**: The Contractor shall ensure that appropriate warning notices are placed at entry points of access roads, and appropriate road safety signals, and safe speed limits observed.

• **Pollution of Water Bodies**: The Contractor shall ensure that drains leading from work areas shall be directed away from nearby water bodies.

• **Solid and Liquid waste generation**: The Contractor shall ensure that cleared vegetation is collected and properly disposed of. The Contractor shall also ensure
that liquid wastes shall be directed away from water bodies. Waste oils and fuels shall be collected and properly disposed of.

- **Environmental Supervision**: Environmental Protection Agency shall supervise the project to ensure that environmental commitments are adhered to by SPC.
- **Archaeological/Cultural Chance Finds**: Liberia Museums Board to take full responsibility for any archaeological/cultural chance finds in the project area.

### 6.5. Emergency Preparedness Response Plan

There is a potential of spillage of transformer oils and other hazardous materials that are used both during the construction and operation of transmission line. One key hazardous material is transformer oil. Thus there is the need to prepare a procedure for an emergency preparedness plan in the event of oil or hazardous chemical spills at the substation, even though the event is very rare.

#### 6.5.1. Purpose

The purpose of the emergency preparedness response procedure is to define a plan of action for potential hazards associated with the transmission line project including accidental spills of all hazardous materials in accordance with the material data safety sheet (MSDS) and international standards.

#### 6.5.2. Scope

The procedure covers the actions to be implemented in the event of spillage or accidents by the relevant personnel. It applies only to the “225 kV Man (Côte d’Ivoire) – Yekepa – (Liberia) – Nzérékore (Guinea) – Buchanan (Liberia) – Monrovia (Liberia) – Bumbuna (Sierra Leone) – Linsan (Guinea) Interconnection Project”.

#### 6.5.3. Notification procedure

The notification procedure indicates the measures to be taken on discovering the spill, and the personnel to be informed. This will enable trained personnel and outside agencies to respond quickly.

**A. First notification**

Upon the discovery of a spill or suspected spill from a transformer, the person discovering the spill, the First detector, must immediately contact the Officer-In-Charge (OIC) at the affected substation. They should attempt to provide the following information:

- Time of discovery
Possible Spill Material
Quantity of Spill Material
Area of land or lake involved in the spill event
Estimate of whether or not the spill is ongoing
Actions which have been taken

Using the above information, together with knowledge of the volumes of petroleum products available for the project, available personnel, and visual observations, the OIC at the substation will make a determination of the severity of the spill event and the notification procedures to be implemented using the Spill Identification Flowchart.

It is the responsibility of the OIC at the substation to collect the above information to determine the source and cause of the discharge. It is anticipated that only about 169.14 m³ of oil will be available at the substation during operations. However, there will be containment about 0.33% of the total oil volume for accidental leakages. Therefore, any accidental spillages will be minor and will be well contained without any offsite notification. However, this will not be the case in the unlikely event of transformer explosion.

B. The OIC at the Substation shall:

- Immediately move logistics as appropriate to the site of the incident.
- Contain the spill and prevent its spread
- Undertake the Oil clean-up
- Take appropriate steps to inform the Project Environmental Coordinator for any relevant internal or external action to be taken.

If any accident or incident detrimental to the environment occurs, the cause(s) of the accident/ incident and the aspects of the action plan that could be improved shall be identified through SPC’s accident investigation procedures and plans to correct the hazard or amend the EMP shall be made.

6.6. Institutional strengthening and training for implementation

To ensure the successful implementation of all the environmental management programs, a training program is recommended for the project Environmental Management Team and key personnel of the contractor. The program will cover the creation of environmental awareness and occupational safety and health issues. The main issues of concern will be:
6.6.1. Environmental awareness

The areas earmarked for environmental awareness creation include:

- Proper usage and definitions of basic environmental terminologies
- Liberia ESIA procedures, provisions of Environmental Act
- Environmental laws, regulations and environmental compliance in Liberia
- General environmental policies
- Introduction to environmental management planning
- Environmental impact assessment
- Mitigation measures
- Monitoring plans
- Environmental audit
- ESIA case studies

6.6.2. Occupational safety and health

The relevant areas for consideration are:

- Fire prevention and fighting methods

6.6.3. Information, Education and Communication (IEC)

In addition to the provision made in 8.13 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 right of way.

6.6.4. Proper and adequate records

The SPC will keep a General Register in the prescribed form as required by the National Social Security and Welfare Corporation Act for the duration of the project. Records that will be kept, as prescribed by the abovementioned law will include, inter alia:
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

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

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/surveyor
- Particulars of action taken to remedy defect indicated (If applicable)
- Name and other particulars of engineer/surveyor including signature

6.6.5. Capacity building programme
As there have been no recent construction of a transmission system in Liberia, a SPC (Special Purpose Company) will be set up for each country. These SPCs, 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 Environment & Community Relations Unit (ECRU) which will be responsible for implementing the ESMP.

