

FINAL COPY

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

OF

THE PROPOSED COAL POWER PROJECT
AT OPIC INDUSTRIAL AREA, ADO-ODO-OTA LOCAL GOVERNMENT
OGUN STATE

BY

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SUBMITTED TO
FEDERAL MINISTRY OF ENVIRONMENT, ABUJA

Prepared by



(Accredited by FME, NESREA, OGSME, DPR and NOSDRA)

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LIST OF ACRONYMS

ABBREVIATIONS	MEANING
AIDS	Acquire Immune Deficiency Syndrome
AIPS	Alien Invasive Plant Species
APHA	American Public Health Association
ASTM	American Society for Testing and Material
ALARP	As Low As Reasonably Practicable
BP	Bank Procedure
BAT	Best Available Technology
BATNEEC	Best Available Technology Not Entailing Environmental Cost
BOD	Biochemical Oxygen Demand
BTU	British thermal unit
CCTV	Closed-circuit television
CO	Carbon Monoxide
CP	Cathodic Protection
COD	Chemical Oxygen Demand
CFCs	Chlorofluorocarbons
CHP	Customer Hold Points
CLO	Community Liaison Officer
CM	Construction Manager
CM	Condition Monitoring
CMMS	Computerized Maintenance Management System
CSR	Corporate Social Responsibility
dB	Decibels
DCD	Development Control Department
DCS	Digital Control System
DPL	Dahua Power Limited
EC	Electrical Conductivity
EMF	Electromagnetic Field
ESD	Emergency Shut Down
EIA	Environment Impact Assessment
EPPRPs	Environment Protection Policy Review Panel
ESMP	Environmental Management Plan

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EA	Environmental Audit
EAR	Environmental Audit Report
EIS	Environmental Impact Statement
EMS	Environmental Management System
EMT	Environmental Monitoring Teams
EHS	Environmental, Health and Safety
EP	Equator Principles
EPFI	Equator Principles Financial Institution
ESD	Emergency Shutdown
FA	Factory Act
FEPA	Federal Environmental Protection Agency
FMEnv	Federal Ministry of Environment
FMCG	Fast-moving consumer goods
FRSC	Federal Road Safety Corps
FGD	Focus Group Discussions
FGI	Focused Group Interview
GM	General Manager
GPS	Global Positioning System
GDP	Gross Domestic Product
HAZOP	Hazard and Operability
HSE	Health, Safety and Environment
HIV	Human Immunodeficiency Virus
HR	Human Resources
HA	Humic Acid
HCFC	Hydrochlorofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
IFC	International Financial corporation
ILO	International Labor Act
IUCN	International Union for Conservation Natural Resources
JHA	Job Hazard Analysis
kV	Kilovolts
LAN	Local Area Network
Ltd.	Limited
LEV	Local Exhaust Ventilation
LGA	Local Government Area
LPFO	Low pour fuel oil
MIS	Management Information system

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MPC	Maintenance Planning Cell
MSDS	Material Safety Handling Sheet
MFMP	Multilateral Fund for the Implementation Montreal Protocol
NESREA	National Environment Standards and Regulations Enforcement Agency
NPE	National Policy on the Environment
NSO	National Standard Organization
NURTW	National Union of Road Transport Workers
NDDC	Niger Delta Development Commission
NMA	Nigerian Maritime Association
NIMET	Nigerian Meteorological Agency
NGOs	Non-Governmental Organizations
OM	Operation Manager
OP	Operational Procedure
O&M	Operations and Maintenance
OEM	Original equipment manufacturer
PPE	Personal Protective Equipment
PHCN	Power Holding Company of Nigeria
PSV	Pressure Safety Valves
PACs	Project Affected Communities
PM	Project Manager
QA	Quality Assurance
QAP	Quality Assurance Plan
QC	Quality Control
ROW	Right of Way
RSA	Road Safety Audit
SHE	Safety, Health and Environment
SCBA	Self-Contained Breathing Apparatus
SMP	Security Management Plan
STIs	Sexually Transmitted Infections
SON	Standards Organization of Nigeria
SPM	Suspended Particulate Matter
TDS	Total Dissolved Solid
TH	Total Hardness
THB	Total Heterotrophic Bacteria
THF	Total Heterotrophic Fungi
TOC	Total Organic Carbon

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TSS	Total Suspended Solids
TMP	Traffic Management Plan
UHF	Ultra high frequency
UN	United Nation
UNFCCC	United Nations Framework Convention on Climate Change
VES	Vertical Electrical Sounding
WAN	Wide Area Network
WMP	Waste Management Plan
WHO	World Health Organization

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EXECUTIVE SUMMARY

ES1 Project Background

The proposed project will entail the construction and installation of Machines with other ancillary units for processing and generation of Coal power 60MW/day as first phase on total land of 200sqm purchased from Ogun State Government at OPIC Industrial Area, behind Jubilee Park, Agbara, Ado-Odo Ota, Ogun State. The Coal which is major material will be sourced through coal mining. The list of equipment are boiler, turbine, generator, water cooling system, conveyor, transformer, Electric system, Power supply system, Coal transport trailer that will be bringing raw Coal from miners to the facility.

The major raw material will be Coal and water (as catalyst in steam generation) which will be sourced locally. Coal is called fossil fuel because it comes from decayed plants. It's formed when dead plant matter submerged in swamp environments is subjected to the geological forces of heat and pressure over hundreds of millions of years. Over time, the Plant matter transforms from moist, low-carbon peat, to coal, an energy—and carbon-dense black or brownish-black sedimentary rock. Coal is classified as a nonrenewable energy source because it takes millions of years to form. Coal mines is majorly in the Eastern part (Anambra and Enugu States) of Nigeria and Central Zone (Kogi and Benue States).

Coal Power is the process of generating electricity by burning coal in a Coal power Plant to create steam that drives a turbine and produces electricity. It can be used to power boilers, gas turbines, and heating and power stations. For example, low speed marine or modular power plant can operate on pure coal fuel whereas medium speed diesels such as locomotive engines may need diesel as a co-fuel which will act as an ignition source. Converting coal into a gas form may simplify the delivery and dispensing of the fuel. It may be a cost-efficient alternative to oil and natural gas. Separating non-carbonaceous material before making the gas may reduce the production of ash to two percent.

The Coal power can be easily produced to have the properties like low ash, low sulfur, and low temperature of the combustion flame center. It is a substitute for fuel oil and provides high combustion efficiency, low discharge of ash, environmental benefit of lower SO₂, NO_x and CO₂ emission.

Towards the development of the proposed Coal Power Plant project, DahuaPower Limited has identified the need to incorporate environmental considerations into project planning and implementation in order to assure sustainability. To this end, Dahua Power Limited contracted the services of *Diskol Environmental Consulting Limited*, to conduct the Environmental Impact Assessment (EIA) study for the Coal power project. This is in compliance with Dahua Power Limited's corporate policy on environmental management as well as in fulfillment of regulatory requirements in the Federal Republic of Nigeria.

In Nigeria any industrial project of the magnitude of this proposed coal power project is required to complete an Environmental Impact Assessment (EIA) in accordance with the requirements of the Federal Ministry of Environment (FMEnv) as stipulated by the

Environmental Impact Assessment Decree No 86 of 1992 (EIA Act Cap E12 LFN 2004). This EIA is also prepared to meet IFC Performance Standards on Environmental and Social Sustainability, as well as Equator Principles. The EIA study covers the entire life cycle of the Project (i.e. preconstruction/design, construction, operation, decommissioning and closure).

ES2 Project Proponent

Dahua Power Limited, head office at km 14, Lagos Abeokuta Road, Owiwi, Abeokuta Ogun State was incorporated in 18th day of September, 2024. The objective of the Company is to generate Coal power 60MW/day in an environmental friendly method.

ES3 Project Location

The Proposed Project site, is located within OPIC Estate, OPIC Industrial Area, behind Jubilee Park, Agbara, Ado-Odo Ota, Ogun State. The nearest communities to the site are Adedigba, Igere and Ihunsa (Agbara) communities. The total acquired land is 200sqm.

ES4 Objectives of the Environmental Impact Assessment (EIA)

In line with statutory requirements for environmental protection in Nigeria, the proposed EIA study has been carried out to:

- Satisfy Federal, State and Local Governments as well as stakeholders, that proactive environmental actions shall be incorporated in the project design, installation, construction and operation phases of the project;
- Provide all necessary answers to stakeholders, assessors, host community, regulators, financiers, pressure groups and other interested parties;
- Give a detailed description of the proposed Project and relevant Project alternatives;
- Ensure all environmental components (baseline) from the project site are established and documented;
- Identify all environmental aspects of the proposed project that may interact positively or negatively with the environment;
- Make appropriate recommendations to prevent, reduce or control identified potential and associated impacts;
- Develop Environmental Management Plan (EMP) and procedures for effective and proactive environmental management of the environment throughout the project life cycle; and
- Include a proposed institutional structure to govern the implementation of the EMP and monitoring programme for the project.

ES5 Legal and Regulatory Framework

Dahua Power Limited is committed to conducting its operations in compliance with applicable national and international legislations and with the company's policies. Existing statutes on environmental protection in Nigeria contain specific provisions designed to prohibit or control environmental pollution / degradation and also prescribe sanctions or fines to be enforced against persons or corporate entities who contravene the provisions. The legal and regulatory framework for carrying out EIA of the proposed project are contained in relevant national statutes and international environmental conventions to which Nigeria is

signatory; consequently, the following sections present the applicable and relevant: National legislations, International Agreements, Dahua Power Limited's Health, Safety, and Environment (HSE) policies, which shall ensure the protection of human health, equipment safety and the environment.

The relevant policies, regulations, laws and guidelines that guide the project's operations are highlighted below:

- Dahua Power Ltd's HSE (Health, Safety and Environment) Policy
- Federal Ministry of Environment (FME) Regulations
- Ogun State Ministry of Environment
- National Environmental Protection Regulations, 1991
- Energy Commission of Nigeria Act
- Nigerian Content Act, 2010
- The Nigerian Constitution, 1999
- National Resources Conservation Council Act, CAP 286, LFN 1990
- The Standards Organisation of Nigeria (SON), Act
- The Land Use Act No. 6 of 1978
- Endangered Species Act
- Trade Union (Amendment) Act, Chapter T14, LFN 2005
- Factories Act (CAP F1), 2004
- Public Health Law, 1958
- The Companies and Allied Matters Acts 2004
- Water Resources Act, CAP W2, LFN 2004
- Criminal Code Act
- Employee's Compensation Act, 2010 Act No. 13
- Harmful Waste [Special Criminal Provisions] Act CAP 165 LFN 1990.
- Criminal Code Act
- The Labour Act, 1971
- The Nigerian Urban and Regional Planning Act 1992
- Other International conventions and standards to which Nigeria is signatory to.

ES6 Project Justification

Project Objectives

Dahua Power Limited (DPL) intends to establish a Coal Power Plant Factory (in an environment-friendly manner), for the following reasons:

- To meet the energy demand for customers.
- Promote the use of solid minerals for power generation to support the economy of the nation.
- To put the abundant coal resource in Nigeria, into fruitful use
- To ensure rapid industrial development in Nigeria
- Make use of abundant availability of coal in Nigeria
- Support the effort of the present administration to diversify economy

- Generation of employment opportunities
- To advance poverty reduction, among other socioeconomic development/gains.

The project is expected to yield a high degree of economic returns to the immediate communities in terms of increased property values, enhanced employment opportunities for local people, which is a secondary effect of enhanced Industrial base potential of contiguous communities in Ado-Odo Ota LGA and Ogun State in general.

ES7 Need for the Project

The need to bring the Nigerian economy into the 21st Century is rested on a reliable power generation system that has adequate electrical power to supply the needs of the population and attract industry to the country. Without a reliable and expandable power generation system, the country cannot support modernization or industrialization.

During the years of oil shortage and rapidly increasing oil prices, the need to decrease dependence on oil-fired utility power source became an urgent concern. The use of the coal-power generation promised a combination of advantages: near-term readiness, low-fuel costs compared to oil, moderate conversion costs, and low technical/economic risks.

The development work sponsored and performed with coal-power has confirmed these expectations. Fuel quality guidelines and test standards have been established, However, Dahua Power Ltd. production of Coal power Plant capacity of 1000tons of coal per day which will be used to generate 130tons of steam per hour from 2 sets of boilers which in turn powers 2 sets of turbine generators each generating 30MW with the total generation of 60 MW per day for the first phase.

This project will no doubt enhance efficiency in the industrial sector and contribute to a sustainable development of the nation thereby promoting Made-in-Nigeria goods and products.

ES8 Benefits of the Project

The provision of steady and reliable energy sufficient to power the surrounding industrial entities will boost production rate and better the socio-economic conditions of the surrounding locals/people. Therefore, the proposed project is needed to support the socioeconomic development initiatives and growth trend of the country there by promoting Made-in-Nigeria goods and products. The proposed project will result in increased energy efficiency, employment opportunities, improvement of infrastructure as well as development of social structure in the surrounding communities.

Generally, the project is expected to yield the following benefits:

- Provide steady and reliable energy sufficient to power the industries with the aim of reducing cost;
- Creation of job opportunities to eligible project-affected persons or nearby settlements.
- Promote indigenous Nigerian investor-led independent power production for the industrial sector;
- Promote secondary social development and services such as healthcare service delivery, manufacturing etc.;

- Provide direct and indirect employment opportunities;
- Support technology development through technical assistance and training for Nigerians as part of overall strategy of institutionalising local content in Nigeria's Energy Sector;
- Reduce environmental emissions associated with privately powered generators; and reduce the pressure on the diesel/ petrol supply chain.
- Attract both local and foreign investors in coal exploration and production.
- Strengthen the local technical and institutional capacity and foster coal-fired industries
- Contribute to the local economy and promote domestic coal industries and provide incentives to both local & foreign investors for the establishment of coal-based industries;
- Source of income to the government through royalties and tax generation; with increased revenue/ derivations to Local and State Governments as well as other mandated agencies/ commissions.

One benefit of the coal power production process is the separation of the non-carbonaceous material that is part of the coal before treatment. This results to a reduction of ash content to 2%, which can make it a viable alternative to diesel fuel in large stationary engines or diesel electric locomotives. Coal power is definitely the most viable and practical option for conversion of the existing Oil and gas-powered plants. Presence of water in Coal reduces harmful emissions into the atmosphere, makes the coal explosion-proof, makes use of a coal equivalent to liquid fuel and gives other benefits. Coal particles suitable for diesel fuel replacement typically need to be less than 20 micrometers in diameter. Other benefits will arise from the Corporate Social Responsibility (CSR) of the proponent to the Host Communities.

ES9 Envisaged Sustainability

It is proposed that Best Available Technology Not Entailing Environmental Cost (BATNEEC) will be installed for the project in order to provide for Local content, social, economic, environmental as well as technical sustainability. The project has been proved sustainable in terms of:

- Social sustainability
- Environmental sustainability
- Economic sustainability

These sustainability aspects are further discussed in the report.

ES10 Project Options

In proposing the project, the following options were considered during the planning stage:

1. 'No-Project' Option
2. 'Delay-Project' Option
3. 'Go-ahead-with-Project' Option

ES11 Project Alternatives

Site Location Alternatives

Major factors of the Project Site Location are founded on Three (3) strategic considerations:

- I. Coal Supply Arrangement (Input)
- II. Water Requirement (Process)
- III. Transporting of the product to the customer (Output)

These three (3) basic considerations paved the way for the siting of the Coal Power Project in the best available location for optimum productivity. This is done by analysis of the following:

- 1. Site Selection Criteria and
- 2. Site Location Options/Alternatives.

These two (2) analyses (of selection criteria and alternative location) provides basis for the choice/preferred site location of the proposed project.

1. Selection Criteria

The following Site selection criteria were considered for the Plant location. These criteria/factors are decisive in influencing the site selection for the proposed project site, as considered during project planning (feasibility studies):

- i. Availability and proximity to coal resource (fuel source)
- ii. Distance and quality of roads from coal mines
- iii. Ease of Site accessibility and road transportation route
- iv. Availability of water requirement
- v. Accessibility for movement and delivery of equipment
- vi. Availability of land for the proposed project and for future expansion.
- v. Land suitability in terms of terrain, topography, soil, geology and hydrology
- vii. Availability of skilled and unskilled manpower nearby
- viii. Extent of damage to existing environmental and socio-cultural resources
- ix. Distance from Residential structures.

2. Site location options

In selecting the proposed project site, comparison of alternative sites was made based on the selection criteria determined. Therefore, based on the above selection criteria, two locations were selected for consideration: Location-option 1 is at Ihunsa Village in Agbara (This site was rejected due to close proximity to the human settlement after due consideration and investigation on the best possible site location for such a project.); and Location-option 2 is at Adedigba Community, OPIC Estate (the current proposed site) about 11km away from the community.

3. Preferred Site Alternative

Based on the assessment/comparison of all considerable site selection factors of the two alternatives, Alternative-2 (OPIC site location) is the most suitable project site for the proposed project, on account of the following reasons:

- ✓ Receptiveness of the community
- ✓ Access roads
- ✓ Proximity to the coal supply route
- ✓ Land requirement/adequacy and acquisition achieved.

- ✓ The area is not an environmental sensitive area and also within reasonable distance away from residential homes because of noise;
- ✓ Less environmental adverse effects on natural resource, to compare cumulative impact of having both (coal mine and Power Plant) projects together at OPIC Estate
- ✓ Sparse habitation of communities on the project site
- ✓ No community places and no ecological sensitive locations/National Parks
- ✓ Availability of suitable land
- ✓ No ground filling is required
- ✓ Least possibility of resettlement
- ✓ Good response from local public

Design and Technology Alternatives

Coal Power Project with local technology will lead to greater cost, produce poor quality product, leads to wastage and will ultimately discourage production, employment and wealth creation. Thus, the need to employ the use of modern machineries, and Best Available Techniques Not Entailing Excessive Costs (BATNEEC) designed for the production. The design and technical specification of the mechanical component of production plant and equipment have encouraged the implementation of the project, considering the technology sustainability of the factory's operation.

Dahua Power Limited has a technically sustainable plan for this project. The use and adoption of best industrial practices in the design, construction and operational phases of the project and the culture for personal health and safety as well as effective environmental pollution prevention programme would ensure technical viability of the project. The project operations shall also be managed by experienced technical engineers.

ES 12 Project Description

Project Background

Dahua Power Limited (the project-proponent) proposes to set up a proposed coal power factory in Ado-Odo-Ota Local Government Area, Ogun State which will also include administrative block and residential in 21 Hectares of land. The proposed coal power Plant is conceived as an independent power project with the intention to produce coal steam/power for customers.

Coal power is another source of power generation, it is a cheap source of energy and is abundant in large quantities in Nigeria.

Process Description

Coal Power Composition

Coal steam is a combustible mixture of coal particles with little water.

Coal – Boiler – Steam – Turbine – Generator – Power.

The coal already has 10-15% natural water. Water addition and additives is for homogenisation. The presence of water in coal reduces harmful emissions into the atmosphere and makes the coal explosion-proof.

Production of Coal Power

The production of coal-power fuel involves receiving the raw coal in trucks and offloaded on a concrete floor in a closed shed. The crushing of coal or coal sludge to particles between 10 and 65 micrometers diameter (standard crushers are used); final fine crushing will be done in the ball mill in presence of water, wet milling and homogenization (with additives as required). The resulting product is then prepared for Boiler (HL – 130/9.8-M4 with capacity of 130KG/h and steam degree of 540⁰C.

1000tons of coal/day will be used to generate 130tons of steam/hr from two (2) sets of turbine generators, each generating 30MW with the total generation of 60MW/day.

ES13 Production Equipment

The following equipment and machineries, amongst others, are available for the proposed project. Boiler, Turbine, generator, Water cooling system, Conveyor system, Transformer, Electric system, Power supply system, Coal Transport Trailers, Crusher, Weighing conveyor, etc. However, the crusher will be used only when crushed coal is not available at some times.

ES14 Plant Maintenance

The overall maintenance of the coal power Plant shall cover the following areas:

- i. Management of the Plant's power source
- ii. Day-to-day operation and current (preventive) maintenance of the Plant, and
- iii. Scheduled maintenance of associated utilities and equipment.

When project is to be maintained, the downtime should be minimal, and failed or faulty components are to be replaced as needed and expeditiously. It is anticipated that all routine maintenance will be conducted by the plant's own maintenance team. This will include preventative, corrective and predictive maintenance in addition to any maintenance or repair required as a result of emergency breakdowns. In the event that major outages occur it is anticipated that the services of sub-contractors will be engaged to maximize economic efficiency. Routine preventative maintenance will be carried out by the operations and maintenance contractor for the period between inspections. In addition, the designated Operations and Maintenance (O&M) contractor will be required to create preventative maintenance plans for all of the plant areas, using software to generate work orders for pieces of machinery and equipment; and all maintenance activities will be recorded on the preventative maintenance programme.

ES 15 Project Waste Management

The proposed project would result in the generation of certain quantities of solid and liquid wastes. Dahua Power Ltd. recognises the need to minimise waste generation in the course of the proposed project implementation and to handle such wastes in accordance with industry and international best practices and in line with its policies on health, safety and environment. The waste items that would be generated during the proposed project include solid wastes (used drums, plants, excavated soil, waste rags, sludge, rubbish/garbage etc) and liquid wastes (waste water produced will be recycled, used engine oil, etc). More so, Septic waste management will be accomplished by containing the effluents from the accommodation toilets and grey water from showers and washing in septic tanks. The tank effluent will be

churned, treated to regulatory limits before being evacuated by third party.

All trash will be separated at source in trash bins that will be placed at the accommodation facility, working areas etc. Trash disposal will be carried out daily. Combustible materials (largely paper) shall be segregated and sent to a third-party contractor that has the capacity to handle such category of waste. Biodegradable materials, largely kitchen wastes shall be handled by a third-party contractor.

Medical waste largely needles and syringes and cotton wools shall be handled by a third-party contractor with approved ownership of an incinerator or OGWAMA Accredited hazardous waste manager.

Waste Handling Guidelines

Wastes handling and disposal procedures shall be well defined at source and a waste inventory register kept. The waste contractor shall define, and document appropriately, all wastes generated and transferred in the course of his work.

Dahua Power Ltd. shall apply the following principles in handling of general garbage (wood, plastics, paper and food wastes):

- Segregate components such as wood, plastic and paper, for recycling or reuse.
- Reduce packaging wastes such as paper and plastic by the use of bulk handling systems.
- Dispose all wastes at approved dumps.
- Refilling and reusing of containers.

However, the proposed project shall adopt the following main principles in terms of operations environmental philosophy:

- **Use of resources:** efficient use of chemicals, material, natural resources and energy sources, aimed at resource conservation and minimization of discharges;
- **Emission to air:** minimization through abatement at source of gaseous emissions that have the potential for negative impact on the environment;
- **Discharge to water:** minimization through abatement at source of aqueous effluents which have the potential for negative impact on the environment;
- **Solid waste:** Correct handling, treating and disposing of solid wastes to avoid/eliminate liabilities in the future and to meet the requirements for due diligence;
- Use of Best Available Technology Not Entailing Excessive Costs (BATNEEC) and good international industry environmental practices.

ES16 Description of Existing Environmental Conditions

The existing environmental condition (physico-chemical, biological, socio-economic and health) characteristics of the proposed project area are herein presented. The environmental characteristics are required to establish the existing environmental status of the proposed project area and also serve as a reference data for future studies and environmental monitoring. The data will also be used as a baseline for which the anticipated impacts of the proposed project would be determined for appropriate mitigation measures to be put in place.

Methodology of Baseline Data Acquisition

A multi-disciplinary approach was employed in the acquisition of environmental conditions

data of the proposed project area. The environmental condition for the proposed project was obtained through desktop research, field observation, sampling and measurements as well as laboratory analyses of biological, chemical and physical characteristics of sampled environmental components.

Baseline data acquisition involved a multidisciplinary approach and was executed within the framework of FMEnv procedural guidance. Elements of this approach include literature research, designing and development of field sampling strategy to meet regulatory requirements; confirmation of the sampling design and locations by Dahua PowerLtd; pre-mobilization activities (job hazard analysis, sampling equipment/materials calibrations and checks) and mobilization to field; fieldwork implementation, sample collection (including field observations), handling, documentation and storage protocols and procedures, demobilization from field, transfer of sample custody to the laboratory for analysis.

It is important after the scoping exercise to measure the baseline levels of those environmental parameters which are likely to be affected by the project. Thus, the planning of the baseline survey should flow naturally from the short-list of impacts which is the output of the scoping exercise. Thus, the exhaustive inventories of the geology, soils and of all plant and animal species in the project area which may not be necessary can be avoided.

ES 17 Environmental Reconnaissance Field Survey/Data-Gathering

A field reconnaissance visit and site verification were carried out from 9th-10th November, 2024 to carry out contents of the EIA terms of reference, identifies representatives of the host community that will join the team as local labour and identify options for logistic planning in order to have a hitch-free field campaign while a detailed one (dry) season data-gathering visit was carried out to project area and host community by the EIA study team on 11th – 12th November, 2024. The consultation process that has started at this reconnaissance visit was maintained throughout the various phases of the study and project execution.

To effectively characterise the study area, a comprehensive field data gathering exercise was carried out. Sample points obtained during site visit were keyed into hand held Global Positioning System (GPS) device which was used to identify and establish sampling points in the field. Field observations were made and documented in field notebooks. Sampling coordinates logged into the GPS prior to mobilisation were then checked for accuracy using the Google Earth Map. Secondary data of Hayat Kimya facility within the OPIC Estate was used to augment rainy/wet season baseline information of the Environment.

ES18 Laboratory Analysis

After the fieldwork exercises, study samples were transported to Lach Consult Limited at Block D6, small scale Industrial Estate, Fatai-Atere way Matori, Ladipo, Mushin for necessary and adequate analyses. Samples were analyzed using standard analytical methods (APHA, 1982). The synoptic descriptions of the laboratory analytical methods and procedures employed for the various physical, chemical and biological parameters as well as the detection limits of these parameters are documented in this report. Also documented are synopsis of the QHSE plan adopted in both field data collection and laboratory analysis. Laboratory analysis was generally in line with international American Society for Testing and

Material (ASTM) and American Public Health Association (APHA) as well as FMEnv Standard protocols. Quality Assurance/ Quality Control (QA/QC) measures adopted for laboratory analyses are in Accordance with FMENV recommendations.

Other QA/QC measures adopted are:

- the use of trained personnel at all phases of the study;
- written analytical standard operating procedures were followed during analyses and
- routine auditing and checking of analyses results, including control solutions and midpoint standards, were introduced into every batch or ten samples as applicable.

ES 19 Climatic Condition/Meteorological analysis of Project area

Information on the climate of the study area was based largely on the meteorological records of the general study area obtainable from the Federal Meteorological department (The Nigerian Meteorological Agency (NIMET) data at Abeokuta station in Ogun State) and available information from literature. The study area is situated within the humid semi-hot equatorial climatic region. Generally, Nigeria's climate is characterized by the hot and wet conditions associated with the movement of the Inter-Tropical Convergence Zone (ITCZ) north and south of the equator. When the ITCZ is to the south of the equator, the dry north-east winds prevail producing the dry-season condition and when it is to the north, the south westerly winds prevail to bring rainfall and the rainy (wet) season thus giving the proposed project area two distinct annual seasons: the dry season from November to March and wet season from April to October.

Climate is hot and humid with temperatures averaging 27°C (80° F) most of the year. The rainfall averages 1000mm per annum. In addition to meteorological data obtained from literature, meteorological parameters such as, wind speed, wind direction, humidity, atmospheric pressure, and temperature were observed and the seasonal variability in the parameters reflects the weather regime experienced at any given location in Nigeria during the year as is determined primarily by geographical location in relation to the fluctuating position of the Inter-Tropical Convergence Zone. The main report gives an account of the Field Observation of Meteorological Data of the Project area, as documented during site visit to the project location.

ES20 Air Quality Characteristics

At the project area, measurement of atmospheric gas pollutants (carbon monoxide (CO), carbon dioxide (CO₂), Sulphur dioxide (SO₂), oxygen, hydrogen sulphide (H₂S), hydrocarbon content and SPM) and noise levels were carried out. The observed air quality data of the study area is presented in Table 4.3 of the main report. Generally, recorded measurements indicated that the ambient air was free from pollution by these measured parameters as at the time of study as well as compared well with national limits for air quality standards.

ES21 Geology, Hydrogeology and Drainage

The project site-Agbara- is located within the western Nigerian coastal zone, a zone of coastal creeks and lagoons (Pugh 1954; Longe et al, 1987) developed barrier beaches associated with sand deposition (Hill and Webb 1958). Agbara / Igbesa area lies within the Eastern portion of Dahomey (Benin) basin, which extends into Ogun State (South West Nigeria). Particularly, The Dahomey Basin is partially separated from the Niger-Delta and the Eastern Nigeria Sedimentary Basin by a Ridge of crystalline rocks. (Kogbe 1974).

Hydrogeological

The ground water is slightly acidic (pH 5.0 – 6.4), fresh and of low conductivity. The result of the pollution indices obtained from previous studies were quite low therefore indicative of groundwater from the tropical zone. The slightly high level of Fe (1.2 – 7.28mg/l) in the ground water is a reflection of the ferruginous nature of the sedimentary material.

Drainage Pattern

There is no drainage pattern observed at the site because there are no surface water bodies observed in the vicinity of site to about 2.5km. This is so because the site is observed to be at the highest point in the area with both sides sliding into valleys. The northern flank is much steeper than the southern flank.

Geomorphology

The site is located within a zone of permeable fine to medium grain size materials that forms a gentle hill landform. It has a landform of hill that steeps gently to the eastern side of the site while it is flanked on the northern and southern side of the site with valleys. Surficial sands, clayey to silty sand were distributed across the site.

Topography

The topography is generally that of hills and valleys with the middle of the site being the highest point relative to its immediate surroundings, thus exhibiting a somewhat double sloping from around its middle. Altitude increases gently eastward, and slopes gently toward the southern and northern sides of the site.

ES22 Groundwater Quality Assessment

One (1) ground water sample was taken from borehole at the Proposed Project Site and one (1) control outside, at control point. The sample was tested for Insitu field analysis measurements of pH, conductivity, Total Dissolved Solids (TDS), Total Salinity, Dissolved Oxygen (DO) and temperature were taken using handheld in situ water sampling metres at the sampling location. Samples for the determination of physico-chemical parameters were collected into plastic bottles after rinsing with portion of the water samples to be collected. The sample containers were well corked and placed in ice chest for transportation to the FMEnv accredited laboratory, *Lach Consult Limited*.

However, summary of the result analysis shows that the good water quality of the groundwater in the study area may stem from the fact that soil is a natural filter where processes such as filtration, adsorption, biodegradation, ion exchange and dispersion may reduce concentration of contaminants.

ES24 Soil Studies

Generally, the soils in most of the study area are largely loamy and clay soils. Field protocols were carried out to meet the needs of the study and for information that were adequate and suitable for achieving valuable results. Soil Sample stations were established, spreading within different section of the proposed project site, at each sampling station, soil samples were taken at various depth level, the soil samples were bulked together to give a composite sample.

Summary of results obtained for the physico-chemical characteristics of soil samples of the study area are presented *the main report*.

ES25 Vegetation Studies

The vegetation of the study area is typically forest, but with some characteristics of a transition zone between the southern guinea zone and the thick forest. This ecological zone is generally made up of a mixture of various species of trees, shrubs, herbs and grasses. It is worthy of note that the vegetation within and around the proposed site for coal power facility has been substantially altered by clearing for agricultural purposes. Although many of the trees encountered, that ought to be of large sizes were indeed small, the vegetation cover surrounding the study site was diverse in species composition, pointing to the fact that it was originally rich with respect to species number and complexity.

Floristic Composition, Distribution and Abundance

All the plant species found on the proposed factory site are enumerated in Tables 34 to 36. A total of 48 plant species in 27 families were encountered. These consist of 28 species of herbs, 5 of grasses, 2 of shrubs and 13 of trees. The most frequently represented families of plants were Asteraceae, Fabaceae, Poaceae and Euphorbiaceae but important families whose members have been acknowledged to be useful in the timber and chemical industries and for other commercial purposes were observed. Some of these include Malvaceae, Apocynaceae, Solanaceae and Verbenaceae. Out of the 13 tree species present in the study site, the most frequent were *Neubouldialeavis*, *Carica papaya*, *Morindalucida* and *Anthocleistadjalonensis*. These species are indicative of both natural forest characteristics and anthropogenic influences.

ES26 Fauna Studies

The wildlife inventory for the study area was carried out by examining the animal footprints, droppings, interview with local hunters, etc. During the course of the fieldwork campaign, birds and some other reptiles were observed and identified. Also, the local markets were visited to see and identify the predominant wildlife species.

The value of wildlife has been widely ignored for many decades, a situation that has encouraged uncontrolled killing of these animals. This situation has changed somewhat, as

the importance of wildlife to local communities is now globally recognized in community-based or participatory natural resources management programmes. Wildlife could be of prime importance in terms of their economic, nutritional, socio-cultural and ecological importance. All these are the positive sides of wildlife, but sometimes they may be seen as presenting negative or adverse values. Depredation of wildlife to people (casualties), livestock (predation), agriculture (crop damage) and natural landscape (invasive pests) are considered counter-productive. In addition, different observers may have diverse views of the same value: the wildlife protectionist might consider normal for the predators to prey on livestock (positive value for wildlife), while the cattle-owner would see the large predators as detrimental (negative value of wildlife). But then, the truth, from ecological point of view is that diversity imparts stability. The greatest value of biodiversity lies in future opportunities to human kind, known and unknown at the moment.

According to the local residents contacted and information obtained during the site visitation, five different categories of vertebrate animals are associated with the study site. These are reptiles, mammals, rodents and birds. All of these except antelopes and the monkeys were frequently encountered by the respondents. The categories of invertebrates observed were five, namely, insects, millipedes/centipedes, earthworms and snails. Going by the entries in the 2017 list of threatened species of animals, only the Alligators (Ornate monitor) i.e. *Varanus ornatus* out of all the animal species enumerated from this study is vulnerable to extinction.

ES27 Land Use

Various land uses were observed at the vicinity of the proposed factory. These include crop farming to produce mainly cassava and banana, but there were also pawpaw, guava, cashew and other tree crops. On either sides of the foot path leading to the stream on the North Western part, are flood plains which are suitable for cultivation of crops in the wet season; and in the dry season, irrigated leafy vegetables can be cultivated. In the flood plains, a few water pools usable for irrigation and for domestic purposes such as drinking water for livestock were observed. Widespread deforestation in form of logging and bush clearing for farming were rampant, and many trees have been removed for fuel wood.

ES28 Socio-Economic Study Approach, Data Collection and Analysis

In this study, the socioeconomic and health characteristics of the proposed project area were established through extensive literature search, field survey and data interpretation.

Effective socio-economic baseline data collection involves the deployment of several techniques and methods, including using interview schedules, questionnaire administration, Focus Group Discussion (FGD) and Key Informant Interviews (KIIs). These techniques are within the basket of participatory rural and learning appraisal techniques.

The data collected from questionnaire administration were analyzed to determine the perception of the inhabitants of the proposed project study area. A total of one hundred (100) questionnaires were administered to different group and household in the project affected communities, 40% of the questionnaires were administered to the youth group which represent 55 % of the population, 30% were administered to the men while 30% were

administered to the women within the proposed project area of influence. Seventy-eight (78) were collected and analyzed for processing while fourteen (14) were returned empty from the responded and eight (8) were not returned back.

The data collected from questionnaire administration were analysed to determine the perception of the inhabitants of the proposed project study area. Ground-trothing was also undertaken to identify, and verify existing social infrastructures, their functional status, and capacity/adequacy and authenticate claims of community representatives/participants. The collection of information on socio-economy was based on an appropriate checklist of questions), which enhanced interview time without necessarily leaving out any vital information.

ES29 Project Stakeholder / Parties

Consulted Stakeholders are persons, group or organization that shares a common interest. In EIA studies, stakeholders are usually concerned with the project or impacted from the project. Stakeholders that were

Consulted and participated in this project are listed below: Federal Ministry of Environment (FMENV); Ogun State Ministry of Environment; Ado-Odo-Ota Local Government Council; Ogun state Ministry of Lands, Housing & Urban Development; Community Based Organization; All Affected Village/Community Heads; Youth and women group in the affected communities: and Non-Government Organizations

ES30 Communities' perceptions/concern on Proposed Project

Consultation activities were undertaken with a broad spectrum of community stakeholders which includes; village council members, representative of the youths, women and social groups. These series of activities gave a profound insight into the mindset of the proponents of the proposed project. However, the community expresses fear, hoping the project will not be abandoned by the proponent. And also, expressed their pleasure at the proposal to site such a gigantic benefit accruing thereof. In general, interactions with communities were positive and there was widespread appreciation of the consultation process undertaken. In terms of the project, the communities were of the view that it afforded considerable potential for providing significant socioeconomic benefits and community assistance projects.

ES31 Demographic Characteristics of Ogun State and Ado-Odo-Ota Local Government

The population of Ogun State during the 1991 Census was 2,333,726. With its growth rate of 2.83 per cent per annum, the population estimate for 2003 was projected at 3,297,408 and 3,486,683 for 2005. The projections indicated that in 2003, about 1,483,834 of the population (45%) would live in urban areas, 1,813,574 (55%) in rural. The male population was estimated at 1,615,730 (49%), and female 1,681,678 (51%). Children under one year old numbered about 5.40% and those under five years accounted for 19.10%. Women of childbearing age (15-49 years) made up 25.0% of the population and about 49% of the total female population. Children under age five accounted for 629,805 (19.1%) of the total population, NPC, 2010.

Adopting a national growth rate of 2.83%, the projected population of Ado-Odo/Ota local government area for year 2016 is 694,580, Table 41, where the population of the study area from the records of Adedigba community in 2006 is 1,750 and 1,200 respectively.

ES32Community Description

Adedigba is the host community while two other communities, Igere and Ihunsa of Ado-Odo/Ota local government area in Ogun State were identified as project affected communities at the proposed acquired site for Dahua Power Limited facilities and is covered in the socioeconomic health study.

All the settlements are permanent, autonomous and possess characteristically rural nucleated clusters in their housing patterns and physical setting. Situated within the greater Agbara Industrial planning area, the villages/communities are fast losing its rural setting of some sort; unless told, it is very difficult for a first time visitor to place it as such being that it is within an industrial layout.

Traditional Governance, Social Institution, Customs, Heritage and Tenure System in the Study Area

The host community belong to the Ogu (Eegun) ethnic minority group majorly found in Ogun(Yewa region) and Lagos(Badagry) States. Oral history infers that the Ogun people were Whydah, Allada and Weme settlers in the old Dahomey presently known as Republic of Benin. But as a result of the Dahomeyan War that occurred during the 18th century, some of them have migrated away from the flash zone into safety to what today is part of Nigeria, *AnthoniaDuru*;Daily Independent (Lagos),2 August 2015. According to Mesawaku, a historian; the Ogu people migrated to Badagry as early as the 15th century due to the need for security and need for new waters for fishing, good farmland. Since their environment is surrounded by water, majority of Ogu(Eegun) people are into fishing, coconut processing and salt production while some are involved in trading and farming. Among the Ogun people, the use of condoms as a method of birth control is perceived to be a taboo due to their long held traditional belief in the old practice of *coitus interruptus*.

