
Prepared by

Environment, Resettlement and Social Unit (ERSU)
Project Management Unit (PMU)
Transmission Company of Nigeria (TCN)
7 Hombori Street, Wuse II,
Abuja.

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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Alternating Current</td>
</tr>
<tr>
<td>ACMs</td>
<td>Asbestos Containing Materials</td>
</tr>
<tr>
<td>ASRs</td>
<td>Air Sensitive Receivers</td>
</tr>
<tr>
<td>ASTs</td>
<td>Above-ground Storage Tanks</td>
</tr>
<tr>
<td>BPE</td>
<td>Bureau of Public Enterprise</td>
</tr>
<tr>
<td>CHS</td>
<td>Community Health &amp; Safety</td>
</tr>
<tr>
<td>Co</td>
<td>Cobalt</td>
</tr>
<tr>
<td>dBA</td>
<td>decibel</td>
</tr>
<tr>
<td>DC</td>
<td>Direct current</td>
</tr>
<tr>
<td>EDC</td>
<td>Electricity Distribution Company</td>
</tr>
<tr>
<td>EER</td>
<td>Environmental Evaluation Report</td>
</tr>
<tr>
<td>EIB</td>
<td>European Investment Bank</td>
</tr>
<tr>
<td>EMS</td>
<td>Environmental Management System</td>
</tr>
<tr>
<td>ENS</td>
<td>European Standards</td>
</tr>
<tr>
<td>ESA</td>
<td>Environmental Site Assessment</td>
</tr>
<tr>
<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
</tr>
<tr>
<td>FGN</td>
<td>Federal Government of Nigeria</td>
</tr>
<tr>
<td>FMEnv</td>
<td>Federal Ministry of Environment</td>
</tr>
<tr>
<td>GBV</td>
<td>Gender Based Violence</td>
</tr>
<tr>
<td>GRM</td>
<td>Grievance Redress Mechanism</td>
</tr>
<tr>
<td>GWP</td>
<td>Global Warming Potential</td>
</tr>
<tr>
<td>HWMP</td>
<td>Hazardous Waste Management Plan</td>
</tr>
<tr>
<td>ICNIRP</td>
<td>International Commission of Non-ionizing Radiation Protection</td>
</tr>
<tr>
<td>IDA</td>
<td>International Development Association</td>
</tr>
</tbody>
</table>
IFC  International Finance Corporation  
KV  Kilovolts  
mg/kg  Milligram per kilogram  
mm  Millimeter  
m/s  Meter per seconds  
NEGIP  Nigerian Electricity and Gas Improvement Project  
NESREA  National Environmental Standard & Regulatory Enforcement Agency  
NETAP  Nigerian Electricity Transmission Project  
NO\(^{-3}\)  Nitrate  
NO\(_x\)  Nitrogen Oxide  
OHS  Occupational Health & Safety  
PCBs  Polychlorinated Biphenyls  
PHCN  Power Holding Company of Nigeria  
PMU  Project Management Unit  
PPE  Personal protective equipment  
PVC  Poly Vinyl Chloride  
SEA  Sexual Exploitation and Abuse  
SMEEnv  State Ministry of Environment  
SOPs  Standard Operational Procedure  
SO\(_x\)  Sulfur Oxide  
SPM  Suspended Particulate Matter  
TCN  Transmission Company of Nigeria  
TOR  Terms of Reference  
USTs  Underground Storage Tanks  
V/m  Volt per meter  
WAA  Waste Accumulation Area  
WHO  World Health Organization
μg/m$^3$ Microgram per meter cube

% Percentage
EXECUTIVE SUMMARY

ES 1 Background

The Federal Government of Nigeria, as part of its efforts to improve the quality and reliability of electricity supply within the country, has taken a number of steps to restructure the Power Sector. The enacting into law of the Power Sector Reform Act (2005) and the eventual unbundling and privatization of the formerly government-owned Power Holding Company of Nigeria (PHCN) was a landmark decision towards achieving this objective.

To support this initiative, the World Bank now plans to finance a Nigeria Electricity Transmission Project (NETAP) that will be national in scope but with focus on the north-Eastern and south-western parts of the country. The project aims to improve the capacity and efficiency of the transmission network and increase access to electricity services. The project will, among others:

i). Upgrade/Reinforce existing Transmission Substations

ii). Upgrade existing Transmission Lines

These might entail relocating people that may have encroached upon the ROW of the transmission lines to be rehabilitated thus leading to resettlement of people, loss of assets or access to resources and consequently loss of income or means of livelihood.

To mitigate the negative impacts of the project on people and their assets Resettlement Action Plans (RAPs) would be prepared for sub-projects under NETAP that will result in involuntary resettlement. A Resettlement Policy Framework (RPF) for NETAP has earlier been prepared and disclosed in compliance with regulations of the Federal Government of Nigeria and the appropriate World Bank Safeguards Policies.
This document, the “Environmental and Social Management Plan (ESMP)" addresses the environmental and social impacts that may be associated with the rehabilitation/re-enforcement of Alagbon, Lekki and Egbin 330/132kV Transmission Substations and Ijora, Alausa, Akoka, Amuwo-Odofin, Itire, Maryland and Ota 132/33kV Transmission Substations under NETAP Package 1, Lot.2. It is based on the existing Environmental Laws of the Federal Ministry of Environment and the Safeguards Policies of the World Bank. An Environmental and Social Management Framework (ESMF) for NETAP has earlier been prepared and disclosed. The ESMF states the appropriate safeguards instruments that would be prepared when the exact location and nature of the proposed intervention are known. Where Bank policy (i.e. OP 4.01) and Nigerian guidelines on the protection of the environment differ, the policy that is more stringent will be enforced.

**ES 2 ESMP Objectives**

The objective of this ESMP is to address the environmental and social impacts that may be associated with the rehabilitation/reinforcement work at the respective Transmission Substations.

In doing this proffers measures to be adopted to mitigate negative, and enhance positive, impacts so identified. A framework shall be put in place to ensure compliance of the rehabilitation process with relevant national regulations and World Bank safeguard policy.
ES 3 ESMP Methodology

The procedures adopted in preparing this ESMP include; review of exiting literature on the proposed intervention plan under NETAP (engineering works and duration of implementation as well as environmental and social documentation on the locations where these projects will be implemented-weather, vegetation, social characteristic etc.), field observations and interactions with the staff of the substations and locals.

ES 4 Legal Framework

This ESMP considered national environmental regulations to comply with the regulations of the supervisory ministry, the Federal ministry of Environment as well as the Safeguards policies of the World Bank to comply with International Best Practice.

National Regulations

Regulations of the Federal Ministry of Environment (FMEnv)

The applicable laws are:

- The Environmental Impact Assessment Act CAP LFN E12 2004
- National Environmental Protection (Effluent Limitations) Regulations (S.I.8) of 1991
- National Environmental Protection (Pollution Abatement in Industries Producing Waste) Regulation (S.I.9) of 1991


FMEnv Guidelines and Standards for Environmental Pollution and Control in Nigeria (Act Cap 131 LFN)

The National Environmental Protection Management of Solid and Hazardous Wastes Regulations (S.I.15, 1991)

Land Use Act of 1978


The Endangered Species (Control of International and Traffic Act, No. 11 of 1985)


These Laws seek to;

Protect the environment from all sorts and types of pollution

Protect public health and social welfare

Incorporate environmental resources protection in all social and economic development plans and promote sustainable development to protect the rights of future generations;

Conserve ecologically sensitive areas, protecting biodiversity, and rehabilitating environmentally damaged areas;

Set inter-ministerial cooperation regulations and standards in various Environmental protection areas and jurisdictions;
Promote environmental information collection and publication, public awareness, education and training.

The Nigerian Environmental Laws cover management and protection of various resources, Environmental and Social Impact Assessment (ESIA), penalties to be applied in case of violation of any article presented under the law, emergency preparedness, public participation, research training and public education on environmental issues.

International Standards

The international safeguard polices to be applied here are the Operational Policies (OP) of the World Bank. These policies contain the statements of the World Bank regarding the manner of implementation of development projects being financed by it and demonstrates its commitment to the eradication/reduction of poverty and promotion of social equality in the world.

World Bank Operational Policies (OP)

The table (Table 1) below lists the various Operational Policies of the World Bank and highlights those that will be triggered by the implementation of NETAP Package 1, Lot 2;
Table 1: World Bank Safeguard Policies.

<table>
<thead>
<tr>
<th>S/N</th>
<th>WORLD BANK SAFEGUARD POLICY</th>
<th>TRIGGERED YES/NO</th>
<th>JUSTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OP 4.01 - Environmental Assessment.</td>
<td>Yes</td>
<td>The impacts associated with the proposed reconstruction of Transmission Lines/Substations will involve existing TCN facilities. These impacts, though significant, are reversible and can be mitigated by the measures proposed in the impact mitigation section of this document. The safeguards instrument required to comply with the respective environmental legislature or safeguards policy of the World Bank are therefore Environmental and Social Management Plan (ESMP) for the existing sites.</td>
</tr>
<tr>
<td>2</td>
<td>OP 4.04 - Natural Habitats</td>
<td>No</td>
<td>NETAP will be implemented in existing TCN facilities and will, thus, be putting no habitat at risk.</td>
</tr>
<tr>
<td>3</td>
<td>OP 4.09 - Pest Management</td>
<td>No</td>
<td>No Pest control measures are proposed for implementation at any of the sites slated for construction/rehabilitation/re-enforcement under this project.</td>
</tr>
<tr>
<td>4</td>
<td>OP 4.10 - Indigenous Peoples</td>
<td>No</td>
<td>There are no indigenous peoples in the vicinity of any of the sites covered under this project.</td>
</tr>
<tr>
<td>5</td>
<td>OP 4.11 - Physical Cultural Resources</td>
<td>No</td>
<td>Same as in 2 above</td>
</tr>
<tr>
<td>6</td>
<td>OP 4.12 - Involuntary Resettlement</td>
<td>Yes</td>
<td>The implementation of NETAP will require the relocation of persons that have encroached upon the Right of Way (ROW) of TCN Transmission lines to allow for access for rehabilitation activities and to prevent any accidents due to electrocution, impact of EMF or objects fall on persons. This will likely result in the displacement of persons and destruction of farmland and structures within the ROW, thus leading loss of assets, means of livelihood or loss of shelter. Resettlement Action Plans (RAPs) will be prepared in line with the</td>
</tr>
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</table>
safeguards policy on Involuntary Resettlement to help mitigate the impacts due to these activities.

<table>
<thead>
<tr>
<th></th>
<th>OP 4.36 - Forests</th>
<th>No</th>
<th>Same as in 2 above</th>
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<tbody>
<tr>
<td>7</td>
<td>OP 4.37 - Safety of Dams</td>
<td>No</td>
<td>Same as in 2 above</td>
</tr>
<tr>
<td>8</td>
<td>OP 7.60 - Projects in Disputed Areas</td>
<td>No</td>
<td>There are no disputed lands in the project-affected areas</td>
</tr>
<tr>
<td>9</td>
<td>OP 7.50 - Projects on International Waterways</td>
<td>No</td>
<td>The project will not have any impact on the quality or quantity of water in any international waterway.</td>
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Of particular interest in this project since most of the risks associated with construction activities revolve around OH&S are the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines); the General Guidelines which describe the broad EHS standards for various activities and the sector-specific Guidelines for Electric Power Transmission and Distribution.

As stated earlier, when host country regulations differ from the levels and measures presented in the World Bank operation policies, projects will be required to achieve whichever is more stringent. This also applies if there is a differences between Federal and State standards.

**ES 5 Project Description and Scope**

Under NETAP IDA will finance specific programs to increase quantity, quality and access to the electricity network, particularly in the Northern part of the country. NETAP will also provide support for improvements in the human capacity of the government agencies that will be involved in the implementation of the project through technical assistance and capacity building.
NETAP Scope

The proposed NETAP, which is to be financed from an IDA Credit, is subdivided into three (3) components as follows:

*Sub-component 1a* will finance investments grouped by geographic locations to reduce interdependence and increase efficiency in implementation. These will involve grid-substation rehabilitation/re-enforcement of existing TCN substations.

*Sub-Components 1 (b)* addresses improvements in power delivery and network reliability on 132kV transmission grid in Kwara, Osun, Ogun, Oyo, Abia, Enugu, Anambra, Edo, Delta, Rivers, Kogi, Kano, Jigawa, Gombe, Borno and Katsina States.

*Component 2* supports integrated operation of the power system, restoration and expansion of the SCADA system and tele-communication equipment.

*Component 3* will support capacity building and technical assistance activities at key sector institutions and other relevant stakeholders in order to ensure that the implementation of reform program is successfully carried out.

Scope of Rehabilitation / Reinforcement

Under NETAP Package 1, Lot 2, IDA will finance the rehabilitation/re-enforcement of existing TCN substations to help achieve the overall objectives of the proposed project. The table (Table 2) below describes the various interventions proposed for implementation at the respective TCN substations in this procurement package. A comprehensive list of the complete procurement packages being proposed under NETAP is shown in Annex 2.
<table>
<thead>
<tr>
<th>S/N</th>
<th>State</th>
<th>Transmission Region</th>
<th>Name of Transmission Substation</th>
<th>Proposed Intervention under NETAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lagos</td>
<td>Lagos</td>
<td><em>Ijora 132/33kV</em></td>
<td>Upgrading of 2 x 30MVA with 2 x 100MVA 132/33kV. Rehabilitation of civil structures of the Control Room and Digital Control System.</td>
</tr>
<tr>
<td>2</td>
<td>Lagos</td>
<td>Lagos</td>
<td><em>Lekki 330/132kV</em></td>
<td>Supply &amp; Installation of 1 x 300MVA 330/132kV and 2 x 100MVA 132/33kV Power Transformer, High Voltage Switchgears and Associated Equipment.</td>
</tr>
<tr>
<td>3</td>
<td>Lagos</td>
<td>Lagos</td>
<td><em>Alagbon 330/132kV</em></td>
<td>Supply &amp; Installation of 1 x 300MVA 330/132kV, 2 x 100MVA 132/33kV Power Transformers, Switchgears and Associated Equipment.</td>
</tr>
<tr>
<td>4</td>
<td>Lagos</td>
<td>Lagos</td>
<td><em>Alausa 132/33kV</em></td>
<td>Reinforcement of 1 x 100MVA 132/33kV Power Transformer, High Voltage Switchgears and Associated Equipment.</td>
</tr>
<tr>
<td>5</td>
<td>Lagos</td>
<td>Lagos</td>
<td><em>Akoka 132/33kV</em></td>
<td>Rehabilitation of Building structure and Sinking surrounding area, Replacement of obsolete 132kV equipment, 33KV Metal clad Switchgears, Control &amp; Relay panel and Reinforcement with 1 x 60MVA 132/33kV Power Transformer. Also refurbishment of the 2x 45MVA transformers and GIS components.</td>
</tr>
<tr>
<td>6</td>
<td>Lagos</td>
<td>Lagos</td>
<td><em>Amuwo-Odofin 132/33kV</em></td>
<td>Rehabilitation of Building structure and Sinking surrounding area, Replacement of obsolete 132kV equipment, 33KV Metal clad Switchgears, Control &amp; Relay panel and Reinforcement with 2 x 60MVA 132/33kV Power Transformer. Also refurbishment of the 1x 30MVA transformers and GIS components.</td>
</tr>
<tr>
<td>7</td>
<td>Lagos</td>
<td>Lagos</td>
<td><em>Itire 132/33kV</em></td>
<td>Rehabilitation of Building structure and Sinking surrounding area, Replacement of obsolete 132kV equipment, 33KV Metal clad Switchgears, Control &amp; Relay panel and Reinforcement with 1 x 60MVA 132/33kV Power Transformer. Also refurbishment of the 1 x 40 &amp; 60MVA transformers and GIS components.</td>
</tr>
<tr>
<td>8</td>
<td>Lagos</td>
<td>Lagos</td>
<td><em>Maryland 132/33kV</em></td>
<td>Upgrading of 2 x 30MVA to 2 x 100MVA 132/33kV Power Transformers, High Voltage Switchgears and Associated Equipment.</td>
</tr>
</tbody>
</table>
### Table 2: Project Locations and Proposed NETAP Interventions

<table>
<thead>
<tr>
<th>9</th>
<th>Egbin 132/33kV</th>
<th>Replacement of obsolete Control and Relay Panels with Digital Control System, Rehabilitation of Control Room, High Voltage Switchgears and Associated Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Ogun</td>
<td><em>Ota 132/33kV</em> Upgrading of the 1 x 30MVA and 1 x 40 MVA with 2 x 100MVA 132/33kV Power Transformers, High Voltage Switchgears and Associated Equipment</td>
</tr>
</tbody>
</table>

#### ES 6 Description of the Environmental and Social Baseline

The proposed projects under NETAP Package 1, Lot 2 are located in Lagos and Ogun States, south-west Nigeria. The climatic/meteorological conditions in these locations are more or less the same with temperatures, rainfall and humidity ranging from 25.0 °C (77.0 °F) to 28.5 °C (83.3 °F), 13.2 millimetres (0.52 in) to 315.5 millimetres (12.42 in) and 80% to 88% respectively. Ikoyi is one of the regions with the highest amount of rainfall in the Lagos area, with rain often exceeding 300cm every year.

The general air quality of the four (4) transmission substation areas was relatively good and devoid of obnoxious gases, however high concentration of pollutant gases (e.g. CO) was recorded on the perimeter of the sites as a result of vehicular movement and other anthropogenic activities along the boundary wall of the transmission substations.

The proposed projects will service highbrow areas like Ikoyi, Lekki and Ikeja in Lagos, Industrial settlements like Ijora (Lagos) and Ota (Ogun), more or less residential settlements that service commercial areas like Amuwo-Odofin, Itire, Maryland, Alausa and Academic institutions like University of Lagos (Akoka). This will significantly improve the quality and reliability of electricity supply to these areas and consequently the quality of lives of the people.
The culture and way of life of the people of these areas are similar, being Yoruba-speaking areas but the influence of the huge population of people from all over the country who have settled in these areas in search of greener pastures cannot be ignored.

Summary of Audit Findings

Most of the Transmission Substations proposed for rehabilitation under this project are old and have not undergone any significant rehabilitation/re-enforcement since they were commissioned. A good number of them are well overdue for a complete overhaul of both structural and engineering structures while a few (Akoka, Itire and Amuwo-Odofin) are in need of URGENT attention. The Akoka 132/33kv substation is sinking and there is severe tension on the power and control cables due to the collapse of the cable trenches, resulting from the sinking of the surrounding, a situation similar to that of the Alagbon 132/33kV substation before it was rescued by a World Bank Project (NEGIP). The station is actually a disaster waiting to happen if nothing is done IMMEDIATELY.

Generally, the substation surroundings are littered with scrap and spare materials as well as empty water sachets. A good number are overgrown with weeds and waste management is generally poor due to the non-existence of a waste management plan.

Wastes are not sorted/segregated into the different waste bins but are dumped haphazardly and disposal is by open burning thereby polluting the ambient air and creating an unhealthy environment which promotes diseases/health conditions. Waste collection points are major attraction for insects and rodents which in turn attracted reptiles especially snakes.

Some of the slabs for the cable trenches in the switchyards are displaced, the gravel is depleted and weeds have taken over some, though a few are relatively clean. The protection and lighting systems in most of the substations are bad
and the operators carry out their duties at very great risks under these conditions, resulting to use of flashlights at night.

The control room at Alagon, having been only recently constructed, is the only one that is close to a standard condition. All the other control rooms are poorly lit, poorly ventilated and littered with all sorts of scrap and spare materials. The control room at Ota was burnt in a fire that engulfed the indoor 33kV Panels but it was never repaired. The control room buildings at Maryland, Akoka, Amuwo-Odofin and Itire are in very bad conditions.

The main Hazardous material associated with the proposed rehabilitation/re-enforcement projects are Polychlorinated Biphenyls (PCBs) and Sulphur Hexafluoride (SF6). PCBs were widely used as di-electric fluids to provide electrical insulation. They are typically found in large quantities at electrical substations and maintenance shops. The use of SF6 is an environmental challenge due to its Green House effect and attendant Global Warming Potential (GWP).

The main Occupational Health and Safety issues at the respective substations are; partial enforcement of the use of PPEs by the substation staff, exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard, non-availability of a well-equipped First-Aid box, insufficient fire extinguisher canisters and lack of adequately trained HSE personnel at some of the substations.

Additional Intervention Recommended for Implementation
In addition to the interventions proposed under NETAP, activities have also been recommended for implementation to add environmental and social
safeguards value to the planned activities and enhance environmental and social sustainability of the project. The Contractors are expected to quote for these activities as part of their assignment.

**ES 7 Potential Environmental and Social Impacts and Recommended Mitigation Measures for the Proposed Rehabilitation Project**

The following impacts are associated with the proposed intervention at Alagbon, Lekki and Egbin 330/132kV transmission substation and Ijora, Alausa, Akoka, Amuwo-Odofin, Itire, Maryland and Ota 132/33kV Transmission Substations;

- Objects falling on persons
- Electric shock (working on a live equipment)
- Slips and trips
- Power outages
- Heavy duty trucks causing traffic congestions
- Fall from height
- Oil spillage
- Indiscriminate disposal of solid waste
- Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers
- Theft of construction materials
- Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs).
• Possible Gender-Based Violence (GBV) and Sexual Exploitation and Abuse (SEA)

A detailed list of the potential associated impacts of the proposed projects under NETAP Package 1 Lot 2 and the recommended mitigation measures as well as cost of remediation is provided in Table 5.1.

ES 8 Stakeholders Consultation

The consultation was limited to the staff of the substation at this stage since a broader consultation for the NETAP was held with some stakeholders at Abuja (see stakeholder Consultation for NETAP in the Environmental and Social Management Framework – ESMF and Resettlement Policy Framework – RPF for NETAP). A more direct interaction with the immediate neighbors of the project site will be done just before, during and the close of the project to ensure a smooth implementation of the project.

ES 9 Conclusion

The various projects proposed for implementation by the Federal Government of Nigeria, through the Transmission Company of Nigeria (TCN), under the IDA-financed Nigeria Electricity Transmission Project (NETAP) will involve upgrade/reinforcement of existing Transmission Substations as well as upgrade of existing Transmission Lines.

The ERSU_PMU has prepared this ESMP, with guidance from the safeguards team of the World Bank, to highlight the existing environmental and social conditions at the respective sites and the potential environmental and social
impacts associated with the proposed rehabilitation/reinforcement projects. Using the relevant environmental laws of Nigeria and the Safeguards Policies of the World Bank, this ESMP, proffers appropriate mitigation measures and assigns responsibilities as well as costs to the tasks required for the sustainable implementation of the projects. All these will be of no use if timely and effective monitoring is not done to ensure compliance with the recommendations.

An estimated cost of USD 90,000 is proposed for the mitigation of the potential impacts associated with the rehabilitation/reinforcement project at each site.

In conclusion, therefore, safeguards monitoring of these projects is key to ensuring the sustainable implementation of the proposed projects if the development objective of the World Bank must be met as far as NETAP is concerned.
1 INTRODUCTION

1.1 Background

The Federal Government of Nigeria is taking steps to improve the quality and reliability of electricity supply within the country in order to meet the growing demands for energy and improve the quality of the lives of the people. Efforts in this direction in the recent past include the enacting into law of the Power Sector Reform Act (2005) and the eventual unbundling and privatization of the formerly government-owned Power Holding Company of Nigeria (PHCN). This led to some major successes which include: (i) addressing broken institutional and regulatory systems; (ii) enhancing sector governance and accountability; (iii) establishing a new pricing regime (multi-year tariff order, MYTO); and (iv) scaling up private sector investment in the sector.

The World Bank now plans to finance a Nigeria Electricity Transmission Project (NETAP) that will be national in scope but with focus on the north-Eastern and south-western parts of the country. The project aims to improve the capacity and efficiency of the transmission network and increase access to electricity services. The project will, among others:

i). Upgrade/Reinforce existing Transmission Substations

ii). Upgrade existing Transmission Lines

These might entail relocating people that may have encroached upon the ROW of the transmission lines to be rehabilitated thus leading to resettlement of people, loss of assets or access to resources and consequently loss of income or means of livelihood.
To mitigate the negative impacts of the project on people and their assets RAPs would be prepared for sub-projects under NETAP that will result in involuntary resettlement.

This document, the “Environmental and Social Management Plan (ESMP), lays out the overall policies for the protection of the environment in Nigeria in line the regulations of the Federal Ministry of Environment and the safeguards policies of the World Bank, identifies the potential impacts associated with the implementation of the proposed intervention projects at these stations, proffers appropriate mitigation measures and assigns responsibilities as well as costs to the tasks required for the sustainable implementation of the projects.

Where Bank policy (i.e. OP 4.01) and Nigerian guidelines on the protection of the environment differ, the policy that is more stringent will be enforced.

1.2 Project Locations

The substations covered by this ESMP are; 330/132kV Transmission Substations at Egbin, Alagbon and Lekki as well as the Ijora, Alausa, Akoka, Amuwo-Odofin, Itire, Maryland and Ota 132/33kV Transmission. These substations are located in Lagos State and Ogun State in south-west Nigeria.
Figure 1: Political Map of Nigeria showing the 36 States of the Federation and the Federal Capital Territory (FCT).
1.3 Objectives of the ESMP

The main objective of this ESMP is to ensure that the proposed rehabilitation/re-enforcement projects comply with the relevant national environmental and social legal requirements of the government of

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1 The Grid Map above does not show some of the stations because their locations are too close together.
Nigeria and the applicable environmental and social safeguards policies of the World Bank.

In order to achieve this objective the ESMP sets out the applicable legal frameworks for ensuring sustainable implementation of the proposed interventions, identifies the potential environmental and socio economic benefits of the project as well as any potential adverse environmental and socio economic impacts and also proffers appropriate mitigation measures to address the adverse impacts to enhance project benefits. The methods applied in arriving at the potential impacts of the project include the following:

- Assessment of the baseline environmental and social situation of the Site and the surrounding area (including auditing the existing facility)
- Assessment of the potential environmental and social impacts of different project components and subcomponents impacts during construction and operation phases
- Proposing measures that may be adopted to mitigate negative, and enhance positive, impacts; and to achieve an overall improved management of environmental and social challenges and opportunities.
- Ensuring compliance of the rehabilitation process with pertinent national regulations and World Bank safeguard policy (Whenever there is a discrepancy between national and international requirements, the more stringent ones will be considered).

The ESMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts in respect of the project life cycle.
1.4 Approach

The preparation of this ESMP involved the compilation of readily available technical data and information concerning the project elements and the project areas. Field visits and investigations (baseline surveys) were performed in order to assess the existing conditions at the project sites and including interviews as well as discussions were also held.

The following standards, regulations, and laws were considered in preparing this ESMP:

- The regulations, guidelines and standards of the Federal Ministry of Power as it concerns high voltage power transmission in Nigeria.
- The regulations, guidelines and standards of the Federal Ministry of Environment concerning power generation and transmission activities in Nigeria.
- All International Conventions/Treaties on Environmental Protection to which Nigeria is party.
- The Corporate and Operational Policies of the Transmission Company of Nigeria.
- Electricity Law related to the right of way and the public electricity connections.
- World Bank Group Environmental, Health and Safety guidelines.
1.5 Impact Evaluation Methodology

The various impacts associated with the rehabilitation projects proposed for Alagbon, Lekki, Egbin (330/132kV), Ijora, Alausa, Akoka, Amuwo-Odofin, Itire, Maryland and Ota (132/33kV) transmission substations are characterized as either positive or negative, direct or indirect, immediate or long-term to depict the level of their importance and probability of occurrence during construction or operation phases. Additional description of these impacts is also provided based on their reversibility or otherwise.

1.5.1 Magnitude of Impact

This describes the degree and extent to which the proposed NETAP interventions at these substations will alter the environment.

- The impacts associated with the NETAP sub-projects are characterized as either positive or negative depending on their merits. The negative impacts are further classified as Negligible, Low, Medium, or High based on the following parameters:
  - Duration – the weight of impact is directly proportional to the duration of exposure of the receptor to the said impact, except for impacts that cover a wide area or exceed the life span of the project.
  - Time – The time of which an impact commences or occurs can be vital to construction and maintenance operations.
• Area – The area impacted is to be considered, as some impacts may extend beyond the project’s boundaries or interfere with land regulations, etc.

• Probability – The chance of an impact occurring and its frequency is to be assessed

• Reversibility - The possibility and extent to which an impact can be intervened or mitigated for a factor to return to the Baseline environment

• Compliance – National and international standards and regulations may dictate an impact’s maximum allowable consequence.
2 ENVIRONMENTAL LEGISLATIVE AND REGULATORY FRAMEWORK

The World Bank, like most donor agencies, requires that projects funded by them comply with relevant International best practices, in this case, as it pertains to environmental and social sustainability. This section therefore lists the relevant national and International environmental and social policies, legal and administrative framework as well as the safeguards policies of the World Bank that will guide the implementation of these NETAP sub-projects at Alagbon, Lekki, Egbin, Ijora, Alausa, Akoka, Amuwo-Odofin, Itire, Maryland and Ota Transmission substations. Where any two or more of these policies differ the more stringent or that which favours the development objective of the World Bank more will prevail.