In order for these units to do 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.
Figure 3 shows the proposed capacity building program strategy.

**Figure 3** The proposed capacity building program strategy

### Environment and Community Relation Unit (ECRU)

**Objective**
- Coordinate ECRU and other stakeholders for implementation of ESMP.
- To strengthen ECRU’s capability in the areas of ESMP, monitoring and communication.

**Contents of Training**
- ESMP, Environmental Law and regulations, Environmental and Social Monitoring, Mitigation measures, Communication, Human Resources management.

### Communities

**Objective**
- To help and support communities be aware of short, medium and long term environmental and social changes due to the project.
- Create a communication channels for members of the community with grievances.

**Contents**
- Community awareness activities such as public sensitization, venerable people support program.

### Other Federal and Regional Level Agencies

**Objective**
- Institutional strengthening to prevent and to cope with possible environmental and socio-economic changes.
- Give government officials tools for decision making and community awareness activities concerning short, medium and long term environmental change.

**Contents of Training**
- ESMP awareness, conflict resolution skills, resettlement and compensation issues.

For the successful implementation of Environmental management and monitoring program, it is essential for a range of training to start as soon as possible.
6.6.5.1. Capacity building of the Project Implementation Unit (PIU) 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 of the proposed Project.

6.6.5.2. 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 Liberia.

6.7. Scheduling & Reporting
The monitoring program shall include a documented monitoring plan, which details all data handling, storage and analysis requirements. The plan shall identify the location where all data is to be held, staff responsibilities for data handling and analysis and appropriate reporting lines for ensuring 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 persons involved in the resettlement and detailed records 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 preconstruction to operation/maintenance phases, SPC will have the ultimate responsibility to ensure environmental reporting procedures are adhered to. The Project Management Unit will hold 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 to the Project Director on all environmental activities for inclusion in the project 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 Environmental Impact Assessment Regulations) to be submitted to the Environmental Protection Agency and relevant international agencies.

All monitoring and reporting documents will be kept on file, as part of SPC documentation procedures. The project reporting schedule is presented in Table 6 below.

Table 9 Project Reporting Schedule

<table>
<thead>
<tr>
<th>Activities in Mitigation Measure</th>
<th>2012</th>
<th></th>
<th>2013</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
<td>Q1</td>
<td>Q2</td>
</tr>
<tr>
<td>Pre-construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>- Line route survey</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Acquisition of right of way</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Line Route Survey Report/ EIA Report</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Access tracks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Transportation of Machinery</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Full grading of tower tracks</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Clearing of RoW</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Erection of towers</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Erection of conductors, Shield wires</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>- and accessories</td>
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<td>- Modification works at substations</td>
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<tr>
<td>- Acquisition of right of way</td>
<td>x</td>
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<td>x</td>
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<tr>
<td>- Compensation</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Dropping of conductor</td>
<td></td>
<td></td>
<td></td>
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<td>- Shattering of insulator units</td>
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<tr>
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<td></td>
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<tr>
<td>Construction – Maintenance Phases</td>
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<tr>
<td>- Management of liquid and solid waste</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<td></td>
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<tr>
<td>- HIV/AIDS Outreach Program</td>
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<td>x</td>
<td>x</td>
<td></td>
<td></td>
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<td>- Project Monthly Progress Reports</td>
<td>x</td>
<td>x</td>
<td>x</td>
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WAPP/LEC/KEPCO-CEDA Consult 75
<table>
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<tr>
<th>Activities in Environmental Monitoring</th>
<th>2012</th>
<th>2013</th>
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<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
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<tr>
<td><strong>Pre-construction</strong></td>
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<td>- Line route survey</td>
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<td>- Public information</td>
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<td>- Project Monthly Progress Reports</td>
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<td>x</td>
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<tr>
<td><strong>Construction</strong></td>
<td></td>
<td></td>
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<tr>
<td>- Transportation of Machinery</td>
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<td>- Civil Works</td>
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<td>- Vegetation clearing</td>
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<tr>
<td>- Waste Management</td>
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<td></td>
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<td>- Socio-economic/Cultural issues</td>
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<td>- Compensation</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>- Project Monthly Progress Reports</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><strong>Operation - Maintenance</strong></td>
<td></td>
<td></td>
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<tr>
<td>- Dropping of conductor</td>
<td></td>
<td></td>
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<tr>
<td>- EMF Levels</td>
<td></td>
<td></td>
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<tr>
<td>- Quarterly Reports</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Institutional strengthening</strong></td>
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<tr>
<td>- National Power Authority</td>
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<td>x</td>
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<tr>
<td>- Contractor</td>
<td>x</td>
<td>x</td>
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<tr>
<td>- PMU</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>- EPA</td>
<td>x</td>
<td>x</td>
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<tr>
<td>- Dept. of Museum</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>- Land Valuation Board</td>
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<tr>
<td>- District Councils</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>- Project Monthly Progress Reports</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><strong>Training</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- EMP Implementation, Redesign, Conflict</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>- Resolution, etc.</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>- Environmental Processes, Methods &amp; Equipment</td>
<td>x</td>
<td>x</td>
</tr>
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</table>
7. FINANCIAL RESOURCE ALLOCATION