The Ogu can also be found in Yewa community of Ogun State but their number is marginal compared to other sub-ethnic groups in the state. However, the Adedigba community have it that their founder is Gbogi-Idada who had two sons, Apadi and Idowu. Interestingly, by virtue of seniority, leadership is with descendants of Gbogi-Idada. However, *Igere community in reality comprises of Igbosunme, Ihunsa and Itosokoh quarters*, while leadership rest with the first family/son of the progenitor, the Apadi family, Appeal Ruling No. CA/1/15/96,.

The Ogu speaking people are socio-politically organized and the institution of **Aholu** represents one of the achievements of the Eegun (Ogu) in political centralization. Traditionally, the Ogu are very religious and ritualistic and every traditional Ogu community has sacred shrines.

It is also a common thing to find Ogu speaking man respecting and adoring his ancestor's cultural heritage. Ogu also produce mats and foodstuffs such as Lagba, Fufu, Koko, Iru (locust beans) with a pre-occupation, which is mainly farming. The main agricultural products of Adedigba community are Cassava, Melon, Maize and Yam, while oil palm produce forms the major cash crop.

Land Tenure System in the Study Area

Access to land in traditional societies is often based on custom. These rights of access may have their origin in the use of the land over a long period. They are often rights developed by ancestral occupation and by the use of land by ancestral societies. In such cases, it is through the act of original clearance of the land and settlement by ancestors that rights are claimed. Hence, ownership of lands in the study area is vested in individuals and the extended families, which is held in trust for the family by the head of family or chief or Baale. More important is the fact that most of the vast expanse of fallow land in the area belong to OPIC Investment Company which it acquired from the original land owners, Adedigba community.

Gender and Age Characteristics of Respondents:

The survey showed that cumulative gender ratio of respondents in the study area indicated that 57.5% of the respondents are male while are 42.5% female.

Housing and Settlement Characteristics in the Study area:

The host community, exhibit both the linear and nucleated housing grid patterns which may have been guided by OPIC Investment Company romance with the study area. Structures are built in clusters at the community central area while the linear and nucleated housing grid layout is found beyond the community centers. Igere community has about 50 housing structures closely arranged and Ihunsa over 45 housing structures in a more compact form along its many roads and streets. There exist Rasco Guest house in Ihunsa and Alako, SoulTrack, Komes and Oasis Guest houses in Igere community.

Housing characteristics are also very distinct in the communities. Houses are predominantly of the brick-walled types, with corrugated iron zinc roofing, although storey buildings are rare. Houses are in most cases plastered but again rarely painted, except for structures built within an estate. There exist several companies and industries in the study area such as Drury, African Fertilizers, Eko Supreme, Natural Prime, Sunflag and Golden Pasta Flour Mills. Meanwhile, OPIC Investment Company has estates such as OPIC, New Dawn, Clusters, New Terrace and Area 1.

Income: As typical of most Nigeria households, personal income levels of self-employed residents of the population were difficult to assess. Many do not keep records and are therefore uncertain of the gross or net amount actually earned from self-endeavours. However, these have been found to vary widely depending on occupational distribution and skills. The study showed that the income of those on contractual employment earn as high as N300, 000 per annum..

Educational Facilities: There are primary and secondary schools at the study area. Igere

community, there is a primary school built in 1955 by the then government of Western Region headed by the Late sage, Chief ObafemiAwolowo, which was upgraded and renovated by Hayat Kimya Nig. Limited. There are also Edun Secondary School and a technical college, Gateway Institute of Technology, Igbesa. Meanwhile, the Ihunsa community claimed that there are as much as 20 private and 1 government primary schools in its domain as well as 10 private post-primary schools, some of which are MobeOyin Primary and Secondary School and Christ the Lord Secondary School.

Electricity: The communities in the study area have access to electricity supply, though not all the quarters are connected; they are all linked to the national grid. However, the incessant power outages have robbed the communities of the joy of the facility.

Transportation and Communication and Other Amenities: The communities are linked and accessible through numerous roads that entered Agbara Estate. The communities are still benefiting from the tarred roads and access routes constructed to easy movement into OPIC Estate Development Area.

The basic mode of transportation in and out of the study area is by private cars, commercial motorcycle operation and Keke-tricycle.

There are no Postal services in the study but available are telecommunication network signals of MTN, Etisalat and Airtel (Zain). Banking facilities are also absent in Adedigba community but POS shops available.

Health Facility, Potable Water Supply and Waste Management: The available orthodox health facilities in the communities are shown in the main report. Patent medicine stores and traditional medicine homes abound in the communities and are patronized by the people side by side with the orthodox health facilities. Most of the Primary Health Centres are understaffed, ill-equipped and underutilized.

The prevalent disease trend reported by respondents with answered questionnaire includes: Malaria, Sexually Transmitted Infections, Typhoid fever, Upper respiratory tract infections and asthma, Tuberculosis, Hypertension, Skin diseases, Diarrhoea diseases and food poisoning.

The main sources of water supply in the study area are private boreholes and hand dug well.

ES 33 Impact Assessment

Impact Assessment Methodology

The methodology adopted in the assessment of impacts entailed identification of aspects and impacts using source reference materials; defining impacts criteria and determination of mitigation measures followed by the formulation of impact management plan.

In general, the assessment of impacts has proceeded through an iterative Process considering Four (4) Key elements:

1. **Identification** or prediction of potential impacts and their magnitude i.e. the consequences of the proposals on the natural and social environment and associated cumulative impact.
2. **Evaluation** of the importance (or significance) of impacts taking the sensitivity of the environmental resources of human receptors into account.
3. Development of **Mitigation** measures to avoid, reduce or manage the impacts

4. Assessment of **Residual** significant impacts after the application of mitigation measures. Where significant residual impacts remain, further options for mitigation may be considered and impacts re- assessed until they are as low as reasonably practicable for the project.

ES 34 Potential/Associated Impacts

Pre-Construction Phase

- Uncertainty and increased perturbation due to a lack of information and communication.
- Perception of the local people (host communities) and stakeholders
- Integration of men and women concerns into the project design
- Exclusion of vulnerable groups from consultations which may lead to strife
- Community agitations over compensations, land disputes, wrong stakeholder identification, leadership tussles, etc
- Increased traffic during mobilisation on road with risks of accidents leading to injury/death and loss of asset.
- Increase of dust particles and vehicular emissions (SO_x, NO_x, CO_x etc)
- Obstruction of/damage to existing roads due to increased usage during mobilisation.

Construction Phase

- Work place accidents/incidents from the use of cranes, forklifts, etc. during loading and offloading of materials/equipment.
- Employment opportunities arising from recruitment of workers
- Skill acquisition and enhancements to local indigenes and workforce.
- Influx of people (migrant workers, subcontractors and suppliers) and increased pressure on existing social infrastructure
- Risk of electrocution and burns (to onsite workers) from welding flashes and high currents during welding
- Possibility of vision impairment from exposure to light emitted from welding sparks and foreign particles/objects entering the eyes.
- Noise and attendant vibration effects from fabrication and associated welding equipment
- Increased jobs and job opportunities from local labour hire and sub-contracting to indigenous suppliers.
- Generation of dust and automobile / heavy duty equipment emissions from construction earth works.
- Flora/habitat loss and disturbance through vegetation clearing and earthworks.
- Fragmentation (i.e destruction and disturbance) of habitat.
- Waste Disposal of scrap metal, wood, sand, concrete, paper, domestic waste, used oil and replaced/obsolete equipment parts that may contaminate soil/groundwater; Waste from lay-down area.

Operation Phase

- Increased availability of coal power for energy efficiency to the customers.
- Development of new infrastructures or improvement to existing ones.
- Localized increase in the ambient concentration of hot air due to high level of heat (energyinput)
- Exposure to mechanical and electrical risks
- Physical hazards and accidents from handling of plant machineries, equipment and tools
- Occupational health and safety of workers
- Respiratory hazards from inhalation of toxic gases
- Heat (high temperature) effect on human health
- Emission of toxic gases and Release of greenhouse gases on air quality and climate change
- Noise generation from Plant operation
- Generation of waste and dust/fine
- Increased vehicular movement and traffic congestions

Decommissioning/Abandonment Phase

- Increase in ambient noise levels above baseline conditions from movement and activities of decommissioning equipments and automobiles.
- Traffic obstruction from transportation of decommissioned structures and equipments to receiving hub.
- Risk of accident and injury to worker during demolition of structures
- Incident/accident resulting from the movement of materials and equipment on low loader
- Risks of pirate/militant/youth attacks and possible hostage taking which may lead to injury or fatality of personnel.
- Interference with public utilities (electric wires and poles), market activities along demobilisation route
- Availability of land for alternative uses

ES35 Mitigation Measures

Pre-Construction Phase

Dahua Power Limited and Project Contractor shall:

- All relevant stakeholders are identified
- Early stakeholder's engagement sessions are held, and all agreed issues properly documented and signed
- Early engagement of stakeholders
- Establish and publicize grievance procedure
- Provide the opportunities for all affected groups (women, youths, religious, etc) to participate in consultations and ensure that all concerns are duly addressed.
- Plan and execute consultations to educate community members and stakeholders on project activities, schedules and potential impacts.
- Ensure consultation throughout project lifespan.
- Due consultation of relevant groups at all phases of the project.
- Provide the opportunities for all affected groups to participate in consultations and that all

concerns are duly addressed.

- Establish and publicize grievance procedure.
- Liaise with local CDC, community head and relevant local organizations to identify actual land owners.
- Consulting all relevant stakeholders and legacy issues identified early, clearly defined, and agreed on Fair compensations in line with national standards are agreed upon and paid.
- Use standard warning notice (e.g. side rides, signal lights and horn) to other roadusers;
- Ensure a practicable journey management programme is developed and adhered to;
- Carry out pre-mobilisation route survey and ensure that mobilization is carried out after due consultation with relevant authorities and other stakeholders to minimize interference along the route

Construction Phase

DPL and Project Contractor shall:

- Ensure that all vehicles involved in the transport of construction material and staff and machinery involved in the construction is properly maintained and serviced.
- Extra care must be taken to reduce dust in periods when wind speed are greatest and the rainfall amounts are lowest which is between November and February (dry season), e.g. This will involve extra wetting of the construction area to suppress dust particles.
- Ensure that all material (sand and aggregate) stockpiled along the site to be used in construction activities are regularly sprayed to reduce the effects of wind whipping.
- All staff employed at the construction site must be provided with dust masks and ensure compliance
- Implement a traffic system that involves appropriate signals and signs to ensure the smooth flow of traffic. This will reduce the idling of vehicles that may occur and therefore reduce the emissions in the area.
- Reduce speed along earth roads
- Plan journey to reduce travel times
- All personnel are qualified and certified for their relevant works
- That approved safe work procedures are provided and complied with at all times
- Use of appropriate personal protective equipment (PPE) e.g. rubber hand gloves, hard hats, safety boots, etc. by all personnel at the project site
- Limit work activities to daytime only where practicable
- Conduct of safety inspections of work equipment prior to mobilization;
- Daily HSE briefings/tool box meetings are carried out before commencement of work;
- Creating requirements for contractors to hire local labour
- Ensure skills acquisition and development
- Maintain regular medical examinations for all staff.
- Abstinence/safe sex shall be encouraged
- Employment of indigenes shall be encouraged
- Air emissions are expected to be short term and minimal at this stage of the operation
- Advance filters and techniques are incorporated in the design to reduce dust emission

- Vehicles carrying earth materials should be covered
- Install and operate air pollution control equipment e.g.mufflers.
- All personnel are qualified and certified for metal works
- That approved safe work procedures are provided and complied with at all times
- Use of appropriate personal protective equipment (PPE) e.g. rubber hand gloves, hard hats, safety goggles, etc. by all metal works personnel
- Relevant personnel are trained one quipment.
- Daily HSE briefings/tool box meetings are carried out before commencement of work;
- Conduct of safety inspections of work equipment prior to mobilization;
- Equipment maintenance programme is developed and adhered to;
- PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel; and activities are avoided when lighting is inadequate and as practicable in inclement weather e.g. periods of low visibility.
- Develop project specific waste management plan and ensure proper implementation
- Provide adequate containers for waste collection

- Periodically assess contractor activities to check the level of compliance to regulatory and DPL waste management requirements.
- Safe operating practices are enforced during construction
- Ensure use of only government approved waste management contractors
- Comprehensive waste management is being developed to help in minimizing waste accumulation on site.
- Oil spill handling strategy especially mopping up oil immediately after spill, engine maintenance particularly oil change off site plan should help avoid pollution due tooils.
- Ensure inclusion of threatened and endangered species management strategies in the site specific Environmental Management Plan to be developed by Project Contractors to ensure appropriate flora management.
- Plan and execute construction work to minimize interference on wildlife
- Maintain construction equipment to optimal function conditions
- Monitor presence of wildlife species during construction activities
- Birds should not be exposed to more disturbance than is inevitably brought about by construction and operations activities.
- DPL shall operate its proposed project in line with regulatory framework and the administrative guidance for the proposed project to minimize the cumulative impact on the aesthetic value of the project area, in consideration of other existing infrastructures in the project location.
- Encourage hiring, as practicable, of appropriately qualified workers from areas in the vicinity of the project
- Work with contractors to ensure that specialised skill workers from outside areas have access to proper accommodations and other basic infrastructure

- Educate all workers to enhance their Health, Safety, Security, and Environment awareness, and performance on the job
- Maintain medical emergency response plan so that injured or ill personnel can promptly access appropriate care

Operation Phase

DPL and Project Contractor shall ensure

- That impact is beneficial and enhanced by sustaining the project's life span, through adequate and effective maintenance activities as well as complying with related/relevant federal government's policies and laws.
- Advanced filters and techniques are incorporated in the plant design to reduce gas and dust emissions
- Incorporate 'Ventilation design' during plant installation.
- Good general ventilation throughout the plant and Local Exhaust Ventilation (LEV) wherever substantial quantities of dust and fumes are generated is in place.
- There is creation of airflow such as exhaust ventilation or air blowers.
- Implementation of the Air Quality Management Plan
- Training is conducted by experts and should make use of effective audio-visual aids.
- Appropriate ergonomic studies to investigate conditions workers are carrying out various operations is made and also explore the impact of the environment on the worker and the functional design of the machinery used.
- All dangerous parts of machinery and equipment, including lifts, conveyors, long travel shafts and gearing on overhead cranes, is securely guarded
- A regular system of inspection, examination and maintenance is done for all machinery and equipment of the plant, particularly for cranes, lifting tackle, chains and hooks.
- Safety meetings or contacts are held regularly for all persons to reinforce safety training and awareness.
- Workers are provided with proper PPEs, with enforcement strategies to wear/use them.
- There are effective controls for the storage and safe handling of raw materials, products, by-products and wastes.
- Ensure the use of respiratory protection equipment (atmosphere-supplying respirators)
- Ensure there are engineering controls (such as local exhaust ventilation)
- Develop and implement a written respiratory protection program;
- Provide worker medical evaluations and respirator fittesting;
- Provide worker training about respiratory hazards and proper respirator use;
- Workers are permitted to distribute the workload evenly over the day and incorporate work-rest cycles.
- Cool rest area in hot work environments is provided considerably to reduce the stress of working in those environments.
- There is thorough medical supervision
- Air seals on the pusher machine level bars to control infiltration during charging and

carbon cutters to remove carbon build-up

- Luting of lids and doors and maintaining door seals as necessary to control emissions after charging
- Routine inspection, maintenance and repair for proper containment of emissions
- Uniform collector-main pressure adequate to convey the emissions
- To check the particles by installing fabric filter collectors or electrostatic precipitators.
- The reuse of waste water before it leaves the plant
- Recycling of effluent where possible.
- That effluent stream is kept separately
- That proper drainage system is created
- Use equipment, which emit low levels of noise with acceptable exhaust gases, which conform to national standards and specifications.
- Ensure that sound proof design is employed during the installation and planning stage of the plant.
- The solid wastes generated in the plant are properly recycled
- There is use of dry dust collection and removal systems
- To provide separate entry and exit gateways for vehicles;
- Car and van parking for the workforce and visitors away from the work area is provided;
- That vehicles reverse is avoided where possible as reversing is a major cause of traffic fatal accidents.
- That all drivers know and understand the routes and traffic rules on site.
- The use of standard road signs where appropriate
- That induction training for drivers, workers is provided.
- That vehicles are maintained so that they are mechanically in good condition.
- To provide a plan of the workplace at the entrance (and at other appropriate points) showing vehicle routes, one-way systems and
- Implementation of the Traffic Management Plan.

Decommissioning/Abandonment Phase

DPL and Project Contractor shall ensure:

- Plan decommissioning activities is in consideration of peak traffic times.
- Ensure that the handling of equipment and materials is supervised.
- The use of signs, posts, and guides to manage traffic and direct users accordingly
- A practicable Traffic Management Plan (journey management programme) is developed and adhered to.
- Develop a work plan for safe demolition
- Ensure hazards are identified and addressed prior to commencement of work.
- Provide and enforce the use of PPE
- Ensure that decommissioning and demobilisation vehicles are under the control of competent personnel.
- Provide adequate facilities on site to treat emergencies to staff.
- Relevant personnel are trained one equipment.

- Daily HSE briefings/tool box meetings are carried out before commencement of work;
- Conduct of safety inspections of work equipment prior to mobilization;
- Equipment maintenance programme is developed and adhered to;
- PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel; and activities are avoided when lighting is inadequate and as practicable in inclement weather e.g. periods of low visibility.

ES 36 Environmental Management Plan (EMP)

Dahua Power Limited (DPL) recognizes the need for the development of an effective EMP to facilitate better achievement and demonstration of sound environmental performance. Furthermore, environmental management is seen as the means to ensure that the commitments specified in this report are properly managed and that unforeseen or unidentified impacts of the proposed development are detected. Thus, DPL has designed the EMP of the proposed project in line with its Health, Safety and Environment (HSE) policy and in accordance with ISO 14001:2015 Environmental Management System specifications. The EMP for the proposed project shall be a “life document” which shall be reviewed periodically with the incorporation of various mitigation measures for potential impacts and shall form the basis for the actual project implementation. It is an open-ended document implying that information gained during pre- construction, construction, operational and decommissioning activities and/or monitoring of procedures on the Site could lead to changes in the EMP.

ES 37 Organizational Structure and Responsibility of Management

Dahua Power Limited is committed to provide resources essential to the implementation and control of the EMP. This commitment includes providing an *updated* Organogram that presents the managerial positions of responsible persons to Environmental Management System, which include the appropriate human resources and specialised skills. Thus, DPL will have dedicated personnel competent on the basis of appropriate education, training, and experience that will manage and oversee the HSE aspects of project construction. The roles and responsibilities, presented in Section 7.3, for the proposed establishment of Coal Power Project is for the Implementation of the EMP (as provided in Table 7.1 of the mainreport).

ES 38 Environmental and Social Management Guidelines

Dahua Power Ltd. has set objectives and targets in managing significant environmental aspects in line with ISO 14001:2015 Environmental Management System requirement for the proposed project during construction and operation phases. Commensurate resources shall be allocated to meet specific plans. These plans shall be reviewed yearly by DPL management to monitor progress. DPL management through HSE engineer shall be responsible for implementing the mitigation measures for environmental aspects/impacts of the proposed project.

This shall be within the scope of relevant HSE policies and regulatory requirement as well as standard industry practice. At Construction Phase however, the DPL contractor shall be responsible for ensuring that all HSE requirements are met. The contractor shall report to the DPL management through the HSE engineer.

The Environmental Aspects that are likely to be significantly impacted by all the phases of the project such as pre-construction, construction, operation, and decommissioning have been identified and addressed in the environmental management plan. In addition to this, project specific plans that will incorporate implementation of recommended measures for each work phase and aspect will be developed by the contractors to ensure that all health, safety, and environmental concerns are fully covered for the entire project. Since these plans will be developed at stages where specific project details are available, they will therefore present comprehensive steps for the implementation, monitoring, and reporting from inception to projects completion and decommissioning.

Environmental Management Plans mapped out for the project include the following, as detailed in the EIA Report Chapter7:

- Air Quality Management Plan
- Noise and Vibration Management Plan
- Water Quality Management Plan
- Soil-Contamination Management Plan
- Biodiversity ManagementPlan
- Consultation and Public Involvement Plan
- Social-Cultural ManagementPlan
- Health, Safety, and Environmental (HSE) and Security Plan
- Waste Management Plan
- Traffic Management Plan
- Training and Awareness Programme
- Communications Guideline
- Documentation and Reporting
- Environmental Audit and Review
- Emergency and Contingency Plan

ES 39 Regulatory Compliance

Majority of the identified impacts would take place during preconstruction and construction phases. Impacts identified for the operation phase are minimal. Mitigation measures for each of the phases have been presented in Chapter 6.

Project-specific compliance requirements such as laws, regulations, permit and approval requirement and conditions shall be identified and documented in a Regulatory Compliance Plan (RCP). This plan will comprise of a spreadsheet that lists the identified obligations along with responsible persons and timings. It will be approved by the Project manager while the site environmental officers will be responsible for its implementation, monitoring, and reporting.

All environment-related regulations as they apply to the proposed projects have been documented and described in this EIA. The environmental management activities at each stage of this project have been guided by the environmental standards including national legislation, international conventions and agreements, and Industry's codes of practice. The Federal Ministry of Environment has responsibilities for environmental protection and the enforcement of environmental standards. Where standards and regulations are not present in Nigeria, standards issued by international bodies such as the World Health Organization

(WHO), International Finance Corporation (IFC) and World Bank have been adopted. The Coal PowerProject management (and all her contractors/subcontractors) shall ensure compliance with these regulations throughout the project's lifecycle in line with measures inherent in the Engineering Project Management.

ES 40 Operational Control/Maintenance Procedures

To assist in maintaining the technical integrity of the Proposed Project facility, a well-defined management system, which shall be approved by the Project Management team, will ensure compliance with the plant's operational and maintenance policies.

Each potentially significant impact identified in the EIA will have an operational control associated with it that specifies appropriate procedures, work instructions, best management practices, roles, responsibilities, authorities, monitoring, measurement and record keeping for avoiding or reducing impacts. Operational controls are monitored for compliance and effectiveness on a regular basis through a monitoring and auditing procedure described in the EMP.

Operational control procedures will be reviewed and, where appropriate, amended to include instructions for planning and minimising impacts, or to at least reference relevant documents that address impact avoidance and mitigation.

The maintenance system shall include plans and procedures for:

- Normal maintenance (routine and breakdown maintenance performed by the various departments);
- Preventive maintenance (activities carried out at pre-determined intervals);
- Predictive maintenance (as initiated by the Project Management monitoring and assessment);
- Inspection (in accordance with a pre-defined programme and based on statutory requirements);
- Production and maintenance personnel shall be properly selected and trained to ensure safe and effective job performance. Ongoing competence training shall be undertaken.
- Routine maintenance and inspection activities shall be carried out for the Project. Inspections shall be carried out to comply with statutory requirements and shall be based on "Risk Avoidance" rather than "Risk Management".

ES 41 Environmental Monitoring Programme

Coal PowerProject activities shall be monitored in order to: ensure that the EMP is implemented; assess the efficiency of mitigation actions; and provide updates where necessary. Environmental Monitoring will be conducted to ensure compliance with regulatory requirements as well as to evaluate the effectiveness of operational controls and other measures intended to mitigate potential impacts. Environmental Monitoring is in place in order to ensure the efficacy of the mitigation measures identified in the EIA.

Environmental Monitoring is a tool to ensure adherence to agreed actions, to access compliance to environmental and social standards, to provide enhanced data for risk management purposes and also facilitate any needed project design or operational changes. It provides feedback to the management on what is working and what is not working.

All contractors shall be required to self-monitor their performance with respect to

environmental and social performance. The DPL HSE Engineer shall also undertake quarterly environmental assessment and random walk throughs and spot checks throughout the project lifecycle. Assessment findings shall be reviewed by the project management team and where corrective actions are necessary, specific plans (with designated responsibility and timing) shall be developed to ensure continuous performance improvement.

The monitoring plans for the project including the environmental components, parameters and frequency of monitoring as well as responsibilities are presented in Table 7.4 of the main report.

ES 42 Decommissioning and Abandonment Plan

DPL shall set up strategies to checkmate project abandonment. In the unfortunate event of abandonment, a project abandonment plan shall be prepared in line with applicable national and international legislative requirements, in addition to implementing measures to mitigate the impact of such abandonment. The design of the facilities shall take due recognition of the need to decommission any ancillary facilities at the end of their operational life.

At the end of the project lifespan (of 50 years), a decommissioning team shall be set up and implement the guidelines for decommissioning/abandonment to ensure that the best and practicable methods available are employed to clean up the project site.

Decommissioning would involve removal of all site facilities that are no longer relevant for the operation of the project which may pose some degree of safety hazards to the general public and personnel with the base. The hazards and safety risks posed by the abandoned facilities shall have long-term effect. However, decommissioning shall make the acquired equipment/material available for alternative uses.

Consequently, the following measures are to be ensured during the decommissioning aspect of the project;

- DPL shall develop a detailed abandonment programme, which shall address the use and management of the equipment/materials after decommissioning and abandonment.
- Facilities that cannot be removed from site shall be clearly marked as danger zone to warn people.
- DPL shall ensure the decommissioning and abandonment are done with the same care and respect for the environment with the project was designed, constructed and operated.
- Temporary structures (camp, storage yard, site offices, etc.) installed at the construction phase to support construction activities shall be cleared, cleaned and safely disposed or reuse.
- Restoring the environment to original condition; e.g. for every tree (>60cm girth) cut down as a result of construction, at least one tree will be planted in replacement.
- After restoration has been effected, the site shall be routinely monitored by the Project Management, community representatives and environmental consultants.

Soil, surface and ground water samples shall be assessed regularly to ascertain quality and extent of site recovery. On successful restoration, the Project Management shall handover the site to the community and a close-up report prepared for future reference. Management actions should focus on the rehabilitation of disturbed areas and the removal of infrastructure.

ES 43 Conclusion and Recommendations

The Environmental Impact Assessment (EIA) Study of the area for the proposed Establishment of a Coal Power Plant Project is based on information from site survey, extensive literature review and field sampling and measurements/testing, which were used to carefully establish and assess the status and sensitivities of the various ecological and socioeconomic components of the project area, in line with the Federal Ministry of Environment (FMEnv) Regulatory framework (Terms of Reference). Data acquisition from terrestrial, aquatic and socio-economic environment as well as the assessment of the sensitivities of the various biophysical and socio-economic parameters involved a multi-disciplinary approach. Consultations with the host community, local government authority as well as regulatory authorities are ongoing and shall continue throughout the project life cycle. The scope of the EIA Study includes gathering extensive baseline environmental data, identifying key stakeholders and stakeholder issues, assessing the potential impacts of the proposed project; proffering practical and cost-effective measures to mitigate identified negative impacts and enhance positive impacts, and development of a workable Environmental Management Plan.

The EIA was carried out (*in accordance with FMEnv EIA Report Writing Format*) in order to predict the impact of the proposed project activities on the various biophysical and socioeconomic components of the project environment and host communities and also to proffer adequate mitigation and enhancement measures for adverse and beneficial impacts respectively. The overall goal of the EIA is to ensure that potential environmental and social impacts of the proposed project are identified and evaluated and adequate mitigation measures proffered for significant impacts; in compliance with required Standards

The implementation of the mitigation measures detailed in Chapters 6 and provided in the Environmental Management Plan (EMP) of Chapter 7, including monitoring, will provide a basis for ensuring that the potential positive and negative impacts associated with the establishment of the development are enhanced and mitigated to a level which is deemed adequate for the development to proceed.

When all the factors discussed in the EIA are taken into consideration and the likely impacts adequately addressed and included in the project programme, then the project is recommended to commence. Considering the workable proffered mitigation measures for adverse impact, the benefits of the proposed project outweighs the negative impacts. In view of the foregoing, Dahua Power Limited, the project proponent of the Coal Power Project at Agbara, Ado-Odo-Ota L.G.A of Ogun State, requests that the proposed project be approved for implementation.

ACKNOWLEDGEMENT

Dahua Power Limited wishes to acknowledge with thanks, the opportunity granted it by the Federal Government, through the Federal Ministry of Environment (FMEnv), and related agencies to carry out this Environmental Impact Assessment (EIA).

We are grateful to the Ogun State Government for their support for the proposed Establishment of a Coal Power Project.

We are very grateful to the host communities especially all community Leaders for their understanding, cooperation and Support to the team. Also, thanking members of the communities who aided or contributed in socio-economy and data-gathering exercise in one way or the other.

The expertise contributions of the Environmental Consultant (Diskol Environmental Consulting Limited, contracted to execute this EIA) is sincerely acknowledged.

CHAPTER ONE INTRODUCTION

1.1 Project Background

The proposed project will entail the construction and installation of Machines with other ancillary units for processing and generation of Coal power 60MW/day for the first phase on total land of 21 Hectares purchased from Ogun State Government at OPIC Industrial Area, Adedigba Community, Agbara, Ado-Odo Ota, Ogun State. The Coal which is major material will be sourced through coal mining. The list of equipment are boiler, turbine, generator, water cooling system, conveyor, transformer, Electric system, Power supply system, Coal transport trailer that will be bringing raw Coal from miners to the facility.

The major raw material will be Coal and water (as catalyst in steam generation) which will be sourced locally. Coal is called fossil fuel because it comes from decayed plants. It's formed when dead plant matter submerged in swamp environments is subjected to the geological forces of heat and pressure over hundreds millions of years. Over time, the Plant matter transforms from moist, low-carbon peat, to coal, an energy–and carbon-dense black or brownish-black sedimentary rock. Coal is classified as a nonrenewable energy source because it takes millions of years to form. Coal mines is majorly in the Eastern part (Anambra and Enugu States) of Nigeria and Central Zone (Kogi and Benue States).

Coal Power is the process of generation electricity by burning coal in a power Plant to create steam that drives a turbine and produces electricity. It can be used to power boilers, gas turbines, and heating and power stations. For example, low speed marine or modular power plant can operate on pure coal fuel whereas medium speed diesels such as locomotive engines may need diesel as a co-fuel which will act as an ignition source. Converting coal into a gas form may simplify the delivery and dispensing of the fuel. It may be a cost-efficient alternative to oil and natural gas. Separating non-carbonaceous material before making the gas may reduce the production of ash to two percent.

The Coal power can be easily produced to have the properties like low ash, low sulfur, and low temperature of the combustion flame center. It is a substitute for fuel oil and provides high combustion efficiency, low discharge of ash, environmental benefit of lower SO₂, NO_x and CO₂ emission.

Towards the development of the proposed Coal Power Plant project, Dahua Power Limited has identified the need to incorporate environmental considerations into project planning and implementation in order to assure sustainability. To this end, Dahua Power Limited contracted the services of *Diskol Consulting Limited*, to conduct the Environmental Impact Assessment (EIA) study for the coal power project. This is in compliance with Dahua Power Limited's corporate policy on environmental management as well as in fulfillment of regulatory requirements of the Federal Republic of Nigeria.

In Nigeria any industrial project of the magnitude of this proposed coal power project is

required to complete an Environmental Impact Assessment (EIA) in accordance with the requirements of the Federal Ministry of Environment (FMEnv) as stipulated by the Environmental Impact Assessment Decree No 86 of 1992 (EIA Act Cap E12 LFN 2004). This EIA is also prepared to meet IFC Performance Standards on Environmental and Social Sustainability, as well as Equator Principles. The EIA study covers the entire life cycle of the Project (i.e. preconstruction/design, construction, operation, decommissioning and closure).

1.2 Project Proponent

Dahua Power Limited (DPL), head office at km 14, Lagos Abeokuta Road, Owiwi, Abeokuta Ogun State was incorporated in 18th day of September, 2024. The objective of the Company is to generate Coal power 60MW/day at the first phase of the proposed project in an environmental friendly method.

1.3 Project Location

The Proposed Project site, is located within OPIC Estate, OPIC Industrial Area, behind Jubilee Park, Agbara, Ado-Odo Ota, Ogun State. The nearest communities to the site are Igere and Ihunsa (Agbara) communities. The total acquired land is 200sqm from Ogun State Government. Below is the proposed site plate.



Plate 1.1: Project Site Location



Fig. 1: Map of Nigeria showing Ogun State

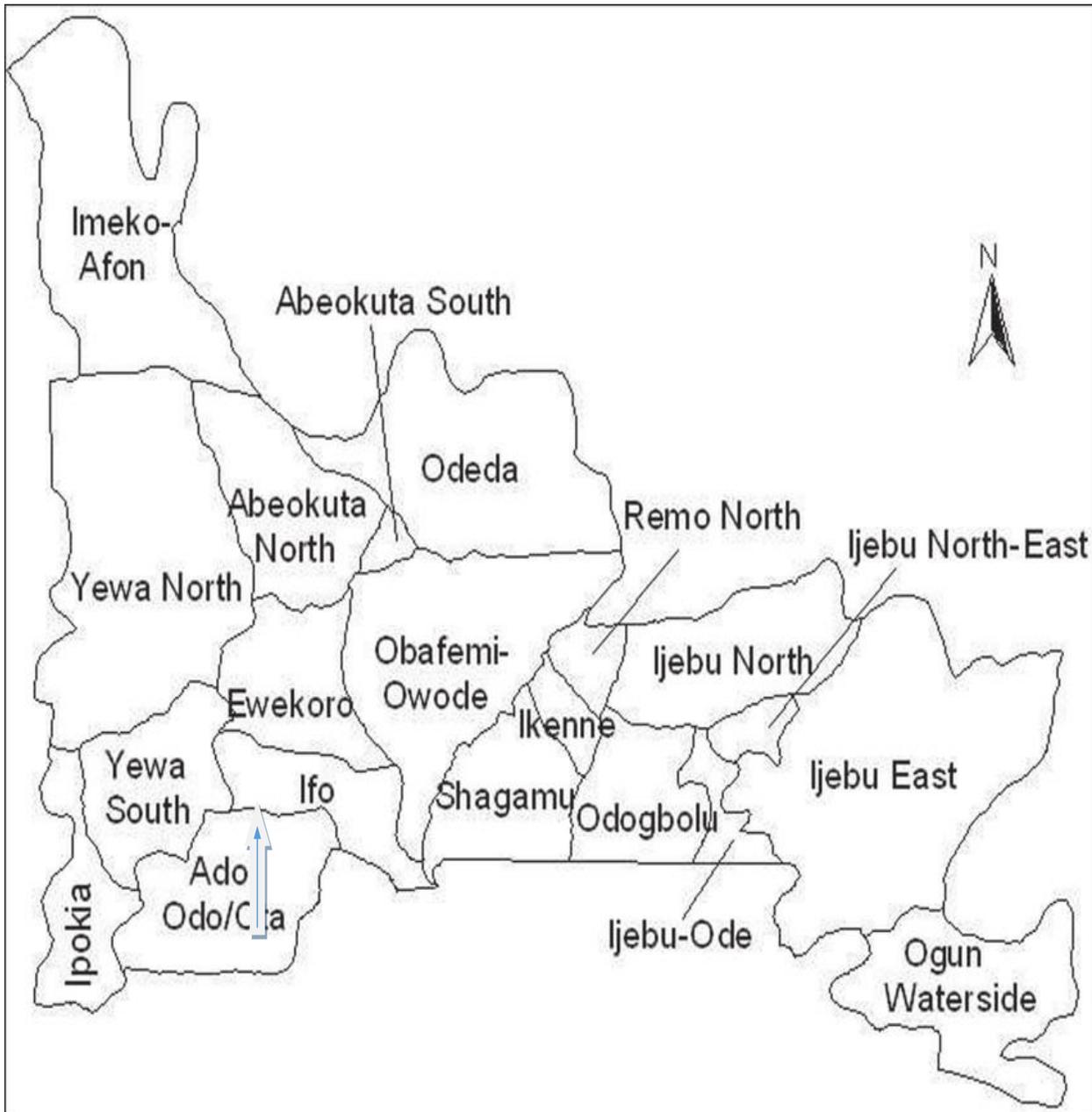


Fig. 2: Fig. 2: Map of Ogun State showing Local Government Areas highlighting Ado Odo/Ota Local Government Area.

1.4 Objectives of the Environmental Impact Assessment (EIA)

In line with statutory requirements for environmental protection in Nigeria, the proposed EIA study has been carried out to:

- Satisfy Federal, State and Local Governments as well as stakeholders, that proactive environmental actions shall be incorporated in the project design, installation, construction and operation phases of the project;

- Provide all necessary answers to stakeholders, assessors, host community, regulators, financiers, pressure groups and other interested parties;
- Give a detailed description of the proposed Project and relevant Project alternatives;
- Ensure all environmental components (baseline) from the project site are established and documented;
- Identify all environmental aspects of the proposed project that may interact positively or negatively with the environment;
- Make appropriate recommendations to prevent, reduce or control identified potential and associated impacts;
- Develop an Environmental Management Plan (EMP) and procedures for effective and proactive environmental management of the environment throughout the project life cycle; and
- Include a proposed institutional structure to govern the implementation of the EMP and monitoring programme for the project.

1.5 The EIA Process

An Environmental Impact Assessment (EIA) is an assessment of the potential impacts whether positive or negative, of a proposed project on the natural environment; dealing with the considerations of environmental impact in respect of public and private projects. The concept is also seen as the assessment or evaluation of the potential impacts made on the environment (land, water and air) by different magnitude of development projects and proffering best alternative options and effective/implementable mitigation measures to cushion the identified project impacts, resulting from proposed aspects/activities of the project. This is, to provide an Environmental Management Plan to guide the projects planning, construction, operation and decommissioning.

EIA is the process of identifying, predicting, evaluating and mitigating the bio physical, social and other relevant effects of developmental proposals prior to major decisions being taken and commitments made. It aims to predict environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision-makers. It is a process of evaluating the likely environmental impacts of a proposed project or development, considering inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.

FMEnv developed a National EIA procedure in response to the promulgation of the EIA Act. This is the procedure that has been laid down by FMEnv for undertaking an EIA to satisfy the requirements of the EIA Act. The Procedure indicates the steps to be followed from project conception to commissioning in order to ensure that the project is implemented with maximum consideration for the environment.

EIA Final Report for the proposed Coal Power project at OPIC Industrial Area, Agbara, Ado-Odo/ota Local Government Area, Ogun State, Nigeria

The process involves the submission of a project proposal by the proponent to the FMEnv. An initial evaluation of the proposal is done by the Ministry to categorize the project. The proposal is then screened and scoped and the EIA draft report is prepared by the proponent through literature reviews and field data gathering exercises. The report is then passed through a public hearing or review/meditation panel. A review report is then sent to the proponent for allowing the preparation of the EIA final report before approval by FMEnv.