2.1 National Legal Framework

The national environmental regulatory framework applicable to Electrical Energy Transmission projects includes the following laws and decrees

2.1.1 National Environmental Law

The Federal Ministry of Environment is the custodian of the Nigerian Environmental Laws. These laws cover the main issues pertaining to environmental protection and strive to attain the following objectives among others:

- Protecting the environment from all sorts and types of pollution
- Protecting public health and social welfare
Some specific guidelines to be used in ensuring compliance include the following:

- World Bank Group EHS General Guidelines
- World Bank Group EHS Guideline for Electric Power Transmission and Distribution

These Guidelines are based on the sustainability principles of the World Bank and are designed to achieve its development objectives. They cover four key areas:

- Environmental;
- Occupational Health & Safety (OHS);
- Community Health & Safety (CHS); and
- Construction and Decommissioning.

The EHS Guidelines contain the performance levels and measures that are normally acceptable to the World Bank. This ESMP provides site-specific targets with appropriate timetable for achieving the tasks designed to ensure compliance with the respective guidelines in keeping with the provisions of requirements for existing facilities. Where these guidelines differ from relevant State laws the more stringent will apply.

The EHS Guidelines for Transmission and Distribution define the environmental issues specific to operation of Power Transmission projects as terrestrial habitat alteration, aquatic habitat alteration, electric and magnetic field, and hazardous materials. Air emissions, wastewater discharges, and solid wastes related to construction and decommissioning activities are evaluated in accordance with the EHS General Guidelines.

The Guidelines also address the occupational and community health and safety hazards during the construction, operation, and decommissioning of
Power Transmission projects. The occupational health and safety hazards may include physical hazards such as working at heights, working with live power, and exposure to chemicals. According to the guidelines the major community health and safety hazards are aircraft safety, electrocution, and electromagnetic interference.

Table 3: Maximum permissible limit for noise intensity in the different areas according to World Bank requirements

<table>
<thead>
<tr>
<th>Requirements of WB</th>
<th>One hour $L_{Aeq}$ (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptor</td>
<td>Day time 7 a.m. to 10 p.m.</td>
</tr>
<tr>
<td>Residential</td>
<td>55</td>
</tr>
<tr>
<td>Industrial</td>
<td>70</td>
</tr>
</tbody>
</table>

Table 4: Standards and Limits for Noise Levels in the Work Environment

<table>
<thead>
<tr>
<th>Requirements of WB</th>
<th>Location /activity</th>
<th>Equivalent level</th>
<th>Maximum $L_{Amax,fast}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heavy Industry (no demand for oral communication)</td>
<td>75 dB(A)</td>
<td>110 dB(A)</td>
</tr>
<tr>
<td></td>
<td>Light industry (decreasing demand for oral communication)</td>
<td>50-65 dB(A)</td>
<td>110 dB(A)</td>
</tr>
<tr>
<td></td>
<td>Open offices, control rooms, service counters</td>
<td>45-50 dB(A)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Individual offices (no disturbing noise)</td>
<td>40-45 dB(A)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Hospitals</td>
<td>30-35 dB(A)</td>
<td>40 dB(A)</td>
</tr>
</tbody>
</table>
### Table 5: Standards for ambient air and air quality

<table>
<thead>
<tr>
<th>Issue</th>
<th>Ambient air parameters</th>
<th>Ambient air pollutants threshold According to WHO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 hr</td>
</tr>
<tr>
<td>Air Quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carbon monoxide CO µg/m³</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Sulfur dioxide SO₂ µg/m³</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Nitrogen oxides NOₓ µg/m³</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Particulates PM₁₀ µg/m³</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Particulates PM₂·₅ µg/m³</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>TSP µg/m³</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Ozone</td>
<td>N/A</td>
</tr>
</tbody>
</table>
3.0 PROJECT DESCRIPTION

The Nigeria Electricity Transmission Project (NETAP) is part of the continuous effort of the Federal Government of Nigeria to improve the quality of the lives of the citizens through access to power for homes and businesses. NETAP is designed to finance specific programs to increase quantity, quality and access to the electricity network, particularly in the Northern part of the country where economic activities have long suffered from lack of affordable energy supply. NETAP will also provide support for improvements in the human capacity of the government agencies that will be involved in the implementation of the project through technical assistance and capacity building.

The gains in the implementation of NETAP, among others, include; improvement the voltage level and system stability, improvement in the quality and reliability of available electricity supply to power homes and businesses, Increase in the revenue base of TCN.

3.1 Project Scope

The proposed NETAP, which is to be financed from an IDA Credit, is subdivided into three (3) components aimed at addressing some critical TCN needs in Transmission Network Infrastructure, Grid Management and Capacity Building & Technical Assistance. **Sub-component 1a** will finance investments grouped by geographic locations to reduce interdependence and increase efficiency in implementation. The geographical areas are selected to cover the entire country as much as possible i.e. (i) the North and Central, reinforcing Kaduna-Kano-FCT Axis; (ii) the South-West including the Lagos network; (iii) the South reinforcing the Delta area network; and (iv) the North East.
Sub-Components 1 (b) addresses improvements in power delivery and network reliability on 132kV transmission grid in Kwara, Osun, Ogun, Oyo, Abia, Enugu, Anambra, Edo, Delta, Rivers, Kogi, Kano, Jigawa, Gombe, Borno and Katsina States.

Component 2 supports integrated operation of the power system, restoration and expansion of the SCADA system and tele-communication equipment.

Component 3 will support capacity building and technical assistance activities at key sector institutions and other relevant stakeholders in order to ensure that the implementation of reform program is successfully carried out.

3.2 Scope of Rehabilitation / Reinforcement

Under NETAP Package 1, Lot 2, IDA will finance the rehabilitation/re-enforcement of existing TCN substations to help achieve the overall objectives of the proposed project. The table below describes the various interventions proposed for implementation at the respective TCN substations in this procurement package;
4 ENVIRONMENTAL AND SOCIAL BASELINE

This section describes the prevailing environmental and social conditions at the respective locations where the proposed projects under NETAP Package 1, Lot 2 will be implemented. It establishes their various safeguard inadequacies, highlights the existing occupational health and safety concerns and weighs the potential impacts the proposed projects will have on the immediate environment and staff working at the substations. In a bid to improve the environmental, health and social conditions at these substations and mitigate associated potential negative impacts, while optimizing the positive impacts, this section recommends various safeguards interventions that should be implemented at the respective substations alongside the proposed engineering interventions in order to add value to the overall rehabilitation/reinforcement projects, bring the substations to a minimum best-practice standard and help achieve the development objective of the World Bank.


4.1 Alagbon 330/132kV Transmission substation.

The Alagbon 330/132kV Transmission Substation is located along Osborne Road, adjacent Dolphin Estate in the Ikoyi Area of Lagos. (Fig. 3). The substation was commissioned in 1970 as 132/33kV, 2/66MVA transmission substation but was later rehabilitated after it started sinking through another World Bank financed project, the Nigeria Electricity and Gas Improvement Project (NEGIP), re-enforced with additional 2x60MVA transformers and upgraded to a 330/132kV Transmission substation with the addition of a
1x300MVA Transformer under another Federal Government intervention, the National Integrated Power Project (NIPP).

The rehabilitation job carried out at the Alagbon transmission substation was designed to arrest the sinking of the substation due to settlement of the surroundings arising from marshy nature of the environment – the larger part of Ikoyi area is built on sand-filled portions of the Lagos Lagoon. The substation had sunk by more than 1 meter when the NEGIP intervention commenced. By this time the entire 132kV switchyard had been submerged, the cable trenches had collapsed – causing tension in the cables and even detachment from the panels in the control room, the foundation of the control room itself had cracked in two, leaving the panels with live cables hanging dangerously. The rehabilitation project reclaimed the entire premises
of the substation, rebuilt the foundations of the major structures (cable trenches, control room building), re-graveled the entire switchyard and refurbished the 2No. 66MVA transformers (Fig. 6). An Environmental and Social Management Plan (ESMP) was prepared for this rehabilitation project under NEGIP to help address the potential environmental and social impacts that were associated with the project. While the rehabilitation work was going on at the substation a 1x60MVA Mobitra was provided, under the same NEGIP project, to serve as alternation source of power supply to the customers that were fed from the station. Several stakeholder consultations were held at different levels to capture the opinion and concerns of the Project Affected Persons (PAPs). The NEGIP rehabilitation project generally demonstrated good practice in environmental and social sustainability throughout its implementation.

The NIPP upgrade project at the Alagbon substation involved the installation of 2x300MVA transformers and complete associated equipment. This required the construction of equipment foundations, erecting of towers for associated equipment and bays for the incoming lines. Though foundations for 2No. 300MVA transformers were constructed only 1 was installed as the second was taken to Lekki, where it was urgently needed thus leaving a spare plinth for an additional 300MVA transformer (Figs. 7 - 9).

4.1.1 Environmental and Social Baseline

Ikoyi lies to the north-east of Obalende in Eti-Osa Local Government Area of Lagos State. The characteristic temperatures, rainfall and humidity ranging from 25.0 °C (77.0 °F) to 28.5 °C (83.3 °F ), 13.2 millimetres (0.52 in) to 315.5 millimetres (12.42 in) and 80% to 88% respectively. Ikoyi is one of the regions with the highest amount of rainfall in Lagos, with rain often exceeding 300cm every year.
The vegetation cover of the project area has been greatly altered by human activity but traces of the original vegetation can be seen in what is left of the marshy soil characteristic of the lagoon.

Ikoyi is regarded as the most affluent neighborhood of Lagos, having some of the most opulent residential facilities in Nigeria. Its real estate is considered to be about the most expensive on the entire African continent, with the average new apartment selling for US$1 million. Ikoyi is arguably the wealthiest community within Lagos State.

Some major attractions in Ikoyi include Awolowo Road, which is a high street lined with upscale shops and boutiques; Ikoyi Club, Ikoyi Gulf club, Ikoyi Hotel, Ikoyi Prisons, Dodan Barracks (the former seat of power in Nigeria), the then Federal Secretariat, Radio House Ikoyi. Some multinational Oil companies have relocated the residential quarters of their staff to Ikoyi due to the Crisis in the Niger Delta. Ikoyi includes the newer suburbs of Banana Island, Parkview Estate, Dolphin Estate and other luxurious blocks of flats that are springing up.

Ikoyi is no longer the modest, single family residential area it was during the colonial era but rapid expansion and development of Ikoyi has not been matched with proportionate development in infrastructure. This general lack of basic amenities like constant electricity, pipe-borne water, and general decay in basic infrastructure in this affluent settlement explains why the Federal Government, through this World Bank-financed NETAP is investing in the rehabilitation of the Alagbon 330/132kV Transmission substation.
4.1.2 Land cover
Ikoyi is a heavily built up area with very good road network and structures that provide residential and office accommodations for homes, shops and corporate establishments. Being a heavily built-up area the greater of Ikoyi is covered with asphalt and interlocking tiles used for road construction and concrete structures used for construction of bridges and houses. In the recent past, the Lagos State government embarked on the beautification of the city of Lagos by converting the lawns in the streets and spaces enclosed by ramps on bridges to gardens thereby increasing the vegetation cover of the land.

4.1.3 Land use
Being a high-brow residential area land in Ikoyi is used mostly for accommodation and business purposes. The types of accommodation provided include both private residences and hotels, most in the highly luxurious status (Banana Island, Parkview Estate, and Dolphin Estate). The Falomo area of Ikoyi has a chain of shops and business offices. Development in Lagos is strictly regulated by the Lags State Development Control and different classes of Land Use Charges are enforced depending on the kind of development.

4.1.4 Audit Findings at Alagbon 330/132kV Transmission Substation.
Rehabilitation work from the NEGIP project is that was designed to address the sinking substation is at its final stages. Traces of construction
materials could be seen at various locations at the site but the site is relatively clean.

4.1.4.1 The Substation Environment
The substation environment is overgrown with weeds in some areas and there are pockets of stagnant water bodies within the substation premises.

Figure 4 Ponds in substation environment at Alagbon 330/132kV Substation.

Figure 5 Overgrown weeds and empty drums at the 330kV side of the substation.
4.1.4.2 *The Switchyard*

The slabs for the cable trenches were displaced in some areas due to ongoing work on the cables the site but the switchyard has been overlaid with a fresh layer of gravel as part of the ongoing rehabilitation works under NEGIP. Generally the switchyard is neat and tidy as a repair works are almost completed on most of the equipment within the switchyard.

There is an existing plinth and space for the installation of the proposed 300MVA transformer and associated equipment in the switchyard under NETAP.

No cable trenches for the proposed 330kV cables taking power from the 300MVA Transformer.

*Figure 6 2x66MVA Transformers at the 132kV switchyard, Alagbon undergoing rehabilitation.*
Figure 7 Section of the 330kV switchyard at Alagbon 330/132kV Substation.
4.1.4.3 **Control room**

The Control Room was newly constructed under the NIPP project for the upgrade of the substation to a 330/132kV Transmission substation.

It was however observed that the Air conditioners supplied under the NIPP project are not functioning properly thus making some sections of the control room warmer than required.

There is insufficient space for the installation of Panels for the proposed 330 kV control room equipment.
4.1.4.4  

**Waste Production and Disposal**

The wastes found at the Alagbon Transmission substation are mainly wastes from the ongoing rehabilitation work at the substation and these include scrap wood from packing containers, scrap cables and polyethylene materials used in wrapping substation equipment. Other wastes include waste water bags and plastic water bottles.

Waste management in the transmission substation could be significantly improved. Wastes were not sorted/segregated into the
different waste streams but are dumped haphazardly and disposal was by open burning thereby polluting the ambient air and creating an unhealthy environment which promotes diseases/health conditions. Waste collection points are major attraction for insects and rodents which in turn attracted reptiles especially snakes.

4.1.4.5 Hazardous Materials

The main Hazardous material electrical power transmission substations are Polychlorinated Biphenyls (PCBs) and Sulphur Hexafluoride (SF6). PCBs were widely used as di-electric fluids to provide electrical insulation. They are typically found in large quantities at electrical substations and maintenance shops. Its use has been largely discontinued due to its potential to cause cancer. Sulfur Hexafluoride (SF6) is used as an insulator for electrical switchgear equipment especially in breakers. The use of SF6 is an environmental challenge due to its Green House effect and attendant Global Warming Potential (GWP). It is advised therefore that its use is minimized.

Old manufactured power transformers like those at Alagbon transmission substation (1970) are a major legacy source of PCBs.

4.1.4.6 Occupational Health and Safety

One of the main Occupational Health and Safety issues at the Alagbon substation is the partial enforcement of the use of PPEs by workers and lack of proper screening and guidance for visitors to the substation.

Another main HSE issue associated with the switchyard is exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard. These emissions have the capacity to affect the functioning of vital body organs like the heart and brain that respond to electric
currents in different ways thus posing serious health risks if over-
exposure occurs for whatever reasons.

No HSE personnel to guide visitors round the facility and ensure they
adhere to safe practices at all times while at the substation.

A well-equipped First-Aid box was sited at the site of the contractor
carrying out he rehabilitation works at the Alagbon Transmission
substation but none was provided at the control room for the
Operators.

4.1.4.7 Site Security

The Alagbon substation premises is well fenced with block walls but no
proper gate. The illumination within the general environment of the
substation, outside the switchyard, is very poor. There is also no security
man manning the entrance to the substation to keep check on the
movement in and out of the substation.

4.1.4.8 Fire and Emergency Precautions

Fire extinguisher canisters were available, functional and serviced.
The staff on duty are conversant with the use of the extinguishers.
Smoke detectors, fire alarms, fire hose and hydrants were
installed in the control room building.

The upgrade of the substation into a 330/132kV Transmission substation however requires the
installation of a higher grade of fire-fighting equipment
like stand-alone fire hydrant systems. The transmission
substation operators have little or no training in firefighting.
4.1.5 Proposed Intervention under NETAP.

Under the proposed Nigeria Electricity Transmission Project IDA will fund the Supply & Installation of 1 x 300MVA 330/132kV, 2 x 100MVA 132/33kV Power Transformers, Switchgears and Associated Equipment.

There is a spare Transformer plinth and bay for the additional 300MVA Transformer being proposed under NETAP.

4.1.6 Additional Intervention Recommended for Implementation.

In addition to the interventions proposed in 4.1.5 above the following activities are also recommended for implementation to add environmental and social safeguards value to the planned activities and enhance environmental and social sustainability of the project:

- Construction of additional cable trench for 2x100MVA Transformer
- The substation should be landscaped and grasses planted to ward off erosion and collection of small ponds within the substation premises.
- Clearing of grass and removal of scrap materials
- Construction of scrap/spare yard
- Construction of water hydrant and installation of fire automatic fire alarm systems at the switchyards.
- Rehabilitation of the lighting system at the switchyards (330 and 132kV).
- Installation of lighting system for the entire substation surrounding.
- Installation of safety warning signs at designated places within the substation premises.
- Provision of first Aid and training in provision of first
4.1.7 Associated Environmental and Social impacts

The following potential impacts are associated with the proposed intervention at Alagbon 330/132kV transmission substation;

- Objects falling on persons
- Electric shock (working on a live equipment)
- Slips and trips
- Power outages
- Heavy duty trucks causing traffic congestions
- Fall from height
- Oil spillage
- Indiscriminate disposal of solid waste
- Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers
- Theft of construction materials
- Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs)
- Possible Gender-Based Violence (GBV) and Sexual Exploitation and Abuse in the surrounding community because of largely male workforce
4.2 Lekki 330/132kV Transmission substation.

The Lekki 330/132kV Transmission Substation is located along the Lekki-Epe Express way (Fig. 12.) adjacent the Redeemed Christian Church of God, Lekki. The 132/33kV section was commissioned with 2 No. 60MVA Transformers and associated equipment while the 330/132kV section was commissioned in June 2015 with 1 No. 300MBA transformer and associated equipment. The substation was initially a 132kV Transmission substation that was fed by a 132kV Transmission line but was later upgraded to a 330kV substation with the addition of the 300MVA Transformer and the conversion of the incoming line to a 330kV line.

4.2.2 Environmental and Social Baseline

**Lekki**, a city in Lagos State, is a natural Peninsula East of the city of Lagos. It is bounded by the famous Victoria Island and Ikoyi to the west and the Atlantic Ocean to its south, Lagos Lagoon to the north, and Lekki Lagoon to its east.
Figure 12 Satellite Image of Lekki, showing Lekki 330/132kV Transmission Substation in yellow.

The temperature and rainfall of the Lekki area is same as those of Lagos State described in earlier sections above. The vegetation is however the typical coastline Mangrove forest type. Lekki hosts the Lekki Conservation Centre, a centre for bio-diversity conservation that was established in 1990 by the Nigeria Conservation Fund (NCF), as a pilot conservation project for the protection of wildlife and mangrove forests of Nigeria's South-West coastline from the threat of urban development. This centre serves as a means of protecting endangered animals species like *bush bucks, mona monkeys, squirrels, snakes, crocodiles, monitor lizards, duikers, giant rats and hogs*. The vegetation here consists of a unique mix of an expansive stretch of marshland and savannah grassland teeming with wildlife, as well as rich aquatic flora and fauna.

The Lekki peninsula is approximately 70 to 80 km long, with an average width of 10 km. Much of the city is still under construction with only the 1st phase having been completed. The city is still largely under construction. Lekki currently houses several Estates, gated residential developments, agricultural farmlands, areas allocated for a Free Trade
Zone, with an airport, and a sea port under construction. Lekki is today a high-brow settlement but much of it used to be a slum known then as ‘Maroko’ before it was destroyed by the Raji Rasak led Lagos State military Government.

4.2.3 Land cover
Lekki is still developing therefore much of it is still natural environment with sands and mangrove forests and water bodies. Since residential and commercial developments are springing up fast, a good portion of Lekki is covered with Asphalt and concrete (roads and bridges) and buildings.
4.2.4 Land use

Land in Lekki, being under development, is used for varying purposes and the Lagos State government is mindful to avoid mistakes made in other parts of Lagos as they developed. Different parts of the City of Lekki have been earmarked for various purposes, as would be found in any modern city across the world. Large, high-brow residential estates of different classes are springing up in Lekki. There is also the Free-Trade Zone that is meant to be an international commercial center. The Dangote Refinery is also located in Lekki. Some sections of the city have been reserved for agricultural purposes. The Lekki Conservation Centre is one of the most impressive effort at preserving a number of endangered species.

Like in other parts of Lagos, development is strictly regulated by the Lagos State Development Control and different classes of Land Use Charges are enforced depending on the kind of development.

4.2.5 Audit Findings at Lekki 330/132kV Transmission Substation.

The Lekki Transmission substation is relatively clean but the control room for the 132kV section is poorly kept with old furniture inadequate lighting. This section describes the general environment of the substation and proffers measures for addressing lapses observed.
4.2.5.1 The Substation Environment

It was evident that efforts are being made at keeping the substation environment clean but more needs to be done in the aspect of waste management. Some sections of the substation are still overgrown with weeds.
4.2.5.2 The Switchyard

Some of the slabs for the cable trenches were displaced in some areas. The switchyards are generally clean but the gravel layer needs to be relayed as some areas have been exposed. There is an existing plinth and space for the installation of the proposed 300MVA transformer and associated equipment in the switchyard under NETAP.

There are available plinths for the prosed 1x300MVA and 2x100MVA Transformers at both the 330 and 132kV switchyards.

Figure 15 Lekki 132kV switchyard section

Figure 16 132/33kV Switchyard Section (Notice weeds and depleted gravel topping at the switchyard)
4.2.5.3 **Control room**

The Control Room was newly constructed under the NIPP project for the upgrade of the substation to a 330/132kV Transmission substation. It was however observed that the Air conditioners supplied under the NIPP project are not functioning properly thus making some sections of the control room warmer than required.

There is insufficient space for the installation of Panels for the proposed 330 kV control room equipment.
Figure 19 Control Panels at the Lekki 132kV Control Room.

Figure 20 Fire extinguisher cans at the Lekki Control Room and Scrap materials dumped in the lower Section of the control room.
4.2.5.4 Waste Production and Disposal

The wastes found at the Lekki Transmission substation are mainly wastes from scrap materials used for repair/rehabilitation works at the substation (scrap metals, empty Oil drums, cables). Other wastes include from the ongoing rehabilitation work at the substation and these include scrap wood from packing containers, scrap cables and polyethylene
materials used in wrapping substation equipment. Other wastes include waste water bags and plastic water bottles.

Waste management in the transmission substation could be significantly improved. Wastes were not sorted/segregated into the different waste streams but are dumped haphazardly and disposal was by open burning thereby polluting the ambient air and creating an unhealthy environment which promotes diseases/health conditions. Waste collection points are major attraction for insects and rodents which in turn attracted reptiles especially snakes.

4.2.5.5 Hazardous Materials
The main Hazardous material at electrical power transmission substations are Polychlorinated Biphenyls (PCBs) and Sulphur Hexafluoride (SF6). PCBs were widely used as di-electric fluids to provide electrical insulation. They are typically found in large quantities at electrical substations and maintenance shops. The use of SF6 is an environmental challenge due to its Green House effect and attendant Global Warming Potential (GWP).

4.2.5.6 Occupational Health and Safety
The main Occupational Health and Safety issues at the Lekki substation is the partial enforcement of the use of PPEs by the substation staff.

Also an issue is the exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard. These emissions have the capacity to affect the functioning of vital body organs like the heart and brain that respond to electric currents in different ways thus posing serious health risks if over-exposure occurs for whatever reasons.

A well-equipped First-Aid box was cited in the control room.
4.2.5.7 Fire and Emergency Precautions

Fire extinguisher canisters were available, functional and serviced. The staff on duty are conversant with the use of the extinguishers. The substation has a well-equipped fire hydrant station that has never really been put to use. This systems is not functioning and therefore needs to be repaired and made ready to use. (Fig. 23). Upgrade of the substation into a 330/132kV Transmission substation however requires the installation of a higher grade of firefighting equipment like stand-alone fire hydrant systems. The transmission substation operators have little or no training in firefighting.

Figure 23 Fire Hydrant Station and Pipes at Lekki Transmission substation.
Fire extinguisher canisters were available, functional and serviced. The staff on duty are conversant with the use of the extinguishers. Smoke detectors, fire alarms, fire hose and hydrants were installed in the control room building.

The upgrade of the substation into a 330/132kV Transmission substation however requires the installation of a higher grade of fire-fighting equipment like stand-alone fire hydrant systems available within the substation. The transmission substation operators have little or no training in firefighting.

4.2.5.8 Site Security

The Lekki substation premises is well fenced with block walls and steel gates that is manned by a security personnel that controls movement of persons and goods in and out of the substation premises. The lighting within the substation premises and switchyard is however very poor.

4.2.6 Proposed Intervention under NETAP.

Under the proposed Nigeria Electricity Transmission Project IDA will fund the Supply & Installation of 1 x300MVA 330/132kV and 2x100MVA 132/33kV Power Transformer, High Voltage Switchgears and Associated Equipment There is a spare Transformer plinth and bay for the additional 300MVA Transformer being proposed under NETAP.
4.2.7 Additional Intervention Recommended for Implementation

In addition to the interventions proposed in 4.2.6 above the following activities are also recommended for implementation to add environmental and social safeguards value to the planned activities and enhance environmental and social sustainability of the project:

- A complete rehabilitation of the control room building and provision of office furniture for control room staff
- Evacuation of scrap/spare materials and removal of waste from the control room building and substation premises
- Rehabilitation of the ventilation system of the control room
- Rehabilitation of the lighting system in the control room and the substation premises, especially the switchyard
- Installation of safety warning signs at designated places within the substation premises.
- Provision of first Aid and training in provision of first
- Re-graveling of the 132kV section of the switchyard
- Construction of access road for maintenance at the 330kV section of the switchyard. (See Fig. 24 below)

![Figure 24 Proposed corridor for maintenance access at 330kV section of Lekki Substation.](image-url)
4.2.11 Associated Environmental and Social impacts

The following impacts are associated with the proposed intervention at Lekki 330/132kV transmission substation;

▪ Objects falling on persons
▪ Electric shock (working on a live equipment)
▪ Slips and trips
▪ Power outages
▪ Heavy duty trucks causing traffic congestions
▪ Fall from height
▪ Oil spillage
▪ Indiscriminate disposal of solid waste
▪ Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers
▪ Theft of construction materials
▪ Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs).
▪ Possible GBV and SEA in the surrounding community due to a largely male workforce.

4.3 Ijora 132/33kV Transmission substation.

The Ijora 132kV Transmission Substation is located in the Ijora Olopa area, off the Ijora course Way on the Lagos mainland. Some notable features in the area include the Ijora Train Terminus, the National Library and the Ijora Fish
market. Adjacent to the substation premises is the Lagos Lagoon that seems to separate the mainland from the Island but linked by the famous Carter Bridge. (See Fig. 25).

The substation premises also houses the old Ijora Power Plant that was commissioned in 1923 to provide power for the Nigeria Railway Corporation and the environs. The substation was commissioned alongside the Power plant by Her Majesty, Queen Elizabeth II in 1923.

![Figure 25 Satellite Image of Ijora Area, Lagos, showing the substation premises in yellow.](image)

### 4.3.1 Environmental and Social Baseline

The temperature, rainfall and vegetation of Ijora are same as those of the other parts of Lagos. Ijora used to be swampy and water-logged till its draining and reclamation in the 1960s by the Lagos Town Planning Authority and the Federal Government of Nigeria.

Originally, Ijora was a slum where residents coming from Lagos Island could reach their homes with the use of canoes. The establishment of a railway terminus at Iddo, however, changed the story and made Ijora very important. This was followed by the construction of a thermal power
plant at Ijora to provide power for the train station in 1923. Nearby settlements in Ijora include Ijora Badiya, Ijora Olopa and Ijora Oloye. The larger part of Ijora consists of slums but the establishment of an industrial estate has attracted firms like K Maroun, Incar cars and West African Cold Storage. The Ijora wharf also functioned as an offloading point for frozen food. Other popular industrial establishments include the 7UP bottling plant, the Iganmu Estate and the National Theatre.

4.3.2: Land cover

Though a significant portion of the Ijora area is covered with construction materials, concrete and Asphalt used for constructing, roads, bridges and houses, parts are still marshy land that open out into the Lagoon.

4.3.3 Land use

Land in Lekki, being under development, is used for varying purposes and the Lagos State government is mindful to avoid mistakes made in other parts of Lagos as they developed. Different parts of the City of Lekki have been earmarked for various purposes, as would be found in any modern city across the world. Large, high-brow residential estates of different classes are springing up in Lekki. There is also the Free-Trade Zone that is meant to be an international commercial center. The Dangote Refinery is also located in Lekki. Some sections of the city have been reserved for agricultural purposes. The Lekki Conservation Centre is one of the most impressive effort at preserving a number of endangered species.
Like in other parts of Lagos, development is strictly regulated by the Lagos State Development Control and different classes of Land Use Charges are enforced depending on the kind of development.

4.3.4 Audit Findings at Ijora 132kV Transmission Substation.

The Ijora 132/33kV transmission substation is an old station and has not undergone any major rehabilitation in recent times. Most of the equipment at the station have been in service since 1923 and have since outlived their lifespans. A complete overhaul of the entire substation and its associated equipment is recommended as the long-term intervention to remedy the numerous lapses at the station. The following section describes the general environmental, health and social characteristics of the Ijora substation as observed on site.

![132/33kV Switchyard Section (Notice weeds and depleted gravel topping at the switchyard).](image-url)
Figure 27 Scrap materials littering the Ijora 132/33kV switchyard (Abandoned Oil Filtration machine) and Broken Cable-Trench Slabs.

Figure 28 Oil leakage from one of the Transformers at Ijora Substation.