7.1. Environmental Management Cost

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 and training programs are effectively implemented. The proponent will make the necessary budgetary provisions to cover all commitments for the Transmission Line Project.

The total estimated budget for environmental and compensation management is shown in Table below.

Table 10 Environmental and Social Management Cost:

<table>
<thead>
<tr>
<th>Activity for ESMP</th>
<th>No</th>
<th>ITEM</th>
<th>Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Review &amp; Disclosure of Environmental Impact Assessment Report</td>
<td>68,040</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Audit for RAP and ESMP</td>
<td>53,200</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Environmental Monitoring</td>
<td>441,480</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Training of environmental management team in house</td>
<td>32,400</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Public Health &amp; Safety (including HIV/AIDS Programmes)</td>
<td>216,720</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Measuring device for air/water/soil pollution and vehicle, laptop etc.</td>
<td>81,000</td>
<td></td>
</tr>
<tr>
<td>Total ESMP Cost</td>
<td></td>
<td></td>
<td>892,840</td>
</tr>
</tbody>
</table>

○ ESMP Cost

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>No</th>
<th>ITEM</th>
<th>Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Compensation for lands</td>
<td>80,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Compensation for trees</td>
<td>586,263</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Compensation for food crops</td>
<td>161</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Huts / Houses / Buildings</td>
<td>158,800</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Constructional damage for plants outside of the ROW, inside access road (=2+3)*10%)</td>
<td>58,642</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Compensation for loss of income ((1+2+4)*10%)</td>
<td>41,253</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Add-on amounts for vulnerable project affected persons (=1+2+3+4)*5%)</td>
<td>41,261</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Professional fees, reimbursement for permits etc =(1+2+3+4)*10%</td>
<td>82,522</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Contingency allowances to cater for the effect of probable increases in property values =(1+2+3+4)*10%</td>
<td>82,522</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td>1,131,424</td>
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</tbody>
</table>

○ RAP Cost

<table>
<thead>
<tr>
<th>Activities</th>
<th>No</th>
<th>ITEM</th>
<th>Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Social action plan, community support</td>
<td>57,659</td>
<td></td>
</tr>
</tbody>
</table>
### Côte d’Ivoire - Liberia - Sierra Leone - Guinea Interconnection Project (Liberia ESMP)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time Required</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> Recruitment of Community Liaison Officer and Assistants</td>
<td>2 months</td>
<td></td>
</tr>
<tr>
<td><strong>2</strong> Orientation of the CLO/As on resettlement and RP implementation</td>
<td>3 weeks</td>
<td></td>
</tr>
<tr>
<td><strong>3</strong> Conduct awareness meetings at community level</td>
<td>2 month</td>
<td></td>
</tr>
<tr>
<td><strong>4</strong> Distribute copies of leaflet, RP and RPF including conditions for land donation to County, District, villages and affected persons</td>
<td>1 month</td>
<td></td>
</tr>
<tr>
<td><strong>5</strong> Undertake verification of lost assets as recommended in RP and finalize the list of affected people in consultation with APs. Photograph buildings etc.</td>
<td>3 month</td>
<td></td>
</tr>
<tr>
<td><strong>6</strong> Strengthen or establish mechanisms for local consultation, participation and grievance resolution</td>
<td>2 month</td>
<td></td>
</tr>
</tbody>
</table>

#### Total RAP Cost

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livelihood restoration program</td>
<td>19,701</td>
</tr>
<tr>
<td>Community infrastructure Program</td>
<td>41,261</td>
</tr>
<tr>
<td>External monitoring and Evaluation</td>
<td>26,600</td>
</tr>
<tr>
<td>Purification rites / ceremonies</td>
<td>7,000</td>
</tr>
<tr>
<td>Indirect cost</td>
<td>15,222</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td><strong>167,443</strong></td>
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</tbody>
</table>

**Total RAP Cost** | **1,298,867**

*Trees include rubber, Cocoa, Coffee and Oil Palm,*

*Corps includes Rice, Cassava, Eddoes*

*Building includes Churches, Mosques, Palava huts.*

### 7.2. Implementation Schedule

Planning as a rational ordering of activities in space should always be done with care. It is in this light that the below Environmental and Social Action Plan (ESMP) was prepared highlighting potential environmental impacts and their respective proposed mitigation measures including the responsible institutions for coordination and implementation.