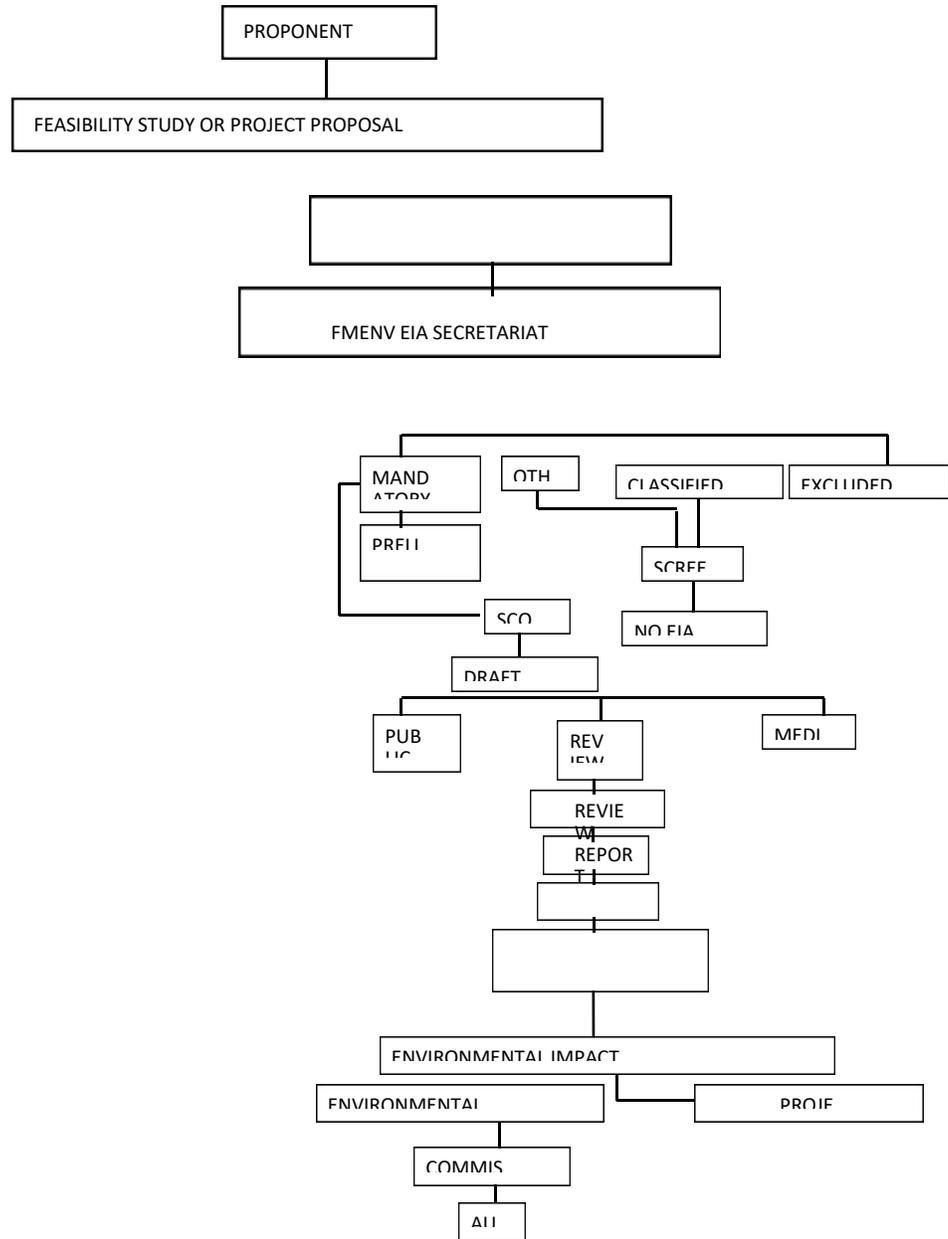


Figure.1.3: FMEnv's EIA Flowchart

1.5.1 EIA Approval Process in Nigeria

The Federal Ministry of Environment (FMEnv) is statutorily responsible for the processing and approval of EIA reports. The EIA Act stipulates that no major project shall be undertaken without prior consideration, at early stages, of their environmental effects. Appropriate mitigation measures for potential significant impacts shall be stated before the commencement of the project.

The formal approval process for the project has followed the normal procedures, which will involve the following steps:

1. EIA Report Preparation:

This should clearly state:

- the environmental effects associated with the project and its alternatives at the construction, operational and abandonment phases.
- mitigation measures and monitoring strategy for the entire life cycle of the project.
- post-closure care / reclamation of the environment should also be explicitly stated in the EIA Reports. (Sections 4, 21 & 24 of the EIA Act).

2. Public Participation / Independent Review

The EIA report is presented to the public for comments. The public display affords the stakeholders and other interested members of the public an opportunity to give their views on the environmental effects and observance of relevant procedures in respect of the EIA process.

The comments arising from the public display of the EIA report are forwarded to the Independent Review Panel as part of the assessment process. (Sections 7; 22 (3), 25 & 37 of the EIA Act). The EIA report is also subject to an impartial, scientific and independent review. The peer review should be independent of the regulatory body and the project proponent. The verification exercise by the independent review body ensures that the information in the EIA report is complete, correct and unbiased.

The Nigerian EIA Act recognises the „Mediator“ and the „Review Panel“ for the independent review. The EIA Act, in sections 34 and 37, set out their duties in the EIA process.

- ensure that the information required for assessment is obtained and made available to the public;
- hold hearing in a manner that offers the public an opportunity to participate in the assessment;
- prepare a report setting out:
 - the conclusions and recommendations relating to the environmental effects of the project and any mitigation measures or follow-up program;
 - a summary of any comments received from the public; and
- submit the report to the council and the regulatory ministry.

Section 39 of the EIA Act places a requirement on the regulatory ministry to publish the report of the independent review body in any manner the council considers appropriate and shall advise the public that the report is available.

3 Final Decision-Making /Authorisation

In view of the relevant provisions of the EIA Act in sections 13 (1) & (2), 40 (1) & (2), 41 & 42, the outcomes of the final decision making can be one of the followings:

- a) The project or one of its alternatives is approved.
- b) Request for further study/modify for future consideration.
- c) The project is cancelled or rejected altogether.

Sections 9 and 41 of the EIA Act sum up, in respect of a project, the issues relating to final decision – making and those to be notified on the decision.

- a) The decision of the regulatory ministry shall be in writing and include the following:
 - i) Its course of action in respect of the project
 - ii) The extent which the recommendations concerning mitigations for adverse environmental effects in the mediation and/or review panel's reports have been adopted
 - iii) Any follow-up programme to be implemented with respect to the project
- b) The regulatory ministry shall make the decision available to interested persons or groups
- c) If no interested persons or groups request for the decision, the regulatory body shall publish the same in any manner by which members of the public and persons / groups interested in the activity shall be notified.

4 Post – Project Authorisation Activities

The regulatory body is required to carry out its statutory role of monitoring the follow – up programme for mitigations at the construction, operational and post-closure stages of the project. (Section 41 of the EIA Act).

1.6 EIA Scope of Work and Terms of Reference

The Terms of Reference (ToR) for the EIA study was prepared and submitted to the Federal Ministry of Environment (FMEnv) in line with the requirements of the National EIA Procedural Guidelines. The ToR defined the objectives and highlighted the scope, approach, methodology and reporting format for the EIA study.

The work scope of the EIA study includes:

- Project screening and site visit;

- Preparation of Terms of Reference (ToR) in accordance with regulatory guidelines;
- Review of national and international environmental regulations guiding the project;
- Consultations with regulators and other relevant stakeholders concerned with the proposed project;
- Extensive and comprehensive literature review specific to the project site to obtain background information on the environmental characteristics of the area;
- Field data gathering exercise and survey of the area in order to establish environmental baseline information specific to the study area;
- Impact identification, prediction, interpretation and evaluation from project activities
- Development of an effective mitigation/ ameliorative measures and monitoring programmes for significant impacts;
- Development of comprehensive Environmental Management Plan covering the project life cycle; and
- EIA draft reporting following Federal Ministry of Environment (FMEnv) guidelines and procedures as well as public disclosure.

The collection of environmental baseline data/information, environmental impact analysis and the preparation of the report were performed by a multi-disciplinary team. The team selection was based on characteristics of the project environment and experience/discipline of each specialist. A team leader coordinated the tasks and team members towards achieving set targets as well as liaison with client.

1.7 Legal and Administrative Framework

In order to achieve sustainable development and live in harmony with nature, environmental protection and control has now become an integral part of laws/regulations/policies promulgated at international, national and state/local government levels. Also, responsible corporate organizations formulate policies that enable them establish and operate sound environmental management systems.

Dahua Power Limited is committed to conducting its operations in compliance with applicable national and international legislations and with the company's policies. Existing statutes on environmental protection in Nigeria contain specific provisions designed to prohibit or control environmental pollution / degradation and also prescribe sanctions or fines to be enforced against persons or corporate entities who contravene the provisions. The legal and regulatory framework for carrying out EIA of the proposed project are contained in relevant national statutes and international environmental conventions to which Nigeria is signatory; consequently, the following sections present the applicable and relevant: National legislations, International Agreements, Dahua Power Limited's Health, Safety and Environment (HSE) policies, which shall ensure the protection of human health, equipment safety and the environment. The relevant policies, regulations, laws and guidelines that guides the project's operations are highlighted below:

1.7.1. The 1999 Constitution of the Federal Republic of Nigeria

The Constitution of the Federal Republic of Nigeria 1999 contains elaborate provisions on the protection and improvement of the environment and safeguard of water, air and land, forest and wildlife of Nigeria in its Section 20. Similarly, Section 16[2] that the state shall direct its policy towards ensuring promotion of a planned and balanced economic development. This provision is also contained in Section 17[2] D of the constitution. The only weakness of the constitutional recognition of the protection and improvement of the environment is that it is categorised under the fundamental objectives and Directive Principles of state policy and therefore non-justiceable.

1.7.2 Federal Ministry of Environment

Act 58 of 30 December 1988 established the Federal Environmental Protection Agency now Federal Ministry of Environment (FMEnv), as the chief regulatory body for environmental protection in Nigeria. The Act was amended as Act No 86 of 1992. FMEnv is vested with the responsibility of ensuring that all industrial activities, operations and emissions are within the limits prescribed in the National Guidelines and Standards. The Federal Government of Nigeria established the Federal Ministry of Environment from the defunct FEPA with an overall mandate to protect, restore and preserve all ecosystem of the Nigerian environment. Twenty-one guidelines for pollution abatement in all categories of industries were laid. Part of the guidelines is a mandatory requirement for environmental auditing of all existing industries and Environmental Impact Assessment (EIA) of new industries and major development projects. Thus, The Federal Ministry of Environment (FMENV) was created in 1999 to take over the function of the Federal Environmental Protection Agency (FEPA).

Primarily, the Ministry has a mandate to coordinate environmental protection and conservation of natural resources for sustainable development. The Ministry has the following mandate to:

- Prepare a comprehensive National Policy for the protection of the environment and conservation of natural resources, including procedure for environmental impact assessment of all developing projects.
- Prepare in accordance with the National Policy on Environment, periodic master plans for redevelopment of environmental science and technology and advise the Federal Government on the financial requirements for the implementation of such plans.
- Advise the Federal Government on National Environmental Policies and priorities, the conservation of natural resources and sustainable development and scientific and technological activities affecting the environment and natural resources.
- Promote cooperation in environmental science and conservation technology with similar bodies in other countries and with international bodies connected with the protection of the environment and the conservation of natural resources.
- Cooperate with Federal and State Ministries, Local Government, statutory bodies and

research agencies on matters and facilities relating to the protection of the environment and the conservation of natural resources,

- Prescribe standards for and make regulations on water quality, effluent limitations, air quality, atmospheric protection, ozone protection, noise control as well as the removal and control of hazardous substances, and
- Monitor and enforce environmental protection measures.

The Federal Ministry of Environment is in the forefront of implementing the Nigerian policy on the environment coupled with some assistance from environmental friendly organizations and nongovernmental organizations, especially in creating the awareness for environmental consciousness. Since inception, the ministry has been empowered with the overall responsibility of environmental matters in Nigeria.

The Federal Ministry of Environment has developed instruments of intervention to halt environment degradation in form of policies, standards, guidelines and regulations. With the initiation of these instruments, enforcement by FMEnv has become the most effective tool to bring industries and regulated community into compliance through compliance promotions.

1.7.2.1 National Policy on the Environment (1989, revised in 1999 and 2017)

The National Policy on the Environment, 1989 (revised 1999 and 2017), provides for a national mechanism for cooperation, coordination and regular consultation, as well as harmonious management of the policy formulation and implementation process which requires the establishment of effective institutions and linkages within and among the various tiers of government that is federal, state and local government. The objective of the policy is to achieve sustainable development in Nigeria through:

- Securing a quality environment adequate for good health and wellbeing;
- Conserving the environment and natural resources for the benefit of present and future generations;
- Raising public awareness and promoting understanding of the essential linkages between environmental resources and developments and encouraging individual and community participation in environmental improvement efforts;
- Maintaining and enhancing the ecosystems and ecological processes essential for the functioning of the biosphere to preserve biological diversity; and
- Co-operating with other countries, international organisations, and agencies to achieve optimal use and effective prevention or reduction of transboundary environmental degradation.

National Environmental Protection Regulations (NEPR), 1991

The Federal Ministry of Environment (FMEnv) has so far promulgated a number of regulations, such as the National Environmental Protection Regulation sets forth regulations concerning

effluent discharges, pollution abatement, and waste management, as follows:

S.I.8: National Environmental Protection (Effluent Limitation) Regulations 1991, which makes it mandatory for industries as wastes generating facilities to install anti-pollution and pollution abatement equipment on site. The regulation is specific to each category of waste generating facility with respect to limitations of solid and liquid discharges or gaseous emissions into the ecosystem. Appropriate penalties for contravention are also specified in the regulation.

S.I.9: National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations 1991, which spells out the restriction on the release of toxic substances, requirement for pollution monitoring unit, machinery for combating pollution and contingency plan by industries, submission of lists of details of chemicals used by industries to FMEnv, permissible limits of discharge into public drains, protection of workers, requirements for environmental audit and penalty for contravention.

S.I.15: National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations 1991, which spells out the requirements for groundwater protection, surface impoundment, land treatment, waste piles, landfills, incinerators, etc. It also describes the hazardous chemicals products and dangerous waste constituents.

Under these guidelines/regulations FMEnv increasingly requires that Environmental Audit be carried out for existing facilities.

1.7.3 The Environmental Impact Assessment (EIA) Act CAP E12, LFN2004

In 1992, the EIA Act No. 86 was enacted to give legal muscle for the enforcement of the various policy provisions on the need for studies in the environment impacts of both public and private sector projects as such projects are being planned. Today, the Federal Ministry of Environment have been legally empowered to administer the EIA Act. The Environmental Impact Assessment (EIA) ACT 86, CAP E12, LFN 2004, being the main law, which regulates the implementation of EIA processes in Nigeria, deals with the consideration of environmental impact, in respect to any proposed public and private projects.

The Act makes EIA mandatory for all new major public and private projects in Nigeria. It provides guidelines for activities for which an EIA is compulsory and prescribes the procedure for conducting and reporting EIAs. Some of these activities include road development, metallurgical activities, major building projects, coastal reclamation, etc. the required process involves the preparation of the mandatory EIA report and an assessment by a review panel. The Act sets out to:

- I. Consider the likely impacts and the extent of these impacts on the environment before embarking on any project or activity;
- II. Promote the implementation of appropriate policy in all federal laws consistent with all

laws and decision-making processes through which goal of this Act may be realized;

- III. Encourage the development of procedures for information exchange, notification and consultation between organizations and persons when the proposed activities are likely to have significant environmental effects on boundaries or inter-state or on the environment of bordering towns and villages.

This regulatory framework for EIA Implementation in Nigeria confers the mandate on the FMEnv to ensure proponents of all new major developments activities carry out EIA on their proposed projects. Sections relevant to environmental emergency prevention under the EIA include: - oSection 2 (1) requires an assessment of public or private projects likely to have a significant(negative) impact on the environment.

- o Section 2 (4) requires an application in writing to the Agency before embarking on projects for their environmental impact assessment to determine approval.
- o Section 13 establishes cases where an EIA is required and Section 60 creates a legal liability for contravention of any provision

Consequently, the environmental management activities at each phase of the project should be guided by environmental standards including those posed by legislation and those established by self-regulating industrial codes of practice, industry standards and company policy.

1.7.4 National Environmental Standards and Regulations Enforcement Agency (NESREA) Establishment Act, 2007

The Federal Government of Nigeria through NESREA has developed about twenty-seven (27) Environmental Regulations which have been published in the Federal Republic of Nigeria Official Gazette and are now in force. These Regulations are to ensure that our national development agenda is not at variance with the carrying capacity of our fragile environment. NESREA has responsibility for the protection and development of the environment, biodiversity conservation and sustainable development of Nigeria's natural resources in general and environmental technology including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws, policies and guidelines.

1.7.5 Ogun State Ministry of Environment

The mandate of the Ministry inter-alia includes to:

- Ensure sustainable development of the environment of the State.
- Ensure a qualitative and healthy environment thereby ensuring the well-being of the people of Ogun State.
- Conserve, protect and enhance the environment, the ecosystem and ecological processes essential for the preservation of biological diversity.

- Control and monitor all forms of environmental degradation.
- Ensure sustainable management of the State forest to meet economic, social and ecological needs of the people of the state.
- Cooperate and collaborate with the Federal, Local Governments and Non-Governmental Organizations (NGO), private sector and individuals on environmental matters.

1.7.5.1 Ogun State Environmental Protection Agency (OGEPA)

The Functions of Ogun State Environmental Protection Agency include to:

- Promote a healthy environment by ensuring sanitary solid waste management;
- Minimize waste generation and promote sorting at source, re-use, recycling and energy recovery;
- Ensure safe and nuisance free disposal of urban and rural domestic and industrial waste in order to adequately protect public health;
- Prevent or stop illegal felling of trees, encroachment into pavements, forest reserves and plantation without the Agency's approval; and
- Issue permits, licenses, and approvals and to administer certification system and operation procedures as may be required by law.

1.7.6 Energy Commission of Nigeria Act

The Energy Commission of Nigeria (ECN) was established by Act No. 62 of 1979, as amended by Act No. 32 of 1988 and Act No. 19 of 1989, with the statutory mandate for the strategic planning and co-ordination of national policies in the field of Energy in all its ramifications. It was established in line with the declaration of the Heads of The Economic Community of West African States in 1982 for the establishment of an Agency in each member state charged with the responsibility of coordinating and supervising all energy functions and activities.

1.7.7 Nigerian Content Act, 2010

The Nigerian Local Content law was created to enhance utilisation of the country's human and material resources for the provision of goods and services to the petroleum industry.

1.7.8 Trade Union (Amendment) Act, Chapter T14, LFN 2005

Nigerian Labour Law looks into the rights, working conditions, minimum wage, termination clauses, and many other rules set by the government of Nigeria. The current version of the Labour Act was put into place in 2004, five years after their current constitution was established. Similarly, is the **Labour Act (LFN 1990)**, which is the primary law protecting the employment rights of individual workers in Nigeria, the country has also ratified all eight core **ILO (International Labour Organisation) Conventions** and enacted laws to enforce the provisions. However, there are indications of restrictions on the trade union rights of workers, discrimination, child labour and forced labour in the country; of which DPL will need to put into consideration

within the implementation of the Project.

1.7.9 Employee's Compensation Act, 2010 Act No. 13

An Act to repeal the Workmen Compensation Act CAP.W6 LFN, 2004, and to make Provisions for Compensations for any death, injury, disease or disability arising out of or in the course of employment; and for related matters. The objectives of the Act are to—

- a. provide for an open and fair system of guaranteed and adequate compensation for all employees or their dependents for any death, injury, disease or disability arising out of or in the course of employment;
- b. provide rehabilitation to employees with work-related disabilities as provided in this Act;
- c. establish and maintain a compensation fund managed in the interest of employees and employers;
- d. provide for fair and adequate assessments for employers;
- e. provide an appeal procedure that is simple, fair and accessible, with minimal delays; and
- f. combine efforts and resources of relevant stakeholders for the prevention of workplace disabilities, including the enforcement of occupational safety and health standards.

Furthermore, the Act provides guideline for:

- Employers obligation to report death, injury or disease of an employee; and Application for compensation
- Part III prescribes guideline for Compensation for Death, Injury or Disease
- Part IV designates various Scale for Compensation and Payment Schedule

The Act states that: Compensation cannot be waived. Also stated in the Act is that Contribution by Employees for Compensation Prohibited.

1.7.10 Fire Service Act, 1981

An act to make provision for the organisation, discipline, powers and duties of the federal fire service and for matters incidental thereto or connected therewith. Section 18(2) of the fire service act 1981 states:

‘it shall be the duty of every person having control over premises to which this section applies to take all reasonable measures to guard against the outbreak of fire on such premises, and to ensure that as far as it is reasonably practicable the safety of the person on the premises in the event of an outbreak of fire’.

Section 19(1) of the fire service act 1981 states:

In this act ‘potentially dangerous building’ means any building which would, in the event of a fire occurring therein, constitute a serious danger to life or any of the following reasons

- b) the absence of any or any adequate appliances or fittings –
 - i. for extinguishing fires occurring in the building
 - ii. for enabling the occupants to escape on the occurrence of a fire
 - iii. for the automatic detention of an outbreak of fire
 - iv. for giving warning to persons in case of fire
 - v. for securing that the means of escape can safely and effectively used at all times, or
 - vi. for emergency lighting.

1.7.11 Factories Act (CAP F1),2004

The Factories Act (CAP. F1), 2004 establishes a legal framework to provide for the registration of factories, factory workers and a wider spectrum of workers and other professionals exposed to occupational hazards but for whom no adequate provisions had been formerly made; to make adequate provisions regarding the safety of workers to which the Act applies and to impose penalties for any breach of its provisions. All workplaces are covered by this Act.

The Act is subdivided into eleven (11) parts which includes general and special provisions for Health, Safety and Welfare of workers as well as notification and investigation of accidents and industrial diseases. All industrial accidents and dangerous occurrences are expected to be reported to the Director of Inspectorate or the nearest factory inspector for proper investigations.

1.7.12 Public Health Law,1958

This provides justification for the execution of developmental projects under guidelines that promote health by protecting the environment and safeguarding the humans’ health. The Public Health Laws empower Medical Officers of Health (operating at the local government council, under the supervision of the State and Federal Ministries) to ensure the promotion of good health.

1.7.13 The Companies and Allied Matters Acts 2004

The Companies and Allied Matters Act (‘CAMA’) 2004 regulates company formation and operation in Nigeria and provides that no foreign company may carry on business in Nigeria unless it incorporates a local subsidiary in the country. The NMMA 2007 incorporates this by providing that no person shall be qualified for the grant of any mining titles unless the person is a corporate body duly incorporated under CAMA 2004.

1.7.14 Labour Act,1990

The Labour Act (1990) is the primary law protecting the employment rights of individual workers. The Labour Act makes general provisions for the protection of wages, contracts of employment as well as terms and conditions of employment. It also makes provisions for recruitment and identifies special classes of workers.

1.7.15 The Nigerian Urban and Regional Planning Act 1992

Act 88 of 1992 established a Development Control Department (DCD) charge with the responsibility for matters relating to development control and implementation of physical development plans at Federal, State and Local Government levels within their respective jurisdiction.

- Approval of the relevant DCD shall be required for any land development
- A developer shall submit a development plan for the approval of the DCD of local Government, State or Federal Government.
- A developer (whether private or government) shall apply for a development permit in such manner using such forms and providing such information including plans, designs, drawings and any other information, as may be prescribed,

- A developer shall at the time of submitting his application for development submit to an appropriate Control Department a detailed Environmental Impact Statement (EIS) for an application for,
- A residential land in excess of 2 hectares or
- Permission to build or expand a factory or for the construction of an office building in excess of four floors of 5000 square meters of a settable space or Permission for a major recreational development.

1.7.16 Land Use Act 1978 (Modified 1990)

The Land Use Act 1978 reviewed under Cap 201, 1990 is the legal framework for land acquisition and resettlement in Nigeria. The following are selected relevant sections: Section 1: Subject to the provisions of this Act, all land comprised in the territory of each State in the Federation are hereby vested in the Governor of that State and such land shall be held in trust and administered for the use and common benefit of all Nigerians in accordance with the provisions of this Act.

Section 2: (a) All land in urban areas shall be under the control and management of the Governor of each State; and (b) all other land, subject to this Act, shall be under the control and management of the Local Government within the area of jurisdiction in which the land is situated. The Act gives the government the right to acquire land by revoking both statutory and customary rights of occupancy for the overriding public interest. In doing so, the Act specifies that the State or Local Government should pay compensation to the current holder or occupier with equal value.

1.7.17 Forestry Law Cap 51, 1994

The Forestry Act 1958 which was amended as the Forestry Law CAP 51, (1994) prohibits any act that may lead to the destruction of or cause injury to any forest produce, forest growth of forestry property in Nigeria. The law prescribes the administrative framework for the

management, utilization and protection of forestry resources in Nigeria, which provides for the preservation of forests and the setting up of forest reserves. It is an offense, punishable with up to 6 months imprisonment, to cut down trees over 2ft in girth or to set fire to the forest except under special circumstances.

1.7.18 Harmful Waste (Special Criminal Provision) Act CAP, LFN 2004

The Harmful Waste Act prohibits, without lawful authority, the carrying, dumping or depositing of harmful waste in the air, land or waters of Nigeria. The following sections are notable:

- Section 6 provides for a punishment of life imprisonment for offenders as well as the forfeiture of land or anything used to commit the offence.
- Section 7 makes provision for the punishment accordingly, of any conniving, consenting or negligent officer where the offence is committed by a company.
- Section 12 defines the civil liability of any offender. He would be liable to persons who have suffered injury as a result of his offending act.

1.7.19 Endangered Species Act, CAP E9, LFN 2004

This Act focuses on the protection and management of Nigeria's wildlife and some of their species in danger of extinction as a result of overexploitation. These sections are noteworthy:

- Section 1 prohibits, except under a valid license, the hunting, capture or trade in animal species, either presently or likely being in danger of extinction.
- Section 5 defines the liability of any offender under this Act.
- Section 7 provides for regulations to be made necessary for environmental prevention and control as regards the purposes of this Act.

1.7.20 Natural Resources Conservation Act CAP 286 LFN 1990

This Act established the Natural Resources Conservation council to be responsible for the conservation of natural resources in Nigeria and formulate national policy for natural conservation. Section 3 of the Act provides that the functions of the council shall be to

- a. Coordinating matters concerning the conservation of natural resources in Nigeria
- b. Formulate a national policy for national resources conservation.
- c. It also carries out such other activities calculated to facilitate the effectiveness of the performance of the functions of the council under this Act in Section 3(e).

Moreover, the Act measures in collaboration with other agencies, control coastal zone development to minimize erosion on the national coastline. As contained in Section 4(e) of the Act. It also designates sites and species of conservation interest as in Section 4(a) of the Act.

1.7.21 Water Resources Act, CAP W2, LFN 2004

The Water Resources Act is targeted at developing and improving the quantity and quality of water resources. The following sections are pertinent: Section 5 and 6 provides authority to make pollution prevention plans and regulations for the protection of fisheries, flora and fauna.

Section 18 makes offenders liable, under this Act, to be punished with a fine not exceeding N2000 or an imprisonment term of six months. He would also pay an additional fine of N100 for everyday the offence continues.

1.7.22 Criminal Code Act

Section 247 of the Nigerian Criminal Code makes it an offence, punishable with up to six (6) months imprisonment for —any person who: a) violates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carry on business in the neighbourhood or passing along a public way; or b) does any act which is, and which he knows or has reason to believe to be, likely to spread the infection of any disease dangerous to life, whether human or animal.

1.7.23 Dahua PowerLtd.’ HSE Policy

Dahua PowerLimited fully accepts the principle that in addition to being a statutory requirement, a sound health, safety and environment practice plays a significant role in all successful management initiatives. Consequently, the company has the primary objective to comply with all relevant legislations or requirements and to ensure:

- The safety and the health of its employees, community and the population at large.
- The protection of the environment.
- The protection of the assets of both the general population and that of the company.

DPL’s attitude with respect to health, safety and environment is that the majority of incidents can be prevented through risk analysis, continuous compliance assessment, and implementation of corrective actions even if a certain level of risk is unavoidable due to the intrinsic hazard in the type of activities that the company engages in. DPL intends to accomplish these objectives through:

- **A Health, Safety and Environment Integrated Management System:** This is with expressed commitment from top management to the single operator. Implementation of the system is a responsibility supported by the Safety and Environment Department staffed by competent personnel. Top management shall ensure continual improvement of the system.
- **A well-defined organization with specified responsibilities and a clear system of communication:** These responsibilities are clearly defined and communication channels well specified and understood.
- **The construction of safe installations:** This shall be achieved by incorporating in their

design and construction, appropriate standards and practices including safety evaluation techniques supported by operational practices of the highest international accreditation. The safety of the installation will be evaluated through risk analysis and regular audits.

- **The use of safe work system:** It is an established fact that majority of accidents are caused by human error. To minimize this, the company shall make every effort to provide safe work system for its employees and contractors and make them fully understand that they have a duty to protect themselves, their colleagues and the environment.
- **Competent and well-trained staff /qualified contractors:** Company shall provide the resources necessary for effective operational training for both normal and emergency situations. Company will engage contractors that will meet HSE standards & requirements.
- **Comprehensive information:** Company shall promote activities within the industrial community to ensure continual information supply and consultation on matters concerning health, safety and environment. Maximum priority shall be given to the investigation of all accidents and potential accidents including formulating, putting in place and communicating the necessary actions to prevent reoccurrence as well as mortem reports.
- **Emergency plans:** Company shall have in place emergency plans for its operating facilities such that should an incident occur, prompt and effective actions are taken to prevent escalation.
- **Operational procedure:** Detailed operational procedures shall be provided, in order to guarantee that safety standards are met and the risks of accidents are reduced.

1.8 International Regulatory Framework

In addition to national and state laws/ regulations, Nigeria is signatory or party to several International Conventions and treaties that support the use of EIA as key tool for achieving sustainable development in executing projects

International conventions to which Nigeria is signatory-to include, but not limited to:

- i. The Vienna Convention on the Protection of the Ozone Layer;
- ii. Montreal Protocol on Substances that deplete the Ozone Layer;
- iii. The United Nations Convention on International trade in Endangered Species of Wild Fauna and Flora (CITES),
- iv. Convention on Conservation of Migratory Species of Wild Animals
- v. The United Nations Guiding Principles on the Human Environment
- vi. United Nations Convention to Combat Desertification
- vii. African Convention on the Conservation of Nature and Natural Resources
- viii. The International Union for Conservation of nature and Natural Resources (IUCN) Guidelines.
- ix. The Basel Convention on the Control of Tran boundary Movements of Hazardous

- Wastes and their disposal;
- x. Protocol on the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.
 - xi. The United Nations Convention Concerning the Protection of World Cultural and National Heritage.
 - xii. Convention on Biological Diversity; and
 - xiii. The United Nations 'Convention on Climate Change.

The following international requirements and standards have been considered within the EIA study:

- i. The World Bank's Environmental and Social Safeguard Policies
- ii. IFC Performance Standards
- iii. The Equator Principles (EPs)

1.8.1 World Bank Group Environmental, Health and Safety Guidelines

The World Bank Group Environmental, Health and Safety Standards emphasises the importance of managing social and environmental performance throughout the life of a project (any business activity that is subject to assessment and management). It provides operational procedures for a project's social and environmental management system as a dynamic, continuous process initiated by management and involving communication between the client, its workers, and the local communities directly affected by the project (the affected communities). The standard therefore applies to projects with social or environmental risks and impacts that should be managed, in the early stages of project development, and on an ongoing basis.

The primary objectives are:

- to identify and assess social and environment impacts, both adverse and beneficial, in the project's area of influence;
- to avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment;
- to ensure that affected communities are appropriately engaged on issues that could potentially affect them;
- to promote improved social and environment performance of companies through the effective use of management systems

In addition, the World Bank has developed specific safeguard operational policies that identify various aspects of the environment that a developmental project may likely impact. The policies applicable to this project and the potential impacts are discussed below.

Operational Policy/Bank Procedure 4.01: Environmental Assessment:

This policy helps ensure the environmental and social soundness and sustainability of investment projects. It supports the integration of environmental and social aspects of projects in the overall decision-making process.

Environmental assessment is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. It evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation.

An environmental assessment takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and trans-boundary and global environmental aspects. The assessment considers natural and social aspects in an integrated way. It also takes into account the variations in project and country conditions; the findings of country environmental studies; national environmental action plans; the country's overall policy framework, national legislation, and institutional capabilities related to the environment and social aspects; and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements. An environmental assessment is initiated as early as possible in project processing and is integrated closely with the economic, financial, institutional, social, and technical analyses of a proposed project.

Operational Policy 4.04: Natural Habitats

This safe guard policy seeks to ensure that World Bank-supported infrastructure and other development projects take into account the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water areas where most of the native plant and animal species are still present). Specifically, the policy prohibits Bank support for projects which would lead to the significant loss or degradation of any Critical Natural Habitats, whose definition includes those natural habitats which are either:

- legally protected,
- officially proposed for protection, or
- un-protected but of known high conservation value.

None of above listed areas was identified in the course of this study. It is therefore not anticipated that the proposed transmission line would pass through or affect any critical natural habitat.

Operational Policy/Bank Procedure 4.11: Physical Cultural Resources

Cultural resources are important as sources of valuable historical and scientific information, as assets for economic and social development, and as integral parts of a people's cultural identity

and practices. The loss of such resources is irreversible, but fortunately, it is often avoidable. The objective of the Physical Cultural Resources policy is to avoid, or mitigate, adverse impacts on cultural resources from development projects that the World Bank finances. No physical or cultural resources were identified along the proposed project route. The project will therefore have no impact on such resources.

Operational Policy/Bank Procedure 4.12: Involuntary Resettlement

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

The proposed project site was chosen after a thorough alternative analysis of various options to ensure that indigenous people are not displaced in the course of the project and its execution. The chosen routing was approved because it provides the path of the most minimal disturbance to the indigenous people. Consequently, the project will not involve involuntary resettlement.

1.8.2 International Finance Corporation (IFC) Performance Standards

The International Finance Corporation (IFC) Performance Standards, which define client's responsibilities for managing their environmental and social risks have been adopted by the World Bank as the Performance Standards (WB Performance Standards) for Private Sector Activities. Over the course of the project, some performance standards will be triggered and must be managed in a manner consistent and compliant with the World Bank's Guidelines. There are eight (8) Performance Standards (PS) which any private entity or project proponent is expected to meet throughout the life of an investment by IFC; see Table 1.1 below.

Table 1.1: Summary of IFC Performance Standards Triggered by Proposed Project

Standard	Summary of Requirement	Applicability to Project and EIA Report Reference
<p><i>Performance Standard (PS) 1: Assessment and Management of Environmental and Social Risks and Impacts</i></p>	<p>The PS 1 underscores the importance of managing environmental and social performance throughout the life of a project. The Standard applies to projects with environmental and/or social risks and/or impacts. The objective of the Standard includes to identify and evaluate environmental and social risks and impacts of the project and to adopt a mitigation hierarchy to anticipate and avoid, minimize, and where residual impacts remain, compensate/offset risks and impacts to workers, affected communities and the environment,</p>	<p>In line with the requirements of PS 1, all potential significant impacts of the project throughout its life have been identified in Chapter 5. Mitigation measures in line with PS 1 hierarchy have also been recommended (Chapter 6) while a project specific EMP to ensure systematic implementation of mitigation and other management actions have been prepared in Chapter 7.</p>
<p><i>Performance Standard (PS) 2: Labor and Working Conditions</i></p>	<p>The PS 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. The Standard recognizes the workforce as a valuable asset and recommends a sound worker-management relationship as a key ingredient in the sustainability of a company. The Standard requires the proponent</p> <ul style="list-style-type: none"> - to promote fair treatment, nondiscrimination, equal opportunity of workers, and promote compliance with national employment and labor laws; - to promote safe and healthy working conditions to protect and promote health of workers; and - to avoid the use of forced labor 	<p>The project will involve employment of skilled and unskilled labour. Chapter 5 of this report identified potential positive and negative impacts on workers during project implementation. The measures recommended in Chapter 6 to guide employment, protect workers and ensure sustainability are consistent with the requirements of PS 2 as well as Nigerian Labour Laws.</p>

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<p><i>Performance Standard (PS) 3:</i> Resource Efficiency and Pollution Prevention</p>	<p>The Standard recommends that proponents should undertake their developments and economic activities in a manner that will enhance human health and protect the environment by avoiding or minimizing pollution to air, water, and land, and to also ensure sustainable consumption of finite resources and reduce project-related GHG emissions</p>	<p>Project will impact on land, air and water. Measures to promote sustainable resource use and prevent environmental degradation have been recommended in Chapter 7 in line with the requirements of PS 3.</p>
<p><i>Performance Standard (PS) 4:</i> <i>Community Health, Safety and Security</i></p>	<p>The PS 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. The Standard therefore emphasizes the proponent’s responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.</p>	<p>Project will pose risk to community health, safety and security. All potential risks and impacts on affected communities have been identified in Chapter 5 with management actions to avoid, minimize or compensate for the risks proffered in Chapter 6.</p>
<p><i>Performance Standard (PS) 5:</i> <i>Land Acquisition and Involuntary Resettlement</i></p>	<p>The Standard emphasizes the avoidance of involuntary displacement by exploring alternative project designs and when avoidance is not possible, to minimize. The Standard further recommends the total avoidance of forced eviction and improvement, or restoration of livelihoods and living conditions of displaced persons.</p>	<p>Although the proposed project does not involve physical displacement of persons. However, the principles specified in PS 5 were adopted in Chapter 6 to ensure land take does not result in poverty exacerbation in affected communities.</p>
<p><i>Performance Standard (PS) 6:</i> <i>Biodiversity Conservation and Sustainable Management of Living Natural Resources</i></p>	<p>The PS 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The Standard requires project proponents to sustainably manage and mitigate impacts on biodiversity and ecosystem</p>	<p>Land clearing for the proposed project will involve some disruption to biodiversity. Potential impacts have been identified in Chapter 5, Sustainable measures to mitigate impacts proffered in Chapter 7 while the EMP to ensure implementation of management</p>

	services throughout the project's lifecycle.	actions has been prepared in Chapter 7.
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1.8.3 The Equator Principles

The Equator Principles (EPs) are a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. Equator Principle Financial Institutions (EPFIs) commit to implementing the EPs in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the EPs.

In order to facilitate potential access to funding for project development potential borrowing organisations need to consider the EPs and environmental and social risk management as part of the EIA process.

1.9 The Report Structure

The EIA Report is structured into eight (8) chapters, as presented in the table below:

Table 1.2: Report Structure of the EIA Draft

Chapter	Contents
<i>Chapter 1- Introduction</i>	Provides a background to the project and discusses the ToR, objectives and scope of the EIA as well as the applicable administrative, policy and legal framework
<i>Chapter 2- Project Justification</i>	Discusses the Project alternatives that have been considered in the EIA process and the rationale for the proposed Project
<i>Chapter 3- Project Description</i>	Describes the Project Area and the proposed Project components, including an overview of ancillary infrastructure
<i>Chapter 4- Description of Existing Environment</i>	Provides a detailed baseline assessment of the receiving physical and biological environment in the Project Area and surrounds
<i>Chapter 5- Potential and Associated Impact Assessment</i>	Discusses the Potential and Associated Environmental and Social Impacts of the proposed project.