Figure 29 Broken concrete slabs and scrap equipment.
4.3.4.1: *The Substation Environment*
The access road to the Ijora substation is narrow and packed with traders selling all sorts of items, especially frozen foods like fish and poultry goods. The environment is that of a typical local Nigerian Market, unorganized and strewed with all kinds of wastes littering the environment. The foul smell of decomposing waste food items and fish fills the air as you approach the substation premises. The TCN premises houses the dilapidated and abandoned Power Plant as well as the Administrative office of the Lagos Transmission Region as well as a private generating firm, Ocean Power.

4.3.4.2 *The Switchyard*
The Ijora 132/33kV Transmission substation is equipped with a 2x30MVA and 1x45MVA transformers and associated equipment. The switchyard is quite untidy and overgrown with weeds. The gravel in the switchyard has practically disappeared. The switchyard is littered with robles of broken concrete from dilapidated civil structures (broken transformer plinths). The cable trenches are broken and quite a number of the slabs are displaced. One of the available transformer plinths for the proposed intervention was destroyed when the transformer it was carrying previously exploded. There is also significant leakage in some of the transformers (Fig. 28). The oil filtration process is also not done in a tidy manner as oil spills accompany practically every filtration exercise.

4.3.4.3 *Control room*
The Control Room has been in service since the construction of the station, but it is relatively clean. Most of the equipment are old and should be replaced with more modern technology.
4.3.4.4 Waste Production and Disposal

The wastes found at the Ijora Transmission substation are mainly concrete rubble, empty transformer oil drums and empty water sachets. Waste management in the transmission substation could be significantly improved. There is not orderly manner of waste collection and handling and disposal at the Ijora substation.

4.3.4.5 Hazardous Materials

The main Hazardous materials at electrical power transmission substations are Polychlorinated Biphenyls (PCBs) and Sulphur Hexafluoride (SF6). PCBs were widely used as di-electric fluids to provide electrical insulation. They are typically found in the large quantities at electrical substations and maintenance shops. Its use has been largely discontinued due to its potential to cause cancer. Sulfur Hexafluoride (SF6) is used as an insulator for electrical switchgear equipment especially in breakers. The use of SF6 is an environmental challenge due to its Green House effect and attendant Global Warming Potential (GWP). It is advised therefore that its use is minimized.

4.3.4.6 Occupational Health and Safety

The use of PPEs is not enforced as the PPEs are not readily available for use by the staff. Also an issue is the exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard. These emissions have the capacity to affect the functioning of vital body organs like the heart and brain that respond to electric currents in different ways thus posing serious health risks if over-exposure occurs for whatever reasons. There is the need to ensure HSE personnel are adequately trained and supervised.
4.3.4.7  Fire and Emergency Precautions

Fire extinguisher canisters were available at the admin-block but not at the switchyard. There is need to provide fire extinguisher canisters dedicated to the switchyard.

4.3.4.8  Site Security

The Ijora substation premises is well fenced with block walls and steel gates that is manned by a security personnel that controls movement of persons and goods in and out of the substation premises. The lighting within the substation premises and switchyard is however very poor.

4.3.4.9  Fire and Emergency Precautions

Fire extinguisher canisters were available, functional and serviced. The staff on duty are conversant with the use of the extinguishers. Smoke detectors, fire alarms, fire hose and hydrants were installed in the control room building.

4.3.5  Proposed Intervention under NETAP.

Under the proposed NETAP IDA will fund the Upgrading of 2 x 30MVA with 2 x 100MVA 132/33kV. Rehabilitation of civil structures of the Control Room and Digital Control System. There is a spare Transformer plinth for an additional transformer but the plinth needs to be re-enforced as parts are broken.
4.3.6 Additional Intervention Recommended for Implementation

In addition to the interventions proposed in 4.3.5 above the following activities are also recommended for implementation to add environmental and social safeguards value to the planned activities and enhance environmental and social sustainability of the project:

- The substation premises needs to be cleared of all scrap materials
- Need to construct new cable trenches and concrete slabs for the trenches
- Need to provide dedicated fire extinguisher kiosk for the switchyard
- Installation of safety warning signs at designated places within the substation premises.
- Provision of first Aid and training in administration of First-Aid
- Re-graveling of the 132kV section of the switchyard

4.3.7 Associated Environmental and Social impacts

The following impacts are associated with the proposed intervention at Lekki 330/132kV transmission substation:

- Objects falling on persons
- Electric shock (working on a live equipment)
- Slips and trips
- Power outages
- Heavy duty trucks causing traffic congestions
- Disturbance of business activities at the fish market along the road to the substation
- Fall from height
- Oil spillage
- Indiscriminate disposal of solid waste
- Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers
- Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs).
- Possible GBV and SEA in the surrounding community due to largely male workforce.
4.4 Alausa 132/33kV Transmission substation.

The Alausa 132/33kV Transmission Substation is located along Obafemi Awolowo Way, adjacent the Ikea Shopping Mall. The Alausa substation has 3 No. Transformers (45MVA, 30MVA and 60MV) serving the entire Ikeja area and surroundings.

![Figure 30 Satellite Image of Ikeja Area showing the Alausa 132/33kV Transmission Substation in yellow.](image)

![Figure 31 Street view of Alausa 132/33kV Transmission Substation.](image)
4.4.2 Environmental and Social Baseline

The temperature, rainfall and vegetation of Ikeja are same as those of the other parts of Lagos.

Ikeja, the state capital of Lagos State, houses the seat of governance in Lagos State. The government house, State Assembly and State Secretariat are all located in Alausa, Ikeja. Other prominent structures in Ikeja include the Murtala Mohammed International Airport, Ikeja City Mall and the famous Shoprite (also in Alausa, Ikeja). Night life in Ikeja is also busy with night clubs like the Femi Kuti's Africa Shrine and Lagbaja's Motherland and a variety of cinemas. Some industrial establishments include the 7UP bottling plant, the Iganmu Estate and the National Theatre.

Business activities in Ikeja are also booming and growing with the ever increasing population of people from all over the country that troop into Lagos. Ikeja is home to the Otigba computer market which started in 1997 as a small market of only 10 shops but now houses about 3000 shops selling all sorts of computers and accessories and office equipment.

4.4.3 Land cover

Ikeja is heavily built-up area with the larger of the surface covered by concrete (houses and road pavements) and tar (road networks). There are, however, patches of green around the Murtala Mohammed International Airport and the various canals that drain into the Lagos Lagoon.

4.4.4 Land use

Ikeja is an old settlement, having been in use since the colonial era. The settlement is heavily built up, with a large of the structures being government buildings, Hotels, shopping centers and residential areas. The
Muritala International Airport as well as the MM1 and MM2 domestic terminals are all located in Ikeja. The presence has, of course, attracted the presence of other aviation authorities/agencies and companies like Nigeria Civil Aviation Authority, Federal Airports Authority etc.

Like in other parts of Lagos, development is strictly regulated by the Lagos State Development Control and different classes of Land Use Charges are enforced depending on the kind of development.

4.4.5 Audit Findings at Alausa 132/33kV Transmission Substation.

The Alausa 132/33kV transmission substation is an old station and has not undergone any major rehabilitation in recent times. Most of the equipment at the station have been in service since its commissioning. A good number of the Cable Trench slabs are broken, leaving rubbles of concrete scattered around the switchyard. One of the Transformers is also leaking and this presents a high risk of PCB contamination, considering the age of the transformer.

There is generally poor housekeeping, with no designated scrapyard or spare yard within the switchyard. The switchyard is also poorly lit and the operators face very serious risks of electrocution, snake bite or injury when they go out in the dark to attend to equipment within the switchyard at night. The Control Room is also poorly lit and the ventilation system is not functioning efficiently.
Figure 32 Transformers at the Alausa 132/33kV Transmission Substation.

Figure 33 Broken Slabs at the 132kV Section of Alausa Substation.

Figure 34 Leaking transformer with Oil on the floor at Alausa Substation
4.4.5.1: *The Substation Environment*

The Alausa 132/33kV Transmission Substation is located along the busy Obafemi Awolowo Way. The access road teeing off into the substation premises is narrow and occupied some road-side mechanics, making it difficult for any heavy duty truck to enter. The substation premises is very tight and there isn’t much space for any form of expansion works within the substation. The immediate surrounding of the substation is overgrown with weeds and the premises is littered with materials for ongoing construction works for a different project by TN/HQ. The
substation shares boundaries with the Alausa Shopping Mall to the left and a canal on its rear and right sides.

4.4.5.2 The Switchyard
The Ijora 132/33kV Transmission substation is equipped with a 60MVA, 45MVA and 30MVA Transformers respectively and associated equipment. One of thetransformers is leaking profusely, leaving a pool of Transformer Oil in its base. The switchyard is untidy with scrap materials littering the premises. The gravel in the switchyard is also significantly depleted. The switchyard is littered with robles of broken concrete slabs, scrap and spare equipment. The cable trenches are broken and quite a number of the slabs are displaced. The lighting at the within the switchyard is poor and operators are not able to see at night.

4.4.5.3 Control room
The Control Room has been in service since the construction of the substation and some of the facilities are in bad shape. The ceiling is gradually coming apart, the ventilation is poor and the lighting is inadequate.

4.4.5.4 Waste Production and Disposal
Most of the waste at the Alausa substation are scrap materials, empty water sachets and waste paper. There is also a pool of transformer Oil from one of the transfers at the substation. There are no designated waste collection bins or collection points. Waste management in the transmission substation could be significantly improved with the introduction of a waste management system.
4.4.5.5 Hazardous Materials

The main Hazardous materials at electrical power transmission substations are Polychlorinated Biphenyls (PCBs) and Sulphur Hexafluoride (SF6). PCBs were widely used as dielectric fluids to provide electrical insulation. They are typically found in the large quantities at electrical substations and maintenance shops. Its use has been largely discontinued due to its potential to cause cancer. Sulfur Hexafluoride (SF6) is used as an insulator for electrical switchgear equipment especially in breakers. The use of SF6 is an environmental challenge due to its Green House effect and attendant Global Warming Potential (GWP). It is advised therefore that its use is minimized.

4.4.5.6 Occupational Health and Safety

The use of PPEs is not enforced as the PPEs are not readily available for use by the staff. Also an issue is the exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard. There is the need to ensure HSE personnel are adequately trained and supervised.

No First-Aid box was sited at the substation. The fire extinguishers had been recently serviced and were in working constrictions. The fire alarms in the control room need to be replaced and appropriate training on fire-safety provided for the HSE personnel.

4.4.5.7 Site Security

The Alausa substation premises is well fenced with block walls and steel gates that is manned by a security personnel that controls movement of persons and goods in and out of the substation.
premises. The access gate, however, needs to be replaced with a more robust one.

4.4.6 Proposed Intervention under NETAP.
Under the proposed Nigeria Electricity Transmission Project IDA will fund the Reinforcement of 1 x 100MVA 132/33kV Power Transformer, High Voltage Switchgears and Associated Equipment.

4.4.7 Additional Intervention Recommended for Implementation
In addition to the interventions proposed in 4.4.7.11 above the following activities are also recommended for implementation to add environmental and social safeguards value to the planned activities and enhance environmental and social sustainability of the project:

- The substation premises needs to be cleared of all scrap materials
- Need to construct new cable trenches and concrete slabs for the trenches
- Need to provide dedicated fire extinguisher kiosk for the switchyard
- Installation of safety warning signs at designated places within the substation premises.
- Provision of first Aid and training in administration of First-Aid
- Re-graveling of the 132kV section of the switchyard
- Need to Rehabilitate the leaking transformer to stop the leakage
• Need to clean the area contaminated with transformer oil and conduct appropriate tests to determine possibility of PCB contamination.

4.4.8 Associated Environmental and Social impacts

The following impacts are associated with the proposed intervention at Lekki 330/132kV transmission substation;

▪ Objects falling on persons
▪ Electric shock (working on a live equipment)
▪ Slips and trips
▪ Power outages
▪ Heavy duty trucks causing traffic congestions
▪ Disturbance of business activities at the fish market along the road to the substation
▪ Fall from height
▪ Oil spillage
▪ Indiscriminate disposal of solid waste
▪ Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers
▪ Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs).
▪ Possible GBV and SEA in the surrounding community due to a largely male workforce
4.5 Amuwo-Odofin 132/33kV Transmission

The Amuwo-Odofin Transmission Substation is located along the Apapa-Oworonshoki expressway in Amuwo-Odofin Local Government Area of Lagos State. It is surrounded by a marshy land that is adjacent to the Nigeria Army Signal Barracks and directly opposite the Nigeria Customs Car Park within the Mile 2 area of Lagos.

The station has 4no transformers; T1 (60MVA), T2 (30MVA), T3 (30MVA) and TR4 (40MVA Mobitra) and was commissioned in 1982 alongside Itire and Akoka Transmission substations. There are 8no 33kV Feeders radiating from the substation to feed the Snake Island, Festak Town, Amukoko, Hoaxing, Kiri-Kiri and Satellite Town areas of Lagos.

![Figure 37 Satellite image showing the Amuwo-Odofin area and the 132/33kV Transmission Substation.](image-url)
4.5.1 Environmental and Social Baseline

The temperature, rainfall and vegetation of Amuwo-Odofin area are same as those of the other parts of Lagos discussed in previous sections above. The Badagry Creek which drains most of Ikorutun, Ikeja, Ejigbo, Ijegun, Oshodi, Isolo and Festa Town empties out into the Atlantic Ocean through the marshy Snake Island.
Amuwo Odofin LGA is made up of largely rural communities with only about 12 out of the 67 communities being urban while 8 are semi-urban. The area hosting the Transmission substation is one of the semi-urban communities with commercial establishments like the Customs Car Park, the Berger Car Depot, a mix of modern residential estates and slums. The Local Government also houses the famous Kiri-Kiri maximum security prison.

Amuwo Odofin LGA has a population density of approximately 300,000 people per square kilometre and a total population of about 1,500,000 according to the 2006 population census. A good number of this population consists of riverine communities like Tomaro, Ilado, Okun Glass, Sankey, Igbo Alejo, Igbologun etc.

The ‘Aworis’ are the native dwellers of Amuwo-Odofin; they, like most Yoruba people, have embraced the Elegba, Oro, Sangbeto and Igunuko festivals. These customs and other traditions of the people are held by their traditional rulers, some of which include the highly reputable Oba Mobadenle Obalade Oyekan- the Onilado of Ilado/Inagbe Islands and Oba Lateef Olayinka Ado, Fabuwa 1, Alado of Ado Land.

The close proximity of the Local Government Area to international waters makes it a good attraction for international trade with people of various extractions engaging in various forms of business activities, especially trading. The hospitality of the people has also attracted people from other ethnic tribes in Nigeria as well as from neighbouring West African States.
4.5.2: **Land cover**
Being a mixture of urban, semi-urban and rural areas the land cover in Amuwo ranges from concrete and asphalt in the urban and semi-urban areas to shrubs, swamps and lagoon in the rural areas.

4.5.3 **Land use**
Land use in Amuwo ranges from commercial and residential development to fishing and farming, especially in the rural communities. Development is spreading fast in Amuwo due to its proximity to international waters and Badagry, the border town with Benin Republic. These generate revenue for the Local Government in the form of taxes and levies on land, assets and business premises.

4.5.4 **Audit Findings at Amuwo-Odofin 132/33kV Transmission Substation.**
The Amuwo-Odofin 132/33kV transmission substation is an old station and has not undergone any major rehabilitation in recent times. Most of the equipment at the station have been in service since 1982 and have since outlived their lifespans.

A major overhaul of the entire substation and its associated equipment is recommended as the long-term intervention to remedy the numerous lapses at the station. The following section describes the general environmental, health and social characteristics of the Amuwo-Odofin 132/33kV Transmission Substation as observed on site.

4.5.4.1 **The Substation Environment**
The access road to the Amuwo substation is well tared and connects to the Apapa-Oworonshoki expressway but the larger part of the
surrounding is this bush (see plate above) and scattered pal trees. The substation environment is laid with concrete.

The water from the borehole at the substation is contaminated with precipitates and there are reports that this could be impurities from chemical dumps from chemical factories around the area. A comprehensive analysis and treatment of whatever is responsible or the water contamination needs to be done.

4.5.4.2 **The Switchyard**

The Amuwo 132/33kV Transmission substation is equipped with 4no Transformers; T1 (60MVA), T2 (30MVA), T3 (30MVA) and T4 (40MVA Mobitra). There are 8no Feeders radiating power to Snake Island, Festak, Hoaxing 1 & 2, Kiri-Kiri and Satellite town areas. The switchyard is located in a small corner of the substation premises (see Fig. 40.). The switchyard is small with no room for expansion and is unfenced, thus constituting a high risk of electrocution.
4.5.4.3: **Control room**

The Control Room has been in service since the construction of the substation and is showing signs of wear and tear. The staircase leading to the control room is not properly lit and constitutes a deathtrap when used at night. The stairway is strewed with all sorts of scrap materials and housekeeping within the control room building is generally poor.
The Gas Insulation System (GIS) room is poorly kept and covered with thick layers of dust (see Fig 42 above).

Lighting and ventilation within the control room are also very poor. The furniture are also in very bad shape and need to be replaced. The fire alarm system also needs to be overhauled while an automatic gas-quencher needs to be installed in the GIS room to protect the facility.

4.5.4.4 Waste Production and Disposal
Waste production at the Amuwo substation is limited due to the small number of personnel at the site. The wastes produced include waste paper, food items, water sachets, scrap equipment. There is no waste generation, handling/management plan in place and there are no sufficient waste collection bins at designated places for waste collection and disposal. The fact that the substation remises is small makes the idea of a separate spare/scrap yard hard to accomplish.

4.5.4.5 Hazardous Materials
The main Hazardous materials at electrical power transmission substations are Polychlorinated Biphenyls (PCBs) and Sulphur
Hexafluoride (SF6). PCBs were widely used as di-electric fluids to provide electrical insulation. They are typically found in the large quantities at electrical substations and maintenance shops. Its use has been largely discontinued due to its potential to cause cancer. Sulfur Hexafluoride (SF6) is used as an insulator for electrical switchgear equipment especially in breakers and Isolators. The use of SF6 is an environmental challenge due to its Green House effect and attendant Global Warming Potential (GWP). It is advised therefore that its use is minimized. One of the Isolators at the substation is said to be leaking, though efforts are on to repair the leakage using competent Contractors, probably, the manufacturer (ABB).

4.5.4.6: Occupational Health and Safety
The use of PPEs is not enforced as the PPEs are not readily available for use by the staff. Also an issue is the exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard and leakages of SF6 gas from leaking Isolators within the GIS room. These emissions have the capacity to affect the functioning of vital body organs like the heart and brain that respond to electric currents in different ways and the lungs thus posing serious health risks if over-exposure occurs for whatever reasons. There is the need to ensure HSE personnel are adequately trained, properly kitted for their job and properly supervised.

A First-Aid box was cited in the control room but is not adequately provisioned with the appropriate items. Provision of first Aid and training in provision of first aid.
4.5.4.7 Fire and Emergency Precautions

Fire extinguisher canisters were available in control room and are regularly serviced. However, there is need to install an automatic fire-fighting equipment in the building.

4.5.4.8 Site Security

The Amuwo substation premises is well fenced with block walls and steel gates that is manned by a security personnel that controls movement of persons and goods in and out of the substation premises. The lighting within the substation premises and switchyard is however very poor.

4.5.5 Proposed Intervention under NETAP.

Under the proposed Nigeria Electricity Transmission Project IDA will fund the Rehabilitation of Building structure and Sinking surrounding area, Replacement of obsolete 132kV equipment, 33KV Metal clad Switchgears, Control & Relay panel and Reinforcement with 2x 60MVA 132/33KV Power Transformer. Also refurbishment of the 1x 30MVA transformers and GIS components.

4.5.6 Additional Interventions Recommended for Implementation.

In addition to the interventions proposed in 4.5.5 above the following activities are also recommended for implementation to add environmental and social safeguards value to the planned activities and enhance environmental and social sustainability of the project:
• The substation premises and control room needs to be cleared of all scrap materials.
• Installation of automatic fire-fighting equipment within the control room and GIS room.
• Need to provide dedicated fire extinguisher kiosk for the switchyard
• Installation of safety warning signs at designated places within the substation premises.
• Provision of first Aid and training in administration of First Aid
• Re-graveling and fencing of the 132kV section of the switchyard
• Rehabilitation of the existing borehole within the substation.

4.5.7 Associated Environmental and Social impacts

The following impacts are associated with the proposed intervention at Amuwo Odoffin 330/132kV transmission substation;

▪ Objects falling on persons
▪ Electric shock (working on a live equipment)
▪ Slips and trips
▪ Power outages
▪ Heavy duty trucks causing traffic congestions
▪ Disturbance of business activities at the fish market along the road to the substation
▪ Fall from height
▪ Oil spillage
▪ Indiscriminate disposal of solid waste
- Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers
- Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs).
- Possible GBV and SEA in the surrounding community due to a largely male workforce

4.6 ITIRE 132/33Kv Transmission Substation

The Itire 132/33kV Transmission substation is located along the Apapa-Oworonshoki Expressway, by Cele Bus Stop, Itire, Lagos State. The substation (marked yellow in Fig. 44) is flanked by a Petrol Service Station on right and a residential estate and Petroleum Depot on the left. Between the substation and the Petrol Service Station is the 132kV Transmission Line that brings supply to the substation (the brown line in Fig. 44). The station was commissioned in 1982 alongside the Amuwo Odofin and Akoka 132/33kV Transmission Substations to provide power to the Itire and Ago areas of Lagos. The substation has not undergone any major rehabilitation or reinforcement since it was commissioned 35 years ago and most of the equipment and even the substation environment are in a terrible state in need or URGENT repair.
Figure 43 Satellite image of Itire area

Figure 44 Itire substation (yellow rectangle), flanked by a petrol service station on its right and a residential estate and petrol depot on its left.
4.6.1 Environmental and Social Baseline Data

The Itire 132/33kV Transmission substation is located in a heavily built and busy area in Itire, Lagos. The immediate surrounding of the substation is drained by a canal that empties into the Badagry Creek. Thus the western boundaries of the substation is a marshy piece of land that
also serves as the Right of Way (ROW) for the 132kV Transmission Line that brings Power into the substation (Fig. 44).

The Itire area provides both corporate and residential accommodation for big and small businesses that provide services for the huge commercial activities that go on at the Apapa Port which is not too far away. Some common businesses include, petrol services stations, petrol depots, warehouses, furniture making outlets, petty trading etc. Some of these businesses, especially petty trading, go on way into the night as most workers only have time to shop on closing from work in the evening. The Local government council generates a huge revenues from taxes paid by all these businesses.

The inhabitants of Itire are attracted from all over the country by the economic/commercial potential of the area, though the native settlers are understandably Yoruba-speaking.

Figure 47 Street Timber and furniture market near the Itire substation.
4.6.2 Land cover and Land Use

Itire is a heavily built-up area with the larger part of the surface covered with concrete (houses and road pavements) and tar (road networks). There are, however, patches of green along the northern canals that drain the area into the Badagry Creek. Like other parts of Lagos, development is regulated by the Lagos State Development Control and different classes of Land Use Charges are enforced depending on the kind of development.

4.6.3 Audit Findings at Itire 132/33kV Transmission Substation.

4.6.3.1 The Substation Environment

Control room building is tightly fitted into the tight space of the substation premises. The floor is covered with concrete but littered with power and control panel cables as well as scrap and spare materials. There is no room for expansion of whatever sort.
4.6.3.2 The Switchyard
There are 3No. Transformers at the switchyard of Itire substation (T1 - 30MVA, T2 – 60MVA and T3 – 40MVA). These transformers feed Ago and Itire areas through Ago & Ago1, Itire1 & Itire2 33kV Feeders. The switchyard is very small (Fig. 50), making difficult for expansion projects. The switchyard is poorly lit and dangerous to access at night.

4.6.3.3 Control room
The Control Room has been in service since the construction of the substation and is in a very bad shape. The Gas Insulation System (GIS) room is poorly kept and covered with thick layers of dust.
Lighting and ventilation within the control room are also very poor. The furniture are also in very bad shape and need to be replaced. The fire alarm system also needs to be overhauled while an automatic fire extinguisher needs to be installed in the GIS room to protect the facility.

Figure 51 Control Panels at the Itire Control Room

Figure 52 Scrap control panels in the control room.
4.6.3.4 **Waste Production and Disposal**

Waste production at the Itire substation is limited due to the small number of the personnel at the site. The wastes produced include waste paper, food items, water sachets, scrap equipment. There is no waste generation, handling/management plan in place and there are no sufficient waste collection bins at designated places for waste collection and disposal.

4.6.3.5 **Hazardous Materials**

The main Hazardous materials at electrical power transmission substations are Polychlorinated Biphenyls (PCBs) and Sulphur Hexafluoride (SF6). PCBs were widely used as di-electric fluids to provide electrical insulation in switchgears and breakers.

4.6.3.6 **Occupational Health and Safety**

The use of PPEs is not enforced as the PPEs are not readily available for use by the staff. Also an issue is the exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard and leakages of SF6 gas from leaking Isolators within the GIS room. There is the need to ensure HSE personnel are adequately trained, properly kitted for their job and properly supervised.

4.6.3.7 **First Aid**

A First-Aid box was cited in the control room but is not adequately provisioned with the appropriate items. Provision of first Aid and training in provision of first aid.
4.6.3.8 Fire and Emergency Precautions

Fire extinguisher canisters were available in the control room and are regularly serviced. However, there is need to install an automatic fire-fighting equipment in the building and the switchyard. The presence of a petrol service station and petrol depot within the neighborhood of the substation increases the risk of fire significantly in the event of a spark.

4.6.3.9 Site Security

The Itire substation premises is well fenced with block walls but the access gate is old and dilapidated. There are security men at the gate that control the movement of persons and goods in and out of the premises. The lighting within the substation premises and switchyard is however very poor.

4.6.4 Proposed Intervention under NETAP.

Under the proposed NETAP IDA will fund the Rehabilitation of Building structure and Sinking surrounding area, Replacement of obsolete 132kV equipment, 33KV Metal clad Switchgears, Control & Relay panel and Reinforcement with 1x 60MVA 132/33KV Power Transformer. Also refurbishment of the 1 x 40 & 60MVA transformers and GIS components.

4.6.5 Additional Interventions Recommended for Implementation.

In addition to the interventions proposed in 4.6.4 above the following activities are also recommended for implementation to add
environmental and social safeguards value to the planned activities and enhance environmental and social sustainability of the project:

- Installation of fire hydrant at the switchyard
- Provision of a fire-truck for the substation
- Reconstruction of the access gate
- Rehabilitation of the ventilation systems and air conditioning systems
- Rehabilitation of the water plant
- Rehabilitation of the control room and rearrangement of fittings and cabling
- Provision of office furniture
- Construction of cable trenches
- Evacuation of all scrap and waste materials from the substation premises
  - Creation of a spare/scrap yard within the substation premises
  - Installation of automatic fire-fighting equipment within the switchyard (fire hydrant).
- Rehabilitation/installation of a fire alarm system at the switchyard
- Provision of dedicated fire extinguisher kiosk for the switchyard
- Rehabilitation of the lighting system for the substation premises and the switchyard
- Installation of safety warning signs at designated places within the substation premises.
- Provision of first Aid kit at the switchyard and training in administration of First-Aid
- Re-graveling of the switchyard
4.6.6  Associated Environmental and Social impacts

The following impacts are associated with the proposed intervention at Itire 132/33kV transmission substation;

- Objects falling on persons
- Electric shock (working on a live equipment)
- Slips and trips
- Power outages
- Heavy duty trucks causing traffic congestions
- Disturbance of business activities at the fish market along the road to the substation
- Fall from height
- Oil spillage
- Indiscriminate disposal of solid waste
- Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers
- Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs).
- Possible GBV and SEA in the surrounding community due to a largely male workforce.

4.7  Maryland 132/33kV Transmission Substation.

The Maryland 132/33kV Transmission substation is located along Mende Road, off the busy Ikorodu expressway in a very busy, heavily built up area, surrounded by residential and commercial buildings as well as schools and shops (see Fig 53. Below). The substation was commissioned in 1982 alongside the Ikorodu, Illupeju and Isolo 132/33kV Transmission substations.
4.7.1 Environmental and Social Baseline

Maryland could loosely be regarded as an extension of Ikeja, only being separated by the Mobolaji Bank-Anthony way on the west and the canal in the northern limits. The environmental statistics and the social patterns are virtually the same (same settlement patterns, urban social life, language etc.). Thus, the temperature, rainfall and vegetation of Maryland area are same as those of the other parts of Lagos discussed in previous sections above.
4.7.2 Land cover and Land Use
Maryland is heavily built-up area with the larger of the surface covered by concrete (houses and road pavements) and tar (road networks). There are, however, patches of green on the northern limits where a canal wraps round its boundary with Ikeja. Like in other parts of Lagos, development is strictly regulated by the Lags State Development Control and different classes of Land Use Charges are enforced depending on the kind of development.

![Satellite image showing the boundaries of Maryland.](image)

4.7.3 Audit Findings at Maryland 132/33kV Transmission Substation.

4.7.3.1 The Substation Environment
The access road to the Maryland substation is well tarred and connects to the Ikorodu express way. The vicinity of the substation is heavily built up
with several businesses and even make-shift shops thriving on the street (see Fig. 56 below). The substation environment is laid with concrete. The elevation of the substation premises is lower than that of the main street (Mende Road). This leads to run-offs from the road flowing into and flooding the substation premises whenever it rains (see Fig. 57), The drainage systems in the substation are also blocked thus compounding the flooding issue. The borehole is functional and the water is very clean.