The plan comprises the Description of mitigation measures, description of Environmental Monitoring Activities and Community Health Impact Assessment mitigation.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time Required</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> Recruitment of Community Liaison Officer and Assistants</td>
<td>2 months</td>
<td></td>
</tr>
<tr>
<td><strong>2</strong> Orientation of the CLO/As on resettlement and RP implementation</td>
<td>3 weeks</td>
<td></td>
</tr>
<tr>
<td><strong>3</strong> Conduct awareness meetings at community level</td>
<td>2 month</td>
<td></td>
</tr>
<tr>
<td><strong>4</strong> Distribute copies of leaflet, RP and RPF including conditions for land donation to County, District, villages and affected persons</td>
<td>1 month</td>
<td></td>
</tr>
<tr>
<td><strong>5</strong> Undertake verification of lost assets as recommended in RP and finalize the list of affected people in consultation with APs. Photograph buildings etc.</td>
<td>3 month</td>
<td></td>
</tr>
<tr>
<td><strong>6</strong> Strengthen or establish mechanisms for local consultation, participation and grievance resolution</td>
<td>2 month</td>
<td></td>
</tr>
</tbody>
</table>
### Côte d’Ivoire - Liberia - Sierra Leone - Guinea Interconnection Project (Liberia ESMP)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time Required</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Discuss the RP with affected persons in community meetings and explain, elaborate and make the policy and entitlement process clear</td>
<td>3 month</td>
<td></td>
</tr>
<tr>
<td>8 Discuss entitlements with Chiefs and elder’s and convene them for RP implementation</td>
<td>3 week</td>
<td></td>
</tr>
<tr>
<td>9 Liaise with County and District administration</td>
<td>2 weeks</td>
<td></td>
</tr>
<tr>
<td>10 Negotiate land access for home with communities: if required for security of tenure undertake land alienation process to get private title</td>
<td>2 months</td>
<td></td>
</tr>
<tr>
<td>11 Finalize list of entitled persons, establish compensation, ensure appropriate advance evacuation notification, implement land transfer procedures and effect compensation payments</td>
<td>4 months</td>
<td></td>
</tr>
<tr>
<td>12 Produce compensation payment documentation for with APs for loss trees and structures</td>
<td>2 months</td>
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</tr>
<tr>
<td>13 Payment of the compensation</td>
<td>5 months</td>
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</tr>
<tr>
<td>14 Provide resettlement and rehabilitation support where necessary</td>
<td>2 month</td>
<td></td>
</tr>
<tr>
<td>15 Resettlement plan implementation verification survey after relocation of houses</td>
<td>3 months</td>
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</tr>
<tr>
<td>16 Implement social impact monitoring system (internal and external monitoring program)</td>
<td>1 month</td>
<td></td>
</tr>
<tr>
<td>17 Permit vegetation clearance to begin. Let contracts for market infrastructure</td>
<td>4 weeks</td>
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<tr>
<td>18 Transferring the land ownership (Deed Transfer) where required</td>
<td>1 year</td>
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<tr>
<td>19 Monitoring and evaluation of RP implementation process and achievements</td>
<td>1 year</td>
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<table>
<thead>
<tr>
<th>County</th>
<th>Trees</th>
<th>FoodCrops</th>
<th>Houses</th>
<th>Huts</th>
<th>Buildings</th>
<th>Lands</th>
<th>Total Cost (USD)</th>
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<tr>
<td></td>
<td>Count</td>
<td>Cost</td>
<td>Area(ac)</td>
<td>Count</td>
<td>Cost</td>
<td>Count</td>
<td>Cost</td>
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<tr>
<td>Nimba</td>
<td>30,681</td>
<td>183,996</td>
<td>7.6</td>
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<td>Margibi</td>
<td>38,217</td>
<td>229,302</td>
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<tr>
<td>Bomi</td>
<td>1,011</td>
<td>6,066</td>
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<td>-</td>
<td>1</td>
<td>4,850</td>
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<tr>
<td>Bong</td>
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<td>61,218</td>
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<td>GrandBassa</td>
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<td>71,307</td>
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<td>9,700</td>
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<td>Montserrado</td>
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<td>19,089</td>
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<td>GrandCape</td>
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<td>15,285</td>
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<td>-</td>
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<tr>
<td>Total</td>
<td>97,883</td>
<td>586,263</td>
<td>15</td>
<td>161</td>
<td>6</td>
<td>29,100</td>
<td>19</td>
</tr>
</tbody>
</table>

- Trees include rubber, coffee, cocoa, and oil palm
- Food corps include rice, eddoes, cassava

---

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