EIA Final Report for the proposed Coal Power project at OPIC Industrial Area, Agbara, Ado-Odo/ota Local Government Area, Ogun State, Nigeria

<i>Chapter 6- Mitigation Measures</i>	Discusses the mitigation and enhancement measures for identified impacts.
<i>Chapter 7- Environmental and Management Plan</i>	Discusses the implementation of the EMP and the Monitoring program. It outlines the management and monitoring actions, roles, responsibilities and cost of EMP implementation,
<i>Chapter 8- Decommissioning and Abandonment Plans</i>	The abandonment, decommissioning and remediation plans
<i>Chapter 9- Conclusion</i>	Presents the conclusions
<i>References</i>	List of References

CHAPTER TWO

PROJECT JUSTIFICATION

2.1 Preamble

This Chapter presents the objectives, needs and benefits of the proposed project. Also presented are the social, economic, technical and environmental sustainability. The project justification is based on the strategic need for the project and in particular, how it would fulfill the proposed project objectives, and the resultant project's benefits when operational. Different alternatives were also considered such as; project-site alternatives; technological alternatives; design and operational alternatives of the proposed project. The outcome of the different alternatives provides the project selection-justifications for the proposed project.

2.2 Project Objectives

Dahua Power Limited (DPL) intends to establish a Coal Power Plant Factory (in an environment-friendly manner), for the following reasons:

- To meet the energy demand for powering customer's productions
- Promote the use of solid minerals for power generation to support the economy of the nation.
- To put the abundant coal resource in Nigeria, into fruitful use
- To ensure rapid industrial development in Nigeria
- Make use of abundant availability of coal in Nigeria
- Support the effort of the present administration to diversify economy
- Generation of employment opportunities
- To advance poverty reduction, among other socioeconomic development/gains

The project is expected to yield a high degree of economic returns to the immediate community in terms of increased property values, enhanced employment opportunities for local people, which is a secondary effect of enhanced industrial base potential of contiguous communities in Ado Odo/Ota LGA and Ogun State in general.

2.3 Value of the Project

The proposed project value is Seven billion, eighty million Naira (N7,080,000,000) 60,000,000usd for the first phase of the project. This project is expected to have enormous value not only to the Ogun state but the entire country in general. The project would provide opportunity for contracting with multiplier effects on third party thereby generating income especially at the procurement and construction stages. Socially, it is expected to significantly contribute to increase in quality of life of the people. The project will lead to improvement in local industry/ economy; improve household savings and general business activities.

2.4 Need for the Project

The need to grow the Nigerian economy is rested on a reliable power generation system that has adequate electrical power to supply the needs of the population and attract industry to the country. Without a reliable and expandable power generation system, the country cannot support modernization or industrialization.

Electricity supply in the country has been characterized by:

- Inadequate supply to meet the demand of a growing economy;
- Frequent power failures and load shedding resulting in heavy economic losses in terms of loss of productivity, damaged equipment, and expensive standby power generation capability; and
- Excessive reliance on hydro power and thermal power plants while coal resources remain underutilized.

The costs of a failure prone and unreliable power supply are difficult, if not impossible, to quantify analytically from available data. However, a descriptive analysis can bring into focus the benefits of reliable electrical generation. The marginal increase in electricity supply will lead to a noticeable reduction in production and productivity losses, as well as reduced production costs.

During the years of oil shortage and rapidly increasing oil prices, the need to decrease dependence on oil-fired utility electrical installations became an urgent concern. The use of the coal-power promised a combination of advantages: near-term readiness, low-fuel costs compared to oil, moderate conversion costs, and low technical/economic risks.

The development work sponsored and performed with coal-power (90 wt % coal, 9 wt % steam, 1 wt % additives of Sodium Naphthalene) has confirmed these expectations. Fuel quality guidelines and test standards have been established. However, DPL production of Coal power Plant capacity of 1000 tons of coal per day which will be used to generate 130 tons of steam per hour from 2 sets of boilers which in turn powers 2 sets of turbine generators each generating 30 MW with the total generation of 60 MW per day for the first phase.

Coal-power may be better than other fuels because of their lower cost than HFO. Coal-power also brings coal into the generation mix coal fired generation with a lower air emission profile than pulverized coal fired power plants. Coal-power can be viewed as bridging clean coal technology for retrofitting existing heavy oil or gas fired boilers to allow for more coal in the electric power generation at a faster pace. By converting the coal into an electric power form, delivery and dispensing of the fuel can be simplified. Because of the low cost of coal when compared to other energy sources, Coal-power is a competitive alternative to oil and natural gas. This project will no doubt enhance efficiency in the industrial sector and contribute to a sustainable development of the nation there by promoting Made-in-Nigeria goods and products.

2.5 Benefits of the Project

The provision of steady and reliable energy sufficient customers will boost production rate and

better the socio-economic conditions of the surrounding locals/people. Therefore, the proposed project is needed to support the socioeconomic development initiatives and growth trend of the country there by promoting Made-in-Nigeria goods and products. The proposed project will result in increased energy efficiency, employment opportunities, improvement of infrastructure as well as development of social structure in the surrounding communities. The people residing in the nearby areas will directly or indirectly benefit from the proposed project through generating employment (temporary and permanent) for substantial number of personnel.

Generally, the project is expected to yield the following benefits:

- Provide steady and reliable energy sufficient to power the industries with the aim of reducing cost;
- Creation of job opportunities to eligible project-affected persons or nearby settlements.
- Promote indigenous Nigerian investor-led independent power production for the industrial sector;
- Promote secondary social development and services such as healthcare service delivery, manufacturing etc.;
- Provide direct and indirect employment opportunities;
- Support technology development through technical assistance and training for Nigerians as part of overall strategy of institutionalising local content in Nigeria's Energy Sector;
- Reduce environmental emissions associated with privately powered generators; and reduce the pressure on the diesel/ petrol supply chain.
- Attract both local and foreign investors in coal exploration and production.
- Strengthen the local technical and institutional capacity and foster coal-fired industries
- Contribute to the local economy and promote domestic coal industries and provide incentives to both local & foreign investors for the establishment of coal-based industries;
- Source of income to the government through royalties and tax generation; with increased revenue/ derivations to Local and State Governments as well as other mandated agencies/ commissions.

One benefit of the coal power production process is the separation of the non-carbonaceous material that is part of the coal before treatment. This results to a reduction of ash content to 2% for Coal power, which can make it a viable alternative to diesel fuel in large stationary engines or diesel electric locomotives. Coal power is definitely the most viable and practical option for conversion of the existing Oil and gas-powered Plants.

Other benefits will arise from the Corporate Social Responsibility (CSR) of the proponent to the Host Communities.

2.6 Envisaged Sustainability

It is proposed that Best Available Technology Not Entailing Environmental Cost (BATNEEC) will be installed for the project in order to provide for Local content, social, economic, environmental as well as technical sustainability. The implementation of recommendations

provided as a result of the EIA and the Environmental Management Plan (EMP) will aid in achieving environmental, economic and social sustainability. These sustainability aspects are further discussed below:

2.6.1 Social Sustainability

A detailed stakeholder consultation process has been implemented throughout the EIA process to assist in ensuring that all stakeholders have the opportunity to make input into the project planning process. This has also assisted in laying a sound foundation for building relationships with stakeholders for the ongoing engagement that will continue throughout the lifecycle of the Project.

DPL is committed to ensure that a portion of the revenues earned by the project is spent on programmes that will benefit the local communities. These programmes are likely to comprise projects aimed at improving the health and education of the inhabitants of these communities. The specific form and extent of these programmes will ultimately be guided by the company's Corporate Social Responsibility Policy (which will have input from all stakeholders including the Company's employees) and by the profitability and liquidity of the Company.

It is pertinent to note that Stakeholder Consultation Process has been implemented throughout the EIA process to assist in ensuring that all stakeholders can provide input into the project planning process. This would go a long way in ensuring better relationship with stakeholders throughout the lifecycle of the project. *Details of conducted Stakeholder's Engagement and Consultation Programme for the proposed project are presented in Chapter Four.*

In view of the proponent's continuous consultations with stakeholders including host communities, a cordial relationship shall be maintained with the people. The company will ensure the fulfilment of the conditions agreed in the corporate social responsibility. The people of the area will be given consideration in employment in both skilled and unskilled labour by adhering to the Nigeria Local Content Development Act.

A community liaison officer shall be appointed to liaise with the community on stringent issues affecting them and report back to the company, with probable solution on how to combat them. This no doubt, will create a sustainable social relationship between the proponents and the host communities.

2.6.2 Environmental Sustainability

Coal Power can be easily produced to have the properties like low ash, low sulfur, and low temperature of the combustion flame center. It is a substitute for fuel oil and provides high combustion efficiency, low discharge of ash, environmental benefit of lower SO₂, NO_x and CO₂ emission than coal as fuel.

The project would eventually lead to reduce footprint of air pollutant emissions. It will also reduce/ eliminate noise generation associated with generators. It is important to note that the proposed project site does not require the removal of any existing structures, such as parking lot, platform, buildings etc. The area is green field devoid of pre-existing infrastructure; hence demolition of any structure would not be required for this project.

The project will be environmentally sustained by incorporating into project design, mitigation measures or controls suggested during this EIA (see Chapter Six). Also, by implementing the environmental monitoring and management programmes as recommended in the EMP (Chapter Seven). Implementing these actions would also ensure that the project meets and/or exceeds the requirements of the Nigerian FMEnv and World Bank/ IFC regarding minimising the environmental and social impacts. DPL, in applying the principle of operating with industrial best practice and ensuring environmental compliance towards achieving environmental sustainability, will ensure efforts to enhance its relationship with the communities that are in proximity of the planned project. DPL will also incorporate the findings and recommendations of this EIA and subsequent implementation of the EMP for every phase of the project, to ensure the required environmental sustainability. To ensure effective implementation of the EMP, a monitoring programme on the mitigation measures will be drafted. Efforts shall be made to ensure implementation through periodic monitoring and reporting, and strict compliance to the mitigation measures.

2.6.3 Technical Sustainability

The design of the proposed project is tailored with a chosen technology that would facilitate simple operation and maintenance. The proposed project is designed to be environmentally sustainable in view of the proven technology and strict adherence to internationally and nationally accepted engineering practices that shall be adopted at all stages of the development. Design of the coal power Plant facility would be carried out using latest technology, which would facilitate simple operation and maintenance system.

DPL has a technically sustainable plan for operating the project. The use and adoption of best industrial practices in the design, construction and operational phases of the project and the culture for personal health and safety as well as effective environmental pollution prevention programme would ensure technical viability of the project. The project operations shall also be managed by experienced technical engineers, while the location of plants shall be carefully chosen in way that the operations will not have much effect on the host community. The project activities shall also comply with local and national guiding laws.

The proposed project shall be technically viable because, it is professionally designed and the

technology employed is readily available. Plant and machinery will be sourced by the appointed Engineering, Procurement and Construction (EPC) contractor, DPL, however, will request that the EPC contractor source raw materials locally to the extent possible as this contributes to the local economy and reduces unnecessary transportation of materials and resulting emissions. The personnel and the technique employed for the plant, which is the utilisation of the best available technology (BAT) are readily available.

Generally, the Plant shall depend on coal supply from local; Kogi, Enugu and Benue States etc.. The coal feedstock is abundant to ensure availability for the continuous operation of the power Plant.

2.6.4 Economic Sustainability

Due to the encouragement of industrialization, the proposed Project will be an important source of FOREX inflows and taxes and will create direct and indirect employment in the state. As such, should large projects in the region go ahead, they will act as a catalyst for development of the regions' economic and education system and practical skills development.

As a result of the above potential long-term benefits to the Nigerian economy, the State Government has shown a strong interest and commitment to support the proposed Project.

It is easy to compare the relative costs of using a Coal power against traditional coal or oil firing because the price of the Coal power itself varies according to the coal price, the location of the plant, and/or the plant capacity etc. The economic advantage compared to pulverized coal is however indicated by significant reduction in handling cost by simplifying facilities required for loading and unloading activities.

In general,

- 1.8-2.2 tons of coal power can replace 1 ton of heavy oil a significant saving of production cost.
- Users can save $\pm 70\%$ fuel cost for per ton of fuel oil (heavy oil).
- Coal power can replace heavy oil fuel and brings tremendous economic benefits as an oil substitute fuel,

Other factors that ensure the project is economically and commercially sustained throughout its designed life span are as follows.

1. Availability of coal fuel-stock to be supplied from different coal mine site in Nigeria. The management has acquired 200 hectares of coalmine site in Kogi State
2. Availability of water requirement
3. The proximity of the proposed Plant to customers.

Economically, using coal to generate energy is cheaper than most other sources. This shows that the proposed plant might be able to serve factories in Nigeria, Africa and the world other than DPL factories. In spite of the economic advantages of using coal as energy source, this material

comes with its moderate adverse effects on the society. The good news is that these effects occur mainly at the mining site and at the firing Plants.

The project will also provide employment and skill acquisition opportunities for Nigerians through direct and indirect involvement of contractors, consultants, suppliers and other professionals during the permitting, construction and operational phases of the project. Direct employment opportunities will likely include a large portion of the estimated workers positions that will be needed for project construction; this include 50% of local recruitments (with one-third for 'skilled' position) they will be available in the operational process of the project. Additional direct employment will go to persons that will be employed to provide security at sites and other work areas. More direct and indirect employment and associated economic effects will be derived from project operation.

Asides employment, raw materials (such as cement, wood, nails, roofing sheets etc.) to be used during the construction phase of the project shall be sourced locally thereby yielding economic benefits to host and neighbouring communities, Ado Odo/Ota LGA and indeed the entire Ogun State. Contracting for other goods and services required for the construction will be consistent with good business practices, transparent and in line with the Nigerian local content law.

The project area will also attract skilled labour and professionals, some of whom might eventually settle in the area. This will lead to the emergence of little towns and villages around the project, which will increase the economic condition of the area. The project will therefore leave the environment economically healthier than it met it.

DPL shall ensure that the project is properly managed in line with the company's project management and financial discipline principles.

2.7 Project Options

In proposing the project, the following options were considered during the planning stage:

1. 'No-Project' Option
2. 'Delay-Project' Option
3. 'Go-ahead-with-Project' Option

'No-Project' Option

This involves retaining the status quo of the Site, i.e. no development and the Site would remain covered by disturbed secondary forest and agricultural fields and activities. The "no project" option will result in zero land take, zero health, safety and environmental impacts. This option is usually considered in cases where the proposed development will have significant negative impact that cannot be effectively or satisfactorily mitigated.

The rationale behind the proposed project is the need for energy efficiency to power the industrial production and reduce cost of production thereby closing the gap between the required

production-capacity and the availability of needed products. If the Project does not go ahead, the wider benefits to the stability and availability of the products and associated benefits to the national economy will not be realized and Nigeria's economic development may therefore be hampered. Thus, the 'No Project Option' is not considered to be a viable development option, seeing that it encourages growth and development as well as boosting the nation's economy. Therefore, this option was rejected.

'Delay-Project' Option

This option (delayed project option) entails that the project be put on hold. This will mean that the current benefits and required development that the proposed project engenders will be delayed or indirectly forfeited. The Proponent have mapped out a Project Implementation Schedule after planning the execution of the project. The proposed project has been timely planned to commence at a time the optimal benefits of the project can be maximized. This alternative option suggests that the project be delayed for some time. This option is rejected because delaying the project indirectly implies non-implementation of the project.

Delaying the project only implies that the area may be free from impacts associated with the project's operations for some time-duration and at the same time proposed benefits to be derived would be procrastinated or eventually deprived. This option is rejected for this project, since there is an existing technically, environmentally and economically sustainable plan for implementing the project.

'Go-ahead-with-Project' Option

This 'development' option allows for full implementation of the project after all considerations of environmental and social components. Based on the required industrial, urban, social and economic development, this option is recommended; with austere compliance with the recommendations of this EIA study and further guidelines and directives of the Federal Ministry of Environment, and other related regulatory bodies; to ensure this project follows an environmentally sustainable routine operation.

This approach would allow the needs and benefits of planned project (listed in above sections) to be achieved. This was therefore the preferred option.

The option provides for the establishment of a Coal power Plant. The choice of this option was necessitated by the numerous economic and social benefits associated with the proposed project and the need to increase product supply and needs.

Apart from meeting the need of product supply, Project implementation is also encouraged by the location-advantage of the project-site; availability of raw materials, easy accessibility route and market needs.

2.8 Project Alternatives

The proposed project alternatives as concluded during the planning stage of the proposed project (*especially during Coal-Supply Arrangement and network to the customer*) were considered

based on engineering judgment, environmental concerns, adaptability, cost effectiveness and ease of operation and maintenance of the project throughout its design life. In order to ensure the environmental and social sustainability of the Project, the EIA presents an analysis of the various project alternatives evaluated during project conceptualization, each of which is analysed/described in relative consideration as follows:

**1. Site Location Alternatives; and
2. Design and Technology Alternatives.**

2.8.1 Site Location Alternatives

Major factors of the Project Site Location are founded on Three (3) strategic considerations:

- I. Coal Supply Arrangement (Input)
- II. Water Requirement (Process)
- III. Transporting of the power to the customers (Output)

These three (3) basic considerations paved the way for the siting of the Coal Power Plant Project in the best available location for optimum productivity. This is done by analysis of the following:

1. Site Selection Criteria and
2. Site Location Options/Alternatives.

These two (2) analyses (of selection criteria and alternative location) provides basis for the choice/preferred site location of the proposed project, as discussed below in this section.

The Project Location, Ogun State, has thus been considered as an appropriate location for the establishment of the proposed project for several reasons:

- Labour costs are one of the most competitive in Nigeria, in the region and globally. The region offers huge opportunity for Employment of labour.
- Access to market: Ogun State, as the closest to the Lagos State, is benefitting immensely from its proximity and is growing exponentially as an investment hub.
- Harmonization of Taxes & Levies: Ogun State Government has harmonized taxes and levies in order to avoid multiple taxation.
- Government offers a comprehensive package of incentives to promote foreign direct investment which include construction and maintenance of road infrastructure etc.
- Ogun State Bureau for Public Private Partnership was established to facilitate investment, streamline and simplify business set-up processes such as granting of permits, taxation issues, access to factory space, and any other requirements of investors, so as to cut on the time and costs associated with doing business in the State.
- Local governments and population are waiting for economic development through private investment projects,
- From an investment standpoint, an important part of the front-end investment can be done in local currency, particularly related to civil works, lowering the need for foreign currencies,

- The projects will help reduce high poverty levels and improve incomes and living standards.

Also, from a security perspective, in comparison to other key States in the North-central region, Ogun State has witnessed fewer instances of civil disturbance and unrest. Naturally the numerous advantages of coal supply, water requirement, transporting of the power to the buyers amongst many other criteria as would be considered in this section to reasons for project site choice. Several locations within Ogun State were considered (based on the availability of Coal-supply) during the design phase of the Project but the preferred Site chosen for the Project is considered to be the site which offers the least disruption to the natural environment and to the local community.

4. Selection Criteria

The following Site selection criteria were considered for the plant location. These criteria/factors are decisive in influencing the site selection for the proposed project site, as considered during project planning (feasibility studies):

- i. Availability and proximity to coal resource (fuel source)
- ii. Distance and quality of roads from coal mines
- iii. Ease of Site accessibility and road transportation route
- iv. Availability of water requirement
- v. Accessibility for movement and delivery of equipment
- vi. Availability of land for the proposed project and for future expansion.
- v. Land suitability in terms of terrain, topography, soil, geology and hydrology
- vii. Availability of skilled and unskilled manpower nearby
- viii. Extent of damage to existing environmental and socio-cultural resources
- ix. Distance from Residential structures.

5. Site location options

In selecting the proposed project site, comparison of alternative sites was made based on the selection criteria determined. Therefore, based on the above selection criteria, two locations were selected for consideration: Location-option 1 is at Ihunsa Village in Agbara (This site was rejected due to close proximity to the human settlement after due consideration and investigation on the best possible site location for such a project.); and Location-option 2 is at OPIC Estate (the current proposed site) about 11km away from the community.

6. Preferred Site Alternative

Based on the assessment/comparison of all considerable site selection factors of the two alternatives, Alternative-2 (OPIC site location) is the most suitable project site for the proposed project, on account of the following reasons:

- ✓ Receptiveness of the community
- ✓ Access roads:

- ✓ Proximity to the coal supply route
- ✓ Land requirement/adequacy and acquisition achieved.
- ✓ The area is not an environmental sensitive area and also within reasonable distance away from residential homes because of noise;
- ✓ Less environmental adverse effects on natural resource, to compare cumulative impact of having both (coal mine and Power Plant) projects together at OPIC Estate.
- ✓ Sparse habitation of communities on the project site
- ✓ Availability of suitable land
- ✓ No ground filling is required
- ✓ Good response from local public

2.8.2 Design and Technology Alternatives

Coal Power Project with local technology will lead to greater cost, produce poor quality product, leads to wastage and will ultimately discourage production, employment and wealth creation. Thus, the need to employ the use of modern machineries, and Best Available Techniques Not Entailing Excessive Costs (BATNEEC) designed for the production. The design and technical specification of the mechanical component of production plant and equipment have encouraged the implementation of the project, considering the technology sustainability of the factory's operation.

Dahua Power Limited has a technically sustainable plan for this project. The use and adoption of best industrial practices in the design, construction and operational phases of the project and the culture for personal health and safety as well as effective environmental pollution prevention programme would ensure technical viability of the project. The project operations shall also be managed by experienced technical engineers.

The proposed project will be technically sustainable because of the Best Available Technology (BAT) and the strict adherence to international standards and codes of practices that shall be adopted at all stages of the proposed project including the including the management of as and emission reduction; which shall also comply with local and national laws most especially the Federal Ministry of Environment (FMEnv), International Finance Corporation (IFC) Guidelines, and others.

Dahua Power Limited has a technically sustainable plan for this project. The use and adoption of best industrial practices in the design, construction and operational phases of the project and the culture for personal health and safety as well as effective environmental pollution prevention programme would ensure technical viability of the project. The project operations shall also be managed by experienced technical engineers, while the location of equipment shall be carefully chosen in way that the operations will not have much effect on the host community. The project activities shall also comply with local and national guiding laws.

CHAPTER THREE

PROJECT DESCRIPTION

3.1 Project Background

The proposed project will entail the construction and installation of Machines with other ancillary units for processing and generation of Coal power 60MW/day on total land of 21 Hectares purchased from Ogun State Government at OPIC Industrial Area, behind Jubilee Park, Agbara, Ado-Odo Ota, Ogun State. The Coal which is major material will be sourced through coal mining essentially from the companys mining site at Kogi State. The list of equipment are boiler, turbine, generator, water cooling system, conveyor, transformer, Electric system, Power supply system and coal transport trailer that will be bringing raw Coal from miners to the facility.

The major raw material will be coal and water (as catalyst in steam generation) which will be sourced locally. Coal is called fossil fuel because it comes from decayed plants. It's formed when dead plant matter submerged in swamp environments is subjected to the geological forces of heat and pressure over hundreds millions of years. Over time, the Plant matter transforms from moist, low-carbon peat, to coal, an energy–and carbon-dense black or brownish-black sedimentary rock. Coal is classified as a nonrenewable energy source because it takes millions of years to form. Coal mines is majorly in the Eastern part (Anambra and Enugu States) of Nigeria and Central Zone (Kogi and Benue States).

Coal Power is the process of generating electricity by burning coal in a power Plant to create steam that drives a turbine and produces electricity. It can be used to power boilers, gas turbines, and heating and power stations. For example, low speed marine or modular power plant can operate on pure coal fuel whereas medium speed diesels such as locomotive engines may need diesel as a co-fuel which will act as an ignition source. Converting coal into a gas form may simplify the delivery and dispensing of the fuel. It may be a cost-efficient alternative to oil and natural gas. Separating non-carbonaceous material before making the gas may reduce the production of ash to 2%.

3.2 Site Location, Surrounding Areas and Access

The Proposed Project site, is located within OPIC Estate, OPIC Industrial Area, behind Jubilee Park, Agbara, Ado-Odo Ota, Ogun State. The nearest communities to the site are Igere and Ihunsa (Agbara. The total acquired land is 200sqm.

At front of the site is Jubille Park while other sides are allocated undeveloped portions of land.

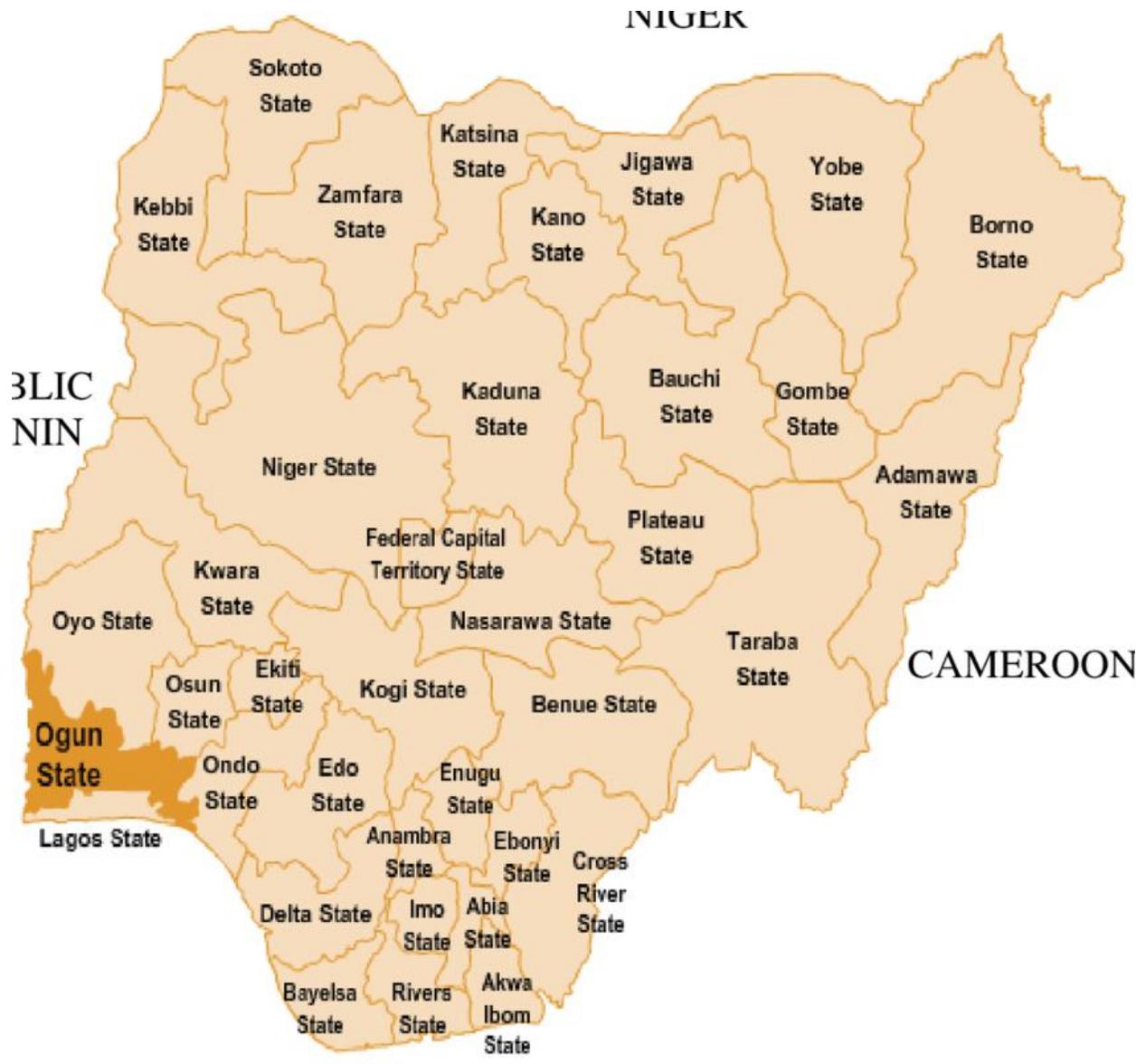


Fig. 3.1: Map of Nigeria showing Ogun State

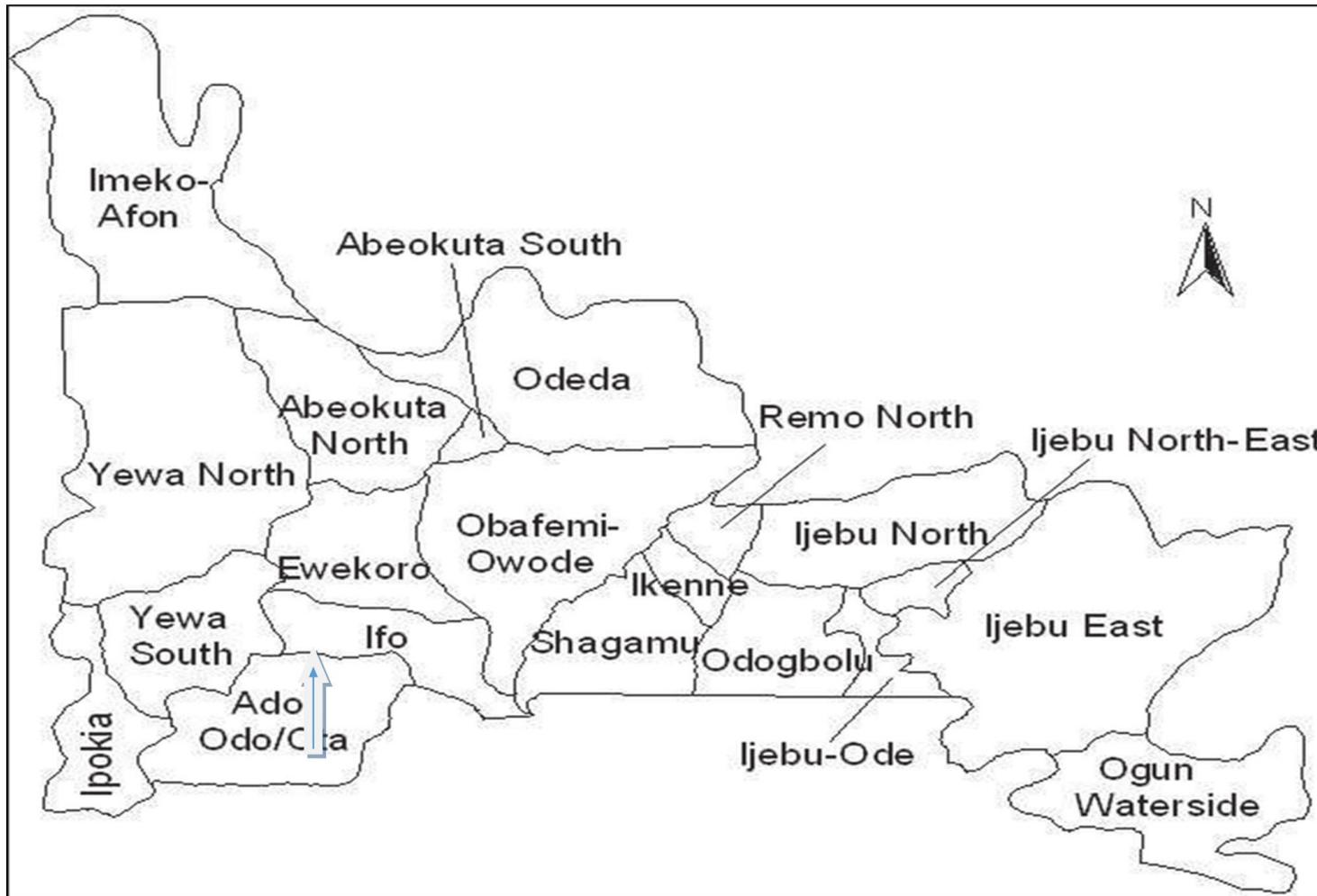


Fig. 3.2: Map of Ogun State showing Ado Odo/Ota

3.3 Project Scope of Work

The scope of work of the proposed project would involve the following project activities:

- Survey of the proposed projectsite
- Determine technically feasible alternative transportation/access routes or corridors (*based on environmental preferences*).
- Negotiation of final land acquisition within corridors of landowners/hostcommunities.
- Clearing of the proposed project factory-site (landarea)
- Development of access road to the projectsite
- Establishment of constructioncamps
- SiteMobilization
- Testing and shipment of machineries forproduction
- Procurement and supply (importation) of raw materials for plantoperation
- operational materials and machineries
- Installation of the Coal Power Plant
- Construction of ancillary facilities andcomponents
- Project Wastemanagement/structures
- Provision of needed Safety/securitymeasures
- Commissioning of the Coal PowerPlant facility
- Demobilization/de-commissioning
- Rehabilitation of all workingareas

3.4. Process Description for Coal Power

Coal Power Composition

Coal is a sedimentary rock that's primarily made of carbon and is used to generate energy. Its black or brownish-black and contains more than 50% carbon by weight and more than 70% by volume. It also contains hydrogen, oxygen, nitrogen, and various minerals.

Coal mining is the process of extracting coal from the earth, either from underground or from the surface. Coal is the most abundant fossil fuel on Earth, and was the primary energy source during the Industrial Revolution. Today, coal mining is a mechanized operation that uses large machines to remove coal from the earth.

When coal is burned, chemical potential energy is transformed into thermal energy, light energy and sound energy. Only the thermal energy is used for electricity production. Light and sound

energy dissipates into the environment, immediately reducing efficiency.



Plate 3.1: Raw mined Coal

The process of generating electricity from coal involves several steps, including:

- Mined coal is crushed, screened, and beneficiated to meet customer requirements.
- Pulverization

Coal is ground into a fine powder in giant grinding mills. This increases the surface area of the coal, allowing it to burn more quickly.

- Combustion

The pulverized coal is transported to a boiler furnace and burned with air.

- Steam generation

The heat from the burning coal heats water in the boiler, creating steam.

- Turbine rotation

The high-pressure steam spins a turbine containing thousands of propeller-like blades. The turbine shaft rotates at high speed.

- Electricity generation

A generator mounted on the turbine shaft generates electricity when its wire coils are rapidly rotated in a strong magnetic field.

- Steam condensation

After passing through the turbine, the steam is condensed and returned to the boiler to be heated again.

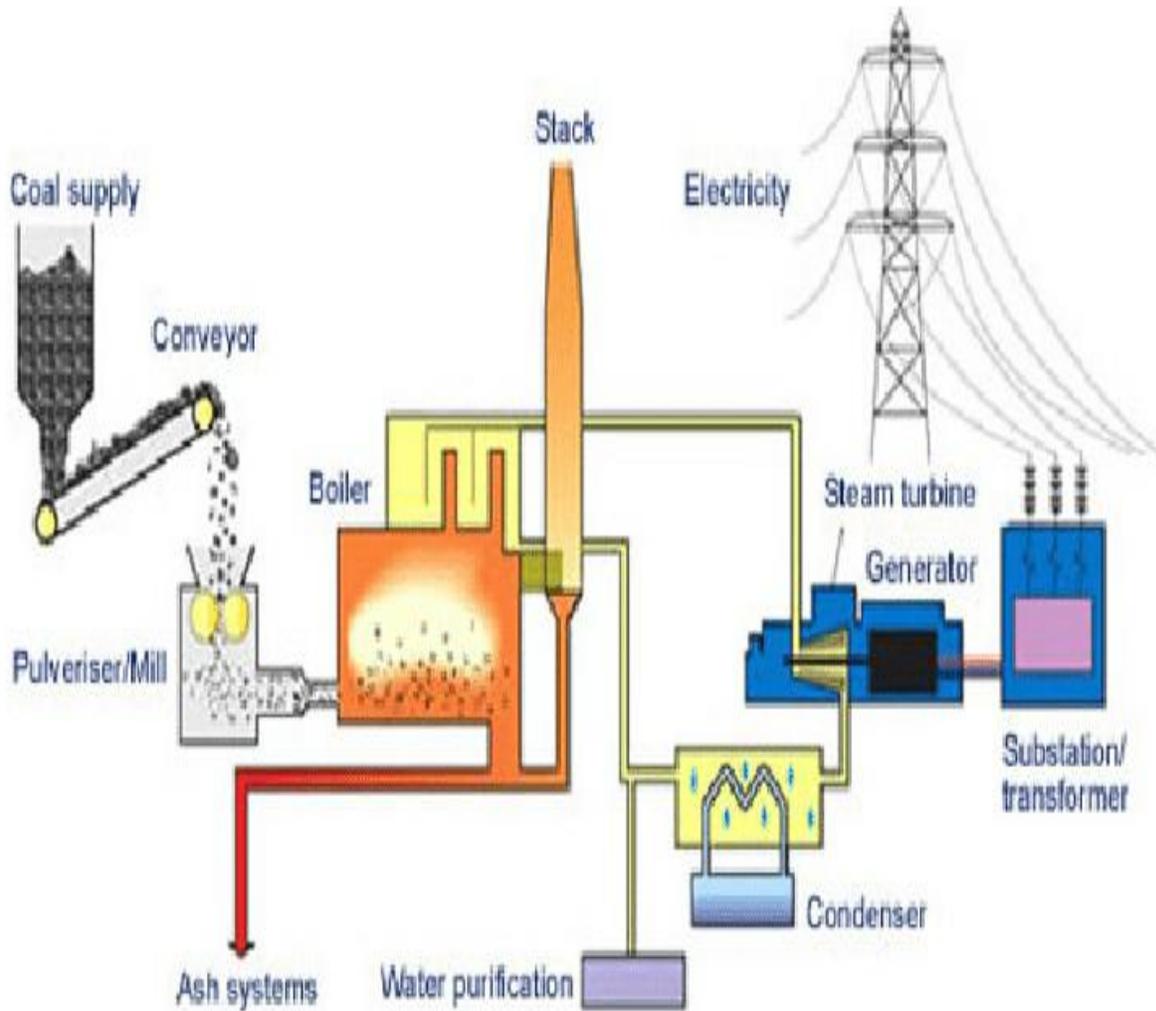


Figure 3.3 Production Process Flow Chart

Nigerian power plants are principally the following:

- Benue Coal Fired Power Plant: A 1,200 MW project in Benue that is currently dormant
- Egbin Thermal Power Plant: Located in Lagos State
- Alaoji Thermal Power Plant: Located in Abia State

- Afam Thermal Power Plant: Located in Rivers State
- Ughelli Delta Thermal Power Plant: Located in Delta State.
- Olorunsogo Power Plant: Located in Ogun State. Etc.

The proposed project will be a major operational coal power plant adding to the national energy input and closing substantially the huge energy gap in Nigeria.

Production of Coal Power

The production of coal-power fuel involves receiving the raw coal in trucks and offloaded on a concrete floor in a closed shed. The crushing of coal or coal sludge to particles between 10 and 65 micrometers diameter (standard crushers are used); final fine crushing will be done in the ball mill in presence of water, wet milling and homogenization (with additives as required). The resulting product is then prepared for Boiler (HL – 130/9.8-M4 with capacity of 130KG/h and steam degree of 540⁰C. 1000tons of coal/day will be used to generate 130tons of steam/hr from two (2) sets of turbine generators, each generating 30MW with the total generation of 60MW/day.

Advantages of Coal Power

Despite all the negative environmental impacts of coal, there are quite a lot of benefits ranging from economic benefits to environmental friendliness of coal power technology as enumerated thus.