Figure 55 Front limits of Maryland substation (notice wire-mesh fence).

Figure 56 Make-shift shops near the entrance of the Maryland substation.
The perimeter fence is made of block wall at the rear but wire mesh in from but is dilapidated and broken in some areas. The substation premises are littered with scrap materials of all kinds including wood, plastics bags, scrap metals and decommissioned equipment (Figs. 58 - 60).
4.7.4.2 The Switchyard

There are 3No. Transformers at the switchyard of Maryland substation; (2x30MVA and 1x60MVA) which feed Ikeja and Environs, Ojota and Maryland areas of Lagos State. The switchyard, like the general environment of the substation, is littered with scrap materials and solid wastes. The slabs for the cable trenches are also broken and scattered all over the place.

The switchyard is poorly lit and staff on night duty usually depend on flash lights for illumination if they have to manually operate the equipment in
the switchyard, thus exposing themselves to risks of electrocution and snake bites.

Figure 61 Front Section of the Maryland 132/33kV substation.

Figure 62 Scrap materials and broken concrete slabs in the switchyard.

4.7.4.3 **Control room**

The Control Room has been in service since the construction of the substation and is in a very bad shape. The concrete structure is giving way, leaving several leakages in the concrete decking of the roof (Fig. 63). The
leakage is so bad that the Operators on duty have to leave a big bucket below cracks during the rainy season to collect the water seeping into the building.

Figure 63 Leakages in concrete decking of Maryland Control room building.

Figure 64 Control panels at Maryland control room.

Figure 65 The cable trenches inside the control room are also filled with all sorts of waste materials.
4.7.4.4 **Waste Production and Disposal**

Wastes produced at the Maryland substation include waste paper, food items, water sachets, scrap equipment. There is no waste generation, handling/management plan in place and there are no waste collection bins at designated places for waste collection and disposal neither is there a separate spare/scrap yard.

4.7.4.5 **Hazardous Materials**

The main Hazardous materials at electrical power transmission substations are Polychlorinated Biphenyls (PCBs) and Sulphur Hexafluoride (SF6). PCBs were widely used as di-electric fluids to provide electrical insulation. They are typically found in the large quantities at electrical substations and maintenance shops. Its use has been largely discontinued due to its potential to cause cancer. Sulfur Hexafluoride (SF6) is used as an insulator for electrical switchgear equipment especially in breakers and Isolators. The use of SF6 is an environmental challenge due to its Green House effect and attendant Global Warming Potential (GWP).

4.7.4.6 **Occupational Health and Safety**

The use of PPEs is not enforced as the PPEs are not readily available for use by the staff. Also an issue is the exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard. These emissions have the capacity to affect the functioning of vital body organs like the heart and brain that respond to electric currents in different ways and the lungs thus posing serious health risks if over-exposure occurs for whatever reasons. There is no HSE personnel on site at the Maryland substation.
A First-Aid box was cited in the control room but is not adequately provisioned with the appropriate items.

Fire extinguisher canisters were available in control room and regularly serviced.

4.7.4.7 Site Security

The perimeter fence of the Maryland substation is made partly with blocks (the rear end) and mesh wire (the front). The fence is old, week and falling apart in most places and there is no real gate. This exposes the substation to theft and stray animals/persons to electrocution. The lighting within the substation premises and switchyard is also very poor.

4.7.5 Proposed Intervention under NETAP.

Under the proposed Nigeria Electricity Transmission Project IDA will fund the Upgrading of 2 x 30MVA to 2 x 100MVA 132/33kV Power Transformers, High Voltage Switchgears and Associated Equipment.

4.7.6 Additional Interventions Recommended for Implementation.

In addition to the interventions proposed in 4.5.7 above the following activities are also recommended for implementation to add environmental and social safeguards value to the planned activities and enhance environmental and social sustainability of the project:

• Re-construction of the control room building
• The substation premises needs to be cleared of all scrap materials.
• Creation of a spare/scrap yard within the substation premises
• Re-construction of the perimeter fence with blocks and construction of an appropriate entrance/exit gate.
• Installation of automatic fire-fighting equipment within the control room and switchyard (fire hydrant).
• Need to provide dedicated fire extinguisher kiosk for the switchyard
• Rehabilitation of the lighting system for the substation premises and the switchyard
• Installation of safety warning signs at designated places within the substation premises.
• Provision of first Aid kit and training in administration of First-Aid
• Re-graveling of the 132kV section of the switchyard

4.7.7 Associated Environmental and Social impacts

The following impacts are associated with the proposed intervention at Maryland 132/33kV transmission substation;

- Objects falling on persons
- Electric shock (working on a live equipment)
- Slips and trips
- Power outages
- Heavy duty trucks causing traffic congestions
- Disturbance of business activities at the fish market along the road to the substation
- Fall from height
▪ Oil spillage
▪ Indiscriminate disposal of solid waste
▪ Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers
▪ Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs).
▪ Possible GBV and SEA due to a largely male workforce

4.8.0 Ota 132/33kV Transmission Substation

The Ota 132/33kV Transmission Substation is located about 1km to the south of the famous Obasanjo Farms in Ota, Ogun State. The station was commissioned in the year 2000 to provide electricity for the two main institutions in this area, Obasanjo Farms and Covenant University, as well as the semi-urban population of Ota. Despite the fire incident that consumed the indoor 33kV switchyard at the station, no significant rehabilitation work has been done here since it was commissioned.
4.8.1 Environmental and Social Baseline

Ota, also known as Sango Ota, is a town in Ogun State, south-west Nigeria. It lies within coordinates 7°00' North, 3°35' East and has a Land Area of 16,409.26 square kilometres.

The climate in Ogun State is tropical with an average temperatures of about 27.1 °C. Temperatures are highest in March, reaching an average of about 29.1 °C while the lowest temperatures are recorded in August.
(about 25.1 °C). The average precipitation in Ogun State is about 1238 mm and the highest and lowest rainfalls are recorded in June (197mm) and January (184mm) respectively.

Two main types of vegetation occur in the State; tropical rain forest and Guinea Savanna. The tropical rain forest is found in the coastal areas in Ogun Waterside and the southern part of Egbado South LGAs. Rain forests are found in some parts of the eastern LGA such as ljebu Igbo, Odogbolu, Sagamu and ljebu Ode. Guinea and derived savanna are found in most of the western and northern LGAs including Egbado North and South, lfo, Ewekoro, Abeokuta, Owode and Ado Odo/Ota.

The State has natural resources that include forest and water bodies. To the South, there is the evergreen forest vegetation and soil which is most suitable for the cultivation of cash and food crops like oil palm, rice, kola-nut, cocoa, cotton, cassava, cocoyam and vegetables. While in the north, there is a vast grazing savannah land that is suitable for animal husbandry. In addition to this, there are forest reserves, rivers and lagoons with a beautiful ocean front down south that is good for beach resorts. The climate is also very conducive for business and industrial growth.

Ota, the traditional capital of the Awori Yoruba ethnic group, has an estimated population of about 163,783 residents living in or around it. This population is made of locals and foreigners working in the numerous companies established in the state or attending some of the institutions in the state. The traditional leader of Ota is the Olota of Ota, Oba Alani Oyede.

Availability of forest, agricultural and mineral resources in Ogun state, access to a large pool of skilled manpower, the presence of water and electric power supply, incentives by successive governments and the
locational advantage of the state, all make it a favourable location for several kinds of industrial establishments.

There are, at present, about 158 manufacturing plants in the state and Ado Odo/Ota LGA has 45% of the total, while Abeokuta, Sagamu and Ijebu Ode LGA together have about 40% of the total. The remaining plants are in some other rural centers.

The major food crops include rice, maize, cassava, yam and banana. The main cash crops include Cocoa, Kolanut, Rubber, Palm Oil and Palm Kernels. Ogun State is one of the largest producers of Kolanut in the country. It also produces timber and rubber on a large scale. About 20% of its total area are forest reserves suitable for livestock production. Mineral resources available include chalk, phosphate, high quality stones and gravels for construction works.

Tourist sites include; the Olumo Rock in Abeokuta, Birikisu Sugbo Shrine at Oke-Eri, Yemoji Natural Swimming Pool at Ijebu-Ode, Oyan Dam in Abeokuta North, Iwopin Boat Regatta and Ebute-Oni in Ogun Waterside. Others sites are Madam Tinubu Shrine, Abeokuta; Oronna Shrine, Ilaro. Area J4 Forest Reserve; Tongeji Island, Ipokia. Old Manse at Ogbe,Abeokuta; St.James Anglican School, Ota and Ijamido River Shrine,Ota.

4.8.2: Land cover and Land Use

Ota is a semi-urban settlement with mostly residential buildings. There are still large expenses of virgin land used for farming. Land Use here are mainly for building and farming and is regulated by the Ogun State government.
4.8.3 Audit Findings at Ota 132/33kV Transmission Substation.

4.8.3.1 The Substation Environment
The premises of the Ota substation is littered with scrap, materials of all sorts, ranging from cables, insulators, scrap wooden containers, broken down equipment, earth material from excavations etc. (Fig. 68). Substation is overgrown with weeds and the drainage are blocked. Housekeeping is generally very poor. The source of water here is a borehole and it is in good condition. The lighting is very poor and the operators depend on flash lights for vision at night.

Figure 68 Scrap/materials, earth materials and concrete slabs littering the premises of the Ota substation.
4.8.3.2  The Switchyard

There are 3No. Transformers in the switchyard (2x40MVA and 1x60MVA). One of the 40MVA Transformers is a Mobile Transformer (see Fig. 70). All Transformers are in good condition but are overloaded thus necessitating the proposed re-enforcement intervention under NETAP. The gravel of the switchyard is depleted and overgrown with weeds in several places. The drains are also blocked with sand and other scrap materials. This is a real cause of flooding in the event of a torrential downpour.
The switchyard is poorly lit and staff on night duty usually depend on flash lights for illumination if they have to manually operate the equipment in the switchyard, thus exposing themselves to risks of electrocution and snake bites.

Figure 71 Displaced concrete slabs at the Ota switchyard.

Figure 72 Transformers at the Ota 132kV switchyard.

4.8.3.3 Control room

The Control Room is poorly lit, the ventilation system is poor as staff resort to leaving the windows to let air in since the Air conditioning systems are not working. The furniture are in a bad state and are insufficient. The ceiling of the control room is falling off as a result of the impact of the heat from the fire that engulfed the in-door 33kV section of the control room. The 33kV section of the control room was engulfed by fire some years ago but
the burnt panels and indoor 33kV equipment are still there, the place has not even been cleaned since then. (Figs. 74).

4.8.3.4 Waste Production and Disposal

The entire substation premises is littered with scrap and spare materials, in addition to the wastes from plastic water sachets, paper and waste food items. There is no waste generation, handling/management plan in place and there are no waste collection bins at designated places for waste collection and disposal neither is there a separate spare/scrap yard.

4.8.3.5 Hazardous Materials

The main Hazardous materials at electrical power transmission substations are Polychlorinated Biphenyls (PCBs) and Sulphur Hexafluoride (SF6). PCBs were widely used as di-electric fluids to
provide electrical insulation. Sulfur Hexafluoride (SF6) is used as insulators for electrical switchgear equipment especially in breakers and Isolators. The use of SF6 is an environmental challenge due to its Green House effect and attendant Global Warming Potential (GWP).

4.8.3.6 **Occupational Health and Safety**

The use of PPEs is not enforced as the PPEs, though provided, are not used. Also an issue is the exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard. A First-Aid box was cited in the control room but is not adequately provisioned with the appropriate items.

4.8.3.7 **Fire and Emergency Precautions**

Fire extinguisher canisters were available in the control room and are regularly serviced. The fire alarm system in the control room was damaged during the fire that gutted the indoor switchyard and no water sprinklers are installed.

4.8.3.8 **Site Security**

The perimeter fence of the Ota substation is made wire mesh and is old, week and falling apart in most places. This exposes the substation to theft and stray animals/persons to electrocution. The lighting within the substation premises and switchyard is also very poor.
4.8.5 Proposed Intervention under NETAP.

Under the proposed Nigeria Electricity Transmission Project IDA will fund the Upgrading of the 1 x 30MVA and 1 x 40 MVA with 2 x 100MVA 132/33kV Power Transformers, High Voltage Switchgears and Associated Equipment.

4.8.6 Additional Interventions Recommended for Implementation.

In addition to the interventions proposed in 4.8.5 above the following activities are also recommended for implementation to add environmental and social safeguards value to the planned activities and enhance environmental and social sustainability of the project:

- Renovation of the control room building
- The substation premises needs to be cleared of all scrap materials.
- Creation of a spare/scrap yard within the substation premises
- Re-construction of the perimeter fence with blocks and construction of an appropriate entrance/exit gate.
- Installation of automatic fire-fighting equipment within the control room and switchyard (fire hydrant).
- Installation of water sprinklers in the control room
- Rehabilitation of the fire alarm system
- Need to provide dedicated fire extinguisher kiosk for the switchyard
• Rehabilitation of the lighting system for the substation premises and the switchyard
• Installation of safety warning signs at designated places within the substation premises.
• Provision of first Aid kit and training in administration of First-Aid
• Re-graveling of the 132kV section of the switchyard

4.7.7 Associated Environmental and Social impacts
The following impacts are associated with the proposed intervention at Maryland 132/33kV transmission substation;

▪ Objects falling on persons
▪ Electric shock (working on a live equipment)
▪ Slips and trips
▪ Power outages
▪ Heavy duty trucks causing traffic congestions
▪ Disturbance of business activities at the fish market along the road to the substation
▪ Fall from height
▪ Oil spillage
▪ Indiscriminate disposal of solid waste
▪ Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers
▪ Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs).
▪ Possible GBV and SEA in the surrounding community due to a largely male workforce.
4.9 Egbin 330/132kV Transmission Substation.

The Egbin 330/132kV Transmission substation is located on the coast of the Lagos Lagoon north of Lekki in Ikorodu Local Government Area of Lagos State. The station was commissioned in 1986 alongside the Egbin Thermal Power plant to evacuate the power (about 1320MW) to be generated by the Power Plant unto the transmission grid.

Figure 75 Satellite image showing the Lagos Lagoon and the position of Egbin 330/132kV substation.

Figure 76 Satellite showing the Egbin substation, the egbin Power Plant ans the Resettled community, Ipakan.
4.9.1 Environmental and Social Baseline

The temperature and vegetation conditions of the coastal area where Egbin lies are similar to those of Lekki described earlier in this chapter, consisting, mainly of marshland and savannah grassland teeming with wildlife, as well as rich aquatic flora and fauna. The presence of the thermal power plant may have introduced some changes, having been in operation for over 31 years, but no literature to this effect could be accessed as at the time of writing this report.

The major settlements in the Egbin area are residential estates for the staff of the Power Plant that used to be a government utility owned by the defunct Power Holding Company of Nigeria (PHCN) and the staff of TCN working at the substation. The substation and the Power plant are
within the same premise but are separated by a mesh-wire fence, in fact the control room for the substation is located inside the power house, even though the power plant has been privatised and is now owned and run by a private company, a consortium of Sahara Power Group and KEPCO Energy Resources. Relations between the staff of TCN working at the substation and those of the Power Plant can best be described as frosty with recurrent disagreements, based on restriction of access to the control room, resulting in the intervention of the Police. The Egbin substation staff complained of frequent harassments by the staff and management of the Power plant whenever they need to access their facilities in the premises of the Power Plant.

A large portion of the Egbin area was acquired by the Federal Government for construction of the power plant, resulting in the resettlement of the inhabitants to Ipakan. Relicts of the old settlements can still be seen in the type of houses and nature of the layout of poorly planned settlements around the estate of the power plant (Fig. 76). The Ipakan Egungun Shrine (Fig. 78) is a prominent feature in the settlement, drawing attention to the traditional practices of the original settlers of the area which is linked to the Yoruba people and traceable to far away Brazil. The Egungun festival is an annual ceremony in honour of the dead among the Yorubas which serves as a means of assuring their ancestors a place among the living.
Figure 78 Location of the Egungun Shrine at Ipakan.

Figure 79 The Egungun Shrine.
4.9.2: Land cover and Land Use

Egbin is a semi-urban area that has transited from a purely rural community due to the siting of the Power Plant in the area. This can be attributed to the near steady supply of electricity from the 330/132kV substation. Though development is springing fast in Egbin, not much has changed in Ipakan, the resettlement area, as the streets are un tarred and other social amenities are still basic. Land in the Egbin area is mused mostly for farming and fishing from the vast green land available and the Lagoon respectively.
4.9.3 Audit Findings at Egbin 330/132kV Transmission Substation.

4.9.3.1 The Substation Environment

The Egbin substation is located within the premises of the Egbin Power Plant, having been constructed to serve its purpose, and is fenced with block walls. Sections of the premises are overgrown with weeds and littered with scrap and spare materials of all sorts, ranging from cables, insulators, scrap wooden containers, broken down equipment, earth material from excavations etc. (Fig. 82.). House-keeping is generally very poor and so is the lighting system.

Figure 81 Waste and scrap materials littering the Egbin substation premises.
Figure 82 Excavated materials at Egin substation premises.

Figure 83 Spare materials dumped indiscriminately at Egbin substation premises.

Figure 84 Grass growing in the switchyard of Egbin substation.
4.9.3.2  The Switchyard

The switchyard of the Egbin substation is divided to two sections; the 330kV section and the 132kV section. The 330kv section consists of are 2No. 1x150MVA transformer and associated equipment presently in service. There is a 1x300MVA transformer that is on plinth that is yet to be installed. The 132kV section does not have any transformers in service at the moment, though work is on to install a 1x100MVA transformer to feed 33kV feeders.

The protection systems at the 330kV are in poor condition as only 5No out of the 21No breakers installed are in good condition. The lighting arresters are also obsolete and need to be replaced.

The lighting in the 330kV section is very poor and the gravel is depleted with grass growing in several areas.

The lighting arresters in the 132kV section are also bad, the lighting is poor and the gravel is also depleted.

4.9.3.3  Control room

The Control Room is located inside the Power House and was not accessed as precautionary measure owing to the history of aggression from the staff of the Power Plant. A new control room for the switchyard is under construction by the TCN Headquarters.

4.9.3.4  Waste Production and Disposal

The substation premises is littered with scrap and spare materials, in addition to the wastes from plastic water sachets, paper and waste food items. There is no waste generation, handling/management plan in
place and there are no waste collection bins at designated places for waste collection and disposal neither is there a separate spare/scrap yard.

4.9.3.5 Hazardous Materials

Like other Power Transmission substations the main Hazardous material are Polychlorinated Biphenyls (PCBs) and Sulphur Hexafluoride (SF6) used in transformer Oils and switch gears/breakers respectively.

4.9.3.6 Occupational Health and Safety

The staff on duty were dressed in their Hard Hats and safety boots but the use of PPEs for working above ground surface need to be enforced when provided as most of the maintenance jobs here are done by the staff of the substation. The remote nature of the substation requires that a well-trained medical personnel, s nurse, should be on site at all times but this was not seen. Also an issue is the exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard. A First-Aid box was cited in the admin office which is a few blocks away from the substation.

Fire extinguisher canisters were available in the control room and are regularly serviced. No fire alarm or automatic fire extinguishers were installed at the substation.
4.9.3.7 *Site Security*

The perimeter fence of the Egbin substation is made of block walls and there is a gate that is manned by security men that control the movement of goods and persons in and out of the substation.

4.9.4 Proposed Intervention under NETAP.

Under the proposed NETAP IDA will fund the Replacement of obsolete Control and Relay Panels with Digital Control System, Rehabilitation of Control Room, High Voltage Switchgears and Associated Equipment.

4.9.5 Additional Interventions Recommended for Implementation.

In addition to the interventions proposed in 4.9.5 above the following activities are also recommended for implementation to add environmental and social safeguards value to the planned activities and enhance environmental and social sustainability of the project:

- Rehabilitation of the entire protection system at the 330 and 132kV switchyards,
- Evacuation of all scrap and waste materials from the substation premises
- Creation of a spare/scrap yard within the substation premises
- Installation of automatic fire-fighting equipment within the switchyard (fire hydrant).
• Rehabilitation/installation of a fire alarm system at the switchyard
• Provision of dedicated fire extinguisher kiosk for the switchyard
• Rehabilitation of the lighting system for the substation premises and the switchyard
• Installation of safety warning signs at designated places within the substation premises.
• Provision of First Aid kit at the switchyard and training in administration of First-Aid
• Re-graveling of the 132kV section of the switchyard
• Construction of a borehole at the substation premises

4.9.6 Associated Environmental and Social impacts
The following impacts are associated with the proposed intervention at Maryland 132/33kV transmission substation;

- Objects falling on persons
- Electric shock (working on a live equipment)
- Slips and trips
- Power outages
- Heavy duty trucks causing traffic congestions
- Disturbance of business activities at the fish market along the road to the substation
- Fall from height
- Oil spillage
- Indiscriminate disposal of solid waste
▪ Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers

▪ Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs).

▪ Possible GBV and SEA in the surrounding community due to a largely male workforce.

4.10 Akoka 132/33kV Transmission Substation.

The Akoka 132/33kV Transmission Substation is located inside the premises of the University of Lagos on a marshy expanse of land adjoining the Lagos Lagoon. (Fig. 85). The station was commissioned in 1982 to provide power for the University community, the Yaba College of Technology and the environs. The design and configuration of the station and control room are similar to those of other stations commissioned about the same period (Amuwo Odofin and Itire Transmission Substations).
Figure 85 Satellite image showing location of Akoka 132/33kV Transmission substation.

Figure 86 Street view of Akoka substation and surroundings
4.10.1 Environmental and Social Baseline

Akoka, a sub-urb of Yaba, is located on the south-eastern fringes of Lagos mainland adjoining the Lagos Lagoon. The soil consists mainly of marshy and swamp land with various species of plants and animals, mostly aquatic species, owing to influence of the lagoon.

Yaba is regarded as the educational hub of Lagos, hosting a large concentration of institutions like Queen's College, the Nigerian Institute of Medical Research, the Yaba College of Technology (Akoka), Igbobi College, the University of Lagos, the Federal Science and Technical College, and the Federal College of Education.

The popular Tejuosho Market, one of the busiest markets in Lagos, is located in Yaba.
Figure 88 Satellite image showing Akoka area of Lagos.
4.10.2: Land cover and Land Use

Akoa is a typical Lagos urban settlement with different grades of houses for different classes of people. The streets are lined with buildings, most of which do not meet standard safety requirements and modern city patterns, but very much typical of Lagos. Shops may be found at intervals between residential buildings (Figs. 89) and the streets are laid with asphalt. The presence of the University of Lagos alone is a major reason why businesses, especially petty trading, thrive in the Akoka neighborhood. The Akoka 132/33kV Transmission substation provides electricity supply for the University community, the numerous educational institutions within Yaba and its environs. The relationship between the staff of TCN at the substation and the University community is very cordial as they see themselves as partners.

Figure 89 Some streets in Yaba area of Lagos.
The eastern fringes of Akoka adjoins the Lagos Lagoon and consists mainly of swamps and various aquatic plant species (Fig. 91).

4.10.3 Audit Findings at Akoka 132/33kV Transmission Substation.

4.10.3.1 The Substation Environment
The Akoka 132/33kV Transmission substation is surrounded by a large expanse of marshy land that opens out into the Lagos Lagoon. This land is practically inaccessible, thus covered with thick aquatic grass. The
perimeter of the substation premises is clearly marked with block walls that are now old and dilapidated. Scrap/spare materials (cables, wood, metals, broken down equipment etc.) litter the substation environment (Fig. 92).

The cable trenches have collapsed due to the sinking of the general surrounding of the substation leaving the cables connecting control room panels exposed and the slabs displaced. The sinking sorrounding leaves a widegaps between the foundation of the constrol room strucrure and the ground and forming hiding places for snakes and rodents (Fig. 93).
Figure 93 Broken concrete slabs and detached foundation structures with gaping holes at Akoka 132/33kV substation.

The substation surrounding is so dangerous at night that the operators venture out of the control room at very great risk of being eaten by pythons that roam the area at will. There were reports of large pythons crawling up the stairs of the control room at night only to be chased away by the staff on duty. Fig. 94 shows a python that was trapped and killed by some of the security guards at the substation.
4.10.3.2 **The Switchyard**

There are 3 No. power transformers at the Akoka transmission substation; 1x45MVA, 1x40MVA and 15MVA (distribution transformer). The 45mVA transformer feeds Yaba, Sabo and Unilag via a 33kV feeder while the 40MVA transformer feeds Nigeria Railway Corporation (NRC) via a 33kV feeder. The 15MVA transformer is a backup distribution transformer that feeds Akoka, Ilaje and community via an 11kV feeder. The switchyard is small and fenced with wire mesh but the gravel is heavily depleted and needs to be re-graveled. The surrounding is also overgrown with weeds. Housekeeping is generally very poor.
4.10.3.3 **Control room**

The controls room is poorly kept and is littered with scrap and broken down equipment, documents and containers. Ventilation is poor and the air conditioning systems are not functioning. The lighting within the control room is also very poor. The control room needs a total rehabilitation, like other parts of the building.
4.10.3.4 Waste Production and Disposal

The substation premises is littered with scrap and spare materials, in addition to the wastes from plastic water sachets, paper and waste food items. There is no waste generation, handling/management plan in place and there are no waste collection bins at designated places for waste collection and disposal neither is there a separate spare/scrap yard.

4.10.3.5 Hazardous Materials

The main Hazardous material are Polychlorinated Biphenyls (PCBs) and Sulphur Hexafluoride (SF6) used in transformer Oils and switch gear/breakers respectively.

4.10.3.6 Occupational Health and Safety

The use of PPEs is not enforced, though they were provided. PPEs for working above ground surface need to be provided and enforced. No first aid kit was cited in the control room.

Fire alarm and automatic fire extinguisher systems are not installed at the station though fire extinguisher canisters were available in the control room and are regularly serviced. Exposure to Electro-Magnetic Field (EMF) of the power equipment within the switchyard is also a safety concern here.
4.10.3.7 Site Security

The Akoka perimeter fence is old and dilapidated and so is the entry and exit gate. The poor lighting within the substation premises is also a security concern.

4.10.4 Proposed Intervention under NETAP.

Under the proposed NETAP, IDA will fund the Rehabilitation of Building structure and Sinking surrounding area, Replacement of obsolete 132kV equipment, 33KV Metal clad Switchgears, Control & Relay panel and Reinforcement with 1x 60MVA 132/33KV Power Transformer. Also refurbishment of the 2x 45MVA transformers and GIS components.

4.10.5 Additional Interventions Recommended for Implementation.

In addition to the interventions proposed in 4.10.4 above the following activities are also recommended for implementation to add environmental and social safeguards value to the planned activities and enhance environmental and social sustainability of the project:

- Complete overhaul of the entire substation structures and premises
- Reconstruction of the perimeter fence and access gate
- Rehabilitation of the ventilation systems and air conditioning systems
- Rehabilitation of the water plant
• Rehabilitation of the control room and rearrangement of fittings and cabling

• Provision of office furniture

• Replacement of battery rack in battery room

• Reconstruction of the cable trenches and replacement of the slabs

• Rehabilitation of the sinking surroundings of the substation premises

• Evacuation of all scrap and waste materials from the substation premises

• Creation of a spare/scrap yard within the substation premises

• Installation of automatic fire-fighting equipment within the switchyard (fire hydrant).

• Rehabilitation/installation of a fire alarm system at the switchyard

• Provision of dedicated fire extinguisher kiosk for the switchyard

• Rehabilitation of the lighting system for the substation premises and the switchyard

• Installation of safety warning signs at designated places within the substation premises.

• Provision of first Aid kit at the switchyard and training in administration of First-Aid

• Re-graveling of the switchyard

4.10.6 Associated Environmental and Social impacts

The following impacts are associated with the proposed intervention at Maryland 132/33kV transmission substation;
- Objects falling on persons
- Electric shock (working on a live equipment)
- Slips and trips
- Power outages
- Heavy duty trucks causing traffic congestions
- Disturbance of business activities at the fish market along the road to the substation
- Fall from height
- Oil spillage
- Indiscriminate disposal of solid waste
- Disrespect to socio-cultural beliefs/practices of locals by foreign contractor workers
- Spread of HIV/AIDS and other Sexually Transmitted Infections (STIs).
- Possible GBV and SEA in the surrounding community due to a largely male workforce.
5 ENVIRONMENTAL AND SOCIAL IMPACTS AND RECOMMENDED MITIGATION MEASURES

The impacts associated with the proposed interventions at the various Transmission substations under Package 1, Lot 2 of NETAP were classified based on whether they are beneficial or harmful, short term or long term, reversible or permanent.

The Impact/mitigation table presented later in this section includes mitigation measures that address the negative impacts using available technologies and managerial procedures.

The major impacts are those arising from the construction works during rehabilitation of the existing facilities and impacts from the Electromagnetic Fields (EMF) during operation.

5.2 Environmental and Social Impacts during Construction

The impacts associated with the proposed rehabilitation/re-enforcement projects at the Transmission Substations under NETAP Package 1, Lot 7 could be grouped under the following headings; Wastes, Occupational Health & Safety and Socio-economic impacts.