1. Good Combustion Efficiency: The combustion efficiency of Coal power is 96% - 99%, boiler efficiency is about 90%, which reach the level of oil.
2. Good Effect on Environmental Protection: The Combustion temperature of Coal power is approximately 1200 – 1300⁰C and emissions of SO₂ and NO_x are low

Coal Power as Energy Source

For Coal power Combustion Process, the atomized Coal burns in the furnace in four stages of combustion:

- Moisture evaporation
- Releasing volatile materials and ignition
- Fix carbon combustion
- Coke burn-out

The Coal Power Technology Development & Its Application Benefits

1. Using coal to replace oil reduces fuel cost of users and investment cost to build new Coal boiler is about the same with new oil-fired boiler, but the operating cost is significantly lower on the Coal Power boiler.
2. To realize clean use of coal, use energy source economically and rationally, improve environmental protection;
 - a. The raw coal for Coal power is cleaned coal – low in ash and sulfur content.
 - b. Coal Power burning temperature is 650 – 700⁰C lower than oil and it can effectively reduce NOx and SO₂ and can easily meet national and local environmental protection standard.
 - c. Additional de-sulfurizer can be provided if further reduction of sulfur dioxide is required

3.5 Coal Supply and Transport

The coal will be crushed and transported from mines, in 50 kg bags. Coal shall be transported from the allocated mine site in Kogi State and other suppliers within Nigeria

For coal transport, Lagos-Ibadan expressway if the material is coming from other States would be used. The road is in very good condition for the transport of the coal. Coal can be transported from mines and processing plants to consumers in several different ways: Conveyors, trains, and trucks move coal around mines, short distances from mines to consumers close to the mines, or to other modes of long-distance transportation. The final product will be supplying to customers (Companies) within 5km radius using cable from point of generation to the customer's destination.

3.6 Water Supply

The water requirements for the project shall be source from the boreholes drilled within the project facility to supply needed water for all production and domestic uses. However, potable water will be supplied by bottled water. The expected water usage is 1210Ltrs/hr or 30,000 Ltrs/day for the Plant.

3.7. Production Machinery & Equipment

The following equipment and machineries, amongst others, are available for the proposed project. However, the crusher will be used only when crushed coal is not available at some times.

Table 3.1 Machinery & Equipment

S/N	Equipment	Qty.
1	Conveyor	2
2	Crusher	2
3	Weighing conveyor	2
4	Turbine	2
5	Generator	2
6	Water cooling system	2
7	Transformer	2
8	Electric system	2
9.	Coal Transport Trailers	10-12
10	Power supply system	2

3.8 Proposed Facility Layout

The proposed project site will include the following layout plan and associated facilities:

Workshop/Store:

There shall be a workshop area where maintenance tools and equipment will be kept.

Administration Block:

There shall be an administrative block located within the plant. It shall be equipped with sanitary facilities, water supply and electricity.

Fuel Storage Area:

This area shall consist of a diesel storage tank with 64,000ltrs capacity, placed on an elevated concrete wall. The tank shall be connected to a fuel pump for easy supply. There shall be bund

walls to contain any spill. The fuel tank will be on a hard standing, impervious seal with surrounding bund. Fuel will be trucked in as needed for delivery to the construction vehicles. Spill containment equipment will be available on site as well as a spill response plan. Fuelling will be carried out via a "gasoline hose" type system with shut-off on either end. The nozzle will be equipped with automatic shutoff and there will be clear operating instructions that the operator shall be hands on at all times.

Power Unit:

Electricity/Power source for the proposed manufacturing plant will be from series of generating sets with the fuel consumption daily as listed in Table 3.2

Table 3.2 Proposed PowerGeneratingsets

S/N	Name of Generator	Capacity of Generator	Estimated Diesel Consumption Per Day
1	Cummins KTA 38G12/CS810/ DSP sound proof (for slurry plant)	810 KVA/640KW	2000 ltrs /Day.
2	Cummins DG, 6BTAA 5.9/G13 Sound proof (Admin/Residential/Others)	100 KVA /80KW	240ltrs / Day

Other-Features of the Project-Site Facilities will include:

- Factory area for the production-plant
- Coal storage area
- Offices/admin building
- Warehouse/storage area
- Factorycomplex/Workshop
- Security/Guardhouse
- Road/Car-parkyard
- Clinic/first-aid emergencyroom
- Rest room/Toilet
- Residential building

3.9 Mobilisation of Envisaged Workforce

Personnel to be mobilized will include: National labour; Local National labour (Indigenes of host communities); National experts and foreign experts.

There will be opportunities of engagement and development of community members, and the community at large via the project. It is anticipated to employ local labor as much as feasible. The construction labor force for the proposed project is expected to average about 20 professional staff consisting of contractor construction management, expatriate construction supervisors, project team representatives and owner representatives including about 80 national labor personnel.

Project Contractor will develop a 'Community Relations and Engagement Plan' which will detail strategies for fair and representative engagement of local labour from the affected communities. This plan will be reviewed and approved by DPL in line with the Nigerian Local Content Act and labour laws before approval. The approved plan will also be used to monitor activities of the project contractor in this regard. Also, consultation between the DPL and the respective stakeholders (local leaders, youths, etc.), to be mediated by regulatory stakeholders will be held to reach agreements on the employment of local labour.

Efforts will be made to accommodate non-indigenous project personnel close to the work site as possible and there will be bus used to and from the project site each day. At a minimum, a security convoy will be provided for the buses travelling to and from the workers' camp. These movements will be coordinated by the logistics team of the project.

Working hours will normally be daylight hours from 7:00 a.m. - 6:00 p.m. In the event that evening hours are worked, emphasis will be placed on proper lighting, safe job procedure and overall safety; especially during night time.

3.10 General Management Plan during Site Operation Activities

Construction and Installation

Construction materials such as sand, granite, and coarse aggregates, good quality bricks and sized stone material required for the construction would be procured from nearby sources. The construction power would be made available from local distribution/feeder line. The construction water would be arranged through tube-wells/nearby sources. Installation of associated mechanical and electrical equipment, auxiliary units like water treatment plant, cooling water system, electrostatic precipitators (ESPs), NOx control equipment etc, will form part of the total installation.

Site Work

The site for the plant is open land with access from hard surfaced roads. Development and preparation of the site will include access roads, drainage, equipment pads, water supply wells, administrative buildings, maintenance buildings, workers quarters, fencing and security systems.

This work will be accomplished by local contractors.

Greenbelt Development

A green belt (Buffer Zone) shall be developed within the project boundary. Minimum 25m wide greenbelt would be provided around the plant periphery. This greenbelt will act as a buffer zone. The greenbelt will dampen the generated noise from the plant. This zone will also be acting as safeguard from nearby community. Local tree species would be selected for green belt development. Provision would be kept to conserve existing special and distinct vegetation species located near the project site and proposed approach channel. However, a landscape planning is necessary for obtaining benefit from green belt.

Air Pollution

Management Operation and maintenance of plant and related components has to be carried out regularly as per instruction given in the manufacturer's guideline. Safety shall have to be ensured for every time of the life period of the project. Emission level of SO_x, NO_x and PM shall also have to be monitored regularly. The Environmental Manager shall be responsible for regular monitoring of emission level, inspection and testing of mitigation measures, environmental efficiency of the plant and regular reporting of the inspection. The monitoring and inspection report shall have to be submitted to concerned regulatory bodies.

Control of Gaseous and Particulate Emissions

The gaseous and particulate emission from the plant shall comply with the requirements stipulated by statutory authorities. The expected air pollutants include particulate matter (PM), nitrogen oxides (NO_x), sulfur oxides (SO_x), carbon monoxide (CO), carbon dioxide (CO₂), volatile organic compounds (VOCs), and hazardous air pollutants. Fuel combustion at the plant results in emissions of SO_x, NO_x, CO, and CO₂.

A monitoring system would incorporate the means to record various time averaged values as required by the performance requirements. Monitoring data would be displayed in the control room, with provision of alarms to notify the operator of any deviation from the specified values. The Contractor shall furnish a list of monitoring equipment he intends to provide with their location in the plant.

Dust Suppression System

Dust suppression systems have to be installed at coal receiving terminal and plant site. The system functions (dust suppression) replenishing the evaporated moisture. An integrated system has to be installed to control dust at offloading points, stackers, reclaimers, conveyor system (including each transfer point), and stockyard. An automated system may be adopted to suppress the dust maintaining moisture level of coal surface not below 7 – 8%. Sprinklers have to be set up in a way that will spray maximum water in form of mist so that no surplus water will be generated. However, Water collecting and recycling system needs to be installed in line with dust

suppression system. Furthermore, the conveyor system might be covered typed so that it winds action in generating coal dust can be controlled. At transfer points, water sprinkler would be installed.

In addition to this plant engineering measure, there are procedures to be observed such as the use of individual protection devices (masks, respirators, etc.) with a degree of filtration appropriate to the powders involved during the main dust-producing phases.

Noise Management

All the equipment and mechanical parts shall have to be maintained in good working order to ensure maximum noise generation within limit of FMEnv standard. Noise level would be monitored at different selected location within the facility and nearest community. The greenbelt shall be planted with the aim of dampening the noise level. The boundary wall will also dampen the noise level further. Whether possible, mechanical parts of high noise potential shall be operating provided with acoustic hood. Noise from other non-point source like project vehicle, vessel, etc shall be controlled adopting mitigation measures. An Environment Manager shall be given responsibility of monitoring efficiency of the management plan and regular monitoring of noise level.

3.11 Maintenance, Supervision and Safety Design

3.11.1 Plant Maintenance

The overall maintenance of the manufacturing plant shall cover the following areas:

- Management of the Plant's powersource
- Day-to-day operation and current (preventive) maintenance of the Plant, and
- Scheduled maintenance of associated utilities and equipment.

When project is to be maintained, the downtime should be minimal, and failed or faulty components are to be replaced as needed and expeditiously. It is anticipated that all routine maintenance will be conducted by the plant's own maintenance team. This will include preventative, corrective and predictive maintenance in addition to any maintenance or repair required as a result of emergency breakdowns. In the event that major outages occur it is anticipated that the services of sub-contractors will be engaged to maximize economic efficiency. Routine preventative maintenance will be carried out by the operations and maintenance contractor for the period between inspections.

In addition, the designated 'Operations and Maintenance (O&M) contractor' will be required to create preventative maintenance plans for all of the plant areas, using software to generate work orders for pieces of machinery and equipment; and all maintenance activities will be recorded on the preventative maintenance programme.

3.11.1.1 Enhancement of Coal Power Plant Maintenance Practices

These maintenance activities will be organized across the production plant facility level. DPL shall implement the best industry practices in line with the recommendations of OEMs for plant maintenance activities to optimize the maintenance outage period. DPL approach towards improving the maintenance practices will focus on the following areas:

- Installation of cooling or wetting system over the coal storage area
- Maintaining a comprehensive database of performance trends and failure history
- Maintaining good record of all inspections made and of the maintenance work performed in order to ensure establishing a sound maintenance program
- Adequate condition monitoring
- Proactive maintenance activities
- Strong Project management tools

For strengthening the maintenance practices and for establishing proactive maintenance program, DPL shall:

Establish Maintenance Planning Cell (MPC):

The Maintenance Planning cell at the facility will be established in terms of placing it as the nodal point in both target review and daily decision-making process for day-ahead maintenance plan, in association with the Facility Operations department. The MPC would be responsible for the overall planning of the maintenance activities both short-term and long-term. This includes developing preventive maintenance schedules and ensuring compliance, formulation of overhauling strategy, spare parts planning, condition monitoring and maintenance of equipment history. MPC shall also carry out Maintenance Process Enhancement Steps in coordination with respective maintenance departments.

Establish a Condition Monitoring (CM) Cell under the MPC:

Setting up of a condition monitoring cell at the facility with priority basis will facilitate the induction of proactive maintenance. The staffing requirements and role definitions for the CM cell would need to be defined and adequate infrastructure in respect of instrumentation shall be required to make it fully functional. CM cell will develop a Condition Monitoring Plan which would include check-lists and frequency for equipment monitoring.

Strengthen Computerized Maintenance Management System:

A Computerized Maintenance Management System (CMMS), a type of management software that performs functions in support of management and tracking of O&M activities, will be established in the facility in order to better optimize the production plant maintenance activities. This system maintains a computer database of information about an organization's maintenance operations which is intended for efficient maintenance of the plant facilities and to help management make informed decisions. This system aims at optimization of production plant reliability and to initiate maintenance program by comparing the investment costs with risk-reduction returns on both annualized and plant lifetime basis. This supporting system shall also develop a technical database to establish relationship between equipment aging rate and equipment reliability.

Spare parts planning

Lack of adequate on-site spares will have a major effect on plants availability. Therefore prior to any planned or unplanned maintenance activities, adequate number of spares would be available which is essential to reduce the duration of outage period. To ensure the adequacy of spares, DPL spare parts planning considers the estimated repair cycles for the major components provided by the equipment manufacturer and the contingencies in parts planning. Based on the recommendations of equipment manufacturer regarding the types and quantities of spare parts needed, DPL shall procure spare parts on a planned basis allowing adequate lead times. Therefore, every spare part will have a re-order point set and DPL store manager shall notify the procurement team to initiate procurement process if the number of items in the store is below reorder point.

DPL shall establish the spare parts planning process through:

- Categorization of spares: Categorization of spares will help us to expedite the procurement process based on its criticality, cost and lead time of the items. Based on this categorization, inventories will be classified as vital, essential and desirable and these three classes will further classify into different classes based on the unit price. In addition, to fast track the procurement process, a list of reputed vendors will be prepared.
- Establish a Quality Assurance (QA) System: A stringent quality assurance system is essential to meet the requirements of regular maintenance and major rehabilitation activities. A Quality Assurance Plan (QAP) will be prepared for all major items detailing out the Checks/Tests to be carried out, Customer Hold Points (CHP) and Acceptance Criteria. The QAP shall detail out the stage, location and agency responsible for testing.
- Establish a Vendor Management System: DPL shall implement a strong vendor management system based on enlistment of vendors after due assessment of vendor's manufacturing capabilities and subsequent monitoring of vendor's performance for ensuring smooth availability of quality components.

- Proper Identification and codification of stores Items: To achieve rationalization of inventory levels by bringing out duplication or redundancy of items proper coding shall be given to the various items. The store manager shall generate monthly report-based inventory positions with respect to all items, and an annual report which should be linked to the physical verification of assets.
- Materials Preservation Manual: Material preservation manual shall be developed/ amended to act as a reference for the store employees to ensure proper storage of spares/ items.
- Establish purchase processes: Since delays in procurement can impact smooth functioning of the plant and timely completion of maintenance, a standardization of tender procedures will be done along with clearly defined delegation of powers (DoP), responsibility and timelines. Bid documents will be strengthened to include appropriate provisions for liquidity damages, price variations etc.
- Procurement manual: Procurement manual shall be developed/ amended to act as a reference for procurement team to ensure purchase of good quality items/ services at the most competitive pricing and to arrange for the service and delivery of the items procured at the proper time.

3.11.2 Project Supervision and Surveillance

There will be different stages during the whole project; the first part is the engineering and then the construction activities. Therefore, the surveillance or supervision is split up in these two parts: (1) Engineering Surveillance and (2) Construction Surveillance.

Supervision and Communications

The facilities operation shall be supervised centrally from DPL location where the control facilities will be extended for the receipt, processing and recording of data. Provision and operation of necessary telecommunication facilities shall be in place at Plant location. A radio and UHF waves system shall be put in place for effective communication.

Effective and functional communication system shall be installed to facilitate supervision and maintenance of the operation of the project and communication channel between Plant site and the administrative office. CCTV will also be mounted at strategic places within the facility.

Information Technology roadmap

Developing a consistent communication between various departments of DPL is required to avoid delays which may hinder decision making process and could lead to operational inefficiencies. Therefore, a streamlined communication system and full-featured operational software shall be developed/ implemented to optimize critical operational processes, including resource management, finance activities, and management reporting. This shall include:

- Formulation of integrated MIS (Management Information system) policy covering all aspects of functioning of the facility – viz. operations, maintenance, stores, purchase, human resource, safety, environment etc
- Development of Plant-wide and Company-wide IT infrastructure development to equip the plant level executives with Local Area Network (LAN) connectivity in the plant and Wide Area Network (WAN) connectivity with DPL’s headquarter.
- Development of IT modules to cater to various functional requirements, such as Computerized Maintenance Management System (CMMS), Materials and Stores Management System, Operation Plant Performance Management System, Business Planning Module, Finance and Accounting and Human Resource related modules.
- MIS shall have an interface with Digital Control System (DCS) of the production plant for automatic generation of management reports.

3.11.3 SafetyDesign

The process design shall be carried out according to the following points:

- The process has to be simple as much as possible, to ensure the ease of operation and the understanding of the consequences of the ongoingoperation.
- Safe materials have to beutilized.
- To provide “fail safe” equipment to limit the effect of failures orleakage.

The design intent of the proposed plant facility construction is to develop environmentally sustainable system that satisfies applicable regulations (local and international), industry standards and codes.

Hence, the design, construction and operation of this project shall be conducted to:

- protect the safety, health and security of employees, customers and otherstakeholders;
- maintain environmentalintegrity;
- comply with applicable laws andregulations;
- apply sound geo-science, engineering, technical and commercial bestpractices;
- focus on flawless execution with minimumre-works;
- meet the reasonable aspirations of the project-impactedcommunity;
- achieve facility performanceobjectives.

The design of the plant (system and layouts) have been carried out taking into consideration corporate safety rules to assure safety, prevent accidents and reduce risks level to as low as practicable.

Further safety and operability studies would be carried out on final transportation route and general technical drawings to verify safety systems and integrity of installations to possible changes in environmental conditions.

The concept and basic design of the proposed plant facilities and components are based on international specifications and are in line with national (SON) and international Standards and Codes. These cover various aspects as electrical, mechanical, civil, transmission and distribution lines and manufacturing plant constructions.

The engineering, design, construction, testing, etc. of all Plant components, including all auxiliary facilities and systems, are according to internationally recognized standards and codes in their latest edition. The latest editions of the standards, codes and recommendations and directives issued by the following organizations shall apply for the design, construction, testing and commissioning of the Project.

Site Security

A project specific site security plan, procedures, and contract will be established and implemented. The Security Management Plan (SMP) will be developed to assess security threats and identify specific measures to be put in place to address such security threats. The plan will be developed in consultation and partnership with local police authority and local vigilante group(s), if any, who shall provide professional advice and update regarding local security challenges as well as security operational assistants as may be required.

DPL intend to engage the services of a reputable security company along with 4 Internal security persons to work alongside the Nigeria Police Force and others to provide 24 hours security at the site. The site security contractors will be required to comply with the above mentioned SMP, code of conduct, as well as good international practices, such as IFC Performance Standards on security personnel in terms of the principles of proportionality, hiring, rules of conduct, training, equipping and monitoring of such personnel. In addition, the security contractor will maintain an ongoing consultation with local police authority to update the plan based on emerging security concerns in the project region.

Project Health, Safety and Protective Measures

Health Safety & Environmental Management Responsibilities Ensures all workers have appropriate safety/ health; accident prevention/ investigation training. Formulation of practical health, safety and environment policies and guidelines in line with the industry best practice shall be implemented.

Health Safety & Environmental Procedures (when there is accidents/Dangerous occurrence, permit to work system and fire precautions.

- Injured person or the first-aider to report accident to designated person (The Supervisor) giving all relevant details.
- Designated person to enter the details in the accident book taking care to ascertain exactly what occurred.
- Injuries which require the first aider to refer the injured person to hospital or to the doctor should be immediately notified to the Head, Safety department, Head, Human Resources or a senior company representative in the factory.
- In such cases the person who the case was reported to accompanied by a representative of the employees and a hospital employee must investigate all the circumstances of how the injury was sustained and a company accident investigation report completed.
- The findings of the investigation will be examined by the management and a hospital employee with the objective of identifying measures to avoid a repetition.
- These control measures will be introduced after consultation by the management with staff on site.
- Injuries or incidents at work leading to ill health which result in an absence from work of more than 3 days must be notified to the Health and Safety Executive and the admin department.
- Injuries or incidents leading to ill health which are more serious than those mentioned above (including injuries leading to death) must be notified to the HSE immediately by the quickest possible means (i.e. by telephone). This call must be followed by a written report on form. (Injuries specified as being reportable in this way are detailed under "other notification"). The Head of plant through the safety department and human Resources must be notified.
- The accident location should be barriered off pending an investigation into the circumstances of the incident, which led to the injuries detailed, by the company's representative. This investigation should include statements from all witnesses and any plant or equipment involved in the incident should not be touched nor moved until the investigation has been concluded.
- The investigators detailed above will discuss their findings with the chief executive to identify measures needed to avoid a repetition. These measures will be introduced as soon as possible after consultation with the construction workers.

However, adequate arrangement would be made for the provision of appropriate personal protective equipment (PPE) to all the workers within the premises. The use of these provided PPEs is mandatory for all workers, failure to adhere to this usage instruction will attract penalty. Regular training and PEP talks would be given to all workers (daily) operatives inclusive) for more safety consciousness and Contractors, suppliers and visitors have to undergo some basics of environment, health and safety ethics (safety induction training) before final contract approval and dealings with the company. Spot check surveillances and risk assessment however are placed on the, while carrying out their businesses. This is to prevent any form of accident.

All works during project implementation and throughout the project life cycle shall conform to DPL HSE Policy presented in Chapter Seven of this Report. The EPC/O&M contractors shall develop a project specific HSE Plan which will guide activities in all phases of project implementation.

Fire Protection/Detection System and PPE

The design of fire protection and detection system shall comply with company codes and standards and shall include the following:

- Inlet and outlet Emergency Shutdown (ESD)valves
- Pressure Safety Valves(PSVs)
- Lightningarrestor

PPE (Personal Protective Equipment) such as canister-type gas masks, cover all, and Self Contained Breathing Apparatus (SCBA) will be provided at appropriate points throughout the plant. Safety goggles, rubber gloves, boots, and aprons will be worn for dangerous work as indicated by procedures established for plant operators.

Proposed Project Contingency/Emergency Plan

In the event of an emergency, DPL's emergency plan clearly identifies the actions to be taken. This includes communication facilities to be used, the individual responsibilities of key personnel and the procedures for reporting such events to the authorities, and arrangement of logistics for extra labour as may be needed. The emergency plan is based upon the location and level of the event. This takes care of the possibility of explosion and fire emergency plan. The plan requires that the factory site be designed and facilities put in place in such a manner as to prevent fire outbreak. This plan covers all phases of project development with the inclusion of catchment systems in all designs in order to minimize domino effects.

The contingency plan has been developed from a six-point strategy for environmental protection based on the following parameters:

- Safe working practices.
- Preventive measures to contain operational and accident, and personnel injuries.
- Understanding of the risk.
- An effective emergency response organization with sufficient trained personnel and equipment to deal with the defined threat / hazard.
- A training and maintenance program to ensure an efficient response
- Co-operation with those who may share the risk and can participate in the response.

The emergency plan clearly identifies the actions necessary in the event of an emergency. These include communication network, the individual responsibilities of key personnel and the procedures for reporting to the authorities and arranging the logistics of extra labour as may be needed.

During Emergency/Contingency response measures.

- All work must stop at once
- All equipment must be shut down
- All must be evacuated to a predetermined point (Assembly or Muster Point)
- A roll call must be taken and all workers and men counted.
- No one would be permitted to return to work until notification has been received from the company's representative that it is free to do so.

Details on Emergency Plan for the Project is presented in Chapter 7 of this Report

3.12 Project Waste Management

The proposed project would result in the generation of solid and liquid wastes. Waste generation is inevitable in all phases of the proposed project implementation and therefore will require great attention. It is the goal of DPL to design, construct and operate the proposed project in a sustainable and environment friendly manner. To this end, effective waste management practices shall be implemented through the entire life cycle of the project. Waste management principles and priorities shall be based on an integrated approach which will involve using a combination of techniques and programs to manage wastes. This approach shall be anchored on the 5Rs of waste management hierarchy of Reduce, Repair, Re-use, Recycle and Recover as the primary drivers while disposal shall be the last option in accordance with industry and international best practices and in line with its policies on health, safety and environment. The waste items that would be generated during the proposed project include solid wastes (used drums, plants, sludges from

processing plant, excavated soil, waste rags, rubbish/garbage etc) and liquid wastes (waste water produced will be recycled, used engine oil collected in designated tanks for recycling exsitu etc).

Compartmentalized Waste Bin will be made available for solid waste. All trash will be separated at source in trash bins that will be placed at the administrative /accommodation unit. Trash disposal will be carried out daily. Combustible materials (largely paper) shall be segregated and sent to a third-party contractor that has the capacity to handle such category of waste. Biodegradable materials, largely kitchen and mess wastes shall be handled by a third-party contractor. (Solid materials and wastes are carefully gathered into waste chambers where sorting is done. Government accredited waste vendor comes when the need for lifting the solid wastes arise. The Solid waste is thereafter taken to the Government approved refuse site by the waste Manager.

Medical waste largely needles and syringes and cotton wools shall be handled by a third-party contractor (an accredited Government Waste Vendor under the Ogun State Environmental Protection Agency) with ownership of an incinerator. However, for gaseous waste, the machines of operations would be fully serviced and maintained as at when due to avoid emission of carbon monoxide.

Waste Handling Guidelines

Wastes handling and disposal procedures shall be well defined at source and a waste inventory register kept. The waste contractor shall define, and document appropriately, all wastes generated and transferred in the course of his work.

DPL shall apply the following principles in handling of general garbage (wood, plastics, paper and food wastes):

- Segregate components such as wood, plastic and paper, for recycling or reuse.
- Dispose all wastes at approved dumps.
- Refilling and reusing of containers.

However, the proposed project shall adopt the following main principles in terms of operations environmental philosophy:

- **Use of resources:** efficient use of chemicals, material, natural resources and energy sources, aimed at resource conservation and minimization of discharges;
- **Emission to air:** minimization through abatement at source of gaseous emissions that have the potential for negative impact on the environment;
- **Discharge to water:** minimization through abatement at source of aqueous effluents which have the potential for negative impact on the environment;

- **Solid waste:** Correct handling, treating and disposing of solid wastes to avoid/eliminate liabilities in the future and to meet the requirements for due diligence. Flue Gas desulfurization (FGD) sludge/gypsum, Fly Ash and Bottom Ash are some of the solid wastes that will be generated amongst others. They will all be well managed to comply with the relevant environmental laws.
- Use of Best Available Technology Not Entailing Excessive Costs (BATNEEC) and good international industry environmental practices.

Waste Water and Drainage

During construction, small amounts of wastewater from equipment washing and concrete production are likely to be produced if an on-site concrete batching plant is used. Such wastewaters will typically be non-hazardous and therefore discharged to the ground surface.

During Operation, wastewater will primarily be as a result of the production coal power during homogeneous mixing of coal and steam. However, waste water produced is recycled back in plant for continuous production hence there is limited waste water discharge.

Adequate drainage system will be constructed around the site according to the site conditions. Storm water will be managed through a combination of open trenches, and ditches and will be led to drain away to the natural environment via gravity. Paved and concreted areas will be sloped to allow for proper drainage.

More so, Septic waste management will be accomplished by containing the effluents from the administrative/accommodation toilets and grey water from showers and washing in septic tanks. The tank effluent will be churned, treated to regulatory limits before being evacuated by third party.

Details on Waste Management Plan for the Project is presented in Chapter 7 of this report.

3.13 Project Schedule

The project lifetime is expected to be about 30 years after which the Plant and associated infrastructures will be decommissioned.

The timeframe scheduled for the implementation of the project is as follows (Table 3.3):

Table 3.3 GANTT CHART for Project Implementation Plan

Activity	Duration – (2024 – 2026)												
	NOV – DEC, 2024	2025 JAN	2025 MAR/ APR	2025 MAY - OCT	2025 NOV- DEC	2026 JAN	2026 FEB	2026 MAR	2026 APR	2026 MAY	2026 JUNE	2026 JUL - DEC	
1 Land Acquisition/planning/preliminary design													
2 E.I.A study/provisional Approval													
3 Land clearing & Leveling													
4 Establishment of Construction Camp/Site Mobilization													
5 Civil Work/ civil foundation													
6 Internal access roads													
7 Water management system													
8 Boundary fencing & yard lighting													
9 Supply of all equipment/material													
10 Cable trenching													
11 Installation of all equipment/material													
12 Testing & Commissioning													

CHAPTER FOUR

ENVIRONMENTAL BASELINE CONDITIONS

4.1 Preamble

The existing environmental baseline (physico-chemical, biological, socio-economic and health) characteristics of the proposed project area are herein presented. The environmental descriptions are required to establish the existing environmental status of the proposed project area and also serve as a reference data for future studies and environmental monitoring. The data will also be used as a baseline for which the anticipated impacts of the proposed project would be determined for appropriate mitigation measures to be put in place. It is important to gain an understanding of the physical, biological and social attributes of the Project Area of the proposed project and its surroundings, as it will provide for a better understanding of the receiving environment in which the Project is being considered. The description of the baseline environment is essential in that it represents the conditions of the environment before the establishment of the proposed Coal power Project. This, therefore, provides a description of the current or *status quo* environment against which social and environmental impacts of the proposed Project can be assessed and future changes monitored. Thus, *this Chapter 4* describes the physical and biological characteristics and the socioeconomic characteristics of the receiving environment of the Project Area. The objective of the baseline data presented in this Chapter is to establish the characteristics of the existing biophysical conditions in the Project's AoI (*Area of Influence*), *i.e.* entailing the locality and specified location of the proposed project within the spatial boundary of 5km. *See Project Location details in Chapter 1 (1.3)*. The Studies conducted in the Project Area are organized into:

1. **Physical Environment** (Climate; Air Quality; Noise; Topography; Geology; Surface Water and Groundwater).
2. **Biological Environment** (Biodiversity Studies of Floral/Vegetation Descriptions and Faunal Observations).
3. **Social Economic Aspects** (Consultations at AOI, Administrative Structure; Demographic Profile; Health; Education; Housing, Economic and Livelihood Activities; Cultural Heritage).

4.2 Methodology of Study

A multi-disciplinary approach was employed in the acquisition of environmental conditions data of the proposed project area. The environmental condition for the proposed Project was obtained through desktop research, field observation, sampling and measurements as well as laboratory analyses of biological, chemical and physical characteristics of sampled environmental components.

Elements of this approach include literature research, designing and development of field sampling strategy to meet regulatory requirements; confirmation of the sampling design and project locations; pre-mobilization activities (job hazard analysis, sampling equipment/materials calibrations and checks) and mobilization to field; fieldwork implementation, sample collection (including field observations), handling, documentation and storage

protocols and procedures, demobilization from field, transfer of sample custody to the laboratory for analysis. Samples obtained were transferred to Lach Consult Limited at Block D6, small scale Industrial Estate, Fatai-Atere way Matori, Ladipo, Mushinfor onward analysis. The laboratory is an FMEnv accredited laboratory.

4.2.1 Desktop Research

The Desktop and Literature Research was carried out prior to field data gathering campaign to obtain relevant background information on the study area, as well as during report preparation. Basically, baseline data acquisition involved a multidisciplinary approach and was executed within the framework of the FMEnv EIA procedural approach and the approved Terms of Reference.

Desktop research involved a detailed search of relevant textbooks, research publications, articles, previous study reports on the proposed project area. The demographic pattern and wildlife characteristics were also complemented with information acquired from relevant literature. The data generated from this process include maps, demographic data, and meteorological data of the area.

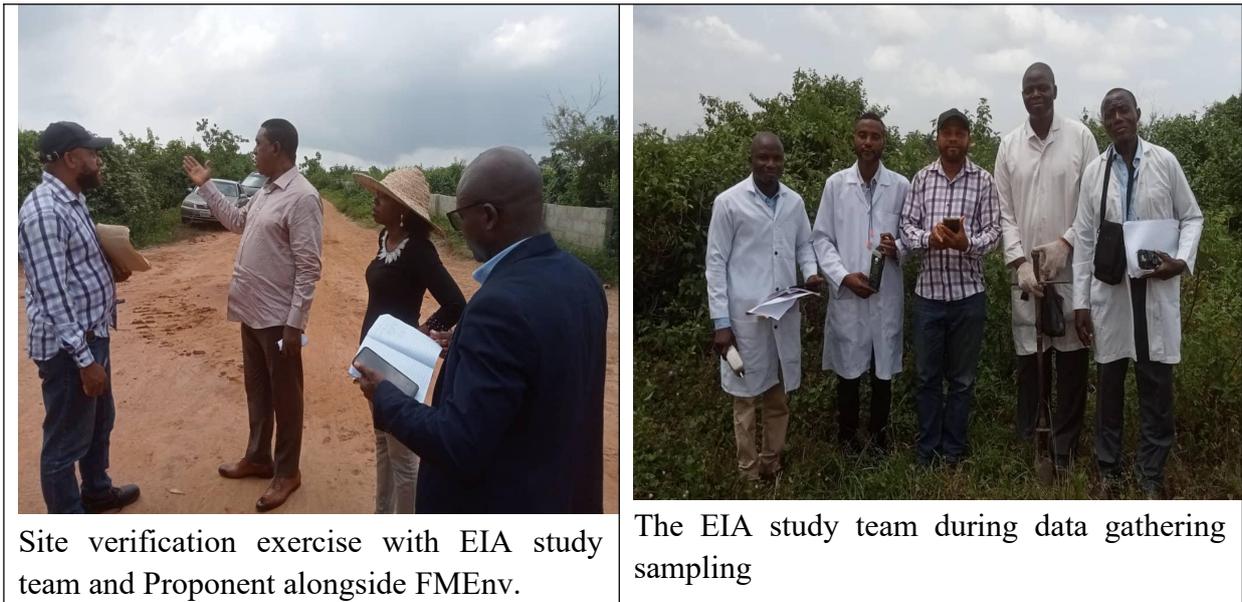
Further research was conducted at the end of the field campaign to compare literature information with generated field data and for additional information on the study area.

Generally, literature research involved consulting relevant textbooks, journals and articles.

4.2.2 Field Survey/Data-Gathering

A field reconnaissance visit and site verification were carried out from *9th-10th November, 2024* to carry out contents of the EIA terms of reference, identifies representatives of the host community that will join the team as local labour and identify options for logistic planning in order to have a hitch-free field campaign while a detailed one (wet) season data-gathering visit was carried out in the project area and host community by the EIA study team on *11th – 12th November, 2024*. The consultation process that has started at this reconnaissance visit was maintained throughout the various phases of the study and project execution.

To effectively characterise the study area, a comprehensive field data gathering exercise was carried out. Sample points obtained during site visit were keyed into hand held Global Positioning System (GPS) device which was used to identify and establish sampling points in the field. Field observations were made and documented in field notebooks. Sampling coordinates logged into the GPS prior to mobilisation were then checked for accuracy using the Google Earth Map.



Site verification exercise with EIA study team and Proponent alongside FMEnv.

The EIA study team during data gathering sampling

Plate 4.1: (left) Site verification team (right) data gathering team

Sample Collection Points

In a bid to capture sufficient environmental data to enable a good impact assessment afterwards, sampling strategic plan based on considerations which include, but not limited to: sampling to obtain baseline data on the specific environment of the study area and sampling strategy that will allow for good coverage of the study area was adopted.

The study team was grouped into separate sub-teams for the various aspects of the field data gathering exercise. The different sub-teams were; (a) Biodiversity (vegetation and wildlife) study team

- (b) Socio-economics/Health Risks study team
- (c) Air Quality and Meteorological Study team,
- (d) Geology and Hydrogeology study team, and
- (e) Water quality and Soil quality sampling/analysis team

Field assistants/guides (local labour) were also engaged to assist the different sub-teams.

Geographical Positioning

Positioning at each 8sampling station during the fieldwork activities was achieved with the aid of *Garmin* Global Positioning System (GPS) V, (model CZ 99052-20). At each sampling station, coordinates at which sampling took place were documented as presented in the Table 4.1 below stating the number of sampling stations, station co-ordinates and sampling requirement at each point based on terms of reference (ToR) approved by the Federal Ministry of Environment (FMEnv). *Sample Distribution Maps of Coordinate Points taken during Sampling at the Project area are attached herein the report.*

Sampling co-ordinates logged into the GPS prior to mobilization were then checked for accuracy using the Google Earth Map. Field observations were made and documented in field notebooks. Also, a number of events were captured using still photographs (details of these are presented in sub-subsequent sections of this chapter).

4.2.3 Laboratory Analysis and Sample Preservation

After the fieldwork exercises, study samples were transported to Lach Consult Limited at Block D6, small scale Industrial Estate, Fatai-Atere way Matori, Ladipo, Mushin, Lagos State, accredited by FMEnv, for necessary and adequate analyses. Samples were analyzed using APHA Standard analytical methods. The synoptic descriptions of the laboratory analytical methods and procedures employed for the various physical, chemical and biological parameters as well as the detection limits of these parameters are documented in this report. Also documented are synopsis of the QHSE plan adopted in both field data collection and laboratory analysis. Laboratory analysis was generally in line with international American Society for Testing and Material (ASTM) and American Public Health Association (APHA) as well as FMEnv Standard protocols.

Quality Assurance and Quality Control (QC) Measures

The integrity of ecological baseline data is significantly dependent on the quality control and assurance measures put in place and implemented by resource persons involved in carrying out the representative field data sampling and laboratory/statistical analysis of the samples. All field sampling methods and procedures followed international standards and as stipulated by the environmental regulatory body (*Federal Ministry of Environment*).

During Fieldwork, Specific mechanisms of QC adopted include:

- Establishment of a station numbering system and pre-labelling of all samples holding containers, prior commencement of field work
- Design and use of appropriate fieldwork recording forms
- Establishing criteria for accuracy of positioning requirements
- Duplicate samples: one duplicate sample was taken for each of the field.
- Calibration of field equipment: All field equipment (except for new ones) were calibrated at the beginning of the measurements (initial calibration)
- Daily meeting was held at each day to assess progress and performance (in the morning prior to work commencement and in the evening at the completion of each day's work).
- Chain of custody document was prepared for each sample starting from the field to final analyses in the laboratory.
- The use of trained personnel at all phases of the study;
- Written analytical standard operating procedures were followed during analyses and
- Routine auditing and checking of analyses results, including control solutions and midpoint standards, were introduced into every batch or ten samples as applicable.

4.3 Physical Environmental Characteristics/Existing Conditions of the Project Area

An overview of the climate and meteorological data (relative humidity, ambient air temperature, rainfall and wind speed/ directions); Air Quality; Noise; Geology; Hydrogeology and Groundwater of the study area are herein presented.

4.3.1 Climate and Meteorology

The climatic/meteorological features (rainfall, ambient temperature, humidity, wind direction/speed and sunshine) of the area presented in this report are based primarily on information from obtained from literature research. The study area is situated within the humid semi-hot equatorial climatic region. Generally, Nigeria's climate is characterized by the hot and wet conditions associated with the movement of the Inter-Tropical Convergence Zone (ITCZ) north and south of the equator. When the ITCZ is to the south of the equator, the dry north-east winds prevail producing the dry-season condition and when it is to the north, the south westerly winds prevail to bring rainfall and the rainy (wet) season thus giving the proposed project area two distinct annual seasons: the dry season from November to March and wet season from April to October.

Climate is hot and humid with temperatures averaging 27°C (80° F) most of the year. The rainfall averages 1000mm per annum. Figure 1 shows the climate variable around the project area and Figure 2 shows the climatic graph of Lagos that shares the same border with Ogun State. The information was obtained over ten years by the meteorological department.