5.2.1 Wastes.

Wastes, under this project, include all by-products of materials or results of construction activities that may constitute a negative introduction into the immediate environment/atmosphere if not properly handled in a timely manner. They could be non-hazardous or hazardous, persistent or bio-degradable and include the following;
i. **Effluents and Storm water**

The rehabilitation project is expected to create open pits due to excavations for equipment foundation and drainage channels. This is a likely source of contamination of surface and ground water bodies. Other substances like transformer oils, paints and other lubricants could also be released into the environment. Besides controlling the release of these substances into the environment it is also recommended that:

- Samples of discharge waters be taken and analyzed to accurately determine the oil load in the water and other contaminants that are above the standards required by law.
- Analysis for PCBs should also be undertaken for the wastewater in the oil drain pit.
- Installation/rehabilitation of the existing the compact gravity oil separator unit.
- Clearing of the existing drainage systems within the facilities
- All separated oil sludge should be handled as hazardous waste while frequent analysis should be undertaken for the sludge to determine whether the PCB level is within the permissible 50 ppm limits. Annex 3 describes the protocol for handling of PCBs when they occur above permissible limits at TCN Transmission Substations.

ii. **Non-Hazardous Waste Materials**

Non-hazardous solid waste, especially scrap materials occupy a large area of land, limit accessibility for cleaning and housekeeping, accumulates dust, provide suitable habitats for insects, rodents and reptiles and affect the general appearance and aesthetic
considerations. It is recommended to have certain designated areas for collecting scrap materials in each location. These include excavated soil, concrete materials, scrap wood from equipment containers, PVC materials from wraps, pipes and insulation material, trimmings of steel, Metals, wood, cement bags, sand and gravel, scrap cables, garbage from daily activities of workers etc.

**Excavations**

These include all materials produced from digging to provide space for equipment foundation and support.

The following mitigation measures should be applied to address the impacts due to excavations:

- All excavations shall be made in accordance with the approved drawings.

- The sides of all excavations, which might expose personnel or facilities to danger resulting from shifting earth shall be protected by providing slope to the appropriate angle of repose or benching in the sides and ends of the excavation or ladders must be used and secured, enough to withstand at least 1 meter above the top of the excavation.

- All excavation deeper than 1.5 meters must have barriers and toe boards around the outside to prevent persons and material failing into the excavation. Barriers must be of a strength that is capable of withstanding the weight of a person falling against the barrier. Barriers shall be readily visible by day or night.

- All persons in excavation must wear safety helmets and safety boots.
o Vehicles and other machineries or construction equipment must not be allowed to come within 2 meters of an excavation unless working in connection with the excavation.

Monitoring Activities for Excavations

- An inspection must be conducted at the end of the work to ensure that the excavation has been left in a safe manner. Heavy loads shall not be put on the edge of the excavation.

- The observer must conduct monitoring of the safety tools for the workers and the vehicles restrictions along the excavation and trenching sites.

Reporting

The observer should report on the monthly basis of the accident or the worker’s obedience.

Building Materials

The rehabilitation of control room buildings will usually involve the demolition of the existing one. Though most TCN control room buildings have concrete decking on the roof the following measures have been put in place to address minor incidences of Asbestos handling; All Asbestos materials should be collected in suitable double air tight PE bags with adequate thickness to bear the asbestos waste. The waste removal and soil clean-up should be undertaken by a professional asbestos contractor. The procedures to be followed in such activity normally includes:

- Wetting all waste items and underneath soil before any handling
o Careful placement wet asbestos waste in suitable container bags

o Cutting large items should be avoided unless they couldn't be fitted in the containment. In such cases the cutting tool should be carefully selected to suite cutting wet materials

o Parts of the soil should also be placed in containers bag in wet condition for cleaning the area.

o The waste area should be isolated and all workers in removing waste and cleaning the site should wear full cloth protection and respiratory protection. All cloth used during clean-up should be disposed in container double container bags as described above.

o Asbestos waste should be handled and transported by qualified hazardous waste contractors.

o Clear warning signs should be fixed inside and outside the affected room

o Any maintenance practices, such as cleaning nearby shelves or using sharp tool in a nearby fixture, within these buildings should consider the following precautions;

- The area of maintenance should be isolated and provided with portable ventilation equipment
- By all means sawing, sanding and drilling asbestos is prohibited
- In case accidental disturbance occurred to an asbestos surface the area should be evacuated.
- Only workers wearing full protective cloth and respiratory protection could enter the area for repairing the damaged part either through encapsulation in plaster or latex paint and adequately wet any asbestos waste which should be collected, along with
contaminated cloth, in double thick air-tight plastic bags. In such cases air sampling should be undertaken to ensure that the damage has been effectively repaired.

- All above measures should be supervised by HSE staff that has received professional asbestos training.
- The wastes generated shall be contained in a concrete box and stored in hazardous waste designated area since no engineered sanitary landfill is available in Nigeria.

It is important to adequately manage solid wastes because of their potential to carry hazardous wastes and also cause negative visual impacts. The following mitigation measure are recommended to reduce the significance of the impacts of solid wastes:

- Use of only officially designated disposal sites by the Contractor for all construction wastes.
- Use of appropriate disposal trucks for the evacuation and disposal of construction wastes.
- The contractor should ensure that the trucks are not overloaded and that the waste is adequately contained inside the rear box or covered to prevent dust or particles movements from the truck.
- The Evacuation and disposal of wastes from the substation must be properly supervised.
- The on-site waste accumulation area (WAA) in the substation shall be designed to accommodate the expected amounts and different types of wastes. It should be covered and provided with adequate flooring for possible access of forklifts and small trucks. EHS officer should keep separate areas for each type of waste, keep internal passages inside the WAA for facilitating access and should
order for regular cleansing of the area. Records of the admitted waste shall be kept in a register and before the WAA is full.

To achieve the above objectives it is recommended that the Contractor should;

1. Develop and inventory for non-hazardous scrap materials for each site. This will help quantify the volume of such wastes and facilitate proper handling and disposal.

2. Provide waste collection bins at selected points. The bins should be designated for each type of waste based on the waste segregation code provided below:

- **Green** – recyclable non-hazardous materials
- **Blue** – non-recyclable, non-hazardous materials
- **Red** – all hazardous waste materials
- **Yellow** – clinical wastes for incineration

3. Training on waste handling and disposal be conducted for the substation personnel, especially the HSE team

4. Designated waste storage sites be created and disposal at these sites be closely monitored to ensure prompt evacuation to avoid over-spill at waste sites that fill quickly.

5. An authorized waste handling firm be appointed to evacuate the waste from the disposal site at regular intervals.
iii. **Air Emissions**

Air emissions are expected to be associated with Excavation, filling, loading, transportation and unloading of soil and raw materials. Though these are temporary, they tend to raise the particulate matter concentration on ambient air. Other sources of air emissions during construction include exhaust fumes from vehicles at the work site. The extent of these emissions depends on the number, type and condition of the machinery working at the site at every point in time as well as the climatic conditions. The amount of dust that would be generated is not high as the soil in the project areas is not the loose type and the roads are laid with asphalt. The impact is thus regarded as Minor.

**Proposed Mitigation measures**

The following measures will significantly mitigate these impacts due to air emissions:

- Store construction materials in pre-identified storage areas.
- Cover friable materials during storage.
- Regulation of speed to a suitable speed (30 km/h) for all vehicles entering the site.
- Implement preventive maintenance program for vehicles and equipment working on site and promptly repair vehicles with visible exhaust fume.
- Using locally available materials whenever possible thus limiting the travel distance.
○ Reducing the distance and number of trips will result in an overall reduction in in gaseous and carbon emissions.

**Monitoring Activities**

An inspection must be conducted on implementation of the site rehabilitation management plan.

**Reporting**

The observer should report on the monthly basis of the status of the implemented rehabilitation plan.

**iv. Noise Emissions**

Noise at construction sites are quite different from the normal kind of noise experienced in the general workplace. This is mainly due to the different activities that go on at every point in time at a construction site. The noise could be due to construction equipment, possible hammering and drilling works in addition to the noise generated from construction related trucks. The permitted noise levels are 55 Decibel during the day (7am-10pm), and 45 Decibel during the night (10pm-7am).

However, noise from the substation sites during construction is not likely to affect residents due to the distance of most substations from residential buildings. The impact of noise emissions is considered medium level 2 at the substation due to the relatively short period of rehabilitation phase.
Construction workers could, however, be exposed to relatively high levels of noise because of their nearness and continuous presence within the vicinity where the noise is generated. This could be mitigated through application of the normal precautions normally taken by construction labor. Impacts due to construction noise is therefore classified as a Minor Impact (level 3), which could be further minimized and fully controlled if construction workers used safety gear as recommended in the ESMP.

**Proposed Mitigation measures**

- Workers that operate noisy machines and nearby workers should be supplied with earmuffs and should be instructed to put them on when they get into noisy zones. Contractors should be responsible to instruct their workers to abide to this role, and the site supervisor

- should make sure the Contractor is compliant with this role

- Working hours for workers exposed to noise equipment should be designed so that noise exposure periods do not exceed the safe limits

- Coordinate and Inform inhabitants/employees at the nearby sensitive receptors about the peak time and hours for construction activities.

- Avoid construction activities at night.
Monitoring activities:

Use of appropriate PPEs by all construction workers working in noisy areas shall be conducted during the routine quarterly monitoring activities.

Reporting

- The monthly report should include how well does the contractor abide to the above measures and any comments noticed by the site supervisor about high noise levels.
- A monthly report on any observations or complaints about high noise level.

v. Hazardous Wastes

The waste segregation process recommended above will separate wastes at the respective substations into hazardous and non-hazardous wastes. The subsection 5.2.1 above deals with non-hazardous wastes during construction works. This sub-sections addresses wastes with properties that make them dangerous or capable of having harmful effects on human health or the environment. The following questions should be asked in determining whether a waste fills in this category or not;

1. Is the material in question a solid waste?
2. Is the material excluded from the definition of solid waste or hazardous waste?
3. Is the waste a listed or characteristic hazardous waste?
4. Is the waste delisted?
The chart below shows the flow in the query to determine whether a material/substance is hazardous or not;

A hazardous Waste Management System should be established at each substation to ensure effective management of hazardous waste substances associated with the rehabilitation project. This will ensure that hazardous wastes are managed safely from the time they are generated through while they are transported, treated, and stored, until they are disposed.
**Hazardous Waste Generation**

The wastes generated during the rehabilitation/re-enforcement projects under NETAP Package 1 must be properly screened to determine whether they are hazardous or not. The Contractors must oversee the ultimate fate of the wastes they generate in the course of the implementation of the NETAP projects. In this regard, all NETAP Contractors MUST properly and fully document that the hazardous waste that they produce is properly identified, managed, and treated prior to recycling or disposal.

**Hazardous Waste Transportation**

Hazardous waste transportation involves all the processes of moving the waste after it is generated to when it is disposed. This includes movement to where it is treated, stored or disposed. It is the duty of the Contractor to ensure that the waste transporter complies strictly with the appropriate regulations regarding waste transportation in Nigeria.

Hazardous Waste Recycling, Treatment, Storage and Disposal

A good number of hazardous wastes can be recycled safely and effectively. This has the benefit of reducing the consumption of raw materials and the volume of waste materials that must be treated and disposed. Other wastes must, however, be treated and disposed of in landfills or incinerators.

Failure to comply with the appropriate regulations governing waste treatment, storage, recycling and disposal might cause spills, leaks, fires, and contamination of soil and drinking water. To encourage
hazardous waste recycling while protecting health and the environment, EPA developed regulations to ensure recycling would be performed in a safe manner.

Generally speaking processes that handle large volumes of waste usually present a higher degree of risk.

**Mitigation Measures**

A hazardous waste management plan should be put in place to direct actions to be undertaken to ensure environmentally sound management of hazardous wastes. The plan must specify the roles and responsibilities of the client and the Contractor as well as the mode of identification of hazardous wastes, safe handling, collection point and appropriate training for staff involved in its management and disposal.

**General Guidelines for Handling Hazardous Wastes**

It is totally prohibited to dump or dispose of any hazardous wastes in uncertified sites or use uncertified means of transporting such wastes. Some rules guiding hazardous waste handling the following: waste transportation means. All hazardous wastes must be recycled or disposed off-site by a licensed hazardous waste contractor as will be discussed in more details below. Hazardous waste disposal contracts are to be developed and administered by the Hazardous Waste Coordinator. The following guideline will help ensure effective hazardous waste management;
Containers must be in good condition.

The waste placed in the container must be compatible with the container.

Containers must be clearly and legibly labeled *Hazardous Waste*, with the chemical name (no abbreviations or chemical formulas) and quantity (percentage) of the contents listed. The label must be firmly attached to the container.

Containers must be placed next to or near the process that generates the waste.

Containers **MUST** be kept closed at all times except when adding or removing waste. Do not leave a funnel in the hazardous waste container.

Containers must be segregated by hazard class (e.g. acids from bases and flammables).

All satellite accumulation areas must be under the control of the operator of the process generating waste.

Containers and area must be inspected at least weekly for leakage.

Complete appropriate waste manifest forms before leaving the evacuation site.

*Management of the waste accumulation area (WAA)*

The WAA shall be designed to accommodate for a separate fenced and shaded area for the accumulation of hazardous wastes pending collection – this could be a closed container. The hazardous Material Coordinator is responsible for managing this area and ensuring that:
The area is secure with limited admission and must be signed with the following: “DANGER - HAZARDOUS WASTE STORAGE AREA”; and “UNAUTHORIZED PERSONNEL KEEP OUT”

- The area is inspected weekly.
- Hazardous waste is being registered
- Hazardous wastes shall be registered in a hazardous waste register containing the following information:
  - Name and address of the establishment/project.
  - Person responsible for maintaining the hazardous waste register
  - The temporal boundaries for the current data
  - Log of hazardous waste held at the storage area including the common name, the characteristics (physical form) and amount (weight/volume) of waste that is being transported off-site.
  - A map indicating the location of accumulation area.
  - MSDSs and waste analyses used to characterize waste streams.
  - Hazardous waste transportation means
  - waste’s destination and disposal methods
  - Waste storage area monthly inspections records and recommendations
  - Records of all spill incidents which required implementation of the Spill Emergency plan or any other corrective actions with regards to hazardous waste handling and storage.
- Training records
Manife
	s and bills of lading for hazardous (and non-hazardous) wastes. These records shall be filed indefinitely in an official file maintained by the Hazardous Materials Coordinator and a duplicate file maintained at the Plant Manager’s office.

- Clear and correct labels are placed on the different storage containers
- The containers are inspected monthly for leaks or any other form of damage and are kept in good condition.
- No mixing of different hazardous waste streams is taking place
- The area is properly shaded from rain and sun heat/light.
- Must have a water supply
- Must be accessed from at least two sides for emergency
- Hazardous waste can be stored in drums, containing small quantities of liquid and solid waste, in order to be easy to handle and to allow proper segregation of incompatible wastes such as reactive substances.

Hazardous Waste Collection and disposal

Special waste which couldn’t be recycled should be disposed of in controlled areas within certified disposal sites. Secured accumulation areas for the collected hazardous wastes (separate or integrated with
the WAA) shall be provided on site where necessary with records being kept of the type, amount and date of collection as described above. Transportation of hazardous wastes could be performed quarterly by certified contractors.

_Awareness_

Project’s stakeholders should be aware of the disposal procedure of hazardous wastes and the possible environmental risks associated with them.

_Minimization_

Waste minimization procedures should be adopted during the operation. The supervisor should make sure that the procedures implemented according to the design measures

_Monitoring Activities:_

- No monitoring activities are required for construction waste as long as the above mitigation measures are implemented

- There should be a form prepared by TCN by the EHS Officer to keep records of quantities, types of scrap received in the store and the location where it has been received from.
**Reporting**

The monthly report of the construction contractor should include how well the contractor complied with the above measures and any issues observed by the site supervisor about mismanagement of construction waste during the month under consideration.

The EHS officer should prepare a monthly report including received scrap items, sold and disposed items.

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**vi. Impacts Associated with Health and Safety**

Potential impacts to workers and public health and safety during construction phase of the rehabilitation of the substations are similar to those associated with any construction project involving earthmoving, use of large equipment, transportation of overweight and oversized materials, and construction and installation of facilities. These include fall from height, objects falling on persons, slips and trips, electrocution, fire, injuries due to manual handling etc.

**Impact significance**

Impacts associated with health and safety are significant because most of the activities on site during construction will require interaction of humans with equipment and construction materials. This impact is thus a Major one.

**Proposed Mitigation Measures**

Both National and IFC EHS general guidelines on occupational health and safety require that:
• The contractor should assign a health and safety supervisor who ensures the workers adhere strictly to prescribed H&S procedures
  o The contractor should make health and safety facilities available in the project site
  o Contracts should be registered with the health facilities close to the construction site
  o Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers be enforced
  o Harnesses should be provided for all personnel working at height and should be of not less than 16 millimeters (mm) (5/8 inch) two-in-one nylon or material of equivalent strength. These should be replaced before signs of aging or fraying of fibers become evident.
  o When operating power tools at height, workers should use a second (backup) safety strap
    ▪ Testing structures for integrity prior to undertaking work be enforced
    ▪ A guard should be assigned to ensure that the community people are not stepping into the project sites. He should pay attention to children and aged people.
    ▪ A tagging system to identify faulty equipment or equipment under maintenance or installation be established.
    ▪ Clock-in, clock-out and duty/equipment handing over system be established at all work sites
- Use of only adequately trained personnel be used for any particular task –
- the Contractor MUST not, under no circumstance, use personnel that are adequately trained or faulty/unsuitable equipment for any task.

**Safety of Mechanical Equipment**

In addition to the above the following measures shall be adopted to ensure that all equipment used on site are in good functional state:

- All mobile mechanical equipment shall be operated by authorized personnel and has a valid license.
- All equipment shall be checked prior to use by qualified personnel.
- Brakes, lights, tire pressures and batteries shall be inspected before using the equipment.
- Revolving lights must be used for heavy duty vehicles.
- The design capacity of any equipment shall never be exceeded. The equipment shall not be modified to alter its capacity.
- All drivers shall have a valid driving license.
- Equipment that could present a hazard to personnel, if accidentally activated during the performance of installation, repair, alteration, cleaning or inspection, work shall be made inoperative prior to state of work.
- Equipment, which is subject to unexpected external physical movement such as rotating, turning, dropping, sliding etc.,
mechanical and/or structural constraint, shall be controlled to prevent such movement.

- All equipment, which are locked or taken out of service, because of potentially hazardous condition, shall be appropriately tagged indicating the reason for being taken out of service.

**Socio-Economic Impacts**

*Impacts due to Movement of Vehicles and Equipment*

The construction activity will involve the movement of personnel, construction materials and equipment to and from the project site. This could cause traffic jams with its attendant social problems that could degenerate into chaos if not properly managed. The increase in the volume of traffic also puts a strain on the road infrastructure leading to the premature wear and tear of same greatest potential for traffic impacts to occur arises during the periods of peak construction activities.

The impact due to traffic could be classified as medium.

**Proposed Mitigation measures:**

- Traffic routes must be prearranged with the Local Government Council.
- Access at entry and exit points to works sites should be controlled and heavy trucks should be assisted by traffic controllers
- Ensure that warning signs are clear and visible at night.
- Limiting the speed within Site.
- Place visually clear instructions in areas close to Construction site
Monitoring activities
The contractors under the supervision of TCN to be done whenever needed.

**Reporting**
A monthly report on any observations or complaints about traffic and accidents.

**Power Outage.**
Live equipment may need to be switched off at some point during the rehabilitation/re-enforcement projects to prevent electrocution or personnel or fire /damage of equipment on site. If this is properly managed in a timely manner it could be of adverse social and economic consequence since our lives and businesses depend largely on availability of power supply.

*Mitigation Measures*
The following measure have therefore been put in pace to mitigate the impacts that may be associated with the blackouts that may be experienced during the rehabilitation projects at the respective sites:

- Provision of alternative source of power supply to residents that may be affected by the knocking off of their regular supply channel.
- Sensitization of the impacted customers through radio announcements, newspaper adverts and other public notices.
- An outage plan should be prepared in conjunction with the Contractor and this should and strictly adhered to by TCN and the Contractor.
**HIV/AIDS and other STIs**

The implementation of the proposed rehabilitation work will result in the gathering of workers of different backgrounds and probably from distant places, many of whom will be away from their families for long periods. Some of these may resort to casual sex which will be provided by willing casual partners who will be attracted by the perceived ‘high pay’ of the project.

**Mitigation Measures**

- HIV/AIDS awareness/ sensitization campaigns for both Contractor workers and host communities on the use need to use condoms correctly every time they have vaginal, oral, or anal sex and the need to refrain from sharing needles or unsterilized piercing objects.
- Voluntary testing of Contractor workers to establish their HIV/AIDS status.
- Provision of condoms and Anti-Retro-Viral drugs for Contractor workers who need them.

**Gender-based Violence (GBV) and Sexual Exploitation and Abuse (SEA)**

When a largely male workforce from outside a community is housed and/or working near the community, the potential for sexual activity between workers and local women exists. Experience on projects with significant numbers of “foreign” workers shows that the situation has the potential to result in instances of gender-based violence and sexual exploitation and abuse of women and children. ESMPs must include mitigation measures to prevent GBV and SEA as well as monitoring and reporting measures to ensure that if it occurs, it is promptly brought to the attention of management and the proper authorities.

**Mitigation Measures**
- Minimize influx through giving local communities first priority when hiring unskilled workers and, to the extent qualified applicants are available, semi-skilled and skilled workers.
- Require the contractor to include in the Contractors Environmental and Social Management Plan (CESMP) measures to avoid SEA, GBV, or other social conflict, including:
  - Mandatory awareness raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women;
  - Awareness-raising to sensitize host communities, with special attention to women, about the social and health risks of sexual engagement with the workforce;
  - Informing workers about national laws that make sexual harassment, exploitation of children, and gender-based violence a punishable offence which is prosecuted and which will be reported to the authorities;
  - Developing a Worker Code of Conduct\(^2\) to be made a part of employment contracts, and including sanctions for non-compliance (e.g., termination), and
  - Contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence.

\(^2\) The Worker Code of Conduct will specify prohibited behaviors on site and in the local communities, including: intimidation and sexual harassment in the workplace, use of drugs and alcohol on site, working under the influence of drugs and alcohol, misuse of contractor equipment and materials, allowing unauthorized access to the worksite, sexual misconduct on site and in the communities. It will also address desirable behaviors, including among others: respect for human rights, respect for and courtesy toward women and other community members, and proper responses to community requests for information or assistance.
- TCN and contractor consult with local community representatives including women regarding potential for SEA or GBV and appropriate measures to prevent and respond to it.
- TCN ensure that contractor’s GRM is robust and operating
- Ensure that implementation of the CESMP (or influx management plan if there is one) is an enforceable provision of the construction contract

The table (Table 6) below show the identified potential impacts associated with the proposed rehabilitation/re-enforcement projects at Alagon, Lekki Egbin, Ijora, Alausa, Akoka, Amuwo-Odofin, Itire, Maryland and Ota Transmission Substations, the proposed mitigation measures and other safeguard interventions that will complement the proposed projects at the respective substations;
<table>
<thead>
<tr>
<th>S/N</th>
<th>CLASS OF ASSOCIATED IMPACT</th>
<th>POTENTIAL SPECIFIC IMPACT</th>
<th>TIMING OF OCCURRENCE</th>
<th>FREQUENCY /DURATION</th>
<th>SIGNIFICANCE OF IMPACT</th>
<th>PROPOSED MITIGATION MEASURES</th>
<th>ESTIMATED COST OF MITIGATION (USD)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Wastes</td>
<td>Storm water</td>
<td>During civil works at the beginning of the project (After rains).</td>
<td>Throughout the rainy season One month 8 months</td>
<td>Medium Major</td>
<td>○ Construction of storm-water drains from the point of discharge; ○ Clearing of all existing drainage channels within the project site; ○ Effluents should be collected into impervious collectors at the point of discharge;</td>
<td>3,000.00 1,000.00 1,000.00</td>
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<td></td>
<td></td>
<td>Effluents</td>
<td>Release of waste fluids from transformer oil filtration process, paints, grease etc. ( Installation).</td>
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<td></td>
<td></td>
<td>Excavations</td>
<td>Beginning of project (civil works).</td>
<td>6 months</td>
<td>Minor</td>
<td>○ Clean-up and restoration of excavation sites IMMEDIATELY the equipment foundations are erected.</td>
<td>1,000.00</td>
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<td></td>
<td>Building Materials</td>
<td>Beginning of project and project and</td>
<td>6 months</td>
<td>Major</td>
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<table>
<thead>
<tr>
<th>Other non-hazardous wastes</th>
<th>During installation</th>
<th>8 months</th>
<th>Medium</th>
<th></th>
<th>3,000.00</th>
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<tr>
<td>Decommissioning of equipment (Transformers/s witchgears, CTs) to be replaced.</td>
<td>During installation</td>
<td>8 months</td>
<td>Medium</td>
<td>1,000.00</td>
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<tr>
<td>Hazardous Wastes (PCBs) and other hazardous substances.</td>
<td>Decommissioning of equipment (Transformers/s witchgears, CTs) to be replaced.</td>
<td>1 months</td>
<td>Major</td>
<td>1,000.00</td>
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- Provision of waste collection bins at appropriate places within the project site.
- Segregation of wastes based on the agreed colour codes.
- Prompt collection and disposal of wastes at designated dump sites by appropriate waste collectors.
- If PCB contamination is detected on testing of Transformer Oils, Oil contaminated soils/water sources refer to PCB Protocol in Annex 3.
- Keep hazardous products 150 feet or more from your well and preferably to the side or downhill from it, even when all your spills and drips will be contained.
- Return excess product, spills or drips to the original container. Collect waste paint, solvents, antifreeze, oil and grease, and other hazardous chemicals for community recycling. Dispose of pesticide container rinse water by spreading it on fields or lawns at the proper application rate.
o Contain any unusable wastes, spills and drips for appropriate disposal.

o Locate all hazardous waste products and activities, including mixing and storage, on a surface which will prevent spilled materials from entering ground water. The cumulative effects of small spills may have as great an impact on ground water as a larger spill.

o Segregate different types of waste in storage to prevent dangerous chemical reactions that could release the products.

o Have emergency equipment, such as adsorbents and shovels, ready to contain spills.

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<td>Emissions</td>
<td>Air Emissions</td>
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<td>Noise Emissions</td>
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<tr>
<td>o During site clearing</td>
<td>o Movement of vehicles on un-tared access roads</td>
<td>o From exhaust fumes of project vehicles</td>
<td>o Surface access roads and on-site roads with aggregate materials, wherever appropriate.</td>
<td>o Substitute a less noisy process. For example, use a hydraulic block splitter rather than a cut-off saw to cut blocks.</td>
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<td>o Minimize the amount of disturbance and areas cleared of vegetation.</td>
<td>o Remove people from the vicinity of noisy work. For example, use a machine mounted breaker on an</td>
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<td>o Reduce project-related greenhouse gas emissions in a manner appropriate to the nature and scale of project operations and impacts.</td>
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excavator with a good quality cab and exclude other people from the area while the breaker is in use.
- Select quiet equipment. For example, compare noise levels from power tools when buying or hiring equipment. Use information from the manufacturer or supplier, and choose the quietest tools that are effective for the job. You can also reduce noise when selecting other types of tool. For example, choose plastic or rubber hammers, rather than metal, to free collars on falsework legs.
- Use of appropriate PPEs (Ear muffs).

<table>
<thead>
<tr>
<th>3</th>
<th>Health and Safety</th>
<th>Fall from Height</th>
<th>During installation</th>
<th>8 months</th>
<th>Major</th>
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</thead>
<tbody>
<tr>
<td>o</td>
<td>Identify all Fall Hazards on site</td>
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<td>o</td>
<td>Communicate the potential fall hazards to all workers/visitors on site through tool-box talks and training</td>
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<td>o</td>
<td>Provide appropriate PPEs for all personnel exposed to any particular fall height associated with their tasks</td>
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<td>o</td>
<td>Enforce compliance with fall hazard prevention protocol established for the project through appropriate supervision and use of PPEs.</td>
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<td>Objects falling on persons</td>
<td>During installation</td>
<td>8 months</td>
<td>Major</td>
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<td></td>
<td>o Avoid working under unstable, suspended equipment/materials</td>
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<td></td>
<td>o Use of Appropriate PPE (Hard Hat).</td>
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<td></td>
<td>o Effective supervision of workers if work must be done under such conditions.</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Slips and Trips</th>
<th>Mostly during civil works (excavation of foundation pits).</th>
<th>3 months</th>
<th>Major</th>
<th>1,000.00</th>
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<td></td>
<td>o Design of workplace &amp; work processes that eliminate or reduce exposure to Slips &amp; Trips</td>
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<td></td>
<td></td>
<td><em>(Design workplace &amp; processes to prevent potential exposures to slip &amp; trip hazards)</em></td>
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<td></td>
<td>o Good housekeeping <em>(Maintain clear, tidy work areas free of clutter).</em></td>
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<td>o Safe walking practices <em>(Follow safe walking practices &amp; routes).</em></td>
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<td></td>
<td>o Wearing proper footwear <em>(Wear proper footwear with good traction).</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o Contain work processes to prevent discharge, splatter, or spillage of liquids, oils, particles, dusts &amp; offal onto floor <em>(Local exhaust ventilation, Extraction/collection systems, Enclosures,)</em></td>
</tr>
</tbody>
</table>

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- Work surfaces with raised or lipped edges, catch/drip pans, drain-offs).
  - Use drip trays to contain leaks of lubricant onto floor from machinery
  - Perform regularly scheduled maintenance
  - Use adequate ventilation to avoid smoke, steam & condensation of water & grease onto floor
  - Provide adequate lighting to keep work areas, aisles & paths of travel well lit
  - Mark/highlight step edges & transition areas (changes in elevations)
  - Use anti-skid paint, slip-resistant coatings & strips
  - Make sure stairs have sufficient lighting & hand rails
  - Provide effective drainage, false floors or work platforms
  - Install slip-resistant floors in high risk areas.
<table>
<thead>
<tr>
<th>Injury</th>
<th>Frequency</th>
<th>Duration</th>
<th>Severity</th>
<th>Precautions</th>
</tr>
</thead>
</table>
| Injuries due to manual handling | Throughout the project but more likely during civil works and installation. | 18 months. | Medium | Appropriate mechanical equipment should be used for lifting heavy items.