Climate Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max Temperature °C (°F)	32 (90)	33 (92)	33 (91)	32 (90)	31 (88)	29 (85)	28 (83)	28 (83)	29 (84)	30 (87)	31 (88)	32 (90)	31 (87)
Average Temperature °C (°F)	27 (81)	28 (83)	29 (83)	28 (82)	27 (81)	26 (78)	25 (77)	25 (77)	26 (78)	26 (79)	27 (81)	27 (81)	27 (80)
Average Min Temperature °C (°F)	22 (72)	24 (75)	24 (75)	24 (75)	23 (74)	22 (71)	22 (72)	22 (71)	22 (72)	22 (72)	23 (73)	23 (73)	23 (73)
Average Precipitation mm (In)	13 (1)	41 (2)	84 (3)	146 (6)	202 (8)	316 (12)	243 (10)	122 (5)	160 (6)	125 (5)	40 (2)	15 (1)	1507 (59)
Number of Wet Days (probability of rain on a day %)	2 (6)	3 (11)	7 (23)	9 (30)	14 (45)	20 (67)	15 (48)	11 (35)	16 (53)	15 (48)	7 (23)	2 (6)	121 (33)
Average Sunlight Hours/ Day	5h 54'	6h 43'	6h 23'	6h 12'	5h 36'	4h 00'	3h 00'	3h 00'	3h 06'	4h 54'	6h 36'	6h 36'	5h 09'
Average Daylight Hours/ Day	11h 46'	11h 54'	12h 04'	12h 15'	12h 24'	12h 29'	12h 27'	12h 19'	12h 09'	11h 57'	11h 48'	11h 44'	12h 00'
Percentage of Sunny (Cloudy) Daylight Hours	51 (49)	57 (43)	53 (47)	51 (49)	46 (54)	32 (68)	24 (76)	25 (75)	26 (74)	41 (59)	56 (44)	57 (43)	43 (57)
Sun altitude at solar noon on the 21st day (°)	63.4	72.6	83.5	84.7	76.3	73.1	76.1	84.5	83.8	72.2	63.2	60	74.6

Figure 4.1: Climate variable of Agbara area of Ogun State.

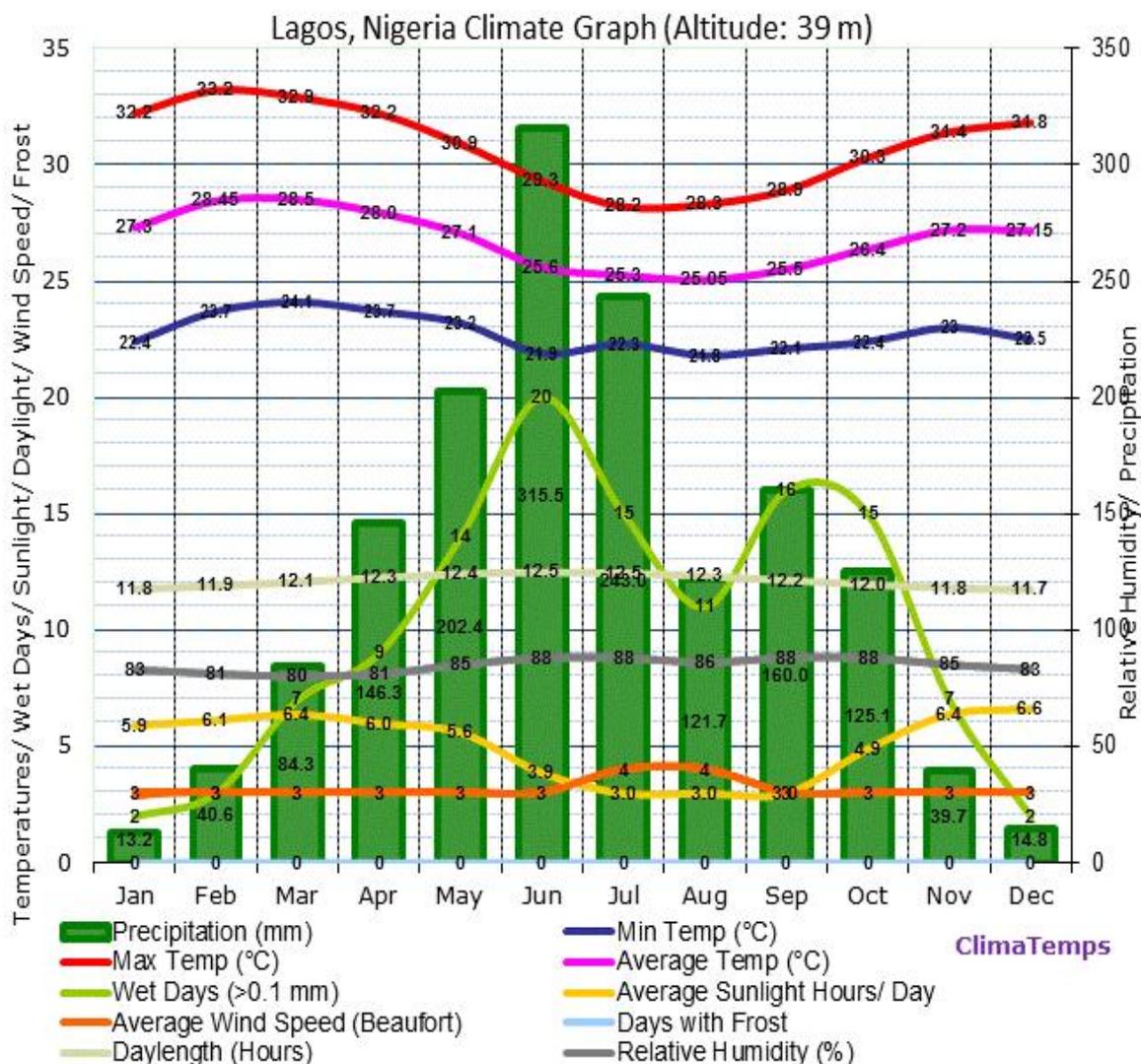


Figure 2: Climate Graph of project area (Altitude 439 m) (Source: www.climatetemp.com)

- The average temperature is 26.8 degrees Celsius (80.2 degrees Fahrenheit). Average monthly temperatures vary by 3.45 °C (6.2°F). This indicates that the continentality type is hyperoceanic, subtype truly hyperoceanic.
- Total annual Precipitation averages 1506.6 mm (59.3 inches) which is equivalent to 1506.6 Litres/m² (36.95 Gallons/ft²).
- On average there are 1885 hours of sunshine per year. Visit the sunshine and daylight section to check monthly details including how high in the sky the sun reaches each month.

4.3.1.1 Micro – Climatic Studies

In addition to meteorological data obtained from literature, meteorological parameters such as, wind speed, wind direction, humidity, atmospheric pressure, and temperature were observed during the fieldwork in both reasons and results are presented in Table 4.1. Obtained field results correspond to that reported in literature and seasonal variability is related the climatic conditions of the study area.

Table 4.1: Meteorological data obtained during Field Work at Project site

S/N	Sample Location	Temp (°C)	Dew Point (°C)	Wet Bulb (°C)	Relative Humidity (%RH)	Atmospheric Pressure (HPA)	Wind Speed (M/S)
1.	Point 1	31.8	21.0	23.7	62.0	1012	1.4
2.	Point 2	34.9	21.6	24.9	70.2	1003	0.6
3.	Point 3	30.9	22.4	22.7	61.1	1013	1.2
4.	Point 4	35.0	21.3	24.5	62.4	1001	0.8
5.	Point 5	32.6	22.1	22.9	65.3	1030	0.6
6.	Point 6	31.2	22.4	27.1	66.2	1010	1.1
7.	Point 7	30.0	21.5	22.3	67.5	1013	1.4
8.	Point 8	30.0	22.0	23.1	59.3	1018	1.2
9.	Point 9	30.7	21.9	26.8	62.2	1008	1.1
10.	Point 10	33.5	23.1	27.9	60.7	1001	0.8
11.	Point 11	29.9	21.9	28.8	68.1	1005	0.4
12.	Point 12	30.0	20.6	22.7	75.7	1012	1.4

Source: Fieldwork 2024

4.3.2 Air Quality and Noise Level of the Proposed Project Area

Methodology:

The atmosphere is a layer of gases that is held in its place by gravity. These layers of gases constitute what is known as air. Air is a mixture of gases, composed mainly of nitrogen, and oxygen with small amounts of carbon dioxide, noble gases and water vapour essential to support life on earth. The introduction into air any chemical, physical or biological agent in quantities large enough to produce harmful effects to man and its surrounding is a call for concern. The concentration of air pollutants depends not only on the quantities that are emitted from air pollution sources but also on the ability of the atmosphere to either absorb or disperse these emissions. The sources of air pollutants include vehicles, industries, domestic sources and natural sources. Because of the presence of high amount of air pollutants in the ambient air, the health of the population and property is getting adversely affected.

Sampling and measurement of ambient air quality and noise level were carried out using portable analyzers. Gaseous components of the air were measured using multi-gas analyzers (Industrial Scientific iTX gas analyzer) to measure the concentration of carbon monoxide (CO), carbon dioxide (CO₂), Sulphur dioxide (SO₂), oxygen, hydrogen sulphide (H₂S) and hydrocarbon content. Battery operated particulate matter (Handheld Kanomax Laser Particle counter, Model 3887) was used for the measurement of suspended particulate matter. Extech Environment meter was used to measure the noise level, temperature and humidity within and around the area.

This equipment was calibrated and a sensor connected to the equipment, the equipment was held at arm's length towards the direction of the prevailing wind at every point. The value of

the atmospheric concentrations of each gaseous pollutant was read off directly on the equipment screen after 5 – 10 minutes.

The equipments were switched on and exposed to the atmosphere for about 5 minutes the result obtained was read off from the meter and recorded in a field note book.

The Ambient Air Quality Study was collected from Ten (10) sample-distribution points and Two (2) controls. Noise level was also monitored, from same sample points

The air quality and noise level values gotten onsite during study are presented in Table 4.2 below.



Plate 4.2: Air Quality and Noise Assessment at project area

Table 4.2: Result of air quality measurement and noise level at the project sites (wet season)

S/N	PARAMETER LOCATION	CH ₄ µg /m ³	CO µg /m ³	H ₂ S µg /m ³	O ₂ %	SO _x µg /m ³	NO ₂ µg /m ³	VOC µg /m ³	CO ₂ v/%	SPM µg /m ³		RH %	AIR FLOW m/s	TEMP O°	NOISE dBA	GPS LOCATION	ELEV (m)
										0.5	1.0						
1.	SS1/AQ1	1.30	0.00	0.00	20.9	0.00	0.01	0.00	0.010	19.7	61.0	61.0	0.10	31.8	49.7	N6 031.7942 E3°6.4384	14
2.	SS2/AQ2	1.320	0.00	0.00	20.9	0.001	0.02	0.01	0.015	17.8	39.7	74.5	1.80	31.0	52.5	N6 031.8154 E3°6.4714	32
3.	SS3/AQ3	1.80	ND	ND	20.9	0.010	0.01	0.01	0.013	181	69	78.3	2.30	30.4	41.1	N6 031.8254 E3°6.4880	61
4.	SS4/AQ4	0.15	ND	0.00	20.9	0.012	0.00	ND	0.010	101	72	75.8	1.10	31.3	48.3	N6 031.8689 E3°6.4825	33
5.	SS5/AQ5	0.011	ND	0.00	20.9	0.008	0.001	ND	0.012	38	20	72.1	0.30	30.5	41.8	N6 031.8411 E3°6.4442	67
6.	SS6/AQ6	0.05	ND	0.00	20.9	0.003	0.012	ND	0.006	85	48.0	75.6	1.50	31.0	43.6	N6 031.9201 E3°6.4910	40
7	SS7/AQ7	0.01	ND	0.00	20.9	0.011	0.008	ND	0.003	95	52	70.8	0.10	31.3	45.0	N6 031.7844 E3°6.4871	66
8.	SS8/AQ8	0.02	ND	0.01	20.9	0.013	0.02	ND	0.001	72	43.0	69.8	0.01	30.5	43.9	N6 031.7910 E3°6.5287	48
9.	SS9/AQ9	0.01	ND	0.02	20.9	0.011	0.015	ND	0.002	55.0	36.0	70.5	0.02	30.1	41.6	N6 031.7725 E3°6.5789	52
10	SS10/AQ10	0.03	ND	0.05	20.9	0.002	0.018	ND	0.013	62.0	45.0	71.8	0.16	30.9	40.3	N6 031.7507 E3°6.4531	31
11	CONTROL1	0.010	ND	0.02	20.9	0.001	0.013	ND	0.016	78.0	66.1	70.1	1.0	31.0	42.2	N6 031.9533 E3°6.4082	34
12	CONTROL 2 FMEnv	0.03	ND 11.4	0.05	20.9	0.013 26	0.010 75	ND 50	0.015	73.0 250	55.3	72.0	1.3	30.8 >40	45.6 90	N6 032.0533 E3°6.2783	15

Source: Fieldwork, 2024

Table 4.2.1: Concentration of trace gases in the project area (Dry Season)

LOCATION Code	SO ₂ , ppm	NO ₂ , ppm	CO, ppm	H ₂ S, ppm	CO ₂ , %	O ₂ , %	NMHC, ppm
01	<0.1	<0.1	<1.0	<0.1	2.34	21.0	<1.0
02	0.2	0.75	4.0	<0.1	2.33	21.0	<1.0
03	<0.1	<0.1	<1.0	<0.1	2.76	21.0	<1.0
04	<0.1	<0.1	<1.0	<0.1	3.01	21.0	<1.0
05	<0.1	<0.1	<1.0	<0.1	1.69	20.3	<1.0
06	<0.1	<0.1	<1.0	<0.1	3.45	20.3	<1.0
07	<0.1	<0.1	<1.0	<0.1	2.26	21.0	<1.0
08	<0.1	<0.1	<1.0	<0.1	2.65	21.0	<1.0
09	<0.1	<0.1	<1.0	<0.1	2.07	21.0	<1.0
10	<0.1	0.03	2.0	<0.1	1.89	21.0	<1.0
11	<0.1	<0.1	<1.0	<0.1	1.80	21.0	<1.0
12	<0.1	<0.1	<1.0	<0.1	2.73	21.0	<1.0
13	<0.1	<0.1	<1.0	<0.1	2.10	21.0	<1.0
14	<0.1	<0.1	<1.0	<0.1	2.07	21.0	<1.0
15	<0.1	<0.1	<1.0	<0.1	2.23	21.0	<1.0
16	<0.1	<0.1	<1.0	<0.1	2.01	21.0	<1.0
17	<0.1	<0.1	<1.0	<0.1	2.30	21.0	<1.0

(Referenced)

Result-Table Discussions:

Suspended Particulate Matter

This is the term for a mixture of solid particles and liquid droplets found in the air. Suspended particulate matter determination values ranged between 20-181 $\mu\text{g}/\text{m}^3$. These generally fall below the FMEnv maximum of 250 $\mu\text{g}/\text{m}^3$. The lower SPM values could be attributed to higher condensation capacity of the prevailing weather and the cleansing effect of the atmosphere by the rain.

Carbon monoxide (CO)

CO is a colourless, odourless gas emitted from combustion processes. In urban areas, the majority of CO emissions to ambient air come from mobile sources. CO can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues (asphyxiation). At extremely high levels, CO can cause death. In the study area, all CO readings were below detection limit < 1.0 far less than the FMEnv limit.

Carbon dioxide (CO₂)

Carbon dioxide (CO₂) measured in all sample stations ranged between 0.001-0.016.

Oxides of Nitrogen (NO_x)

NO_x is the group formula for nitric oxide (NO) and nitrogen dioxide (NO₂). Nitrogen dioxide is the main toxic component in the air; it could be released directly from combustion points

or arises as the oxidation product of nitric oxide which is a less harmful species. NO₂ forms

quickly from emissions from cars, trucks and buses, and off-road equipment. In addition to contributing to the formation of ground-level ozone, and fine particle pollution, NO₂ is linked with a number of adverse effects on the respiratory system. The value for NO₂ at the study area was below detection limit of < 1.0 which is far less than the FMEnv limit.

Hydrogen Sulphide (H₂S)

Hydrogen sulphide (H₂S) is a toxic, odorous and corrosive gas, which is rapidly oxidized to SO₂ in the atmospheres. It causes eye irritation in humans and odour annoyance. Exposure to concentrations in excess of 500 ppm can be fatal (SIEP, 1995). The concentration of H₂S in the study area gives an < 1.0 .

Oxides of Sulphur

SO_x are the group formula for SO₂, SO₃ and SO₄ which usually occur as both primary and secondary air pollutants, industry, volcanoes and the oceans emit these species as primary pollutants. In addition, biological decay processes and some industrial sources emit H₂S which is oxidized to form the secondary pollutant, SO₂. The combustion of

fossil fuels containing sulphur yields SO₂ in direct proportion to the sulphur content of the fuel. Sulphur dioxide (SO₂) measured in all sample stations gives an average of < 0.1 which is within FMEnv regulatory limits.

Generally, recorded measurements indicated that the ambient air was free from pollution by these measured parameters as at the time of study as well as compared well with national limits for air quality standards.

Noise

Noise is an unwanted sound, considered as an environmental pollutant, a waste product generated in conjunction with various anthropogenic activities. Noise is any sound, independent of loudness, that can produce an undesirable physiological or psychological effect in an individual and that may interfere with the social end, such as communication, work, rest, recreation and sleep of an individual or group.

The results obtained from field sampling in the study area show that the ambient noise within the proposed site varied between 41.1 and 52.5 dB (A). Sources for noise generation were mainly vehicular and human activities. Equipment that will be deployed at various stages of project implementation will add to the sources of missions and noise during operation. It is necessary to ensure that the cumulative pollutant levels from these operations do not exceed FME_{env} limit. Where regulatory limits are exceeded, necessary steps must be taken to abate such during construction period. Environmental impacts arise through the exposure to pollutants in the ambient air. Concentration limits set by regulatory bodies are the key to protecting human health, and that of flora and fauna.

4.3.3 Hydrogeological Studies of the Project Area

Methodology

Geological Reconnaissance:

The geological reconnaissance involves obtaining information about the site and its environs by visual observations and sampling of soil. The observations made include landforms, drainage pattern, surface and near-surface water availability, soil texture and colours.

Resistivity Method Statement:

The electrical resistivity method is premised on the ability of rocks to conduct electric current, that is, the physical property of interest is the conductivity of the Earth material. Thus, the enormous variation in electrical conductivity found in different rocks (earth materials) makes the technique possible. (Telford *et. al.*, 2004).

The method employs the introduction of artificially generated electric currents into the ground and measurement of the resulting potential difference at the surface (Keary *et. al.*, 2004) and is used in study of Horizontal and Vertical discontinuities in the electrical properties of the ground. Therefore, the applications of the method used in this exercise is Vertical Electrical Sounding.

Materials used:

PASI 16GL Earth Resistivity Meter, Garmin GPS, Cables for spreading, Hand, Hammers, Stainless Steel Electrodes, Measuring tapes, Geological Map, Recording materials

The project site-Agbara- is located within the western Nigerian coastal zone, a zone of coastal creeks and lagoons (Pugh 1954; longe *et al*, 1987) developed barrier beaches associated with sand deposition (Hill and Webb 1958). Agbara / Igbesa area lies within the Eastern portion of Dahomey (Benin) basin, which extends into Ogun State (South West

Nigeria). Particularly, The Dahomey Basin is partially separated from the Niger-Delta and the Eastern Nigeria Sedimentary Basin by a Ridge of crystalline rocks. (Kogbe, 1974). The sediment of the basin vary significantly in lithology and texture.

The vertical Electrical Sounding (VES) data of the area shows that the area is stratigraphically made up of 5 geoelectric layers :

- 1st& 2nd layer – made up of Sandy Ferruginous top soil (Reddish clay)
- 3rd layer – Clayey units / soil
- 4th layer – Sandy aquifers
- 5th layer – Grayish Dark clay.

The grain size analysis of borehole sediment samples in the project / Factory Complex.

Information on the hydrogeology of this area showed that the water table commences from about 12 - 15 meters depth; but discontinuous, according to the strata and electrical log reports of previous studies in the vicinity. The data on the two boreholes at the project site also corroborate this assertion. The thick clay units within the area form a protective layer for the deep aquifer system .

Report of hydrogeological information on the site

The ground water is slightly acidic (pH 5.0 – 6.4), fresh and of low conductivity. The result of the pollution indices obtained from previous studies were quite low therefore indicative of groundwater from the tropical zone is low concentration of industrial pollution. The slightly high level of Fe (1.2 – 7.28mg/L) in the ground water is a reflection of the ferruginous nature of the sedimentary material.

The Vertical Electrical Sounding (VES) data of the area shows that the area is stratigraphically made up of five geoelectric layers. The first two layers are made up of Sandy Ferruginous top soils which are Reddish / Brownish in colour.

4.3.4 Surface Water Quality Assessment

Water quality monitoring studies are centered mainly on physico-chemical, and biological analysis of water samples. For the assessment and analysis of the surface water in the project area, samples were collected from the water body present in the location. Three (3) Surface Water (SW) samples were collected from the Stream around the study area about 6km away from the proposed project site).

In-situ measurements were taken for all water samples collected to determine Total Dissolved Solid (TDS), Conductivity, Temperature and Salinity with appropriate and standard probes. These samples transported to *Lach Consult Laboratories Limited* for physico-chemical analysis in compliance to the Federal Ministry of Environment (FMEnv) Water Quality Standards. Separate samples were collected for analysis of physicochemical parameters, heavy metals, and microbiological parameters. Samples for the determination of physico-chemical parameters were collected into plastic bottles after rinsing with portion of the water samples to be collected. The sample containers were well corked and placed in ice chest for

transportation to the laboratory. The result of analysis carried out on the sample, while in the same condition as submitted is presented in Table 4.3 below:



Plate 4.3: Surface Water Sampling and In-Situ Analysis Onsite

Table 4.3: Result of Analysis of Surface water Samples

PARAMETER/UNIT	METHOD	UP stream	Midstream	Downstream	FMEnv.	NESREA
Coordinate	GPS	8.467305	8.46741666	8.468259	-	-
		6.942131	6.94138333	6.939895	-	-
		105	114	120	-	
Appearance	SENSORY	Turbid water with Particles	Turbid water with Particles	Turbid water with Particles	Colourless	Colourless and odourless
Odour	SENSORY	Objectionable	Objectionable	Objectionable	Unobjectionable	Not objectionable
pH @ 30.2°C	-	5.7	5.62	5.71	6-9	6-9
Temperature, °C	-	32.4	32.7	32.7	Ambient	
Conductivity, µS/cm	APHA 2510-B	144	142	144.5	2000	
Electrode Potential, Mv	-	-072	-061	-104	-	
Colour, Pt-Co	APHA 2120-C	650	590	496	7.0	
Turbidity, NTU	APHA 2130-B	< 2	< 2	< 2	10	
Total Solids, mg/L	APHA 2540-B	155	227	223	-	
Total Dissolved Solids, mg/L	APHA 2540-D	178	127	176	1000	
Total Suspended Solids, mg/L	APHA 2540-C	126	200	196	30	-
Total Hardness, mg/L	APHA 2340-C	48	50	64	-	
Total Alkalinity, mg/L	APHA 2320-B	186	192	212	-	
Total acidity, mg/L	APHA 2310-B	38.6	43.5	34.7	-	
Calcium, mg/L as Ca	APHA 3500-B	18	19.8	24.4	-	
Magnesium, mg/L as Mg	APHA 3500-B	0.73	0.12	0.49	-	
Chloride, mg/L	APHA 4500-B	87.0	86.9	84.3	200	100
Nitrate, mg/L	4500-NO ₃ ⁻ B	0.2	0.12	0.13	50	
Nitrite, mg/L	4500-NO ₂ ⁻ B	0.04	0.07	0.05	0.3	

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Sulphate, mg/L	APHA 4500-E	72	70	76	250	100
Phosphate, mg/L	APHA 4500-C	8.9	11.8	14.2	-	-
Iron (total), mg/L	APHA 3500-B	0.77	0.95	0.86	20	2.0
Lead, mg/L	3500 -Pb-B	<0.01	0.02	0.01	<1.0	0.1
Copper, mg/L	3500 -Cu-B	<0.01	<0.01	<0.01	<1.0	1.0
Manganese, mg/L	3500 -Mn-B	<0.01	<0.01	<0.01	0.10	1.0
Cadmium, mg/L	3500 -Cd-B	<0.01	<0.01	<0.01	<1.0	0.1
Nickel, mg/L	3500 -Ni-B	<0.01	<0.01	<0.01	<1.0	0.1
Cobalt, mg/L	3500 -Co-B	<0.01	<0.01	<0.01	<1.0	0.5
Arsenic, mg/L	3500 -As-B	<0.001	<0.001	<0.001	<1.0	0.1
Chemical Oxygen Demand, mg/L	APHA 5220-D	11.2	13.7	12.3	80	40
Biochemical Oxygen Demand, mg/L	APHA 5210-B	4.8	5.5	5.1	30	20
Dissolved Oxygen, mg/L	APHA 4500-G	14.8	14.2	15.3	>2.0	>2.0
Oil & grease, mg/L	APHA 5520-B	<0.1	<0.1	0.5	10	10
Total coliform count, MPN/mL	APHA 9225-D	1.2 x 10 ²	72	2.0 x 10 ²	10 ²	
Faecal coliform (E. coli), CFU/100mL	APHA 9222-D	Nil	20	16	-	0
Total plate count, CFU/mL	APHA 9215-B	3.6 x 10 ³	Too numerous	5.4 x 10 ³	10 ⁴	10

Source: Diskol Environmental Consulting Limited, 2024

Result Discussion:

Physico-Chemical Characteristics

Colour: The appearance of colour in water is caused by the absorption of certain wavelengths of normal white light by dissolved or colloiddally dispersed substances. The appearance of colour in the water sample may be due to the presence of coloured organic substances originating in the decay or aqueous extraction of natural vegetation, such as in soil runoff, erosion; the presence of metals such as iron, manganese and copper, which are abundant in nature, are weathered from rock as have been similarly reported (Black *et al.*, 1963). The obtained true colour units (TCU) of water samples are within the aesthetic objective for colour has therefore been set at ≤ 15 TCU (APHA, 1998). For domestic consumption water should be free from colour, odour and its taste should be agreeable. Surface water sample in the project area was generally turbid with Particles.

pH:

Insitu measurement of pH values in the sampled surface water indicates that the level of pH in the sampled water ranges from 5.62 to 5.71. The recorded values were below Standard (*FMEnv*) limit.

Temperature:

Insitu measurement of temperature values ranges between 32.4 and 32.7⁰C for all surface water samples. The recorded values were within Standard (*FMEnv*) limit.

Turbidity:

The surface water samples were not turbid < 2 NTU. This low turbidity accounts for visibility of the stream bed from the surface. It helped the transmission of light rays of the sun and hence supports the bottom dwelling phytoplankton. The recorded values were below Standard (*FMEnv*) limit.

Electrical Conductivity:

Electrical conductivity refers to the specific electrical conductance of water i.e. the ability of water to pass electric current. The conductivity of water in $\mu\text{S}/\text{cm}$ is roughly proportional to the concentration of dissolved solids (mostly inorganic salts) it contains. Thus, conductivity is important in ecology and environmental management as an indicator of the total dissolved inorganic salts and other solids in water. The electrical conductivity of the water sample ranged from 142 to 142.5 $\mu\text{S}/\text{cm}$. The high values of electrical conductivity may be attributed to the presence of rocky materials.

Dissolved Oxygen (DO):

DO level, from sample analysis, of the surface water ranges from 14.2 to 15.3 mg/L. The value-result are above Standard (*FMEnv*) limit.

Total Dissolved Solids:

TDS level in the surface water samples ranges between 27.00 mg/L and 29.00mg/L. The recorded values were within Standard (*FMEnv*) limit.

Total Suspended Solids:

TSS level in the surface water samples was between 127mg/L - 178mg/L. The obtained levels of TSS may have resulted from presence of silt and other suspended materials observed in the water body.

Biochemical Oxygen Demand (BOD):

The BOD level in the surface water samples was between 4.8 mg/L to 5.5 mg/L. The recorded values were within Standard (*FME_{env}*) limit.

Chemical Oxygen Demand (COD):

COD level in the surface water samples were between 11.2 mg/L to 13.7 mg/L.

Nutrients:

Nitrates, Nitrites, Sulphates and Phosphates are important plant nutrients in water. The ionic forms (NO_3^- , NO_2^- , SO_4^{2-} and PO_4^{2-}) are the utilisable forms of nitrogen, sulphur and phosphorous which are key elements in plant growth. Moreover, higher conductivity will result from the presence of various ions including nitrate, phosphate, and sodium. During water-quality sampling at the project area, the concentrations of Nitrite, Nitrate, Phosphate and Sulphate in the water sample were ranged from 0.04 to 0.07mg/L; 0.2 to 0.12mg/L; 8.9 to 14.2mg/L; and 70 to 76mg/L respectively.

Total Hardness (Carbonate and Bicarbonate):

The Total Hardness of the surface water samples was between 40 mg/L to 50mg/L. The high level of total hardness is an indication of the presence of rocky materials in the study area and that the problem of scale formation in facilities may be an issue of concern. Obtained total hardness values are below regulatory limits of 500mg/L (DPR, 2002).

Total Alkalinity

The Total Alkalinity of the surface water samples was between 186 mg/L to 212 mg/L.

Total Acidity

The Total Acidity of the surface water samples was between 34.7 mg/L to 43.5 mg/L.

Exchangeable Cations:

Magnesium (Mg), Chloride (Cl), and calcium (Ca) were the exchangeable cations determined. The concentrations of the cations measured in surface water samples ranged from 0.12 – 0.73 mg/L; 84.3 – 87.0 mg/L; and -18 to -24.4 mg/L for Mg, Cl and Ca respectively.

Heavy Metals:

Heavy metals analysed for in the surface water samples from the area were Cobalt (Co), Arsenic (As), Iron (Fe), Manganese (Mn), Nickel (Ni), lead (Pb), copper (Cu), and Cadmium (Cd). The availability of trace metals in water are controlled by physical and chemical interactions. These interactions are affected by factors like pH, redox potential, temperature, CO_2 level, the type and concentration of available ligands and chelating agents, as well as type and concentrations of the metal ions. Trace or heavy metals in environmental

perspective have potential of bio-accumulation and bio-concentration in aquatic organisms. Severe effects of heavy metal contamination include reduced growth and development, cancer, organ damage, nervous system damage, and in extreme cases, death. Exposure to some metals, such as mercury and lead, may also cause development of autoimmunity, in which a person's immune system attacks its own cells.

The results of analysis of the concentrations of heavy metals in the surface water are: Fe (0.77 - 0.95mg/L); Lead (<0.01–0.2); Copper (<0.01mg/L); Manganese (<0.01mg/L), Cobalt (<0.01mg/L); Arsenic (<0.001mg/L), Nickel (<0.01mg/L); and Cadmium (<0.01mg/L).

Microbiological Characteristics of the Sampled Surface Water:

Analysis result of surface water samples collected from the sampling stations indicated that the Total Coliform Counts ranged from 1.2×10^2 to 72 MPN/mL; Total Plate Counts ranged from 3.6×10^3 to 5.4×10^3 CFU/mL and Fecal Coliform count from Nil to 20 CFU/100mL respectively.

The microbiological analysis carried out on the water samples show presence of pathogenic bacteria in the water samples. All strains of pathogenic bacteria recorded some values, thus indicating the presence of some disease-causing agents in the water samples.

The analyst's comment indicates the aesthetic quality and microbiological quality of the samples differ from the standard.

4.3.5 Groundwater Quality Assessment

Ground water quality assessment was undertaken to define the nature and scale of potential environmental impacts associated with the project specifically in terms of the effects near sensitive receivers in accordance with the requirements of the Study. Both construction and operational phase impacts have been assessed and mitigation measures will be identified to reduce any residual impacts to acceptable levels.

One (1) ground water sample was taken from borehole at the nearest facility to the Proposed Project Site and surrounding community. The sample was tested for Insitu field analysis measurements of pH, conductivity, Total Dissolved Solids (TDS), Total Salinity, Dissolved Oxygen (DO) and temperature were taken using handheld in situ water sampling metres at the sampling location. Samples for the determination of physico-chemical parameters were collected into plastic bottles after rinsing with portion of the water samples to be collected. The sample containers were well corked and placed in ice chest for transportation to the FMEnv accredited laboratory.

The sample-analysis and lab result for the ground water quality in the study as expressed in values of measured parameters is *as follows*, pH 5.27 – 8.1, EC 078 - 140us/cm, TDS 045.0 – 112ppm, Temp. 25.6 – 27°C. etc.

However, summary of the result analysis shows that the good water quality of the groundwater in the study area may stem from the fact that soil is a natural filter where processes such as filtration, adsorption, biodegradation, ion exchange and dispersion may reduce concentration of contaminants.

Table 4.3.1: Physical, chemical and microbial examination of water samples (Wet season)

PARAMETER/UNIT	HBH1	HBH2	HBH3	HBH4	HWW	HSW
Appearance	Clear and colourless water					Brown water with particles
Odour	Unobjectionable					Unobjectionable
Taste	Unobjectionable					
pH @30.3 °C	6.10	6.90	6.88	7.40	7.20	8.40
Temperature, °C	27.6	27.5	27.8	28.9	28.0	27.8
Conductivity, µS/cm	79.9	78.8	52.1	131	144	110
Electrode Potential, mV	41	62	38	38	55	40
Colour, Pt-Co	<1	<1	<1.0	<1	<1	12
Turbidity, NTU	<1	<1	<1.0	<1	<1	16
Total Solids, mg/L	37.8	32.5	23.1	110	71.1	123
Total Dissolved solids, mg/L	75.1	61.1	41.0	110	69.9	48.2
Total Suspended Solids, mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	8.2
Total Hardness, mg/L CaCO ₃	9.0	14.0	12.0	11.5	16.0	18.0
Total Alkalinity, mg/L	6.9	8.80	7.90	14.2	5.83	16.8
Total acidity, mg/L	27.9	10.0	12.5	13.1	12.0	10.5
Calcium, mg/L as Ca	<0.1	1.84	0.47	2.94	3.88	3.10
Magnesium, mg/L as Mg	1.72	1.66	0.42	0.54	1.25	2.05
Chloride, mg/L	20.9	12.5	18.4	13.5	24.0	22.8
Residual chlorine, mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Fluoride, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, mg/L	0.84	0.77	1.10	<0.01	0.94	0.71
Nitrite, mg/L	0.09	0.10	0.12	<0.01	0.14	0.30
Sulphate, mg/L	4.10	4.00	5.80	18.0	28.0	14.2
Phosphate, mg/L	<0.1	<0.1	<0.1	0.3	<0.1	2.43
Free carbon dioxide, mg/L	52.4	42.1	22.01	112	32.9	110
Iron (total), mg/L	<0.01	1.50	<0.01	<0.01	<0.01	0.64
Lead, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.02

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Arsenic, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hydrogen Sulphide, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.64
Dissolved oxygen, mg/L	5.40	4.50	4.11	0.01	5.30	3.52
Biochemical oxygen demand, mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.55
COD, mg/L	1.0	1.0	<1.0	<1.0	1.0	0.59

HBH1 = Borehole 1

HBH2 = Borehole 2

HBH3 = Ground water (at the site opposite New Dawn Gardens)

HBH4 = Ground water (Ihunsa community)

HWW = Ground water (Igere community)

Microbiology							
PARAMETER (CFU/100mL)	HBH1	HBH2	HBH3	HBH4	HWW	HSW	NIS554: 2007
Total coliform count	0	0	0	0	0	40	10
Faecal coliform (E.coli)	0	0	0	0	0	12	Nil
<i>Clostridium perfringens</i> ,	0	0	0	0	0	0	Nil
<i>Salmonella/Shigella sp.</i>	0	0	0	0	0	0	Nil
<i>Staphylococcus sp.</i>	0	0	0	0	0	0	Nil
<i>Pseudomonas aureus</i>	0	0	0	0	0	0	Nil
<i>Total plate count,</i>	2	2	2	2	2	3.6 x 10 ²	10 ²

Physical, chemical and microbial examination of water samples (Dry season)

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PARAMETER/UNIT	HBH1	HBH2	HBH3	HBH4	HWW	HSW
Appearance	Clear and colourless water					Brown water with particles
Odour	Unobjectionable					Unobjectionable
Taste	Unobjectionable					
pH @30.3 °C	5.36	5.84	5.43	6.40	5.27	6.10
Temperature, °C	27.6	27.6	28.3	27.4	27.4	27.5
Conductivity, µS/cm	74.2	76.1	43.1	244	151.9	79.6
Electrode Potential, mV	34	50	36	-42	63	37
Colour, Pt-Co	<1	<1	<1.0	<1	<1	246
Turbidity, NTU	<1	<1	<1.0	<1	<1	56
Total Solids, mg/L	37.3	37.7	21.5	122	76.1	149.1
Total Dissolved solids, mg/L	37.3	37.7	21.5	122	76.1	40.1
Total Suspended Solids, mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	109
Total Hardness, mg/L CaCO ₃	5.0	12.0	2.0	7.5	14.0	14.0
Total Alkalinity, mg/L	6.7	8.4	6.7	16.2	3.8	18.1
Total acidity, mg/L	87.9	100	3.5	131	147	133
Calcium, mg/L as Ca	<0.1	2	0.40	2.4	3.2	1.60
Magnesium, mg/L as Mg	1.2	1.7	0.2	0.4	1.5	2.43
Chloride, mg/L	30.9	13.8	10.3	15.5	36.1	22.4
Residual chlorine, mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Fluoride, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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Nitrate, mg/L	0.44	0.58	1.15	<0.01	0.62	0.40
Nitrite, mg/L	0.06	0.08	0.10	<0.01	0.09	0.10
Sulphate, mg/L	2.0	4.0	3.0	28.0	33.0	8
Phosphate, mg/L	<0.1	<0.1	<0.1	0.3	<0.1	8.1
Free carbon dioxide, mg/L	77.3	88	3.06	115	129	117
Iron (total), mg/L	<0.01	1.10	<0.01	<0.01	<0.01	0.35
Lead, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.05
Arsenic, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hydrogen Sulphide, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.25
Dissolved oxygen, mg/L	5.49	2.50	4.10	<0.01	3.33	2.08
Biochemical oxygen demand, mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	28
COD, mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

(Referenced)

4.3.6 Soil Studies

The soil type of the proposed site as observed in the field is loamy. In soil science, loam with higher clay content is called heavy loam, and that with less clay is called light loam. A distinction is made between coarse sandy, fine sandy and silty loam, depending on the content of sand grains of the corresponding size and silty or laurite particles.

The flood plains in Ogun State have the hydromorphic soils which contain a mixture of coarse alluvial and colluvial deposits. The alluvial soils along the valleys of the rivers are sandy, while the adjoining laterite soils are deeply weathered and grey or reddish in colour, sticky and permeable.

Generally, the soils in most of the study area are largely loamy and clay soils. Field protocols were carried out to meet the needs of the study and for information that were adequate and suitable for achieving valuable results. Soil Sample stations were established, spreading within different section of the proposed project site, at each sampling station, soil samples were taken at various depth level, the soil samples were bulked together to give a composite sample.

Investigations of the topsoil physical and chemical properties are essential to establish the important factors of water retention in the study area. The study area of is underlain by thick, extensive sand and sandstone deposits which enhance the groundwater resources potential of the area. Soil samples were collected at different locations within the study area, a total of thirty (30) samples were collected at two depth intervals (0 - 15cm of topsoil and 15 - 30cm of subsoil) using a stainless-steel auger. The soil samples were then stored in stainless steel basin, and homogenised before sub-sampling. The sub-soil samples were subsequently stored on ice (below 4°C) and transported to Environmental Laboratories Limited. The sampling locations with latitude and longitude coordinates for all biophysical variables measured are included in the geo-referenced table.

The lab analysis (*Physiochemical and Microbial Characteristics*) of the soil samples, as collected are as presented below in Tables 4.6.



Plate 4.4: Soil Sample collection and analysis at proposed project site

Table 4.4: Physiochemical and Bacteriological Characteristics of Soil Samples at Project site

PARAMETER/UNIT	DTS1	DBS1	DTS2	DBS2	DTS3	DBS3	DTS4	DBS4	DTS5	DBS5	DTS6	DBS6	DTS7	DBS7	DTS8	DBS8
Appearance	Light Brown Solid Substance															
pH (1:1)	5.8	5.4	5.9	5.6	6.5	6.2	6.3	6.2	5.8	5.4	5.6	5.2	5.4	6.3	5.5	6.0
Temperature, °C	28.0	28.5	28.0	27.9	27.5	27.6	27.5	27.9	28.3	28.3	28.0	27.9	28.3	27.5	27.5	27.4
Conductivity (1:1), μS/cm	30	10	30	20	40	30	10	30	10	20	30	10	30	10	20	10
Phosphorous, mg/kg	36.1	49.5	29.2	45.2	59.5	27.1	27.3	52.2	44.9	25.2	27.1	31.9	39	75.5	34.2	52.5
Carbonate, mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bicarbonate, mg/kg	849.4	422.4	419.1	510.6	509.6	510.6	502.1	424.6	335.8	421.6	509.6	846	335.8	340.5	338.8	340.5
Chloride, mg/kg	520.1	258.9	256.9	260.7	260.2	260.7	257.3	260.2	771	516.5	260.2	259.2	513.9	260.7	259.4	260.7
Easily oxidizable carbon, %	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total carbon, %	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Organic matter, %	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite, mg/kg	0.98	1.19	0.66	0.45	0.59	0.39	0.15	0.17	0.74	0.60	0.36	1.44	1.41	0.91	0.24	0.32
Nitrate, mg/kg	0.79	0.80	0.35	0.65	0.32	1.21	0.30	0.31	0.45	0.33	0.68	1.72	1.39	1.15	0.84	0.52
Sulphate, mg/kg	628	868	444	88	299	119	30	150	<1	59	628	868	443.8	87.8	299.4	118.6
Moisture Content, %	0.65	0.50	0.80	0.10	0.55	0.40	0.55	0.35	0.35	0.30	0.30	0.25	0.80	0.25	0.35	0.55
Calcium, mg/kg	139	138	278	139	280	418	491	139	138	140	278	277	120	280	279	280
Magnesium, mg/kg	84.5	83.9	168.8	84.8	<1	84.5	169.8	169.1	84.3	85.4	169.1	84.5	73.1	170	169.7	170.1
Iron, mg/kg	5.54	7.56	4.86	8.34	9.8	2.78	2.79	9.74	9.67	3.5	6.26	4.85	39	0.79	5.56	11.9
Arsenic, mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Oil & grease, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Manganese, mg/kg	068	0.97	0.05	0.11	<0.01	0.03	0.11	0.73	0.08	0.10	0.05	0.08	068	0.97	0.05	0.11
Total coliform, MPN/g	12	6	8	2	0	4	10	6	0	0	2	0	12	6	8	2
Faecal coliform (E. coli), CFU/g	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Total plate count, CFU/g	1.6 x 10 ³	7.8 x 10 ²	7.6 x 10 ²	1.5 x 10 ²	1.6 x 10 ³	3.0 x 10 ²	3.2 x 10 ²	1.2 x 10 ²	2.7 x 10 ³	5.6 x 10 ²	6.0 x 10 ²	1.2 x 10 ²	1.6 x 10 ³	7.8 x 10 ²	7.6 x 10 ²	1.5 x 10 ²

PARAMETER/UNIT	DTS8	DBS8	DTS9	DBS9	DTSC	DBSC	DTS	DBS								
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					10	10	11	11	12	12	13	13	14	14	15	15
Appearance	Light Brown Solid Substance															
pH (1:1)	5.5	6.0	6.50	6.08	5.58	5.22	7.1	7.3	6.4	5.2	6.2	6.1	6.1	5.8	7.2	6.7
Temperature, °C	27.5	27.4	27.4	27.8	27.5	27.4	29.4	29.2	29.0	29.2	29.8	29.6	30.0	29.8	29.9	30.0
Conductivity (1:1), µS/cm	20	10	30	30	20	10	400	300	70	60	70	40	80	60	80	40
Phosphorous, mg/kg	34.2	52.5	41.1	54.3	50.4	48.3	59.2	116.2	208.0	104.2	46.8	59.8	33.4	80.3	59.9	5.6
Carbonate, mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bicarbonate, mg/kg	338.8	340.5	509.6	509.6	508.1	504.1	848	507	510	671	848	678	678	508	678	679
Chloride, mg/kg	259.4	260.7	260.2	260.2	259.4	257.4	3762	1266	637	501	509	254	254	508	254	254
Easily oxidizable carbon, %	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.38	2.31	0.65	0.44	0.72	0.48	0.21	0.27	0.30	0.23
Total carbon, %	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.39	3.00	0.84	0.57	0.94	0.62	0.27	0.35	0.39	0.30
Organic matter, %	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	13.0	8.90	2.50	1.69	2.79	1.84	0.80	1.04	1.16	0.89
Nitrite, mg/kg	0.24	0.32	1.09	0.20	0.60	0.60	<0.01	<0.10	<0.10	0.45	0.32	0.39	0.15	0.17	0.56	0.32
Nitrate, mg/kg	0.84	0.52	0.60	1.23	0.40	0.80	0.05	<0.1	<0.1	0.7	0.6	1.2	0.3	0.3	0.7	0.6
Sulphate, mg/kg	299.4	118.6	29.9	149.6	<1	59.3	139	79	239	239	239	297	79	140	179	220
Moisture Content, %	0.35	0.55	0.20	0.55	0.25	0.75	2.15	1.75	1.20	1.60	1.10	0.90	1.80	1.60	0.50	0.95
Calcium, mg/kg	279	280	279	278	280	280	3269	2703	573	574	430	275	567	428	575	574
Magnesium, mg/kg	169.7	170.1	677.7	169.1	170.1	170.1	4404	5090	174	343	261	175	172	260	175	348
Iron, mg/kg	5.56	11.9	17.2	26.3	1.56	3.99	15.0	20.6	13.6	5.6	2.4	4.8	0.8	10.3	13.6	18.3
Arsenic, mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Oil & grease, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Manganese, mg/kg	0.05	0.11	<0.01	0.03	0.11	0.73	0.08	0.10	0.05	0.08	0.11	0.73	0.08	0.10	0.05	0.08
Total coliform, MPN/g	8	2	0	4	10	6	0	0	2	0	10	6	0	0	2	0
Faecal coliform (E. coli), CFU/g	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Total plate count, CFU/g	7.6 x 10 ²	1.5 x 10 ²	1.6 x 10 ³	3.0 x 10 ²	3.2 x 10 ²	1.2 x 10 ²	2.7 x 10 ³	4.8 x 10 ²	6.0 x 10 ²	1.2 x 10 ²	3.0x 10 ²	1.0 x 10 ²	2.7 x 10 ³	5.6 x 10 ²	6.0 x 10 ²	1.6 x 10 ²

Source: Lach Consult Laboratories Limited, 2024

Table 4.4.1: Result of analysis carried out on the top soil samples collected during the dry season

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PARAMETER/UNIT	1	2	3	4	5	6	7	8	9	10
Appearance	Reddish brown									
pH (1:1)	7.34	5.32	5.20	5.55	6.03	7.56	5.29	8.64	4.28	4.59
Temperature, °C	27.2	25.9	25.8	26.3	25.1	26.2	26.3	26.3	26.8	26.5
Conductivity (1:1), µS/cm	57.1	8.7	4.0	12.4	13.2	130.2	58.0	161.1	4.0	5.1
Phosphorous, mg/kg	11.7	5.23	49.4	10.4	213.6	52.1	103.9	81.4	<0.1	71.5
Calcium, mg/kg	4449	1118.9	956.2	954.3	1277.5	833	561	554	926	469
Magnesium, mg/kg	2317	388.4	290.4	386.5	388.0	336	512	336	188	190
Iron, mg/kg	0.79	4.00	3.19	1.59	7.19	2.08	4.95	6.93	4.63	21.9
Carbonate, mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
Bicarbonate, mg/kg	2739	1082.4	2988.6	994.2	831.0	77.3	1324	2896	322	823
Arsenic, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride, mg/kg	1590	239.5	257.1	513.2	386.1	1412	1023	1470	1495	1781
Easily oxidisable carbon, %	0.30	18.4	16.5	3.81	5.06	1.28	1.02	1.94	0.92	1.31
Total carbon, %	0.39	6.12	5.55	4.95	6.55	1.66	0.54	2.52	1.19	1.70
Organic matter, %	1.16	4.77	4.27	14.7	19.4	4.92	0.26	7.48	3.54	5.05
Nitrite, mg/kg	2.06	4.83	6.37	3.72	6.37	7.05	6.26	7.08	6.40	5.31

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Nitrate, mg/kg	17.2	15.9	25.1	15.8	25.1	19.8	31.6	31.3	19.9	33.1
Sulphate, mg/kg	299.4	<0.1	<0.1	159.2	79.7	217.6	154.3	238.8	139.3	159.5
Cation Exchangeable capacity(CEC), meq/100g	0.47	3.40	1.43	3.42	1.44	0.98	0.44	0.49	2.91	0.99
Total Hydrocarbon, mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead, mg/kg	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Cadmium, mg/kg	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Zinc, mg/kg	1.6	0.8	0.07	0.5	0.6	0.3	0.02	0.33	0.24	0.2
Total coliform, MPN/gg	12	16	20	8	4	10	18	24	20	8
E.coli, cfu/g	0	0	0	0	0	0	0	0	0	0
Total aerobic count, cfu/g	1.0 x 10 ²	1.2 x 10 ²	1.6 x 10 ²	1.1 x 10 ²	1.7 x 10 ²	1.0 x 10 ²	3.4 x 10 ²	1.0 x 10 ²	0.4 x 10 ²	3.0 x 10 ²

Table 24: Result of analysis carried out on the sub soil samples collected during the dry season

PARAMETER/UNIT	1	2	3	4	5	6	7	8	9	10
Appearance	Reddish brown									
pH (1:1)	6.68	4.91	4.51	5.84	5.03	6.37	5.91	7.58	4.13	4.72
Temperature, °C	27.8	25.1	25.3	25.5	25.5	26.1	26.5	26.3	26.8	26.4
Conductivity (1:1), µS/cm	46.3	13.1	32.1	9.4	9.3	26.3	68.2	221.3	9.0	13.6
Phosphorous, mg/kg	80.7	41.4	114.2	12.9	127.3	9.19	58.7	207.2	9.99	15.0
Calcium, mg/kg	2552.3	1110.0	954.3	1271.1	955.2	114	600	1239	4899	614
Magnesium, mg/kg	775.3	385.3	579.7	289.6	386.9	513	729	376	2976	373
Iron, mg/kg	3.19	5.55	4.77	0.79	7.16	2.82	23.2	7.74	6.89	49.8
Carbonate, mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bicarbonate, mg/kg	2576.1	995.2	1990.4	1497.3	1328.3	81.7	78.9	497	780	159
Arsenic, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride, mg/kg	1061.4	513.7	642.2	257.6	385.7	1492	489	1025	724	744
Easily oxidisable carbon, %	0.30	25.2	25.1	21.8	6.46	0.53	1.31	0.86	0.74	1.45
Total carbon, %	0.39	8.93	8.46	7.36	8.39	0.68	1.70	1.62	0.96	0.49
Organic matter, %	1.16	6.87	6.52	5.66	24.9	2.03	5.04	3.32	2.85	0.38
Nitrite, mg/kg	2.75	3.26	4.15	4.05	4.23	5.59	7.16	7.28	5.99	5.71
Nitrate, mg/kg	15.9	6.63	18.5	12.0	15.9	33.0	34.6	19.9	29.1	22.5
Sulphate, mg/kg	209.4	358.9	334.7	119.5	159.8	255.7	139.4	417.5	238.6	158.3
Cation Exchangeable capacity(CEC), meq/100g	1.99	1.98	1.91	1.36	1.94	0.89	0.40	2.36	0.96	0.49

Total Hydrocarbon, mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead, mg/kg	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Cadmium, mg/kg	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Zinc, mg/kg	0.9	0.5	0.03	0.5	0.4	0.3	0.1	0.3	0.4	0.2
Total coliform, MPN/gg	12	16	20	8	4	10	18	24	20	8
E.coli, cfu/g	0	0	0	0	0	0	0	0	0	0
Total aerobic count, cfu/g	0.6×10^2	0.4×10^2	0.65×10^2	1.2×10^2	0.7×10^2	1.8×10^2	2.0×10^2	1.0×10^1	0.8×10^2	2.4×10^2

(Referenced)

4.4 Biological Environment Characteristics

The study was aimed at examining the extent of vegetation cover as well as the flora and fauna composition on, and around the proposed site, believing that empirical data about the plant and animal communities on, and near the study location will provide baseline information regarding the ecological status of the area and the wider environment namely, Agbara Ado-Odo/Ota, Ogun State. Additionally, future impacts due to the proposed facility can be estimated with time and mitigating strategies can be proposed. During the field survey, an inventory and botanical characterization of the plant diversity at the location was undertaken. Observations were also made and a brief ethno-zoological survey involving some residents and local farmers near the site was conducted to enumerate the wild animal species around the community.

4.4.1 Sampling Method and Field Measurements

The environmental components covered in the study included determination of elevation and directions of locations using GPS equipment and identification and characterization of plant species composition. The general vegetation structure and distribution of the plant species were noted and the landscape pattern was documented. As much as practicable, all the plants located on the site, both woody and non woody were identified to the species level. The number of individuals of each of the tree/shrub species encountered was counted and the sizes noted. The land use pattern within and outside of the proposed site was also noted and documented.

Total count technique was used to determine the abundance of tree/shrub species. In doing this, the number of individuals of each species encountered was counted and a total obtained. Thereafter, the frequency of each species was estimated as a percentage of number of each in relation to the total. Abundance of herbs and other non woody plant species was determined using frame quadrant technique with 50 randomly placed 1 x 1 m² quadrants. The frequency of a species was computed as a percentage of the number of quadrants in which it occurred divided by the total number of quadrants thrown. In order to calculate relative percent frequencies, a total of all the frequency estimates was first obtained. Then, the percent frequency estimate of each species was used as a numerator of the total and multiplied by 100.

Reports on vertebrate animals were based on information provided by fifteen of the farmers and the local residents found working/passing by the study site, eleven of whom were women. Each of these persons was interviewed separately on the wild animal species which they had sighted around the village at one time or the other. Information was also obtained on wild vertebrates from two security personnel who were on guard at the Hayat Nig. Ltd., facility bordering the study site. The recorded percent frequency of each animal species was divided into three class interval sizes namely, not frequent (i.e. animal had been sighted by 1-30% of the respondents); frequent (when it had been sighted by 31-59% of the respondents) and very frequent (i.e. animal had been sighted by 60 -100% of the respondents.). On the contrary, direct observations were used to identify the invertebrates encountered such as grasshoppers, termites, millipedes and snails, which were recorded in photographs. The kinds and frequency of birds at the study site could not be ascertained in detail but based on few empty

bird nests found hanging on a tree and lying on the ground a decision on likely kinds of birds inhabiting the study area was made. In addition, members of the few familiar bird species that flew over the proposed site during data capturing were noted while some were identified using vocal individuality technique. Information on domestic animals was not available as no nearby human settlements were found within a radius of about 1 km.



Plate 4.5 Quadrant Set up and Plant Identification

4.4.2 Vegetation Study

The vegetation of the study area is typically of woodland/ forest. This ecological zone is generally made up of a mixture of various species of trees, shrubs, herbs and grasses. It is worthy of note that the vegetation within and around the proposed site for Coal power facility has been substantially altered by clearing for agricultural purposes. Although many of the trees encountered, that ought to be of large sizes were indeed small, the vegetation cover surrounding the study site was diverse in species composition, pointing to the fact that it was originally rich with respect to species number and complexity.

Floristic Composition, Distribution and Abundance

All the plant species found on, and around the proposed project site are enumerated in Tables 4.7 to 4.10. A total of 51 plant species in 24 families were encountered (Tables 4.7 and 4.8). These consist of 1 species of sedge, 1 of epiphyte, 2 of shrubs, 7 of grasses, 20 of trees, and 20 of herbs. The most frequently represented families of plants along with their number of species observed were Poaceae (8), Fabaceae (6), Euphorbiaceae (5), Astaraceae (5), Anacardiaceae (3), Malvaceae (3), Rubiaceae (3) and Verbernaceae (2), the other 16 families being represented on the study site by only one species each (Table 4.7). Members of some

of these families have been acknowledged to be useful in the timber, medicinal, chemical industries and for other commercial purposes (Table 4.5).

The vegetation is fairly rich but the natural setting has been distorted through farming activities. Within the proposed site, only 20 non-woody plant species were observed with quadrant sampling (Table 4.7). However, additional efforts towards discovering other non-woody species that were not captured by the quadrants revealed eight additional species, all of which are enumerated in Table 4.5. Among the 28 species that are non-woody, the most widely-distributed in terms of their relative frequencies in the study area were *Digitariahorizontalis* (14.5%), *Andropogongayanus* (11.2%), *Euphorbiaheterophylla* (9.7%), *Hypitissuaveolens* (8.15%), *Tephrosiabraceolate* (8.1%) and *Mariscus alternifolius* (6.4%) as indicated in Table 4.7. Although most of these species are weeds of agricultural fields, some are of medicinal value or useful as fodder, and a few others such as *Dioscorea* sp, cassava and melon are important food crops (Plate 4.8).

Table 4.5: Enumeration of the plant species found on, and around the proposed site

S/N	Botanical name	Plant growth Habit	Family name	English (common) Name	Economic importance
1	<i>Albizia adianthifolia</i>	Tree	Fabaceae	Flat crown	Timber; medicinal
2	<i>Anacardium occidentale</i>	Tree	Anacardaceae	cashew	Fruit, Oil
3	<i>Andropogon gayanus</i>	Grass	Poaceae	Gamba grass/ bluestem grass	Weed
4	<i>Annona senegalensis</i>	Small tree	Annonaceae	Wild custard apple	Medicinal
5	<i>Aspilia africana</i>	Herb	Asteraceae	Haemorrhage plant	Weed, fodder
6	<i>Borreria ocymoides</i>	Herb	Rubiaceae	Button weed	Medicinal
7	<i>Bridelia ferruginea</i>	Tree	Euphorbiaceae	-	Medicinal
8	<i>Chromolaena odorata</i>	Herb	Asteraceae	Thoroughwort	Weed
9	<i>Citrullus colocynthis</i>	Trailing herb	Cucurbitaceae	Bitter cucumber	Vegetable oil
10	<i>Commelina benghalensis</i>	Herb	Commelinaceae	Bengal dayflower	Weed
11	<i>Crotalaria retusa</i>	Herb	Fabaceae	Rattle weed	weed
12	<i>Dactyloctenium aegyptium</i>	Grass	Poaceae	Crow foot grass	Weed

13	<i>Daniellia oliveri</i>	Tree	Fabaceae		Timber; fuelwood
14	<i>Digitaria horizontalis</i>	Grass	Poaceae	Hairy crab grass	Weed
15	<i>Dioscorea spp.</i>	Twining herb	Dioscoreaceae	yam	Food crop
16	<i>Emilia coccinea</i>	Herb	Asteraceae	Tassel flower	Medicinal, weed
17	<i>Eragrostis tenella</i>	Grass	Poaceae	Canegrass	Weed
18	<i>Euphorbia heterophylla</i>	Herb	Euphorbiaceae	Wild poinsettia	Weed
19	<i>Ficus sur</i>	Tree	Moraceae	Fig	Ornamental
20	<i>Gardenia ternifolia</i>	Tree	Rubiaceae	Wild gardenia	Medicinal
21	<i>Gmelina arborea</i>	Tree	Verbernaceae	Melina	Timber, paper tree
22	<i>Hibiscus sabdariffa</i>	Herb	Malvaceae	Roselle	vegetable
23	<i>Hymenocardia acida</i>	Small tree	Hymenocardiaceae	Large red-heart	-
24	<i>Hyptis suaveolens</i>	Herb	Lamiaceae	Mint weed	Weed
25	<i>Imperata cylindrica</i>	Herb	Poaceae	Spear grass	Weed
26	<i>Lannea barteri</i>	Tree	Anacardiaceae	-	Timber
27	<i>Mangifera indica</i>	Tree	Anacardiaceae	Mango	Fruit, medicinal
28	<i>Manihot esculentus</i>	Herb	Euphorbiaceae	Cassava	Food crop
29	<i>Maranthes polyandra</i>	Tree	Chrysobalanaceae	-	Timber/medicinal
30	<i>Mariscus alternifolius</i>	Sedge	Cyperaceae	Umbrella sedge	weed
31	<i>Newbouldia laevis</i>	Tree	Bignoniaceae	African border tree	Cultural, Medicinal
32	<i>Parkia biglobosa</i>	Tree	Fabaceae	Locust bean	Spice; timber
33	<i>Parquetina nigrescens</i>	Herb	Periplocaceae		Medicinal
34	<i>Pennisetum polystachion</i>	Grass	Poaceae	Mission grass	Weed
35	<i>Phyllanthus amarus</i>	Herb	Euphorbiaceae	Hurricane weed	Medicinal
36	<i>Piliostigma</i>	Small tree	Fabaceae	Monkey bread	Medicinal

	<i>thonningii</i>				
37	<i>Psidium guajava</i>	Tree	Myrtaceae	Guava	Fruit/medicinal
38	<i>Rottboellia cochinchinensis</i>	Grass	Poaceae	Itch grass	Weed
39	<i>Sarcocephalus latifolius</i>	Shrub	Rubiaceae	African peach/Country fig	Medicinal
40	<i>Securinega virosa</i>	Shrub	Euphorbiaceae	White berry bush	Medicinal
41	<i>Sesamum indicum</i>	Herb	Pedaliaceae	Sesame	Vegetable, seed oil
42	<i>Sida acuta</i>	Woody herb	Malvaceae	Common wireweed	Weed
43	<i>Sorghum bicolor</i>	Grass	Poaceae	Guinea corn	Food crop
44	<i>Tapinanthus bangwensis</i>	Woody Epiphyte	Lauranthaceae	African mistletoe	Medicinal
45	<i>Tephrosia bracteolata</i>	Herb	Fabaceae	Hoerypea	Weed, fodder
46	<i>Terminalia glaucescens</i>	Tree	Combretaceae	Chew-stick	Chewing stick, Medicinal
47	<i>Tridax procumbens</i>	Herb	Asteraceae	Coat buttons	Weed, medicinal
48	<i>Urena lobata</i>	Herb	Malvaceae	Congo jute	Fibre; weed
49	<i>Vernonia amygdalina</i>	Tree	Asteraceae	Bitter leaf	Medicinal
50	<i>Vitellaria paradoxa</i>	Tree	Sapotaceae	Shear butter tree	Timber
51	<i>Vitex doniana</i>	Tree	Verbenaceae	Chaste tree	Timber

Table 4.6: List of Plant families according to species richness as observed within site

S/N	Family	Number of Species
1	Anacardaceae	3
2	Annonaceae	1
3	Asteraceae	5
4	Bignoniaceae	1
5	Chrysobalanaceae	1
6	Combretaceae	1
7	Commelinaceae	1
8	Cucurbitaceae	1
9	Cyperaceae	1
10	Dioscoreaceae	1

11	Euphorbiaceae	5
12	Fabaceae	6
13	Hymenocardiaceae	1
14	Lamiaceae	1
15	Lauranthaceae	1
16	Malvaceae	3
17	Moraceae	1
18	Myrtaceae	1
19	Pedaliaceae	1
20	Periplocaceae	1
21	Poaceae	8
22	Rubiaceae	3
23	Sapotaceae	1
24	Verbenaceae	2
Total		51

Table 4.7: Relative abundance of some non-woody plant species encountered

S/N	Species Name	Frequency (%)	Relative Frequency (%)
1	<i>Andropogon gayanus</i>	41.2	11.2
2	<i>Aspilia Africana</i>	5.9	1.6
3	<i>Borreria ocymoides</i>	17.6	4.8
4	<i>Chromolaena odorata</i>	11.8	3.2
5	<i>Citrullus colocynthis</i>	5.9	1.6
6	<i>Commelina benghalensis</i>	11.8	3.2
7	<i>Crotalaria retusa</i>	5.9	1.6
8	<i>Dactyloctenium aegyptium</i>	11.8	3.2
9	<i>Digitaria horizontalis</i>	52.9	14.5
10	<i>Eragrostis tenella</i>	11.8	3.2
11	<i>Euphorbia heterophylla</i>	35.3	9.7
12	<i>Hyptis suaveolens</i>	29.4	8.1
13	<i>Manihot esculentus</i>	11.8	3.2
14	<i>Mariscus alternifolius</i>	23.5	6.4
15	<i>Pennisetum polystachion</i>	11.8	3.2
16	<i>Phyllanthus amarus</i>	5.9	1.6
17	<i>Rottboellia cochinchinensis</i>	17.6	4.7
18	<i>Sesamum indicum</i>	17.6	4.7
19	<i>Tephrosia bracteolate</i>	29.4	8.1
20	<i>Tridax procumbens</i>	5.9	1.6

Total	364.8	100.0
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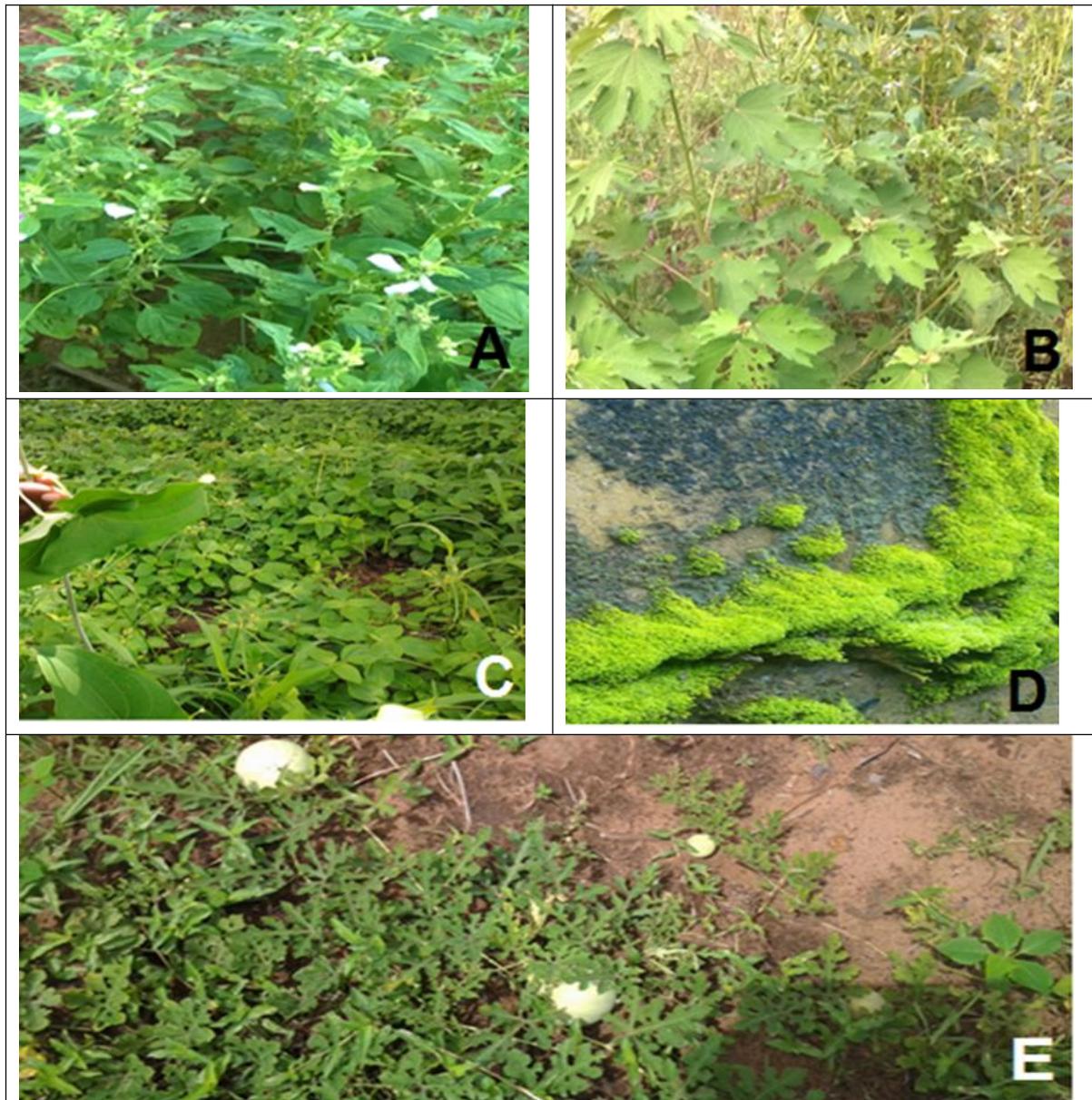


Plate 4.6: Non-tree plant species found within and around the proposed site. *Sesamum indicum* (A); *Urena lobata* (B); *Dioscorea* sp., *Euphorbia heterophylla* and *Mariscus alternifolius*(C); Bryophytes on the perimeter fence of Bulletine Construction company bordering the proposed site(D); and *Citrullus colocynthis* (E).

Among the tree species present in the study site, *Daniellia oliveri* was the most predominant with 13.2 % relative frequency, followed closely by *Terminalia glaucescens* (10.3%), *Newbouldia laevis* (9.7%), *Maranthes polyandra* (8.6%), and *Vitellaria paradoxa* (8.0%). (Table 4.8). High frequency of *Newbouldia laevis* (African border tree) on the proposed site is particularly notable as an indicator of anthropogenic activities. A few of the other tree species are useful as timber (e.g. *Daniellia oliveri*, *Maranthes polyandra*, *Lannea barteri*), or for medicinal and nutritional purposes (e.g. *Maranthes polyandra*, *Parkia biglobosa*) (Plate 4.9).

Table 4.8: Enumeration and relative abundance of the trees and shrubs encountered at the site

S/N	Tree/ Shrub Species	Growth Habit	Number of Individuals	Relative Frequency (%)
1	<i>Albizia adianthifolia</i>	Tree	6	3.4
2	<i>Anacardium occidentale</i>	Tree	2	1.1
3	<i>Annona senegalensis</i>	Tree	16	9.1
4	<i>Bridelia ferruginea</i>	Tree	3	1.7
5	<i>Daniellia oliveri</i>	Tree	23	13.2
6	<i>Ficus sur</i>	Tree	1	0.6
7	<i>Gardenia ternifolia</i>	small tree	2	1.1
8	<i>Gmelina arborea</i>	Tree	1	0.6
9	<i>Hymenocardia acida</i>	Small tree	13	7.4
10	<i>Lannea barteri</i>	Tree	2	1.1
11	<i>Mangifera indica</i>	Tree	2	1.1
12	<i>Maranthes polyandra</i>	Tree	15	8.6
13	<i>Newbouldia laevis</i>	Tree	17	9.7
14	<i>Parkia biglobosa</i>	Tree	4	2.3
15	<i>Piliostigma thonningii</i>	Small tree	1	0.6
16	<i>Psidium guajava</i>	Tree	2	1.1
17	<i>Sarcocephalus latifolius</i>	Small tree	7	4.0
18	<i>Securinega virosa</i>	Shrub	19	10.9
19	<i>Tapinanthus banguensis</i>	Woody climber	1	0.6
20	<i>Terminalia glaucescens</i>	Tree	18	10.3
21	<i>Vernonia amygdalina</i>	Small tree	1	0.6
22	<i>Vitellaria paradoxa</i>	Tree	14	8.0
23	<i>Vitex doniana</i>	Tree	5	2.9
Total			175	100.0

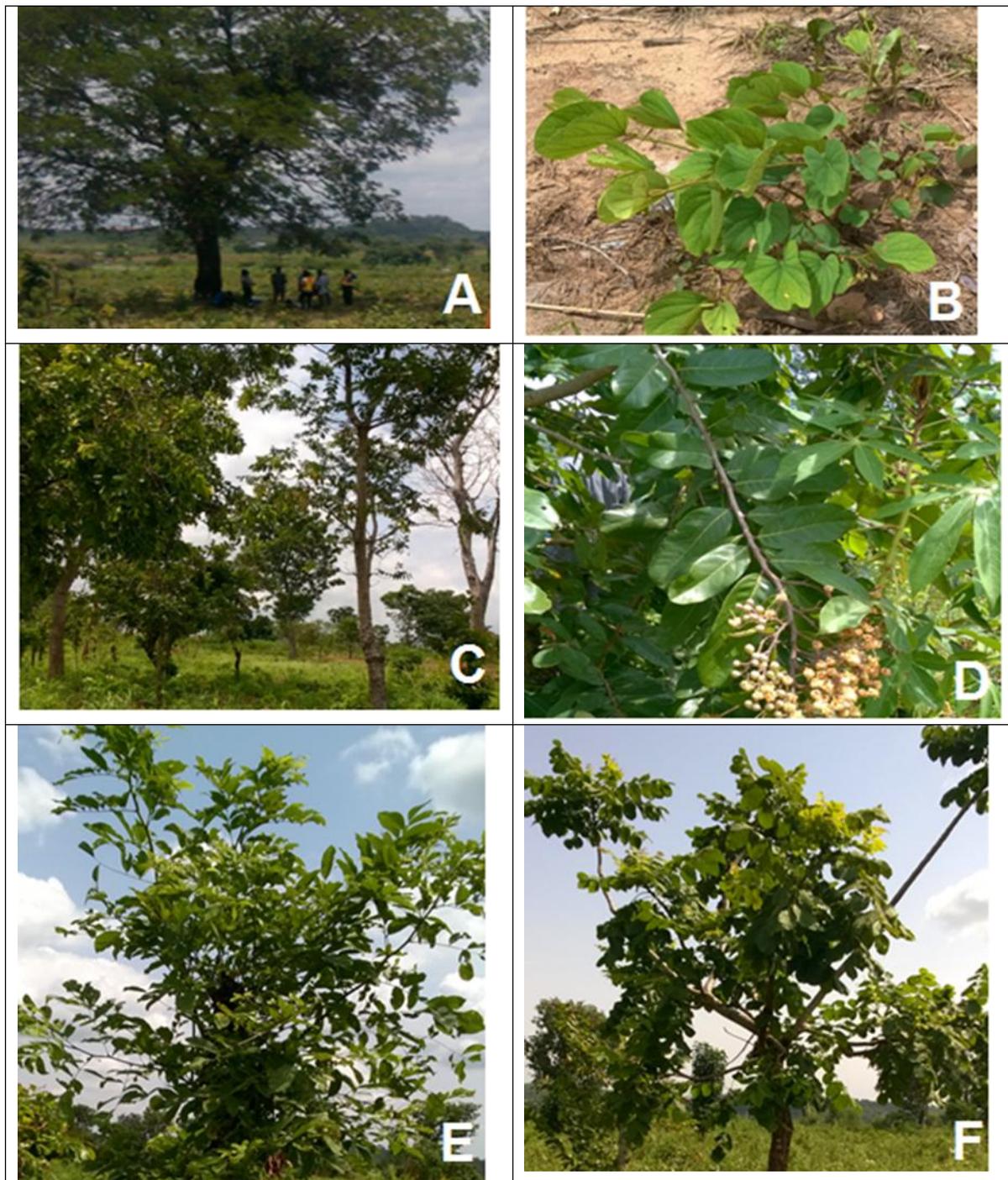


Plate 4.7: A few of the woody plant species found within and around the proposed site. *Parkiabiglobosa* (A); *Piliostigmathonningii* (B); *Danielliaoliveri* (C); *Maranthespolyandra* (D); *Terminaliaglaucescens* (E); and *Lanneabarteri* (F).

4.4.3 Wild Life Study

The value of wildlife has been widely ignored for many decades, a situation that has encouraged uncontrolled killing of these animals. This situation has changed somewhat, as the importance of wildlife to local communities is now globally recognized in community-based or participatory natural resources management programmes. Wildlife could be of prime

importance in terms of their economic, nutritional, socio-cultural and ecological importance. All these are the positive sides of wildlife, but sometimes they may be seen as presenting negative or adverse values. Depredation of wildlife to people (casualties), livestock (predation), agriculture (crop damage) and natural landscape (invasive pests) are considered counter-productive. In addition, different observers may have diverse views of the same value: the wildlife protectionist might consider normal for the predators to prey on livestock (positive value for wildlife), while the cattle-owner would see the large predators as detrimental (negative value of wildlife). But then, the truth, from ecological point of view is that diversity imparts stability. The greatest value of biodiversity lies in future opportunities to human kind, known and unknown at the moment.

Information about the animal species present at, and near the proposed site is provided in Table 4.9. According to the local residents contacted and information obtained during the site visitation, four different categories of vertebrate animals are associated with the study site. These are reptiles, mammals, rodents and birds. All of these except antelopes and the monkeys were frequently encountered by the respondents (Table 4.9). The categories of invertebrates observed were five, namely, insects, millipedes/centipedes, earthworms and snails (Plate 4.10). Going by the entries in the 2017 list of threatened species of animals, only the Alligators (Ornate monitor) i.e. *Varanus ornatus* out of all the animal species enumerated from this study is vulnerable to extinction.

Table 4.9: Wildlife at the proposed site

Wildlife Species		Frequency*	IUCN Status	
1.	Vertebrates sighted and reported by the respondents			
	(a) Reptiles			
	i. Black-necked spitting cobra	<i>Naja nigricollis</i>	Frequent	Least concern
	ii. Green grass snake	<i>Ophedrysvernalis</i>	Very frequent	Least concern
	iii. Alligators (Ornate monitor)	<i>Varanus ornatus</i>	Frequent	Vulnerable
	(b) Mammals			
	i. Bate's pygmy antelopes	<i>Neotragus bates</i>	Not frequent	Near threatened
	ii. Silver fox	<i>Vulpesvulpes</i>	Frequent	Least concern
	iii. Tantalus monkey	<i>Chlorocebus tantalus</i>	Not frequent	Least concern
	(c) Rodents			
	i. African grass cutter (Greater cane rat)	<i>Thryonomys swinderianus</i>	Frequent	Least concern

		ii. Rabbits (Cape hare)	<i>Lepus capensis</i>	Very frequent	Conservation dependent
		iii. Giant black rat	<i>Rattus sp.</i>	Very frequent	
		iv. Green bush squirrels	<i>Paraxerus poensis</i>	Very frequent	Least concern
	(c)	Birds			
		i. Long-tailed cormorant	<i>Phalacrocorax africanus</i>	Very frequent	Least concern
		ii. Mourning dove	<i>Zenaidamacrourea</i>	Very frequent	Least concern
		ii. Common yellowthroats	<i>Geothlypis trichas</i>	NA	Least concern
2.	Invertebrates observed during data collection				
	(a)	Insects			
		i. Subterranean termites	<i>Reticulitermes flavipes</i>	NA	Least concern
		ii. Grasshoppers (common green grasshopper)	<i>Omocestus viridulus</i>	NA	Least concern
	(c)	Millipedes and centipedes: flat-backed millipede	<i>Harpaphe haydeniana</i>	NA	Least concern
	(d)	Earthworms	<i>Lumbricusterrestris</i>	NA	Not threatened
	(e)	Garden snails	<i>Helixpomatia</i>	NA	Least concern

* Not frequent (= sighted by 1-30% of the respondents); frequent (= sighted by 31-59% of the respondents); and very frequent (= sighted by 60 -100% of the respondents); NA not applicable.