**If manual lifting must be done then:**
- Get a secure grip.
- Use both hands whenever possible.
- Avoid jerking by using smooth, even motions.
- Keep the load as close to the body as possible.
- To the extent feasible, use your legs to push up and lift the load, not the upper body or back.
- Do not twist your body. Step to one side or the other to turn.
- Alternate heavy lifting or forceful exertion tasks with less physically demanding tasks.
- Take rest breaks.

**When working with Power Tools:**
- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords and hoses away from heat, oil, and sharp edges.
- Disconnect tools when not using them, before servicing and cleaning them, and when changing accessories such as blades, bits, and cutters.
- Keep all people not involved with the work at a safe distance from the work area.
- Secure work with clamps or a vise, freeing both hands to operate the tool.
- Avoid accidental starting. Do not hold fingers on the switch button while carrying a plugged-in tool.
- Maintain tools with care; keep them sharp and clean for best performance.
- Follow instructions in the user's manual for lubricating and changing accessories.
- Be sure to keep good footing and maintain good balance when operating power tools.
- Wear proper apparel for the task. Loose clothing, ties, or jewellery can become caught in moving parts.
- Remove all damaged portable electric tools from use and tag them: "Do Not Use."
<table>
<thead>
<tr>
<th>Electrocution</th>
<th>During installation</th>
<th>8 months</th>
<th>Major</th>
</tr>
</thead>
</table>
| ○ A tagging system to identify faulty equipment or equipment under maintenance or installation be established.  
○ Clock-in, clock-out and duty/equipment handing over system be established at all work sites  
○ Use of only adequately trained personnel be used for any particular task - the Contractor MUST not, under no circumstance, use personnel that are not adequately trained or faulty/unsuitable equipment for any task.  
○ Proper outage system on live equipment to be worked must be established and enforced. |

<table>
<thead>
<tr>
<th>Socio-Economic</th>
<th>Movement of vehicles and equipment.</th>
<th>Delivery of equipment to site.</th>
<th>1 month</th>
<th>Minor</th>
</tr>
</thead>
</table>
| ○ Traffic detour routes must be prearranged with the Local Government Council.  
○ Access at entry and exit points to works sites should be controlled and heavy trucks should be assisted by traffic controllers  
○ Ensure that warning signs are clear and visible at night.  
○ Limiting the speed within Site.  
○ Place visually clear instructions in areas close to Construction site. |

| 4 | 1,000.00 |
| 500,00 |

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<table>
<thead>
<tr>
<th>Power Outage</th>
<th>During installation</th>
<th>Intermittently within 8 months</th>
<th>Minor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>o Provision of alternative source of power supply to residents that may be affected by the knocking off of their regular supply channel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>o Sensitization of the impacted customers through radio announcements, newspaper adverts and other public notices.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>o An outage plan should be prepared in conjunction with the Contractor and this should and strictly adhered to by TCN and the Contractor.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HIV/AIDS and other STIs</th>
<th>Throughout project life</th>
<th>Throughout project life (24 months)</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>o HIV/AIDS Sensitization/awareness campaigns/workshops. Sensitization programme should include provision for special targeting of girls and young women, as well sex workers and other At Risk populations around the project area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>o Voluntary HIV/AIDS testing for Contractor staff.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>o Distribution of condoms.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50,000.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender-based Violence and Sexual</th>
<th>During construction and installation</th>
<th>Throughout project life (24 months)</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Minimize influx through local hiring</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Require the contractor to include in the Contractors Environmental and Social Management Plan (CESMP)</td>
</tr>
</tbody>
</table>
measures to avoid SEA, GBV, or other social conflict, including:
- mandatory awareness raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women;
- informing workers about national laws that make sexual harassment, exploitation of children, and gender-based violence a punishable offence which is prosecuted;
- Code of conduct to be established for contractor employees and contract workers, acknowledging a zero-tolerance policy towards child labor; child sexual exploitation as well as Sexual and Gender Based Violence. The code of conduct will be a part of employment contracts for each contractor staff, and will include sanctions for non-compliance (e.g., termination), and
- Contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence.
• TCN and Contractor should consult with local community representatives including women regarding potential for SEA or GBV and appropriate measures to prevent and respond to it.
• TCN should ensure that contractor’s GRM is robust and operational
• Ensure that implementation of the CESMP (or influx management plan if there is one) is an enforceable provision of the construction contract

Table 6: Impact/Mitigation Table

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

Grand Total = $90,000/site x 10 sites (900,000 USD)
6 GRIEVANCE REDRESS MECHANISM (GRM).

This ESMP recognizes that grievances may arise as a fallout of the implementation of the rehabilitation/re-enforcement projects under NETAP Package 1, Lot 2. It therefore, creates a platform and procedure for effective handling of complaints and grievances that are aimed at avoiding lengthy litigations which may hinder or delay project implementation and objectives.

6.1 Objective of the GRM

The objectives of the grievance redress mechanism are to:

- Provide an effective avenue for affected persons to express their concerns and resolve disputes that are caused by the project
- Promote a mutually constructive relationship among PAPs, government and project proponents
- Prevent and address community concerns
- Assist larger processes that create positive social change and
- Identify early and resolve issues that would lead to judicial proceedings

6.2 Grievance Redress Committee (GRC)

The TCN-PMU shall establish a committee that will be responsible for the day-to-day implementation of the grievance redress process. This shall consist of representatives of all key stakeholders in the respective projects especially the PAPs, local traditional institutions, Local Government Councils, the State governments, local NGOs/CSOs, women and youth groups, TCN-PMU and any other disadvantaged groups that may be identified in the local community.
To achieve the above objective the PMU will incorporate the use of existing local grievance redress processes available in the community to addressing disputes that may result from this project. This will entail co-opting the traditional council and some local leaders as members of the GRC.

6.2.1 Composition of Grievance Redress Committee (GRC)

The specific composition of these committees will vary depending upon location and context. Further details will be spelt out at the RAP stage.

The main functions of the Committee are to:

- Publicize within the list of affected persons and the functioning of the grievance redressed Procedure established;
- Verify grievances and their merits;
- Recommend to the PMU solutions to such grievances;
- Communicate the decisions to the Claimants;
- Ensure that all notices, forms, and other documentation required by Claimants are made available in Local language understood by people
- Ensure documentation of all received complaints and the progress of remediation.

6.3 Grievance Redress Process

The structure or steps of the grievance redress mechanism shall comprise of:

- Receive, register and acknowledge complaint
• Screen and establish the foundation of the grievance
• Implement and Monitor a redress action
• Advise for a judicial proceedings as last resort if necessary
• Document the experience for future reference

Receive, Register and Acknowledge complaint
The PMU will establish a register/complaint log book for all complaints at the project level. The PMU is required to maintain/designate the register at a centre close to the people. The log book will contain: 1) the complainant’s name, 2) date of complaint, 3) nature of complaint, 4) follow-up action and schedule. The PMU will communicate the functions of the GRC and the process to accessing redress.

It must be noted that proper and honest responses to grievances, an apology, adequate compensation, and modification of the conduct that caused grievances are fair remedies for grievance redress. Therefore, the GRC should be trained on the diplomacy of handling aggrieved persons while verifying/screening the merit or otherwise of his/her complaints.

Screen and Establish the Foundation/Merit of the Grievance
The GRC will, upon receipt and registration of grievance, proceed to investigate the cause/merit of the complaints. This should be undertaken within one (1) week of receiving complaints. Depending on the nature and complexity of the matter in question the GRC may invite the parties involved in the process of investigation and redress.
Implement and Monitor a Redress Action

Once the cause of the grievance and eligibility of the PAP is established, the GRC shall recommend to the PMU the remedial package or line of action to address the grievance in line with established entitlement matrix. The PMU shall spell out in writing to the aggrieved PAP(s) and copied to the GRC within two weeks of resolution of grievance, of its commitment and when to pay the compensation. This is particularly necessary if the PMU will need to obtain “NO Objection” or undergo application procedure in funding the compensation, which may take some time. The GRC will issue a grievance resolution form to be completed and endorsed by the complainant confirming resolution of the grievance. It is recommended that implementation of the redress action plan be witnessed and monitored by the GRC and/or a third party. If established that PAP was ineligible for the claim he/she presented, the GRC will persuade the PAP to drop the complaint.

Alternative Action for Dissatisfied Aggrieved Persons

In the event that the aggrieved person is dissatisfied with the resolution/decision of the GRC, he/she can bring the matter up to the project coordinator at PMU, who will expedite actions to logical resolution within 2 to 4 weeks of receipt of complaints.

Where the matter appear unresolved or unsatisfactory to the complainant, court of law will be a last resort to seek redress.
6.4 Financing of the Grievance Redress Mechanism and Cost of Remediation

The TCN-PMU shall be responsible for the funding of logistics for the GRC as well as the eventual compensation or remediation that aggrieved party may be entitled to. The TCN-PMU will also be responsible for the cost of the judicial process for cases that result to court for adjudication.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Process</th>
<th>Description</th>
<th>Completion Time frame</th>
<th>Responsible Agency/Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receipt of complaint</td>
<td>Document date of receipt, name of complainant, village, nature of complaint, inform the PMU</td>
<td>1 day</td>
<td>Secretary to GRC at project level</td>
</tr>
<tr>
<td>2</td>
<td>Acknowledgement of grievance</td>
<td>By letter, email, phone</td>
<td>1-5 days</td>
<td>Social safeguard officer at PMU</td>
</tr>
<tr>
<td>3</td>
<td>Screen and Establish the Foundation/Merit of the Grievance</td>
<td>Visit the site; listen to the complainant/community; assess the merit</td>
<td>7-14 days</td>
<td>GRC including the social safeguard officer and the aggrieved PAP or his/her representative</td>
</tr>
<tr>
<td>4</td>
<td>Implement and monitor a redress action</td>
<td>Where complaint is justified, carry out redress in line with established Bank Safeguard Policies and regulations of the Federal Ministry of Environment.</td>
<td>21-30 days or at a time specified in writing to the aggrieved PAP</td>
<td>PC-PMU and Social safeguard Officer</td>
</tr>
<tr>
<td>5</td>
<td>Extra intervention for a dissatisfied scenario</td>
<td>Review the redress steps and conclusions, provide intervention solution</td>
<td>2-4 weeks of receiving status report</td>
<td>PC-PMU</td>
</tr>
<tr>
<td>6</td>
<td>Judicial adjudication</td>
<td>Take complaint to court of law</td>
<td>No fixed time</td>
<td>Complainant</td>
</tr>
<tr>
<td>7</td>
<td>Funding of grievance process</td>
<td>GRC logistics and training, redress compensation, court process</td>
<td>No fixed time</td>
<td>The proponent (government or investor)</td>
</tr>
</tbody>
</table>

Table 7: IMPLEMENTATION plan for grievance REDRESS mechanism
7 MONITORING

Environmental and Social monitoring will include visual observations, selection of environmental parameters at specific locations and sampling and regular testing of the relevant parameters. Monitoring will be done at a number of levels. The first level of monitoring of the ESMP will be conducted by the Contractor at work sites during construction/rehabilitation, under the direction and guidance of the Engineering Consultant who is responsible for reporting the monitoring to the implementing agency. The second level of monitoring of the ESMP will be done by the PIU who will verify the report of the Contractor by directly auditing the implementation of environmental mitigation measures contained in the ESMP and submit quarterly reports on this to the World Bank. The third Level will be done by the World Bank, through appointed external E&S Auditors that will conduct and annual check on the implementation of the ESMP by both the Contractor and the PIU and reports to the Bank for further actions. Instances of GBV or SEA are to be reported immediately to TCN and World Bank.

In addition to this ESMP, the Contractor is expected to prepare a “Contractor’s ESMP” (CESMP) that will be reviewed by the ESU of PMU and cleared by the Bank. This CESMP (sample shown in Annex 1) shall contain the statement and commitment of the Contractor regarding the sustainable implementation of the rehabilitation/reinforcement project being executed under NETAP.

To ensure that all the measures are applied and that the contractor complies with the requirements of the ESMP, TCN substation Management shall appoint an HSE personnel that will be attached to the Contractor handling the NETAP project. This staff shall be responsible for the day-day supervision of works and ensuring compliance. The site HSE staff shall produce and submit weekly reports to the ERSU-PMU.

The ERSU-PMU shall designate a staff to manage each project site. This ERSU-PMU staff shall review the weekly reports from the TCN substation HSE staff as well as the
month HSE reports from the Contractor and conduct a quarterly site assessment and supervision visit to the respective sites. The ERSU-PMU staff shall produce quarterly reports which will be submitted to the World Bank for review and further necessary actions.

Using the quarterly reports submitted by the ERSU-PMU, the Bank safeguards team shall conduct safeguards supervision Missions at intervals to be decided by them and employ the services of the external E&S Auditor as may be required to address any issues requiring such attention.

7.1 Training

The PIU shall conduct training for all the site HSE personnel that will be responsible for the day-to-day monitoring of the NETAP projects at the respective sites. This training shall include on-shore specialized training in environmental management and Occupational Health and Safety. The world Safeguards Team shall also conduct training on the Safeguard Policies of the Bank which will hold at a destination within the country. Budget for these trainings have been proposed and approved in the ESMF for NETAP.

7.2 Cost of Mitigation

An estimated cost of USD 90,000 is proposed for the mitigation of the potential impacts associated with the rehabilitation/reinforcement project at each site.
<table>
<thead>
<tr>
<th>S/N</th>
<th>SAFEGUARDS ASPECT</th>
<th>SUB-ASPECT</th>
<th>GUIDELINE</th>
<th>OBSERVATION</th>
<th>SAFEGUARDS PERFORMANCE NOTE (Breach/Partial Compliance/Full Compliance)</th>
<th>REMEDIAL ACTION</th>
<th>ENFORCEMENT ACTION/PENALTY</th>
</tr>
</thead>
</table>
| 1   | Occupational Health and Safety | Working in confined spaces | • Adequate lighting in dark working areas.  
• Provision of smoke extractors.  
• Installation of industrial fans for adequate ventilation.  
• Conservation of energy in the work place - Installation of white energy saver bulbs/flood lamps.  
• Working environment must be safe at all times.  
• Use of nose masks when working in areas where smoke/dust is generated. | | | |
| 2   | Working at height | • Erection of scaffolds  
• Use of Harness  
• Provision of safety net | | | |
| 3   | Working surfaces | • Protruding sharp/pointed edges of equipment | | | |

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<table>
<thead>
<tr>
<th></th>
<th>Lifting/moving heavy equipment/materials</th>
<th>Heavy equipment/materials should be lifted by mechanized means. The weight of the item must be considered in selecting the lifting device to be used for the purpose.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Safety signs/Tagging</td>
<td>Must be displayed at strategic places to guide/warn people of hazards associated with the work going on in the area.</td>
</tr>
<tr>
<td>6</td>
<td>House-Keeping</td>
<td>Provision of waste Bins within the working areas</td>
</tr>
<tr>
<td></td>
<td>Waste bins should be provided for collection and handling of wastes within the work area.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Training</td>
<td><strong>Type of Training</strong></td>
</tr>
<tr>
<td></td>
<td>• Training should address the task required to be executed by the employee.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The duration of the training should be sufficient for the complete delivery of the subject matter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The training MUST be conducted by a competent/accredited person in the field in question.</td>
<td></td>
</tr>
</tbody>
</table>
- The content of the training should address all areas where skill gaps exist.
- No personnel MUST be assigned to any task for which he/she has been adequately trained.
8 CONCLUSION

The Federal Government of Nigeria, through the Transmission Company of Nigeria (TCN) is implementing an IDA-financed Nigeria Electricity Transmission Project (NETAP) that will be national in scope but with focus on the north-Eastern and south-western parts of the country as part of efforts to improve the capacity and efficiency of the transmission network and increase access to electricity services. The project will involve upgrade/reinforce of existing Transmission Substations as well as upgrade existing Transmission Lines.

This ESMP lays out the overall policies for the protection of the environment in Nigeria in line the regulations of the Federal Ministry of Environment and the safeguards policies of the World Bank, identifies the potential impacts associated with the implementation of the proposed intervention projects at these stations, proffers appropriate mitigation measures and assigns responsibilities as well as costs to the tasks required for the sustainable implementation of the projects.

The recommendations proposed for implementation in this ESMP form the backbone for the sustainable implementation of the proposed rehabilitation projects at Alagbon, Lekki and Egbin 330/132kV Transmission Substations and Ijora, Alausa, Akoka, Itire, Amuwo-Odofin, Maryland and Ota 132/33kV Transmission Substations. Strict implementation of these recommendations and application of appropriate sanctions to defaulting Contractors is key in ensuring that these, projects meet the development objectives of the World Bank.
ANNEX 1    SAMPLE CONTRACTOR’S ESMP

CHINA HARBOUR ENGINEERING COMPANY LIMITED

CONTRACTORS
ENVIRONMENTAL MANAGEMENT PLAN

(LAE PORT DEVELOPMENT PROJECT – TIDAL BASIN PHASE 1)

August 2012 (Revision2).

CHINA HARBOUR ENGINEERING COMPANY Ltd
C-/NEW VISION CONSULTING
LEVEL 3 ADF HAUS
MUSGRAVE ST
P. O. BOX ____PORT MORESBY
NATIONAL CAPITAL DISTRICT
PAPUA NEW GUINEA

<table>
<thead>
<tr>
<th>CHINA HARBOUR ENGINEERING COMPANY LIMITED</th>
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<tbody>
<tr>
<td>CONTRACT NO. 1879</td>
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<tr>
<td>LAE PORT DEVELOPMENT PROJECT – TIDAL BASIN PHASE I</td>
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<tr>
<td>Document No.</td>
</tr>
<tr>
<td>CEMP-01</td>
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<tr>
<td>Revision 2</td>
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ENGINEER & CONTRACTOR DOCUMENTATION REVIEW:

<table>
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<tr>
<th>STATUS</th>
<th>Approval Status</th>
</tr>
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<tbody>
<tr>
<td>□ STATUS 1</td>
<td>Approved as submitted</td>
</tr>
<tr>
<td>□ STATUS 2</td>
<td>Approved subject to implementation of Engineer’s and/or Employer’s comments / notation without re-submission</td>
</tr>
<tr>
<td>□ STATUS 3</td>
<td>Rejected and being subject to full re-submission in response to the Engineer’s and/or Employer’s comments / notation</td>
</tr>
</tbody>
</table>

NOTE:
Consent by the Employer shall not relieve the Contractor of any duty and responsibility under the Contract.

---

<table>
<thead>
<tr>
<th>Rev.0</th>
<th>Date</th>
<th>Status</th>
<th>Prepared By:</th>
<th>Reviewed By:</th>
<th>Approved By:</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>Danny Wame</td>
<td>Wu Guansheng</td>
<td>Ma Jianhua</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ES&amp;H Manager</td>
<td>Deputy project Manager</td>
<td>Project Manager</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Rev.1</th>
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<th>Status</th>
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<tr>
<td>11.0 COMPLAINT MANAGEMENT</td>
<td>14</td>
</tr>
<tr>
<td>12.0 ENVIRONMENTAL TRAINING</td>
<td>14</td>
</tr>
</tbody>
</table>
FOREWORD BY THE PROJECT MANAGER:

China Harbour Engineering Company Limited (CHEC) has prepared this Contractors Environmental Management Plan (CEMP) as a practical guide for employees & sub-contractors for the proposed Lae Port Development Project-Tidal Basin Phase 1.

The document is designed to be a reference point for regulatory authority, external and internal audits and general stakeholder interests in environmental practices. The overall custodian of this CEMP is the Project Manager. “Ownership” of the plan, rests with sectional heads, employees, & sub-contractors.

Sectional heads will continuously remind employees of the need to follow the dictates of the CEMP and will carry out checks to enforce environmental controls. Employees are expected to take ownership by adopting and implementing the plan in order to continually maintain and improve environmental performance. They will attend induction sessions, refresher training sessions and have daily reminders on specific topics during daily tool box briefings. Incentives may be offered to staff who demonstrate environmental awareness.

The environmental requirements detailed in the CEMP will be included in sub-contracts. Sub-Contractors will be required to implement the CEMP as a contractual obligation and this will be monitored by site supervisory staff.

The document is a living “organism”. All requests for modification to this document should be submitted to the Deputy Project Manager through Environment, Safety & Health Office. Suggestions would be reviewed and incorporated where necessary.

Together we can create a healthier and safer workplace and protect our environment and assets from harming and ensures continues improvements in our environmental practices.

Mr. Ma Jianhua

Project Manager
CHEC ENVIRONMENTAL POLICY STATEMENT:

A Project Environmental Management Policy is established to demonstrate the Project Team’s commitment in improving our environmental performance. It aims to communicate CHEC’s mission, vision and beliefs towards the environment to the staff and provides a framework for guiding CHEC’s ongoing environmental improvement efforts.

The policy will be reviewed periodically by relevant parties and will be displayed on notice boards in languages suitable for the local workforce. CHEC will modify the CEMP as needed relevant to actual construction work.

As a contractor, the Environmental Policy (See Appendix A) will be implemented and maintained by the project team, until the completion of the project.

CHEC is certified to ISO Standard 14001 - Environmental Management System (See Appendix B). Thus, the project team will continue to implement and maintain these systems for the Lae Port Development Project Tidal Basin Phase I to prevent accidents and minimize adverse environmental impacts from the project.

CHEC ENVIRONMENTAL COMMITMENT

The contractor will comply with all PNG environmental legislation, regulations and PNG government policies and procedures. In addition it will comply with the ADB’s Safeguard Policy Statement 2009.

China Harbour Engineering Company (CHEC) is internationally recognised as having a reputation for safeguarding the environment and has achieved certification to ISO Standard 14001-Environmental Management System (EMS). CHEC acknowledge that it is essential to maintain the annual renewal of this ISO certification and they ensure construction works comply with environmental standards. The steps needed to meet these standards are included in regular staff training plans.

Activities during construction will be constantly monitored on a daily basis to ensure compliance. As part of the continual improvement program, this plan will be reviewed at least once a month, and if necessary amended after discussions with the Supervisory Consultants. It may be amended and updated at any time at the discretion of the Project Management and will be formally reviewed once a year for the life of the project. At completion of the project a Project Completion Report will be submitted confirming that all necessary environmental clean-up measures have been completed.

The basis for amendments, improvements and updates will be environmental inspections, audits and reviews of the contractor’s environmental performance. This will ensure procedures for control of contractors are sufficient to maintain project environmental standards, meet project environmental targets and comply with environmental legislation and regulations relevant to the project.

1.0: INTRODUCTION:

This Contractors Environmental Management Plan (CEMP) covers the Construction Phases of Lae Port Development Project – Tidal Basin Phase 1. The plan is developed following the findings of the Environmental Impact Assessment (EIA) undertaken by Haskoning Nederland BV in association with Ports & Maritime Consultancy Ltd. Port Moresby, in year 2007. In the EIA, both bio-physical & socio-economic impacts of the project have been identified and mitigation measures recommended. It also follows the requirements and recommendations of the Initial Environmental Examination (IEE) of “PNG: Lae Port Development Project –
China Harbour Engineering Company (CHEC) is an internationally recognised company and maintains its reputation in safeguarding the environment by meeting regulatory requirements in the country of operation and adopting a “Best Environmental Code of Practice” which is based on CHEC’s certification to ISO Standard 14001-Environmental Management System (EMS). Thus all construction works will comply with acceptable relevant environmental standards and the steps needed to meet these are included in staff training plans.

2.0: DEFINITION:

<table>
<thead>
<tr>
<th>Terms</th>
<th>Definitions</th>
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<tbody>
<tr>
<td>Environment</td>
<td>Surroundings and conditions in which CHEC’s construction works operates or which it may affect including living systems (human and others) therein.</td>
</tr>
<tr>
<td>Environment Policy</td>
<td>A unique document that shows <strong>who</strong> does what and <strong>when</strong> and <strong>how</strong> to do it. Environment policy does influences all business activities including the selection of people, equipment and materials, the way work is done and how it is designed to provide goods and services. The policy is in compliance with PNG environmental protection laws and ADB’s Safeguard Policy Statement.</td>
</tr>
<tr>
<td>Hazard</td>
<td>Any situation with the potential to cause danger to environment, cause injury or illness to people</td>
</tr>
<tr>
<td>Accident</td>
<td>Any event which result in damage or loss to environment</td>
</tr>
<tr>
<td>Incident</td>
<td>An event which has caused or could have caused damage or loss to environment or injury to personnel on site</td>
</tr>
<tr>
<td>Near-miss</td>
<td>Any event which has the potential to cause damage or loss to environment but avoided by circumstances</td>
</tr>
<tr>
<td>Risk</td>
<td>The potential for a hazard to result in an incident</td>
</tr>
<tr>
<td>Risk Assessment</td>
<td>A careful consideration by competent people of the hazard associated with a task. The potential effect of each hazard, how severe it might be and the likelihood of it occurring</td>
</tr>
<tr>
<td>Risk Management</td>
<td>A management system which eliminates or mitigate the threat from hazard</td>
</tr>
<tr>
<td>Environmental Management System</td>
<td>The company structure, responsibilities practices, procedure process and resources for implementing environmental management</td>
</tr>
<tr>
<td>Environmental Audit</td>
<td>An independent systematic &amp; documented process of assessing compliance of an Environmental program with legislation</td>
</tr>
<tr>
<td>Contractors Environmental Management Plan</td>
<td>A description of the means of achieving environmental objectives during the construction phase in compliance with the EIA and IEE prepared for the project.</td>
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</table>

3.0: PROJECT BACKGROUND:
Due to the archipelagic nature of Papua New Guinea (PNG) and rugged terrain, which creates widely dispersed population pockets and limits mobility and opportunities to develop the domestic market, the country heavily relies on trade, particularly exports, for economic growth and fiscal revenue. The port sector provides a vital link between PNG and the world market, with more than 80% of PNG exports shipped from ports.

The city of Lae, located in Morobe province, is PNG’s industrial and commercial trade centre. Lae port, the largest port of Papua New Guinea, is centrally located in the country and is on most Pacific shipping routes. It is situated on the coast of the Markham Bay at the north-western corner of the Huon Gulf, approximately 1.5 km east of the mouth of the Markham River.

Over the past decade Lae port has been adapting to the demands of container operations. However, the current five berths of Lae port, with a total length of about 520m and a total storage area of 52,600 m² for cargo marshalling, are aging and insufficient to handle increasing cargo volumes and ship size. As early as the 1970s a plan to expand port capacity by developing a tidal basin project in the marshland area located to the west of the existing port facilities was formulated. The project did not proceed due to a dispute relating to land ownership. During the following two decades decreased economic growth discouraged not only investment in the tidal basin project, but also adequate maintenance of the existing port facilities. Improved economic performance and steady increase of the cargo throughput at Lae port since 2003 have generated revenues for the Government and PNG Ports Corporation Limited.

4.0: PURPOSE:

The purpose of this CEMP is to;

➢ Comply with the requirement of PNG Environment Act 2000
➢ Practically apply CHEC’s Environmental Policy
➢ Comply with EMS (ISO 14001) Requirements
➢ Address potential environmental issues pro-actively and systematically in a timely manner
➢ Ensure compliance with PNG’s environmental protection laws and ADB’s Safeguard Policy Statement and agreements between Government and Contractor

5.0: OBJECTIVES & TARGET:

Project environmental objective & target are as follows;

<table>
<thead>
<tr>
<th>No</th>
<th>Objective</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To comply with legal requirement</td>
<td>Zero conviction</td>
</tr>
<tr>
<td>2</td>
<td>To ensure best environmental performance</td>
<td>Zero non-compliance in environmental practice</td>
</tr>
</tbody>
</table>

6.0: ENVIRONMENTAL LAWS, POLICIES & STANDARDS:

➢ PNG Environmental Act 2000
➢ CHEC Environmental Policy
➢ Environmental Management System
➢ ADB’s Social Safeguard Policy Statement 2009
Standards to be adopted for discharges will be in accordance with the PNG Department of Environment and Conservation Permits for Noise, Air, Water and Land Discharges as issued after Minister’s Approval in Principle is given, which has been obtained.

Standards for Mitigation and Monitoring will be as stipulated in the IEE 2011 to include parameters, locations, timing and frequency.

7.0: ENVIRONMENTAL MANAGEMENT STRUCTURE:

The ES&H management structure is shown below. The ES&H Manager is directly responsible and report to the Project Manager/ Project Director.
8.0: RESPONSIBILITIES:

Respective personnel within the environmental management structure are responsible and accountable for the implementation of this EMP.

8.1: Project Manager (PM);

The Project Manager is responsible for providing support in dealing with all aspects of environmental issues within the project, and reporting to the CHEC Supervisory Board.

8.2: Deputy Project Manager (DPM);

The responsibilities of the Deputy Project Manager are as follows:

a) Ensure works are executed in accordance with the CEMP.

b) Arrange routine joint site inspection with ES&H Manager and ES&H Engineer.

c) Provide necessary guidance & supervision to ES&H Manager and ES&H Engineer in order to implement CEMP

d) Monitor and control the works including those subcontractor(s) to ensure compliance with specified requirements.

e) Ensure appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the relevant procedures.

f) Assist in handling any complaints received from the public.

g) Ensure remedial action is undertaken immediately if there is a non-compliance of statutory or contractual requirements of the environment practices.

h) Liaise with PMU and PMU’s IES as required

8.3: Environmental, Safety & Health (ES&H) Manager;

ES&H Manager is responsible for;

a) Providing advice to project management in respect of any environmental protection issues such as noise abatement, air & water pollution control, refuse disposal etc.

b) Assuming environmental duty on site with the assistance of Environmental Engineer. Held responsible for any environmental issues arising due to construction activities and in relation to environmental practices adopted on site.

c) Providing necessary guidance & supervision to ES&H engineer in order to implement environmental management plan & program

d) Ensure works are executed in accordance with this CEMP.

e) Liaise with relevant government department in obtaining required license, permit and test report.

f) Arrange routine joint site inspection with ES&H engineer in consultation with Deputy Project Manager.

g) Prepare, implement and update the Contractors Environmental Management Plan;
h) Arrange and provide the environmental training including the site specific induction training and toolbox talks for the staff and workers on the Site, and to organize environmental promotional activities;

i) Advise the company on the implementation of an environmental management system;

j) Attend Site Safety and Environmental Management Committee (SSEMC) Meetings

k) Liaise with PMU and PMU’s IES as required

l) Apply for environmental permits and ensure conditions stated therein are complied with during construction activities and site works

m) Ensure that approved CEMP is available at the site office

n) Ensure that the elements from the approved CEMP are translated into site inspection forms and monitoring forms.

n) Ensure that the regularity of the site inspections are followed as per the daily and weekly inspection charts given in the Appendices C and D.

8.4: Environmental, Safety & Health (ES&H) Engineer;

Duties and responsibilities of the ES&H Engineer are as follows;

a) Provide engineering advice to project management in respect of any environmental protection issues such as air & water pollution control, refuse disposal etc.

b) Work in parallel with the design team and project management to ensure environmental issues are fully considered during the design and implementation stages.

c) Advise on measures to be taken in the interest of environmental protection, and implement such measure;

d) Liaise on all matters relating to environmental monitoring and auditing;

e) Carry out inspections of the site for identifying potential hazards to the environmental, and to report findings with recommendations for corrective actions ;

f) Participate in the environmental audit, and monitor the environmental performance on the Site;

g) Check and ensure that any polluting or potentially polluting situation is promptly rectified as per ES&H Managers advice

h) Attend Site Safety and Environmental Management Committee (SSEMC) Meetings

i) Keep a copy of the following documents (including but not limited to):
   • Any statutory required environmental permits/licenses including construction noise permits, noise levels for compressors and hand held percussive breakers, effluent discharge licenses, dumping permits;
   • All correspondences with Department of Environment and Conservation. Central Environment Authority and complaints;
   • Records regarding the handling of contaminated wastes;
• Records regarding the disposal of all construction and demolition materials to the specific or designated area.
• Record of all trained personnel in the site offices and update the record.
j) Update the monthly summary Waste Flow Table
k) Report to the ES&H Manager regarding non-compliance of any environmental protection issues and ensure any non-compliance is handled
l) Ensure complaints are handled properly
m) Liaise with PMU and PMU’s IES as required
n) Apply for environmental permits and ensure conditions stated therein are complied with during construction activities and site works
o) Ensure that approved CEMP is available at the site office
p) Ensure that the elements form the approved CEMP are translated into site inspection forms and monitoring forms
q) Updating of CEMP based on changes in operating procedures or new issues brought to light. Proposed revisions to the CEMP will be tabled in the monthly progress meetings CHEC/KECC/IPBC.(See Figure 1 below)
r) Carry out site inspections in accordance with the monitoring plan and complete daily and weekly inspection charts as given in the appendices C,D. All findings will be reported including “Near Misses”, not just corrective actions. This relates to potential incidents that were avoided and no actions were required but these must still be reported, as lessons learned can be circulated
8.5: Site Engineers & Assistant Engineers;

The Site Engineers / Assistant Engineers have the following duties in relation to environmental control;

a) Assist the Environmental Manager in implementing the CEMP

b) Monitor and control the works including those of sub-contractors to ensure compliance of both contractual and statutory requirements;

c) Report to the Environmental Manager or Environmental Engineer regarding non-compliance of any environmental protection issues;

d) Investigate and verify the complaint received from public;

e) Ensure the remedial actions or mitigation measures are carried out as planned
f) Carry out noise and vibration monitoring as required.
g) Attend induction and regular meetings on environmental health and safety matters
h) In the event of complaints being received by any staff i.e. site engineers/assistant engineers they must report to ESHE and ESHM and follow the procedure laid down in the Complaints Response Procedure. (Figure 2)

8.6: Technical officers, Foremen, Supervisors;

Technical officers/Foremen/Supervisors are responsible for the following duties in relation to environmental control;

a) Assist the Site Engineers/Assistant Engineers to implement the CEMP
b) Control the works, including those of sub-contractors, to fulfil environmental requirements;
c) Report to the Site Engineers/Assistant Engineers any non-compliance of environmental protection and mitigation measures;
d) Investigate the complaint received from the public,
e) Carry out remedial actions or mitigation measures to rectify the non-compliance.
i) Attend induction and regular meetings on environmental health and safety matters
j) In the event of complaints being received by any staff i.e. site engineers/assistant engineers they must report to ESHE and ESHM and follow the procedure laid down in the Complaints Response Procedure. (Figure 2)

8.7: CHEC Employees;

a) to carry out agreed site environmental practices as instructed by ES&H Manager, ES&H Engineer, Site Engineers and Foremen.
b) Report promptly to their immediate supervisor who will report to ES&H Manager/Engineer on any non-compliance of environmental protection and mitigation measures.
c) Participate and co-operate with the Project Management Team to achieve the environmental objectives.

9.0: IMPLEMENTATION AND MONITORING:

It is essential to formulate monitoring system in order to evaluate remedial action taken in respect of water, air, land & waste pollution etc. The CEMP Monitoring Plan is a process of observing the tasks to be carried out on site after identification of environmental risks and hazard events and check whether the actions were executed according to the codes, regulations, and specification requirements. The construction works executed will be observed and checked from time to time through site inspection or Ad-hoc inspection, any non-conformance found will be recorded and collective action will be taken. Thus, work procedures will be setup for controlling and monitoring the construction works to be implemented within the codes and specifications requirements.

The CEMP Monitoring Plan includes the following:

- Setup CEMP Monitoring Program.
• Carry out preliminary survey and take necessary records for all elements involved before construction;
• Carry out daily site visit to monitor project construction compliance with codes and regulation requirements (Please refer appendix–C for daily inspection check list)
• Weekly site visit to monitor material production plants such as metal quarry, crusher, asphalt plant and concrete batching plant. (Pls refer appendix –D for weekly inspection check list)
• Carry out CEMP site inspection and audit, issue Non-Conformance Record (NCR)
• Regular communication with local community, and record any complaint regarding to environmental issues;
• Report to the ES&H Manager, Project Manager, Employer and Employer Representative on any non-conformance;
• Documentation of records

9.1: Monitoring Program;

The monitoring program is a detail environmental monitoring work program, it defines each and individual mitigation action which needs to be taken during the construction period. Moreover, the “daily inspection check list” & “weekly inspection check list” (see Appendix C & D) will be main tool for monitoring program since those lists indicate both compliances and non compliances in all relevant aspects of project activities. (See Appendix E).

Within the monitoring period, site inspection, the environmental audit frequency will be planned according to the construction works program. Furthermore, environmental monthly meeting will be assigned as one aspect of monitoring program. The environmental monthly meeting will include Employer, Employer Representative, contractor and sub-contractors (if any).

9.2: Preliminary Survey and Records;

Before commencement of construction, each and individual item listed in the EIA report will be reviewed. Action plan will be prepared for the necessary testing items to be carried out on site.

Finally, the necessary investigation will be carried out to verify of any changes on the existing environmental conditions. Detail records and testing report will be kept and documented, and it will be submitted for review and approval.

9.3: Environmental Inspection and audit;

In the CEMP, the site inspection and audit procedures will be setup.

To enhance the environmental management and control, environmental inspections and audit are the effective mitigation measure to reduce the environmental impact. As a minimum, it will include the following:

1). The environmental site inspection will be carried out according to the program to verify site activities compliance with the project specifications and local codes requirements;

2). The environmental non-conformance records will be listed in the monthly construction progress report to bring the attention to the project team;
3). Non-Conformance Report (NCR) will be issued in an event of non-conformity with ES&H aspect and it should be closed after rectifying with given time period. (Pls refer Appendix –E for NCR)

4). Random or Ad-hoc environmental inspection will be carried out to check the site activities without advance notice by senior management staff.

5). The Environmental documentation audit will be carried out periodically and adjust to suit the needs;

6). The anticipated environmental impact will be monitored to provide continuous improvement and maintain at the As Low As Reasonably Practicable level;

7). All NCR, CAR will be reported to Project Manager, Engineer & Employer, and in the monthly meeting.

8). Monitoring report will be prepared and included in the monthly report.

The ES&H Manager and ES&H Engineer will be response to carry out the environmental site inspection and audit.

9.4: Monitoring & Reporting;

The ES&H Manager will be response for the preparation of monitoring report, and the coordination and communication among Engineer, Employer, and CHEC project team. He is also response for reporting to the Engineer, Employer, ES&H Manager, and Project Manager on major environmental issues or non-conformance found.

9.5: Job Hazard;

For those works with high risk or dangerous factors, proper guidance will be provided for safety operational, such as confined space, welding, etc.

In accordance with related law, requirements and regulations of job hazard and risk assessment in PNG, prediction and evaluation of the present or expected hazards/ dangers in the operating environment will be conducted.

To control ES&H risks more effectively, all the engineering activities must comply with the plan, and with the other relevant applicable PNG ES&H directives. In general, the ES&H risks identified as having the most serious impact or consequences must be dealt immediately.

Most of the risks identified have direct repercussions on the construction and operational process; therefore, the continued monitoring of these risks is an important part of Construction Management. Examples of risk that have been identified include:

- Delivery of major equipment & materials such as caissons, piles, quarry rock.
- Contamination of sea water or accidental dumping of dredge material.
- Environmental impact such as noise and dust during construction
- Weather considerations
- Accidents.
- Precautionary measures with regard to health and safety will be described comprehensively in The Project Health & Safety plan.
9.6: Emergency Response Plan

CHEC will establish, implement and maintain a procedure to identify potential emergency situations and potential accidents that can have an impact on the environment. It will consider the following:

- Accidents, hospital facilities and ambulances
- Fire, distance to fire station, how long does it take a fire engine to get to the site (response time), what on-site fire fighting equipment is maintained on site to fight the fire?
- Fire fighting water tank. Does it hold enough water to fight the fire until the fire brigade responds?
- Marine spill - does the Lae port have an oil spill response plan? What equipment do they have? Do they have boats? What is their response time? Can CHEC participate in their plan? Can this be applied to the dredger?
- UXO - what is the procedure in the event of finding UXO?

This procedure will be prepared and submitted to ADB for approval before works commence.

9.7: Performance Monitoring

The ES&H Manager will be responsible for the monitoring on the environmental management carried out on site. He will check regularly either on site activities or documented records. The performance of the environmental management will be properly monitored through the site activities, inspection records, audit records, and other reports. If any abnormal situations happen action will be taken either informing site staff to take immediate action or report to the Project Manager/Employer regarding to the issue.

10.0: ENVIRONMENTAL MANAGEMENT & MITIGATION MEASURES;

Summary of the potential hazard events identified in EIA Report are listed below. The initial mitigation measures are proposed for identified impacts. Any other site specific impacts which occur during the construction period will be evaluated and appropriate measures taken accordingly.

11.0: COMPLAINT MANAGEMENT:

CHECL have developed a complaint management program to deal with any complaints raised from the public with regard to environment, health and safety issues as a result of operations. The complaint registers will be maintained and will be regularly monitored.

12.0: ENVIRONMENTAL TRAINING:

All project personnel carrying out activities affecting the environment are sufficiently trained and competent in performing their assigned duties. All employees will receive appropriate training on environmental and waste management as followings:

a. Environment Training for Site Supervisory Staff

A training session of “Environmental Protection” shall be provided to Site Supervisory Staffs within 14 days from the date of employment of such staff on the Site.

b. Environment Management Training for Site Managerial Staff

A training session of “ISO14001 Environmental Management System on Site” made by Head Office shall be provided to site managerial staff within 3 month from the date of works commencement.
c. Environmental Site Specific Induction Training

All staff and workers employed in the Project directly or in connection with the Project indirectly shall attend the Environmental Site Specific Induction Training delivered by the ES&H Manager/ES&H Engineer. They shall also attend the refresher training per every half-year. The training should cover but not be limited to legislation and regulations, policy, organization structure, duties and responsibilities, mitigation measures, targets in Environmental Management Plan, in-house rules and regulations.

d. Environmental Toolbox Talk

All the workers employed on the Project directly or in connection with the Project indirectly shall attend the Environmental Toolbox Talk regularly regarding the environmental nuisance abatement and waste management. Toolbox meetings will take place daily. The topics of toolbox training shall include but not limited to:

- Air pollution control;
- Wastewater treatment;
- Noise control;
- Waste reduction;
- Waste management;
- Site tidiness;
- Handling of chemical waste; and
- Environmental emergency preparedness.

13.0: ENVIRONMENTAL REPORTING:

Related environmental issues will be included in the monthly report including records from site inspection, environmental accidents, etc.

ESH inspection form and reporting procedure have been developed. This form will be modified relevant to actual work. CHEC is developing relevant forms such as incident investigation form, ESH toolbox forms, incident reporting forms and others with respect to ISO 14001 – EMS.

CHEC has developed non conformance record sheets modified to match this project. ESH issues will be recorded in a register and CHEC management will ensure these issues are addressed in a timely manner.

The monthly report shall be prepared by the ES&H Engineer containing the following information:

- A list of major forthcoming activities in the next two months which will likely have environmental impacts and nuisances to the surroundings and the control measures in mitigation;
- The training programme for the next month and the records of training arranged/conducted in the previous month;
- The updated organization chart on environmental management; and
- A summary of defects and deficiencies identified during inspections and weekly environmental walks and the follow-up actions and remedies taken to prevent recurrence.

The ESH Manager will prepare a quarterly ESH performance report and submitted to Project Manager who then report to PMU & IPES.
In addition, the Employer/ Employer’s Representative will be informed immediately if any major environmental incident occurs.

The evaluation and identification of all possible hazard events will follow the procedure as described below.

14.0: MANAGEMENT REVIEW:

Top management of CHEC will review the Environmental Management System, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness. Reviews will include assessing opportunities for improvement and the need for changes to the Environmental Management System, including the environmental objectives and targets. Moreover the ISO14001 Environmental Management System will be followed in implementation of the CEMP.

15.0: SITE SPECIFIC ENVIRONMENTAL PARAMETERS:

Potential site related specific environmental issues identified in the EIA and IEE are listed here under.

   a) Noise emission & Vibration
   b) Air quality
   c) Water quality
   d) Ecology & fisheries
   e) Solid waste
   f) Sewage waste
   g) Oil spillage & leakage
   h) Littering
   i) Vegetation
   j) Visual impact
   k) Erosion & sedimentation
   l) Socio-economic impact
   m) Archaeological & cultural heritage
   n) Environmental training

15.1: Noise & Vibration

Noise emission will comes from the following sources

➢ Construction works carried out in land,
➢ Vehicular traffic associated with construction requirement
➢ Operation of machineries and equipments.
➢ The construction activities for breaking, piling, excavation, loading/unloading materials, reclamation
➢ Site formation work

Other major source of noise and vibration includes
➢ Quarry, crusher plant
➢ Asphalt plant operations.

With the proper implementation of all noise & vibration mitigation measure during the construction period, the resultant noise & vibration impacts can be mitigated and minimized to an acceptable level.

It is expected that the vibration issue will arise during the breaking of rock profile at a location along the quarry wall foundation. CHEC management will overcome this by using control blasting method under the supervision of qualified engineer. To minimise noise and reduce vibration forces, quarry site will have to be located further away from residential areas to reduce level of vibration and noise reaching them.

Noise emitted from the sources identified poses a threat to the employees working in the site and general public. This noise causes naissance and can cause problems in hearing. However impact level is expected to be a minor medium level. A sound noise survey will be undertaken periodically to establish noise levels within the construction site.

15.2: Air Quality

The potential of air quality impact during construction is limited. Air pollutants will come from the following sources
➢ Breaking
➢ Excavation
➢ Loading/unloading materials
➢ Reclamation operations
➢ Acquiring of construction materials such as metal aggregates and sand etc from outsourcers

Small particles dispersed in the air and ozone sourced from the mentioned areas are air pollutants. When inhaled, these pollutants can aggregate the lungs and can lead to chest pain, coughing, shortness of breath and throat irritation.

Air quality & vibration management plan is being developed to deal with air quality issues at the construction site.

15.3: Water Quality

The major cause of marine water quality impacts will be due to dredging marine sediments and the associated reclamation activities. The dredging works and reclamation are planned to be carried out simultaneously in a marine environment. These will likely to give rise to the following environmental impacts
➢ Increased turbidity
➢ Threatened geotechnical stability
➢ Siltation in the existing harbour
➢ Sediment transportation
➢ Change in the current pattern
➢ Change in adjacent beaches
➢ Wave disturbance and impact on water quality
It is necessary to note that periodic widespread high turbidity will be common in the project area because of sedimentation processes caused by the Markham River. The surface runoff from construction site may create potential pollution to the sea water during construction period. This will be effectively mitigated through the implementation of standard control measure, such as sediment traps, on-site wastewater collection and treatment systems, chemical toilet etc.

15.4: Ecology & Fisheries

The dredging and reclamation work will cause permanent loss of benthic habitat over about 340 ha of seabed for the reclamation, and temporary loss of 820 ha for the approach channels and basin, the benthic habitat support mollusks, crustaceans, and fishes. Fish and shrimp spawn generally appear on the sandy sea bottom. The ecological value of benthic in these areas is not significant and similar habitats exist elsewhere. There are also two small isolated areas of limestone cap rock at the proposed entrance channel, but they do not provide a habitat for sponges, corals, and echinoderms. There are no protected habitats close to the project area, and therefore dredging and reclamation are not anticipated to have significant impacts on identified habitat in the dredging and reclamation areas. However, due to the high rock profile at a location along the quay wall foundation, under-water blasting is necessary. This may affect to marine fauna badly if blasting take places without considering possible danger for marine fauna.

15.5: Solid Wastes

Different types of waste will be generated during the construction period Following are the major construction wastes;

- Construction and dredged materials,
- Chemical waste
- General refuse.

Unsuitable dredged & paving materials, used materials for temporary works such as concrete, off-cut timbers, paving materials, unsuitable metal and glass etc. are unavoidable although the amount can be controlled and minimized at the construction site. It is estimated that there will be a large volume of waste produced every month. CHEC management realizes the importance of proper management of waste arising from the construction works and has developed a Waste Management Plan to minimise environmental impact during the construction period. Waste Management Register will be developed to track down types and classes of wastes produced during the construction activities.

15.6: Sewage

Sewage waste and grey water would be produced from the construction area as the construction works will accumulate construction personnel for the project duration. Such waste would require proper management as this may contribute towards problems of odor, surface and groundwater pollution.

15.7: Oil spillage & leakage

Environmental issue in relation to a spill and leak are expected in the construction area. Leak & spills can escapes into the storm water drainage accelerated by fluvial processes and can pollutes storm & marine water. Hazardous materials such as battery acids can cause significant effect on both health and environment when improperly and or incorrectly used or applied.

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Proper storage, handling and usage of both hazardous and non-hazardous chemical at the construction site are required to reduce the risk of spillage and leachate which will have impact on the health and environment when carelessly stored, handled or used.

15.8: Littering

Littering of construction site by the employees and sub-contractors may become an environmental health hazard if trash and other solid wastes are not properly managed. Although impact would be minor and temporary, it requires proper management and therefore specific details of managing littering will be implemented.

15.9: Vegetation Clearance

Portions of the proposed construction area and the surrounds are fully covered by vegetation of mainly short grasses and scattered scrubs.

The terrestrial ecological status is being maintained over time. This means that the area is a bird and insects friendly environment

15.10: Visual impacts

Visual impact of the proposed construction site due to clearance of vegetation and alteration of landscape is inevitable hence will cause nuisance to the nearby community and the general public. Therefore it is an issue required to be addressed in this EMP.

15.11: Erosion & Sedimentation

The key environmental issue for consideration with respect to topography, geology & soil are erosion & sedimentation control. Proposed construction site clearance will be implemented with respect to design drawing or site plan to maintain the potential of erosion and sedimentation.

15.12: Socio-economic issues:

The Lae Port Development Project would generally have a positive impact on the lives of the locals. This project already provides employment opportunities for the locals who would earn some cash from the project and improve local income generation.

However, with the positive impacts, there are also negative impacts that are anticipated on the social environment. However due to the Resettlement Program the local community now live further away from the project site so negative impacts are expected to be minimal.

15.13: Archaeological & Cultural Heritage

The proposed construction project may uncover some relics of archaeological and cultural significances. Archaeological and cultural heritage management issues are considered during the construction periods.

16.0: ENVIRONMENTAL MANAGEMENT PLAN:

Table 1 below summarizes the environmental monitoring plan, showing the environmental issues, proposed mitigation measures and monitoring plan (locations, parameters, frequency, and responsibility). The monitoring plan for construction operations will be refined after the baseline is completed.
Table 1 - Environmental Management and Monitoring Plan of Lae Harbor Construction and Operation

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
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<tbody>
<tr>
<td>DESIGN / PRE-CONSTRUCTION PHASE</td>
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<tr>
<td>Avoidance of sensitive areas for dredge disposal</td>
<td>• Detailed field surveys in consultation with authorities ascertained that proposed dredged material disposal sites are not in sensitive areas. Area is clearly delineated and tipping must remain further than 300m from mouth of Markham River and in at least 50m depth of water.</td>
<td>Proposed dredged material disposal site</td>
<td>Design plans</td>
<td>Verify draft and final plans</td>
<td>CHEC / PMU</td>
</tr>
<tr>
<td>Environmentally sound design</td>
<td>• Ensure that final harbor configuration will not cause changes to shoreline, Adjacent shore line beach and river mouth</td>
<td>Adjacent shore line beach and river mouth</td>
<td>Design plans</td>
<td>Verify draft and final plans</td>
<td>CHEC / PMU</td>
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<tr>
<td>Environmental Management and mitigation monitoring</td>
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<td>Environmental Issue</td>
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<td>Locations</td>
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<td>entrance to existing port and dynamics of adjacent areas.</td>
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### CONSTRUCTION PHASE

#### Turbidity (suspended sement load/sediment plumes) during harbor dredging

- CHEC will identify and map all area where soil disturbances will occur
- For each of these areas identify appropriate sediment control structures (silt fences, bunds, sediment traps, basins and various sediment control drains and install these structures prior to commencement of work

- CHEC will inspect its surrounding to ensure that the erosion and sediment control measures recommended are implemented on site
- If the recommended measures are not implemented, appropriate action will be undertaken immediately to remedy the situation

- Weekly during dredging operations

- Daily with direct reading instruments for Contractor-CHEC
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<tr>
<th>Environmental Management and mitigation</th>
<th>Monitoring</th>
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<tbody>
<tr>
<td><strong>Environmental Issue</strong></td>
<td><strong>Mitigation Measures</strong></td>
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<tr>
<td>- CHEC will establish which month of the year are likely to experience higher rainfall</td>
<td>- Site preparation works will be minimised during period of high rainfall</td>
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<tr>
<td>Environmental Management and mitigation</td>
<td>Monitoring</td>
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<td>Environmental Issue</td>
<td>Mitigation Measures</td>
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<tr>
<td>completion of construction works.</td>
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<tr>
<td>• All disturbed earthworks sites will be covered or protected to avoid exposed soil from being washed away</td>
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<tr>
<td>• All construction will be implemented according to the design plans that are compatible with respect to soil, climate, landform, drainage, vegetation cover and land use factors at the site.</td>
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<tr>
<td>• All drainage on site will be constructed according to design plan so that run-off</td>
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<td>Environmental Management and mitigation</td>
<td>Monitoring</td>
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<tr>
<td>Environmental Issue</td>
<td>Mitigation Measures</td>
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</table>

- from outside the construction area does not mix with unfiltered run-off within the works area.
- Earthwork area will be protected as much as possible so that only a smallest area is required to be exposed at any one time. Disturbed soil will be compacted on an artificial slopes.
- Construction spoil materials will not be placed on high grounds where materials can easily be washed off during unexpected rainfall period. Spoil material stockpile will be
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<th>Environmental Management and mitigation monitoring</th>
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<td>Environmental Issue</td>
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<tr>
<td>Stored in bunded areas to prevent erosion. If necessary such stockpiles will be covered up with mulch or temporary vegetation</td>
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</tbody>
</table>

**Excessive noise during dredging, sheet-piling, and demolition**

- All employees working in an environment subject to high ambient noise level would be required to wear hearing protectors, which meets an international noise standard so that excessive noise is limited and minimized.
- ES&H Manager will provide hearing protectors such as earplug and ear muffs to the employees exposed to noise in the construction area.
- ES&H Manager will carry out visual monitoring within the construction areas. Any workers not wearing full PPE including ear protectors in noisy areas will be disciplined.
- Any noise complaints from residents will be dealt with in a timely and effective manner.

Vibration and noise levels will be measured periodically (half yearly intervals) to verify its acceptability as per standards.

Noise measurements will be made if necessary in response to complaints.

Contractor CHEC PMU KECC
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<th>Environmental Management and mitigation monitoring</th>
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<td>Environmental Issue</td>
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<tr>
<td>emitted by machinery within the construction site</td>
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<tr>
<td>• The ES&amp;H Manager in liaison with ES&amp;H Engineer will ensure that equipment and machinery utilized in the construction works are well maintained and serviced so that the noise levels are minimized as much as possible.</td>
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<td>• Noises sourced from crusher plants &amp; asphalt plant will be minimised by providing adequate buffer zone away from any residential areas</td>
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<td>Environmental Management and mitigation</td>
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<td>Environmental Issue</td>
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- Working area will be suitably shielded from surrounding area either by bunding or appropriate noise reflective security fencing.
- Silencers or mufflers will be utilized in all construction equipment and properly maintained.
- Any areas where noise levels are above 85 dB(A) will be highlighted with sign boards and appropriate control measures taken.

<table>
<thead>
<tr>
<th>Disposal of dredge spoils</th>
<th>• Surface debris will be cleared and disposed of to an approved landfill</th>
<th>• Construction site</th>
<th>Direct readings will be made of water quality for turbidity near the onshore discharge point and around the dumping zone</th>
<th>Daily observation</th>
<th>Contractor CHEC PMU</th>
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</table>
### Environmental Management and mitigation

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<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>Monitoring parameter</th>
<th>Monitoring frequency</th>
<th>Monitoring responsibility</th>
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<tbody>
<tr>
<td>0. Dredged materials which are unsuitable will be dumped in an approved Disposal Area offshore. Silt curtains will be deployed at the excavation area and at the dumping area. See Dredging Plan in Appendix G for details.</td>
<td><em>Approved dumping ground 300m offshore in &gt; 50m water depth.</em></td>
<td>Stockpiled materials will be inspected for dust generation.</td>
<td>KECC</td>
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<td></td>
<td>Cutter suction hopper dredger will be employed as far as practically possible to minimize increased turbidity</td>
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<td></td>
<td>Level of suspended solid, turbidity, dissolved oxygen and PH will be monitored during dredging operation in order to identify changes in marine water. If any significant changes occur, remedial</td>
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- Action will be taken promptly.
- A stable transition region will be established between existing sea bed and the area to be dredged in order to minimize risk of geotechnical instability.
- The dredging will increase turbidity, but the spread of suspended solids is anticipated to be limited. The impacts...
Environmental Management and mitigation monitoring

Environmental Issue | Mitigation Measures | Locations | monitoring parameter | monitoring frequency | monitoring responsibility
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- Related to a high level of suspended solids will not significantly reduce the primary productivity of these areas.

- Although high level of suspended solids in the water column are not uncommon and localized increase in turbidity are not expected to significantly impact on water quality, the best practice controls in dredging operations will be
• Silt curtain will be deployed around the
  locations of sediment-laden water.

• All construction plant and equipment will
  be designed and maintained properly to
  avoid the risk of silt, sediments, other
  contaminants being released or leaked into
  the sea.
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- Immediate dredging area when there is significant chance of silt dispersion to surrounding water body.

- Marine ecology and fishery
  - To reduce the impact to the marine fauna during blasting at quay wall foundation, control blasting practices and setting up of bubble curtains will be carried out during blasting work.
  - CHEC will carry out ecological survey & sediment analysis half yearly intervals to identify changes in marine fauna and flora. Thereby magnitude of changes can be identified by

<p>| Contractor | CHEC | PMU | KECC |</p>
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- Ensuring that the dredging and reclamation as well as construction of the permanent and temporary revetments do not extend beyond the designated areas.

- CHEC will monitor marine and fishery impacts by observation of behaviour of marine fauna regularly to help identify any changes in behavioural pattern.

- Material Safety Data Sheet (MSDS) will be made available as a guide for the proper use of a type of chemical.

- ES&H Manager will undertake regular inspection of fuel storage tanks or drums to ensure
### Environmental Management and mitigation monitoring

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<td></td>
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<td>that no leach or spill occurs.</td>
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<td>MSDS will be consulted whenever needed to guide the use of hazardous &amp; non hazardous chemicals.</td>
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<tr>
<td>The CHEC management will construct a hard surface area with a containment bund for the refuelling facility to contain spills should a refuelling facility be built within the construction site.</td>
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<tr>
<td>Oil storage containers or drums will be placed in the bunded area to contain leach and spill.</td>
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<td>ES&amp;H Manager will undertake daily visual checks around the construction site to detect any leakages or spill of effluents.</td>
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<tr>
<td>ES&amp;H Manager will make Regular checks of containers for any minor leaks where in service or in storage after being emptied.</td>
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<tr>
<td>• Drip trays will be used under drums during fuel or solvent transfer</td>
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<td>• Waste oil will be collected and removed from the site by a licensed contractor to an authorised disposable location</td>
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<td>• Implementation of hauling schedules that minimize local traffic problems</td>
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<td>• Implementation of traffic control scheme to minimize need to cross against existing traffic flows</td>
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<td>• All vehicles carrying loads to be covered with tarpaulins</td>
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<td>From port area to land disposal sites and from quarry to port site</td>
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<tr>
<td>Complaints or traffic jams Reports from local traffic police</td>
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<td>Daily observation</td>
<td>Contractor CHEC</td>
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<td>Environmental Management and mitigation monitoring</td>
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<tr>
<td></td>
<td>Disturbance of</td>
<td>• Wheel washing</td>
<td>Harbor area and surroundings</td>
<td>Reports from site staff, site supervisors</td>
<td>Constant observation</td>
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<tr>
<td></td>
<td>cultural remains</td>
<td>facilities and</td>
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<td>Daily reminders to staff during “Tool Box” briefings</td>
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<td>“cattle grids” at</td>
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<td>site</td>
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<tr>
<td></td>
<td>Archaeological and cultural heritage</td>
<td>• Protect and never touch known cultural relic building during working.</td>
<td>Harbor area and surroundings</td>
<td>Reports from site staff, site supervisors</td>
<td>Constant observation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Report to the Engineer for instruction when possible cultural relics are found and stop work until getting approval from the Engineer.</td>
<td>Harbor area and surroundings</td>
<td>Reports from site staff, site supervisors</td>
<td>Constant observation</td>
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<td></td>
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<td>• CHEC will raise awareness among employees, on the significances of archaeological relics</td>
<td>Harbor area and surroundings</td>
<td>Reports from site staff, site supervisors</td>
<td>Constant observation</td>
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<td></td>
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<td>• CHEC’s construction personnel are to watch out for any items of cultural significances</td>
<td>Harbor area and surroundings</td>
<td>Reports from site staff, site supervisors</td>
<td>Constant observation</td>
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<td>Environmental Management and mitigation monitoring</td>
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<tr>
<td>and heritage found on site</td>
<td>• CHEC will ensure that the sub-contractors and employees are mindful of cultural heritage when undertaking the works</td>
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<tr>
<td>• CHEC will ensure that personnel on site are aware of or trained in the need to report any sightings of artefacts and relics or heritage remains that are uncovered or disturbed during the excavations activities</td>
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<tr>
<td>• Any archaeological finds during works should be reported to ES&amp;H Manager to have them salvaged</td>
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<td>Environmental Management and mitigation</td>
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<td>Environmental Issue</td>
<td>Mitigation Measures</td>
<td>Locations</td>
<td>monitoring parameter</td>
<td>monitoring frequency</td>
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<tr>
<td>Monitoring</td>
<td>parameter</td>
<td>responsibility</td>
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</tbody>
</table>

- The National Museum will be immediately contacted to undertake any salvage activity which cannot be handled by CHEC.

<table>
<thead>
<tr>
<th>Complaints from local Community over construction activities</th>
<th></th>
<th>Harbor area and surroundings</th>
<th>Reports from site staff, site supervisors concerning verbal or formal complaints</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Report to the Engineer for instruction when complaints received.</td>
<td>CHEC</td>
<td></td>
<td>Daily reminders to staff during “Tool Box” briefings</td>
<td></td>
</tr>
<tr>
<td>Follow complaints procedure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Construction Workers Camp</th>
<th></th>
<th>Site area</th>
<th>CHEC will undertake visual monitoring to ensure the adequate treatment of sewage and grey water before being discharged</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of camps for vehicle parking,</td>
<td></td>
<td></td>
<td>Daily Observation Monthly formal reporting</td>
<td></td>
</tr>
<tr>
<td>CHEC will provide showers, toilets, and clothes washing facilities for use by employees</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Contractor</th>
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</thead>
<tbody>
<tr>
<td>CHEC</td>
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<td>PMU</td>
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<td>KECC</td>
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<tr>
<td>Environmental Management and mitigation</td>
<td>Monitoring</td>
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<tr>
<td>Environmental Issue</td>
<td>Mitigation Measures</td>
<td>Locations</td>
<td>monitoring parameter</td>
<td>monitoring frequency</td>
</tr>
<tr>
<td>maintenance and repair</td>
<td>at convenient locations within the construction site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of camp for refuelling</td>
<td>• Waste water discharges from general site activities includes waste water treatment units, oil traps, silt traps and settlement tanks will be properly controlled before released to the city sewer system or through any temporary outfall.</td>
<td></td>
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<tr>
<td>HIV Awareness</td>
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<tr>
<td>Gender Issues</td>
<td>• If connection to the city system is not feasible CHEC will ensure that all sewage waste are properly treated prior to discharge into surroundings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Issue</td>
<td>Mitigation Measures</td>
<td>Locations</td>
<td>Monitoring Parameter</td>
<td>Monitoring Frequency</td>
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<tr>
<td>Environmental Management and mitigation</td>
<td>Monitoring</td>
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</tbody>
</table>

- Ensure that sewage treatment units established on site are working adequately
- Ensure that all grey water is also treated prior to discharge
- Provide awareness to all personnel working on site to use the toilet facilities provided and not the bushes
- If alternative pit toilet are used on site, they will be kept hygienic to avoid nuisance
- Any cooking facilities will be cleaned regularly and maintained in a sanitary condition
Environmental Management and mitigation

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
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<tbody>
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</tbody>
</table>

- Any food waste will be stored in closed bins to be bagged and removed from site daily.
- All other waste such as paper, cardboard, plastic bags and bottles, glass bottles, and cans will be segregated for recycling if possible and the removed by an authorised sub-contractor to a government approved sanitary landfill.
- Scavenging of recyclable solid waste materials by employees will be disallowed.
- Forbid unnecessary burning of garbage within the
<table>
<thead>
<tr>
<th>Environmental Management and mitigation monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Issue</td>
</tr>
<tr>
<td>construction site as this will contributes to Green House Effect.</td>
</tr>
<tr>
<td>• Vermin control will be implemented. Uncontrolled waste food disposal will not be permitted as it encourages vermin and disease bearing vectors.</td>
</tr>
<tr>
<td>• Regular pesticide and insecticide spraying will be implemented to control mosquitoes.</td>
</tr>
<tr>
<td>• Stagnant water will not be allowed to accumulate as it provides a haven for mosquito breeding.</td>
</tr>
<tr>
<td>Environmental Management and mitigation</td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td><strong>Environmental Issue</strong></td>
</tr>
<tr>
<td>HIV awareness programs will be instituted and all workers required to attend</td>
</tr>
<tr>
<td>Interaction with local populace will be carefully monitored and workers continually reminded to avoid conflict situations</td>
</tr>
<tr>
<td>The Workers Camp will enforce a Zero Tolerance Policy towards possession on site or in the camp of alcohol, drugs, and weapons.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Littering</th>
<th></th>
<th>Site area</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>• CHEC will establish a central litter collection centre at the construction area</td>
<td></td>
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<td></td>
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<td>• ES&amp;H Manager will undertake visual monitoring on a regular basis</td>
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<td></td>
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<td>Daily</td>
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<td>Contractor</td>
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<td>CHEC</td>
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<td>KECC</td>
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<tr>
<td>Environmental Issue</td>
<td>Mitigation Measures</td>
<td>Locations</td>
<td>Monitoring parameter</td>
<td>Monitoring frequency</td>
<td>Monitoring responsibility</td>
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<tr>
<td></td>
<td>so that all litter at the construction area are collected at the main collection point which will be disposed at the authorised site.</td>
<td>to ensure that littering does not become a problem at the construction area</td>
<td></td>
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</tr>
</tbody>
</table>

- Place rubbish bins at the strategic locations within the construction site to store rubbish.
- ES&H Manager will notify and encourage all sites personnel to avoid littering and dump their wastes at
<table>
<thead>
<tr>
<th>Environmental Management and mitigation monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Issue</strong></td>
</tr>
<tr>
<td>the central collection points or into the rubbish bins provided.</td>
</tr>
<tr>
<td><strong>Vegetation</strong></td>
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<tr>
<td>Environmental Management and mitigation monitoring</td>
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<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Environmental Issue</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>the grassland ecosystems.</td>
</tr>
<tr>
<td>• Water sprinkling will be done as required in exposed area of quarry site and transport route to suppress dust generation.</td>
</tr>
</tbody>
</table>
### Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>parts of the crusher which emits dust</td>
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</tbody>
</table>
- Material transport route is also to be watered to minimize dust emission.  
- When transporting dusty material by vehicles, those materials will be covered with tarpaulin cover in order to prevent accidental spillage.

**OPERATION PHASE**
<table>
<thead>
<tr>
<th>Environmental Management and mitigation</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Issue</strong></td>
<td><strong>Mitigation Measures</strong></td>
</tr>
</tbody>
</table>
| Pollution from port’s sewage and stormwater | • Waste water discharges from port activities includes waste water treatment units, oil traps, silt traps and settlement tanks will be properly controlled before released to the city storm-drainage system or through any temporary outfall.  
• Toilet and other sanitary facility for employees will be provided at convenient locations within the port  
• All sewage waste will be properly treated prior to discharge into surroundings | Harbor area | IPBC will undertake visual monitoring to ensure the adequate treatment of sewage and grey water before being discharged | Monthly | IPBC/ Port Management Authority |
Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollution from port’s solid wastes</td>
<td>• All solid wastes will be placed into the rubbish bin drums. When full, they will be removed and disposed of to an authorised dump site for land filling.</td>
<td>Harbor area</td>
<td>• ES&amp;H Manager will watch out for any unacceptable practice of waste disposal within the port by employees and visitors.</td>
<td>Weekly</td>
<td>IPBC / Port Management Authority</td>
</tr>
<tr>
<td>Pollution from sewage of ships in port</td>
<td>• Disposal of sewage and bilge water in</td>
<td>Harbor area</td>
<td>Illegal sewage discharges</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Provide awareness to all personnel working on site to use the toilet facilities provided and not the bushes.
<table>
<thead>
<tr>
<th>Environmental Management and mitigation monitoring</th>
<th>Monitoring</th>
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<tbody>
<tr>
<td>Environmental Issue</td>
<td>Mitigation Measures</td>
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<tr>
<td>accordance with MARPOL 73/78.</td>
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</tr>
</tbody>
</table>

**Oil spills and leakage within harbour, or escape the harbour area**

- The sewage and waste oil of vessels should be collected. Applications should be applied before pumping out of tanks. All vessels’ engineers should make records of the Oil Discharges.

| Port area and offshore water | Illegal waste water discharges | Daily | Harbor Master & Port Management Authority |

**Oil spills from vessels entering, berthing and leaving the harbour**


<p>| Port area and offshore water | Spills of oils | Daily when ships are in harbor | Visiting ships and Harbor Master |</p>
<table>
<thead>
<tr>
<th>Environmental Management and mitigation</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
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<tbody>
<tr>
<td>Environmental Issue</td>
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<tr>
<td>Mitigation Measures</td>
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<td>Locations</td>
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<tr>
<td>monitoring</td>
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<tr>
<td>frequency</td>
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<tr>
<td>responsibility</td>
<td></td>
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</tr>
<tr>
<td>and of existing oil spill contingency plan</td>
<td>Disposal of sewage and bilge water in accordance with MARPOL 73/78.</td>
<td>Harbor area</td>
<td>Illegal sewage and bilge water discharges, presence of oil sleek</td>
<td>Daily when ships are in harbor</td>
<td>Harbor Master</td>
</tr>
<tr>
<td>Pollution from sewage and bilge water from ships in harbor areas</td>
<td>With prior notice, CIPA will provide solid waste reception for disposal in accordance with MARPOL 73/78.</td>
<td>Harbor area</td>
<td>Illegal dumping of solid wastes</td>
<td>Daily when ships are in harbor</td>
<td>Harbor Master</td>
</tr>
<tr>
<td>Pollution from solid wastes of ships in port</td>
<td>Implementation of a Contingency Plan with the necessary equipment and personnel training.</td>
<td>Harbor area</td>
<td>Release of materials during accidents and emergencies</td>
<td>During accidents and emergencies</td>
<td>Harbor Master</td>
</tr>
</tbody>
</table>
### Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>Monitoring parameter</th>
<th>Monitoring frequency</th>
<th>Monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proactive management of port's environmental footprint and advance port sustainability</td>
<td>• Implement an environmentally responsible port management system (EMS) to achieve and maintain continual environmental quality of the harbor area.</td>
<td>Harbor area</td>
<td>EMS components</td>
<td>Monthly</td>
<td>IPBC PMU</td>
</tr>
<tr>
<td>Air quality</td>
<td>• Periodic emission test will be carried out on machineries &amp; equipment in order to identify malfunction areas and possible</td>
<td>Harbor area</td>
<td></td>
<td>Monthly</td>
<td>IPBC PMU</td>
</tr>
<tr>
<td></td>
<td>• Carry out a regular visual inspection around the port to ensure that the does not becomes a problem</td>
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<tr>
<td>Environmental Management and mitigation</td>
<td>Monitoring</td>
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<td>Environmental Issue</td>
<td>Mitigation Measures</td>
<td>Locations</td>
<td>monitoring parameter</td>
<td>monitoring frequency</td>
<td>monitoring responsibility</td>
</tr>
<tr>
<td>inefficiency of emission control mechanisms</td>
<td>• Water sprinkling will be applied on exposed excavation areas to suppress dust generation.</td>
<td>• Ambient air quality test will be carried out half yearly at the port.</td>
<td>• Loading, unloading, transfer, handling or storage of bulk cement will be carried out in an</td>
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<tr>
<td>Environmental Management and mitigation monitoring</td>
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<tr>
<td>Environmental Issue</td>
<td>Mitigation Measures</td>
<td>Locations</td>
<td>monitoring parameter</td>
<td>monitoring frequency</td>
<td>monitoring responsibility</td>
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</table>

Enclosed area and any vent or exhaust will be fitted with air pollution control system.

Water quality

- Refuelling facility will be bunded to prevent spill which when percolated into the soil will pollute the underground water table and when washed down to into the storm water drainage and further into the sea Harbor area

- ES&H Manager will continue to undertake a daily visual monitoring within the facility and surrounds to ensure that all solid wastes are correctly disposed off and spill should not occur and all forms of liquid

ES&H Manager | Monthly | IPBC PMU
Environmental Management and mitigation

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Will affect aquatic &amp; marine organisms.</td>
<td></td>
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<tr>
<td>• Sewerage water arisen from toilet will driven to sewerage water treatment unit for required purification before disposed to marine environment or city sewer water drainage pipeline.</td>
<td></td>
<td></td>
<td>Waste are being discharged or placed in a designated area.</td>
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</tbody>
</table>

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### Appendix C - Daily Monitoring check list – Construction area

**DAILY MONITORING CHECK LIST – CONSTRUCTION AREA**

Date____________ Time__________________ Location________________

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Constraints/ Mitigation Measures</th>
<th>Yes</th>
<th>No</th>
<th>NR</th>
<th>Remarks/ Action taken (if any NCR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dredging</td>
<td>Are TB(dredger name) used for dredging</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Are there any spillage of oil or other hazardous substance from machineries/equipment</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Is level of suspended solid within tolerance</td>
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<tr>
<td></td>
<td>Is level of turbidity within tolerance</td>
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<tr>
<td></td>
<td>Is level of dissolve oxygen within tolerance</td>
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<tr>
<td></td>
<td>Is any complication observed in marine fauna</td>
<td></td>
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<tr>
<td>Disposal of sewage and waste water from land</td>
<td>Is oil trap/ grease trap working properly</td>
<td></td>
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<tr>
<td>based source</td>
<td>Is sewer water treatment plant working satisfactory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposal of sewage and waste water from</td>
<td>Is there any leakage or spillage of waste water</td>
<td></td>
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<tr>
<td>construction Vessels.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Surface water runoff from reclamation area</td>
<td>Are silt/sand traps available in required area</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Are de silting done satisfactory</td>
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<td></td>
<td>Are manhole covered adequately</td>
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<tr>
<td></td>
<td>Are material stockpiles covered adequately</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Key Aspects</td>
<td>Constraints/ Mitigation Measures</td>
<td>Yes</td>
<td>No</td>
<td>NR</td>
<td>Remarks/ Action taken (if any NCR)</td>
</tr>
<tr>
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<td>-----------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Production Process</td>
<td>Is noise/vibration level within standards at the boundary</td>
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<tr>
<td></td>
<td>Is it necessary to adopt sound proof measure</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Are there any spillage of oil or other hazardous substance from machineries/equipment</td>
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<td></td>
<td>Is waste water generated</td>
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<td></td>
<td>If “yes”, is there any waste water treatment system</td>
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<tr>
<td>Category</td>
<td>Description</td>
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<tr>
<td>Waste water analytical report</td>
<td>Is waste water analytical report available</td>
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<td></td>
<td>If “yes” are tested parameters conformed with standards</td>
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<td></td>
<td>Is air emission possible</td>
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<td></td>
<td>If “yes” is emission control system / water sprinkling available</td>
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<td></td>
<td>If “yes”, is treatment system satisfied</td>
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<td></td>
<td>Is ambient air quality test report available</td>
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<td>If “Yes”, are tested parameters conformed with standards</td>
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<tr>
<td>Storage of materials</td>
<td>Are stock piles are covered or applied wet process</td>
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<td></td>
<td>Is chemical waste storage met with CEA requirements</td>
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<tr>
<td>Surface water runoff</td>
<td>Are silt/sand traps available in required area</td>
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<td>Are de silting done satisfactory</td>
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<td>Are manholes covered adequately</td>
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<tr>
<td>Loading/unloading and</td>
<td>Are emission test available for equipments, machineries &amp; vehicles</td>
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<td>transportation of materials</td>
<td>If yes, are they conformed with required standards</td>
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<td></td>
<td>Are silencers or mufflers fixed in machineries</td>
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<tr>
<td>General refuse disposal</td>
<td>Are disposal bins available for bio degradable waste &amp; non bio degradable</td>
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<td></td>
<td>Is previous day waste collection carried out</td>
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</table>

*Inspected by: ____________________  Approved by: ____________________*
Appendix – E Non Conformance Report

NCR No. ___________ To __________________

Location ______________ Date ______________ Time __________________

Description of non-conformity:

Suggestion for rectification:

--------------------------------------
ES&H Manager

TO: ________________________________
Please implement above suggestions immediately / within ------ days & report
--------------------------------------
ES&H Manager

TO: ES&H manager

Completed/ not completed.

--------

Head of the department (NCR receiver)

Satisfactory / Unsatisfactory

--------------------------------------

☐ ES&H Engineer / ☐ Safety Officer

Approved & recommend for closing

ES&H Manager
ANNEX 2: PROCUREMENT PACKAGES UNDER THE PROPOSED NIGERIA ELECTRICITY TRANSMISSION PROJECT (NETAP) – PACKAGE 1.

<table>
<thead>
<tr>
<th>REGION</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td><strong>Lot 1</strong> To be Managed at Kaduna</td>
<td></td>
</tr>
<tr>
<td>1 North West Kaduna Kumbotsho</td>
<td>Reinforcement with 1 x 300MVA 330/132kV Power Transformer, High Voltage Switchgears and Associated Equipment, Replacement of Control and Relay Panel with Digital Control System</td>
</tr>
<tr>
<td>2 North West Kaduna Dakata</td>
<td>Reinforcement with 1 x 100MVA 132/33kV Power Transformer, Switchgears, Associated Equipment, Digital Control System. Supply &amp; Installation of Additional 3 No. Feeders Bay and Rehabilitation of Control Room</td>
</tr>
<tr>
<td>3 North West Kaduna Kankia</td>
<td>Replacement of Faulty 1 x 30MVA and upgrading of 1 x 30MVA Transformers to 2 x60MVA 132/33kV Transformers, High Voltage Switchgears and Associated Equipment including Digital Control System</td>
</tr>
<tr>
<td>4 North West Kaduna Dan Agundi</td>
<td>Reinforcement of 1 x100MVA 132/33kV Transformers, High Voltage Switchgears and Associated Equipment including Digital Control System and Rehabilitation of Control Room</td>
</tr>
<tr>
<td>5 North West Shiroro Birnin kebbi</td>
<td>Reinforcement with 2 x150MVA 330/132kV and Installation of 1 x 60MVA 132/33kV Power Transformers with associated 3no. Outgoing 33kV Feeders and Rehabilitation of Control Room</td>
</tr>
<tr>
<td>6 North Central Shiroro Shiroro</td>
<td>Replacement of obsolete Control and Relay Panels with Digital Control System, High Voltage 330kV Switchgears and Associated Equipment</td>
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<td>Location</td>
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<tr>
<td>7</td>
<td>North Central</td>
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</table>

**Lot 2**

**To be Managed at Lagos**

<table>
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<tr>
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<th>Location</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Lagos Area</td>
<td>Lagos Ijora</td>
<td>Upgrading of 2 x 30MVA with 2 x 100MVA 132/33kV. Rehabilitation of civil structures of the Control Room and Digital Control System.</td>
</tr>
<tr>
<td>2</td>
<td>Lagos Area</td>
<td>Lagos Lekki</td>
<td>Supply &amp; Installation of 1 x300MVA 330/132kV and 2x100MVA 132/33kV Power Transformer, High Voltage Switchgears and Associated Equipment</td>
</tr>
<tr>
<td>3</td>
<td>Lagos Area</td>
<td>Lagos Alagbon</td>
<td>Supply &amp; Installation of 1 x300MVA 330/132kV, 2 x 100MVA 132/33kV Power Transformers, Switchgears and Associated Equipment.</td>
</tr>
<tr>
<td>4</td>
<td>Lagos Area</td>
<td>Lagos Alausa</td>
<td>Reinforcement of 1 x 100MVA 132/33kV Power Transformer, High Voltage Switchgears and Associated Equipment</td>
</tr>
<tr>
<td>5</td>
<td>Lagos Area</td>
<td>Lagos Akoka</td>
<td>Rehabilitation of Building structure and Sinking surrounding area, Replacement of obsolete 132kV equipment, 33KV Metal clad Switchgears, Control &amp; Relay panel and Reinforcement with 1x 60MVA 132/33KV Power Transformer. Also refurbishment of the 2x 45MVA transformers and GIS components</td>
</tr>
<tr>
<td>6</td>
<td>Lagos Area</td>
<td>Lagos Amuwo-Odofin</td>
<td>Rehabilitation of Building structure and Sinking surrounding area, Replacement of obsolete 132kV equipment, 33KV Metal clad Switchgears, Control &amp; Relay panel and Reinforcement with 2x 60MVA 132/33KV Power Transformer. Also refurbishment of the 1x 30MVA transformers and GIS components</td>
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<td>Area</td>
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<td>Lagos Area</td>
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<td>8</td>
<td>Ogun State</td>
<td>Lagos</td>
<td>Ota</td>
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<tr>
<td>9</td>
<td>Lagos Area</td>
<td>Lagos</td>
<td>Maryland</td>
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<tr>
<td>10</td>
<td>Lagos Area</td>
<td>Lagos</td>
<td>Egbin</td>
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ANNEX 3: PROTOCOL FOR THE DECONTAMINATION OF PCB MATERIALS AT TCN SUBSTATIONS.

Polychlorinated Biphenyls (PCB)

Polychlorinated Biphenyls are synthetic chlorinated chemicals. PCBs are generally classified as Persistent Organic Pollutants (POPs) under the Stockholm Convention due to the following properties: high toxicity, persistent in the environment, not biodegradable, accumulative in the fatty tissue of living things and also ability to evaporate and travel long distances through water and air.

PCB Containing materials may include:

- Transformers and Capacitors.
- Old electrical devices or appliances containing PCB capacitors.
- Fluorescent light ballasts.
- Cable insulation.
- Electrical equipment including voltage regulators, switches, re-closers, bushings, and electromagnets.
- Oil used in motors and hydraulic systems.
- Cable insulation.

Due to the different health and environmental risks posed by PCBs exposure, it is essential to develop a step by step approach for its management. The steps below describe actions that should be taken to properly manage PCB contamination at TCN substations;
Step 1 – Testing and Analysis.
To determine if PCB is present in transformer oils, a PCB test will be carried out on the transformers where oil spills and leakages are observed. The test can be carried out using a Chlor-N-Oil kit, a positive result indicates that the oil contains chlorine. However, in order to be determine if it contains PCB and the level of concentration, a gas chromatography analysis on a sample of the transformer oil will be required considering that PCB concentrations in transformer fluid are regulated at less than or equal to 50ppm.

There are two options to be considered in the management of PCB contaminated transformers, namely decontamination and disposal.

Step 2 – Disposal or Decontamination

2.1. Decontamination
Decontamination is an operation by which the concentration of PCBs in fluids in equipment is reduced. For decontamination to be effective it should result in a residual total PCB concentration of at most 500ppm and ideally less than 50ppm.

- Mineral Oil Transformers
Contaminated mineral oil transformers can be decontaminated either by retro filling or on-line chemical treatment. To retro-fill, the PCB contained oil will be replaced with a transformer oil which has a concentration ≤ 50ppm while for on-line chemical treatment, the transformer fluid will be treated chemically to ≤ 2ppm. A test will be carried out on the transformer oil after 90 days in service use to determine if the PCBs concentrations have been reduced, this testing applies to both processes. In cases where the PCBs concentration is still high, the transformers should be put up for disposal.
• Askarel Transformers

Contaminated Askarel transformers can be decontaminated by treating the transformers. The Askarel will be drained from the transformers and replaced with a leaching fluid through multiple retro-fills or in-situ processing for a period of 18 – 24 months. After 90 days in service use, the transformer will be retested. If the test results show concentrations ≤ 50ppm, the transformers will be declassified to non-PCB status and retest annually. If the results are ≥ 50ppm the transformer will be scrapped and disposed.

2.2 Disposal

Disposal is clearly defined as an operation by which PCBs and PCB-contaminated equipment’s are destroyed or irreversibly transformed. This process is only considered if the PCBs concentration is still above the standard 50ppm. Disposal of PCB contaminated materials can only be carried out by reputable companies whose sole responsibility is to do so and these materials are only disposed in certified sites.

• Mineral oil transformers (see illustrations in figure Below)

When decontamination fails, another option to be considered as earlier stated will be disposal. If the PCB concentration for the transformer oil is between 50 -200ppm, the oil will be carefully drained and the equipment scrapped. If > 200ppm the transformer will be cleaned via solvent degreasing method. The transformer fluids extracted in these two processes will be chemically treated to ≤ 2ppm, this fluid can be reused or incinerated.
- **Askarel Transformers (see illustrations in Fig. 98 below)**

For Askarel transformers which fail decontamination, the transformers are disassembled and metals undergo a decontamination process which involves solvent cleaning method and autoclave. After decontamination these metals are further tested and they are either recycled or disposed through landfilling. Other porous materials are stored for incineration.
Figure 97: Protocol for the Re-Use, Recycling and Disposal of PCB Contaminated Mineral Oil Transformers
Protocol for the Re-Use, Recycling and Disposal of Askarel Transformers

**Protocols for the Re-Use, Recycling and Disposal of Askarel Transformers**

**Re-use**
- **TREATMENT**
  - Drain Askarel
  - Replace with leaching fluid
  - Multiple retrofits

- **In-situ processing** (16-24 months)

- **Test after 90 days in-service use**

- **Test results** (<50 ppm)
  - **YES**
    - Declassify to non-PCB status
    - Retest annually
  - **NO**
    - Re-treat or scrap (see Recycle/Disposal)

- **Scrap at end of service life and test fluid**

**Fluids**
- Storage for incineration

**Recycle/Disposal**
- **Disassemble** components

**Impermeable Materials** (Metal)
- **Decontamination process** (solvent cleaning, autoclave)

- **Test surfaces** (<10 pg/100 cm²)
  - **YES**
    - Metal recycling or landfill disposal
  - **NO**
    - Re-treat or storage for incineration

**Porous Materials** (Wood & Paper)
- Storage for incineration

- **Test results** (<0.5 ppm)
  - **YES**
    - Metal recycling or landfill disposal
  - **NO**
    - Re-incinerate