Plate 4.8: Invertebrate animal species and their nests observed in the proposed site. Grasshopper captured on a young shear butter tree (A); Insect larva (B); A termitarium of subterranean termites(C); Flat-backed millipede (D); Fresh earthworm castes (E); and Garden snails (F).

On the contrary, many species of invertebrate animals were directly observed on, and around the proposed site. The preponderance of fresh earthworm castes was particularly noted as an indicator of well aerated and fertile soil, while different kinds of snails encountered pointed to well mixed loamy topsoil which is ideal for agricultural purposes.

Summary

The study area is species-rich with respect to plant biodiversity. A total of 51 plant species representing 24 families were identified. All the species are angiosperms, majority being dicotyledons. In addition, a population of bryophytes was observed on the ageing concrete perimeter fence of the neighbouring facility. The observed composition of the vegetation truly represents a woodland savanna which has been impacted mainly by farming activities. There were eight species of grasses and a preponderance of savanna trees belonging to the species such as *Daniellia oliveri*, *Terminalia glaucescens*, *Maranthes polyandra* and *Vitellaria paradoxa*. The presence of good number of *Neubouldia leavis* (African border tree)

is a further reason why the site is believed to have suffered from anthropogenic activities. Members of the family Fabaceae were among the most frequent (about 8%) and dominant plants. These are legumes which provide the soil with natural fertility. Additionally, the soil in the study area can be said to be rich in minerals with the presence of food crops such as yam, maize and cassava.

Some of the plant species identified in the study area such as *Parquetina nigriscens*, *Sarcocephalus latifolius*, *Bridelia feruginea*, *Phyllanthus amarus* and *Borreria ocymoides* are widely acknowledged medicinal plants. Many more species such as *Chromolaena odorata*, *Aspilia africana*, *Rottboellia cochinchinensis*, *Tridax procumbens* and *Sida acuta* are important agricultural weeds that are indicators of previously disturbed soils. A few of the non-woody species are good as fodder and these include *Tridax procumbens*, *Tephrosia bacteolata*, *Euphorbia heterophylla* and *Andropogon gayanus*.

A number of economic tree species were among those encountered in the study area. These include *Anacardium occidentale* (oil and fruit), *Mangifera indica* (fruit), *Psidium guajava* (fruit), *Parkia biglobosa* (timber), *Lannea barteri* (timber), and *Albizia adinthisfolia* (timber). A few of the woody species identified, that are known to be ethno-medicinally valuable and which have been found to be potential raw materials for chemical/drug industries are *Terminalia glaucescens*, *Neubouldia leavis* and *Securinega virosa*. It is however regrettable that some of the species only occurred in the study area as seedlings and small trees/shrubs. The land had been, and was still being exploited through farming activities and many trees felled for various reasons including fuel wood collection. As such, the vertebrate animals, which were natural dwellers on the land, have been driven somewhat far away, and the expected ecological balance can be said to be distorted.

Conclusion

Based on the land use activities within the land area being proposed for Coal power plant, and on the strength of the qualitative and quantitative data obtained in respect of flora and fauna on the site, it is logical to conclude that the already impacted ecological setting of the study area may further be negatively impacted. Due to the location of the proposed site being quite a distance from human settlements, no significant direct impact on human life is expected to occur with the execution of the proposed project. However, indirect effects on the surrounding environment and its inhabitants cannot be ruled out, more so that representatives of more than fifty species of plants and animals that are of economic, health and ecological benefits stand the risk of being displaced or extinguished. Further to enumeration of the potential impacts, the already disturbed species-rich vegetation along with its animal life, stands the risk of being further degraded.

4.5 Land Use Pattern

Various land uses were observed at the vicinity of the proposed factory. These include crop farming to produce mainly cassava and banana, but there were also pawpaw, guava, cashew and other tree crops. On either sides of the foot path leading to the stream on the North Western part, are flood plains which are suitable for cultivation of crops in the wet season; and in the dry season, irrigated leafy vegetables can be cultivated. In the flood plains, a few

water pools usable for irrigation and for domestic purposes such as drinking water for livestock were observed. Although, some of the environment has been turned to industrial area, the site is adequate for industrialization..

4.6 Socioeconomic-Baseline Studies

Introduction

Socioeconomic and health study is an essential part of an EIA; hence, this section discusses the social, cultural and economic characteristics of the proposed facility in Igere and Ihunsa (Agbara) communities of Ogun State. The basic human activities and interests were assessed and addressed, while an attempt was made to establish the potential impacts in these perspectives, and suggestions made on feasible mitigations where necessary. The Adedigba community of Agbara were identified through the help of the proponent's representative and community liaison officer. Government organs were identified, while community leaders and entire members of the communities gave the study an unparalleled support during the field survey.

Aim and Objectives

The aim of the study is to assess the impacts of proposed project on the socio-cultural, economic and health environment of Adedigba community of Agbara in Ogun State.

However, the objectives for this study are to: -

- identify the socio-cultural, economic and health characteristics of host environment,
- identify impacts of proposed project on the socioeconomic and health environment,
- establish people's perception of the potential impacts,
- identify and document people's perception of the proposed project,
- proffer solutions to mitigate and enhance the identified impacts.
- provide the basis for monitoring whatever impacts the project may have on socioeconomic and health environment,

Study Technique

The under listed was adopted for the field survey. Several survey tools were employed to achieve the desired aims and objectives of this assessment study. In order to capture the necessary basic data, a reconnaissance survey was embarked upon. It was observed during the reconnaissance survey that two (2) communities own the location where the proposed project will be sited. The proposed project is located on farmland, though the area is being controlled by OPIC Estate which acquired the area from the community's years back. Development and human presence are present in the area.

To further obtain information of the potential impacts of the proposed project on socio-cultural, economic and health environment, both primary and secondary methods of data collection was employed.

Questionnaire Administration

The administration of questionnaire was through stratified random sampling among where Taro Yemeni's formula was used to arrive at about 75% of the entire population sampled with 10% error of significance. By randomly selecting respondents, questionnaires were distributed on gender and age line at both locations (Appendix).

Informal Interview

This was carried out to compliment the data and information gathered from other sources other than formal interview method.

Emphasis during the interview session focused mainly on established impacts, which included their disposition.

On-the Spot-Assessment

It combined with the other survey methods to achieve a comprehensive coverage of data acquisition. This was effective where the survey team met hostile members of communities and over-zealous stakeholders.

Socio-demographic characteristics of the communities

The population structure of the communities is consistent with those of the other traditional Ogu (Eegun) communities found in the states of Ogun and Lagos. The communities are cosmopolitan, and made up of not only people of Ogu (Eegun) ethnic group, but people from other parts of Nigeria and the world. Farming is still the main occupation of the indigenous population; however, several members of the communities are increasingly being employed in paid work and in their private business, as a result of the rapid urbanization in Lagos - Ogun States corridor.

Common crops grown within the precinct of the farms identified in the study area comprised mainly of vegetables, plantain, pawpaw and potatoes; and discussants in the focus group discussions held in the community's spoke of an abundance of farmland, even with the rapid urbanization of the communities. According to a respondent from the Igere community:

"There is enough farmland in the community. Any member of the community wishing to engage in farming is sure of accessing enough farmland."

Focus Group Discussions (FGD)

It is used to obtain perceptions on defined areas of interest. Each group is conducted with 3 to 10 people led by a skilled interviewer, see below. Discussions are relaxed, and participants enjoyed sharing their ideas and perceptions in a permissive but nonthreatening environment, Richard A. Krueger, Mary Anne Casey, 2009.

Published Materials/ Sources

Data and information were obtained from the internet, Population Commission, EIA Report and Ogun State Ministry of Environment.

Consultation

At this stage of activities, representatives of Adedigba community of Agbara were consulted, which was preceded by initial consultation with proponent representatives at the proposed location cabin in Igere community. At the community level, the objectives and scope of the assessment was made known to the community representatives, while their perception was sort and their proffered solutions documented. The stakeholder's concerns about the proposed project included

- Loss of farmland.
- Influx of all shades of people into the study area.
- Security concerns.
- Litigations and inter-community feud.
- Leadership tussles.
- Health issues
- Industrial pollution



Plate 9: Igere and Ihunsa Community, OPIC Estate, Agbara in Ado-Odo/Ota L.G.A.





Fig. 4.3: Map showing Ado-Odo/Ota Local Government Area.

The Study Area

Two communities, Igere and Ihunsa of Ado-Odo/Ota local government area in Ogun State as shown in the plate above were identified as host communities at the proposed acquired site for the facility and is covered in the socioeconomic health study

All the settlements are permanent, autonomous and possess characteristically rural nucleated clusters in their housing patterns and physical setting. Situated within the greater Agbara Industrial planning area, the villages/communities are fast losing its rural setting of some sort; unless told, it is very difficult for a first time visitor to place it as such being that it is within an industrial layout. Map of Ado-Odo/Ota showing in fig. 4.3.

The Historical Background of Adedigba community

The two communities belong to the Ogu (Eegun) ethnic minority group majorly found in Ogun(Yewa region) and Lagos(Badagry) States. Oral history infers that the Ogu people were Whydah, Allada and Weme settlers in the old Dahomey presently known as Republic of Benin. But as a result of the Dahomeyan War that occurred during the 18th century, some of them have migrated away from the flash zone into safety to what today is part of Nigeria. According to Mesawaku, a historian; the Ogu people migrated to Badagry as early as the 15th century due to the need for security and need for new waters for fishing, good farm land. Since their environment is surrounded by water, majority of Ogu (Eegun) people are into fishing, coconut processing and salt production while some are involved in trading and

farming. Among the Ogun people, the use of condoms as a method of birth control is perceived to be a taboo due to their long held traditional belief in the old practice of *coitus interruptus*.

The Ogu can also be found in Yewa community of Ogun State but their number is marginal compared to other sub-ethnic groups in the state. However, the Adedigba community have it that their founder is Gbogi-Idada who had two sons, Apadi and Idowu. Interestingly, by virtue of seniority, leadership is with descendants of Gbogi-Idada. However, *Igere community in reality comprises of Igbosunme, Ihunsa and Itosokoh quarters*, while leadership rest with the first family/son of the progenitor, the Apadi family, Appeal Ruling No. CA/1/15/96.

The Ogu speaking people are socio-politically organized and the institution of **Aholu** represents one of the achievements of the Eegun (Ogu) in political centralization. Traditionally, the Ogu are very religious and ritualistic and every traditional Ogu community has sacred shrines.

It is also a common thing to find Ogu speaking man respecting and adoring his ancestor's cultural heritage. Ogu also produce mats and foodstuffs such as Lagba, Fufu, Koko, Iru (locust beans) with a pre-occupation, which is mainly farming. The main agricultural products of Adedigba community are Cassava, Melon, Maize and Yam, while oil palm produce forms the major cash crop

One other significant thing among the Ogu speaking people is variety of dialects, for instance, there is the Thevi, Whla, Seto, Toli, etc. which are common in parts of Badagry, Lagos and Mauto in Ogun State.

Ogu places great premium on their culture and tradition, hence they attached value at sustaining their culture and jealously guard every aspect of its culture. The various shrines and divinities perform different roles in the development of the community.

They have creatively re-invented tradition to serve multiple purposes by the use of Zangbeto in the context of economic crisis and challenges for urban growth, which they adapted its roles to include communal policing, conflict mediation, oral art and entertainment, and the maintenance of communal order. In more ways than one, it captures the essence and multiple identities of Zangbeto in the society. The involvement of Zangbeto in local policing or 'night watching' provides an alternative or an exception to the dominant representation of vigilantism in Nigeria as disorderly violence, sometimes for political or criminal ends. It is argued that rather than act in an arbitrary and violent manner, Zangbeto operates through the combination of traditional symbolic actions and oral art in mediating local conflicts and preserving social harmony and local order. An interesting point relates to how Zangbeto co-exists peacefully with formal political and security institutions, and operates without causing tensions within for example, Igere, Ihunsa communities and Badagry town, where some inhabitants share different ethnic identities and religious faiths.

The study also opens up a humanist perspective to how the aesthetics of Zangbeto's cultural tropes of oral presentation, rhetoric and representation act as a powerful force for preserving cherished communal norms and values, and facilitating communication in ways that strengthen social cohesion. In this regard this study demonstrates the wealth of possibilities that exist within Africa's traditional cultures and oral arts for alternative grassroots based conflict mediation and security. Zangbeto are men in a costume that resembles a haystack but they fall into a trance which enables their bodies according to tradition to be inhabited by spirits who possess special knowledge of the actions of people. However Ogu legend tells that there are no humans under the costume, only spirits of the night. Oro festival is practiced also in the communities being an adoption of the culture of the Yoruba that they live in their mist.

Social Organization and Traditional Characteristics of the Study Area

The State comprises of 20 Local Government Areas (LGAs) each headed by a Chairman, as enshrined in the Constitution. It is divided into four Geo-political Zones, three Senatorial Districts, nine Federal and 26 State Constituencies. Government policies and programmes are administered through various Ministries, Bureaux, Commissions, Boards, parastatals and other agencies.

In addition to the three (3) tiers of government in the country, each settlement in the study area, operate an organized traditional system of government. Each component of the structure has its own executives and responsibilities.

There is basically no difference in the pattern of social organization and local governance of Adedigba community with that of the other communities in typical Yoruba/Ogu clan. According to key informants, the Baales presides over the affairs of communities. Though, peculiar to Ogu (Eegun) people is the **Aholu**, whereby in typical Yoruba setting it is an Oba.

Thus, in the power and authority hierarchy in Adedigba community, after the Baale, are chiefs, women group and the youths, the traditional Zangbeto peculiar to the Ogu people operate as the watch-dog for maintenance of peace and security in the communities. The leadership structure found within Adedigba community is however shown in the table and figure below.

The traditional head is usually referred to as the Baale, and is supported by a Council of Elders/Chiefs drawn from association of family heads or compounds' "secession to the throne is not hereditary but rotates among the families. It is more or less a democracy of sort to the choice of a Baale as it is contested. The traditional government ensures that peace, unity, religious tolerance, inter-family interaction and security are maintained.



Plate

10: Community Representatives, OPIC Estate, Agbara in Ado-Odo/Ota L.G.A during scoping

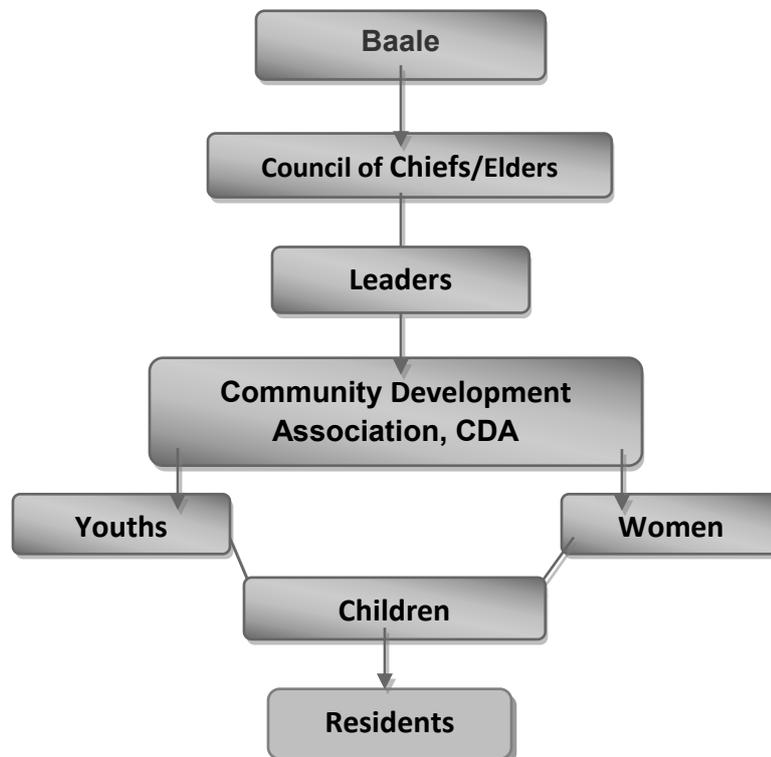


Fig. 4.4: Traditional Administrative Structure in Adedigba community

There are community development association, CDA, youth and occupational guilds, social clubs and religious units, which maintain an important role in commerce, social control, and vocational education in the community's politics. The CDA in particular is a fall-out of today's contemporary polity triggered by politicians' insensitivity to infrastructural decay and non-delivery of dividends of democracy.

Most traditional communities are composed of the nuclear families, the extended family units and the lineage wards, a conglomeration of which make up a settlement (Okaba, 1999). Four to six of these extended families make up a lineage ward, all sharing a common ancestry (Okaba, Ibid.) Polygamy is widely practiced, while Monogamy is mostly restricted to the Christians. Households are patrilineal and patrilocal, both serving as basic residential and economic units. An amalgam of three to eight nuclear families of common descent constitutes an extended family unit. This survey covered only Adedigba community.

Customs, Belief Systems and Heritage

Both administered questionnaire and focus group discussions reveal that Christianity and Islam is the predominant religion in the concerned communities. The traditional African religion is also practiced. In fact, traditional, cultural and religious beliefs have a strong influence on the people and position of women in the society.

The orthodox churches like the Anglican (CMS), spiritual (Christ Army Church – CAC) are easily the dominant denominations among Christians, while the presence of the Pentecostal sects like the Assemblies were confirmed to have a strong hold in the communities. In fact, sign posts identifying numerous emergent denominations were seen all over the place. Islam is a formidable religion which commands about 55% of the population.



Plate 11: A church around the project site

Despite the overwhelming presence and influence of Christianity, the communities still retain some of their traditional beliefs. In the two communities, there are areas considered sacred

and ‘unauthorised.’ Trespassers are sanctioned for the sacrilege. Cultural and traditional practices relating to such ‘‘forbidden grounds and forests,’’ are either conducted at the level of the nuclear family or at the community level. Such sacred sites are regarded as the abode of the gods. In fact, the beliefs of the people as it relates to their establishment on the land are still very much reliant on the deities/gods. However, such places can be trespassed on conditions of making some sacrifice or appeasement by those in charge of the shrines. Some of such sacred bushes/shrines mentioned during the interactive sessions are detailed in Table below.

Table 4.10: Communities Sacred Places and other Cultural Practices in the Project Area

Communities	Sacred/Forbidden Areas	River/Lakes	Remarks
Igere	<ul style="list-style-type: none"> • Igbo oro 	<ul style="list-style-type: none"> • Ojuigbesa river 	Oro can take place at any time of the year; whereby the Oro shrine is beside the primary school.
Ihunsa	<ul style="list-style-type: none"> • Oogun shrine • Oro Forest 	<ul style="list-style-type: none"> • Isan river 	

The marriage custom of paying bride price on nubile and marriageable girls is widely practiced within the study area. Two major types of marriages are recognised: the traditional and religious (Islamic and Christian marriages).

Land Tenure System in the Study Area

Access to land in traditional societies is often based on custom. These rights of access may have their origin in the use of the land over a long period. They are often rights developed by ancestral occupation and by the use of land by ancestral societies. In such cases, it is through the act of original clearance of the land and settlement by ancestors that rights are claimed. Hence, ownership of lands in the study area is vested in individuals and the extended families, which is held in trust for the family by the head of family or chief or Baale (fig 4.4). More important is the fact that most of the vast expanse of fallow land in the area belong to OPIC Investment Company which it acquired from the original land owners, Adedigba community.

People use a wide range of strategies to gain access to land in the community and these include:

- Purchase, often using capital accumulated while working as migrants.
- Adverse possession or prescription (the acquisition of rights through possession for a prescribed period of time).
- Leasing, or gaining access to land by paying rent to the owner.
- Sharecropping, or gaining access to land in return for paying the owner a percentage of the production.
- Inheritance or gaining access to land as an heir.

- Squatting illegally on land.

Meanwhile, land acquisition from the community for developmental projects usually go through the individual families who owned them, while industrial or corporate and non-natives who wish to acquire land for any purpose can do so through outright sale or payment of compensation in cash and kind. Such as acquisition from the community still requires certification and ratification from OPIC.

Housing and Settlement Pattern

The host community Adedigba, exhibit both the linear and nucleated housing grid patterns which may have been guided by OPIC Investment Company romance with the study area. Structures are built in clusters at the community central area while the linear and nucleated housing grid layout is found beyond the community centers. The host community has about 50 housing structures closely arranged and Ihunsa over 45 housing structures in a more compact form along its many roads and streets. There exist Rasco Guest house in Ihunsa and Alako, Soul Track, Komes and Oasis Guest houses in Igere community.

Housing characteristics are also very distinct in the communities. Houses are predominantly of the brick-walled types, with corrugated iron zinc roofing, although storey buildings are rare. Houses are in most cases plastered but again rarely painted, except for structures built within an estate. There exist several companies and industries in the study area such as Drury, African Fertilizers, Eko Supreme,

Natural Prime, Sunflag and Golden Pasta Flour Mills. Meanwhile, OPIC Investment Company has estates such as OPIC, New Dawn, Clusters, New Terrace and Area 1.



Plate 12: Linear Housing Grid Pattern



Plate 13: New Dawn Gardens around the project site

Respondents Characteristics Profile in Adedigba community

Cumulative gender ratio of respondents in the study area, Fig. 4.5, indicated that 57.5% of the respondents are male while 42.5% are female.

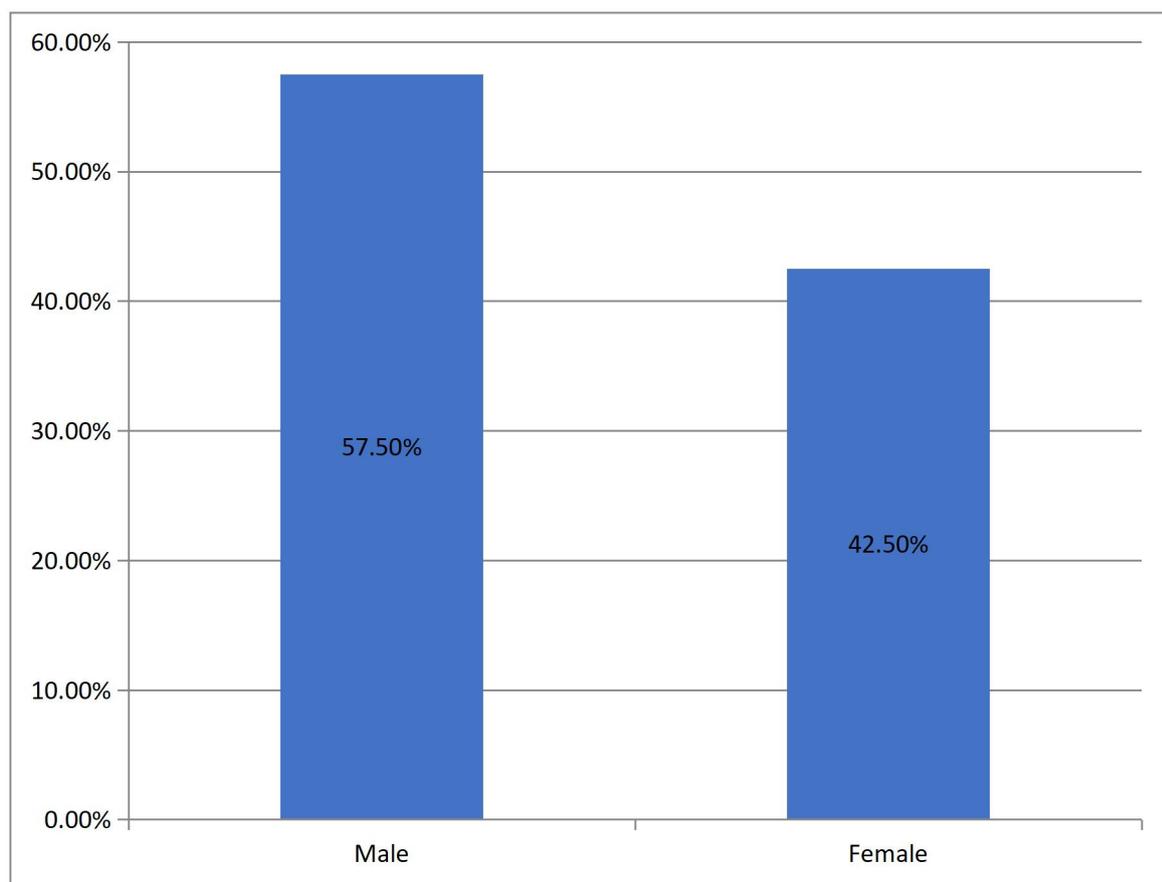


Fig. 4.5: Gender Ratio of Respondents

The ear-marking of the study area as an industrial layout no doubt have influenced the migration of job seekers into the study, hence increase in working class age population bracket. The cumulative age structure of the respondents shown in Table 4.2 below suggested that there is appreciably a good number of young population in the study area; meaning that most of the respondents are below 50 years. This invariably suggests that 23.81% of the respondents are between the ages of 30 – 39 years and 17.86% fall within the age bracket of 20 – 29 years. Furthermore, those within the age bracket of 40 - 49 years accounted for 11.9% of the respondents and these three groups fall within the working class. The dependent populations among the respondents accounted for 32.14% of the sampled population and are in the age bracket of 10-19 years and 60 years and above.

Table 4.11: Age Structure of Respondents in the Study Area

Age Group (Year)	Respondents			
	Male	Female	Total	%
10 - 19	8	7	15	17.86
20 – 29	10	5	15	17.86
30 – 39	12	8	20	23.81
40 – 49	4	6	10	11.9
50 – 59	8	4	12	14.29
60 – 69	6	3	9	10.71
> 69	2	1	3	3.57
Total	50	34	84	100

Source: Field survey, 2024

Subsequently, it can be deduced that 50 of the respondents are male while 34 are females, Table 4.11 above; whereas, Table 4.12 shows that 52.4% of the respondents are married, 14.3% being single parent, while 33.3% are single.

Table 4.12: Marital Status of Respondents

STATUS	MALE	FEMALE	TOTAL	%
Married	24	20	44	52.4
Single Parent	8	4	12	14.3
Single	18	10	28	33.3
TOTAL	50	34	84	100

Source: Field survey, 2024

Polygamy is a practiced form of matrimony, inheritance is the partri-lineal and the marriage custom of bride price payment on nubile and marriageable girls is widely practiced within the study area.

Household Size

The demography of the State showed that there are more females than males, however in the study area, Ado Odo/Ota Local Government Area, the reverse is the case as there are more males (118,424) than females (116,223). The respondents' household survey indicated that cumulatively in Table 4.13, the male population was 57.7% against the female population of 42.3% of household survey. The number of persons in each respondent household varied. The average number of persons per household of married male respondents is 6, where it is 5 for female respondents. Female single parents have an average of 3 persons, their male counterpart have an average of 2 in the household.

Table 4.13: Household Characteristics of Respondents

Gender	Married	Single Parent	Single	Total	Percentage
Male	144	16	28	188	58.8
Female	100	12	20	132	41.2
Total	244	20	48	320	100

Source: Field Survey, 2024

Household Population structure of Respondents

The population structure reflects the age and sex composition of a population. Information on age and sex composition is very important especially for the evaluation of the quality of the enumeration, and for the description and analysis of several types of socio-economic and demographic data. The population structure is usually characterized with reference to (a) the age-sex distribution and (b) two other key demographic ratios: the sex ratio and the dependency ratio.

(i) Age and Sex Structure:

In terms of the household age structure and distribution of the population, communities in the proposed project area exhibit the typical pyramidal structure found for Nigeria as a whole. Population is rather loaded from the lower age-cohorts. The bulk of the population consists of persons aged below 45 years (Fig. 4.6). While infants alone constitute approximately one-fifth (19.6%) of the household members, children of primary school age make up another 11%. Adolescents/teenagers and youth make up another 22.1%, while those expected to be in the labour market proper (20-59 years old) constitute 10.5% of the stakeholder communities.

This indeed implies a young and growing population with heavy burden on the adult population, a high dependency ratio, as well as large number of unemployed people. In addition, more of the limited resources of the state have to be invested on the less productive group in an effort to provide this group with more schools, health care services and other children-related facilities.

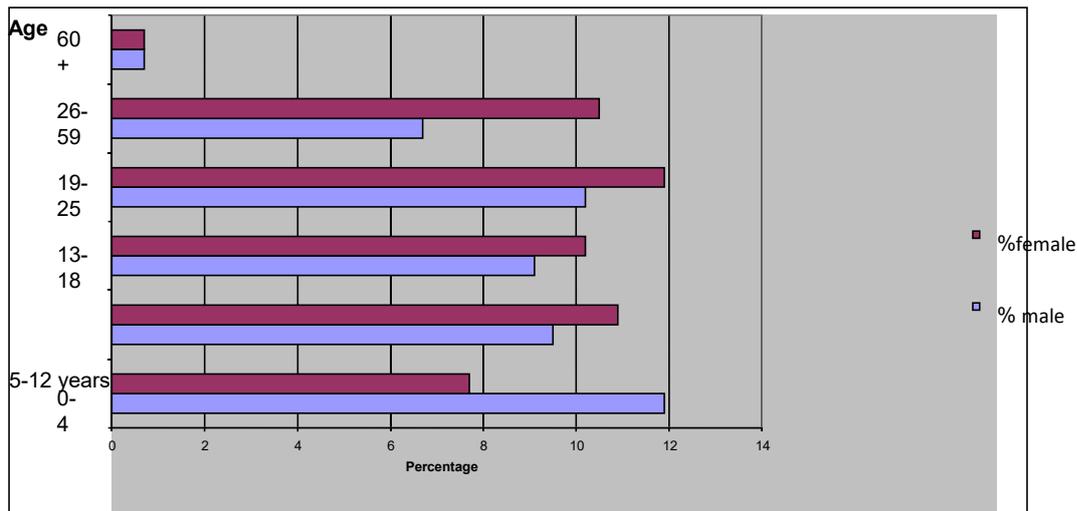


Figure 4.6: Age and sex structure of household members

Although children are as persons between ages 0-5 and 6-11 years, adolescents, aged 12-17 years and the youth, aged 18-24 years make up the vast majority in household composition, decision making and community affairs are still vested in the older generation. Less than half of the respondents’ household members were aged 21-40 years, while over half the respondents were people in the 41-60 years’ age-cohort. Above the 60 years’ bracket were 11.5%.

The population profile of the community’s mirrors that of the entire Ogun State structure (Fig. 4.7). The median age of the state population had long been reported. In fact, the age profile of the Ogun State is widely acknowledged to mirror that of the country as a whole: approximately 70% of the population is below the age of thirty.

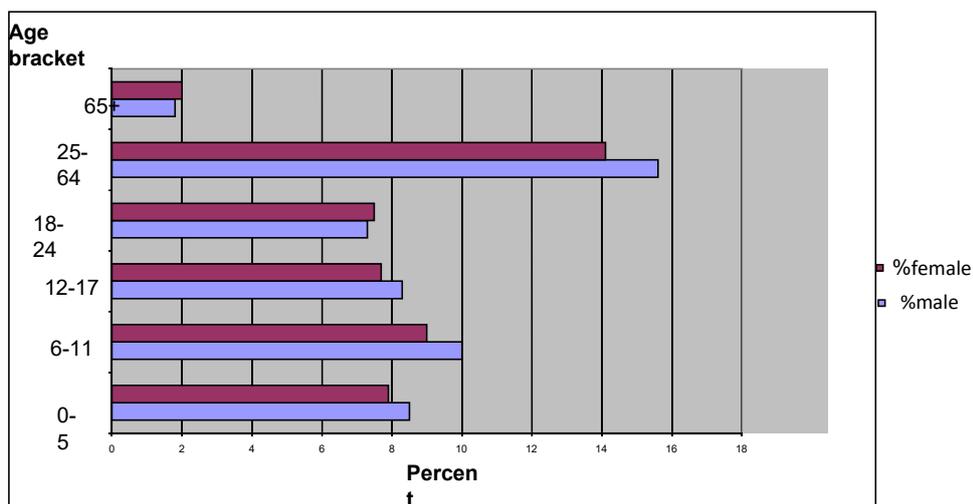


Fig. 4.7: Age and sex structure of Ogun State population as at 2024

(ii) Dependency Ratio:

According to a recent report (NISER, 2021), the overall average dependency ratio for Nigeria which is a summary of the child and the aged dependency ratio, typical of a developing country with high fertility was about 87.4% over 1996 – 1999 analytical years. Hence, it is a measure of the relative size of the non-working age population (those under 15 years and those 65 years and above) to that of the working age population (those between 15 years and 64 years). It indicates the burden on the working age population in having to support the non-working age population. The higher this ratio, the higher the number of persons each worker has to support as regards education, food, shelter and health.

In other words, besides taking care of himself/herself, the average Nigerian of working age is expected to take care of approximately one other person. However, the decline in the dependency ratio indicates a lessening of the economic burden of persons in the productive age range who support those of non-productive ages (NPC, 2000).

The dependency ratio is given by:
$$\frac{\text{Number of persons under 25 or over 60}}{\text{Number of person between 26 or 60 years old}} \times \frac{100}{1}$$

In the study communities, employment used to be overwhelmingly dependent on the cultivation of the land and fisheries, but with rapid urbanisation of Agbara Estate as well as location of more industries in the area, traditional employment has been abandoned where new generation of working class now seek employment in the numerous sprouting endeavours. Even farmlands have been ceded for these new enterprises. Unfortunately, growing population overwhelm available vacancies, hence many more persons still remain unemployed or under-employed.

4.6.1 Educational Characteristics

The level of educational attainment of respondents of the study area was found to be slightly satisfactory (about 54%); however, low technical/skills and educational attainment which abound in the study area short-changed the people of the host community from the demand of high skill employment labour/personnel needed in the industries sprouting in the study area. The survey showed that 45% of the respondents have secondary education, 9% has tertiary education and about 16% has no formal education, while approximately 30% have primary school educational training. It is of note to mention that some of the young women are aspiring to acquire higher education especially those in teaching profession where six (6) of the respondents with secondary education are part-time students of Adeniran Ogunsanya college of education (3) and Lagos State University (3) respectively.

4.6.2 Employment Opportunities and Income

The geographical landscape of the State comprises extensive fertile soil suitable for agriculture, and Savannah land in the north western part of the State, suitable for cattle rearing. There are also vast forest reserves, rivers, lagoons, rocks, mineral deposits and an oceanfront.

Agriculture is the main occupation of the people, providing income and employment for a large percentage of the population. The State is blessed with appropriate climate that supports cultivation of a variety of crops such as yam, cassava, maize, rice, plantain, beans, vegetables and citrus fruits such as orange, paw-paw, pineapple and so on. The main cash crops produced in the State are cocoa, cashew, kola nut, oil palm and palm kernels, rubber and coffee.

The Agricultural Policy of the State is to increase agricultural output substantially as a weapon against malnutrition and a means of improving the standard of living of the people, as well as producing for export. The State is a major producer of kolanut in the country. The State also produces rubber on a large scale, as well as timber of various species. Out of the total land area of about 16,409 square kilometres, about 20 per cent is preserved as forest reserves.

The Forest Reserves have over 26,352ha of gmelina, teak and pine. All these species are available as raw material for pulp and other wood based industries. Because of their abundant natural resources, ample level of infrastructure and availability of recreational facilities, these forest reserves have become a viable Tourist Centre. There are large-scale industries in the State, both privately and publicly owned. The private industries include cement, pharmaceuticals, paint, ceramics, roofing sheets, plastic, agro allied, foods and beverages, foam, breweries, distilleries, soaps and detergents, to mention a few. Government-owned industries are the Gateway Pharmaceutical Company Limited, Ikangba, Gateway Industrial and Technical Company Limited, Gateway Hotels at Abeokuta, Ijebu-Ode and Otta, amongst others. Moreover, Iwopin (Ogun Waterside) is witnessing a rebirth in the development of the multimillion naira Paper Mill in the State.

There is also a salt Industry at Ijoko Ota. As a complement to the economic activities of the State, there is a good network of roads for the transportation of goods. However, transportation within the coastal areas of the State is by speedboats and canoes. The basic objectives of setting up most of the industries are to meet the local demands for manufactured goods, provide industrial outlets for locally produced raw materials and provide employment opportunities for both skilled and unskilled manpower. While some people find employment in the public service, others are engaged in private concerns, and specialize in professions such as tailoring, wood works and carpentry, cloth weaving, tie and dye and the like. The small scale industries are mainly private initiatives.

These include farming, bakery, sawmilling, metal fabrication, woodworks and carpentry. Within the rural society, the major traditional economic activity of women is subsistence farming. Some of the literate women in the urban areas are employed in the mainstream of the public service, while a number of others are engaged in petty trading. The riverine areas of the State specialize in fishing, lumbering and boat building. Both the Federal and the Ogun State Governments provide a wide range of gainful employment in the State through the long established Public Service, which include the Judiciary, the Military, the Police Force, Customs, Immigration and Prison Services, Local Government service, Residential and Industrial Estates and Sports Stadia.

The proximity of the study area to Agbara Industrial area and several of OPIC Estates, has given it an advantage of diversified economy to which the people keyed-in, away from “their

traditional economic activities of farming, fishing, hunting and petty trading. The survey has shown that there has not been significant impact regarding employment of indigenes in the surrounding industries and facilities, which is lopsided in favour of non-indigenes, though opportunities abound for local contractors. A survey on some operating facilities/companies has shown that less than 10% of workforces in any of the company surveyed are indigenes. There are well qualified youths and able-bodied men very desirous of working among the respondents, which is a determinant of gaining employment, if only they can be considered. Furthermore, it was discovered that as a result of evolutionary trend in line with present diversified economy in the study area, some indigenes of host community have left all form of indigenous trade of farming and hunting to non-indigenes of Igbo extraction, while the marketing is for all comers. Some combine these occupations depend on how favourable the season.

Other opportunities of employment are found in cooked food vending, motorcycle commercial transportation, building construction artisanship and factory employment, Plate 14.



Plate 14: Employment opportunity – cooked food vending.

Fragmentation of land by land vendors has affected farmers in the study area. Farmlands are sold without notification of whose crops are there to harvest before the current owners introduces bulldozer to take possession for construction purposes.

Income

As typical of most Nigeria households, personal income levels of self-employed residents of the population were difficult to assess. Many do not keep records and are therefore uncertain of the gross or net amount actually earned from self-endeavours. However, these have been found to vary widely depending on occupational distribution and skills. The study showed that the income of those on contractual employment earn as high as N600, 000 per annum, while those employed as artisans are reported to earn an average of N474, 000 and N500, 000 to N920, 000 per annum respectively.

In the other hand, farming activities have not been favorable as a result of land vendor activities, development, and low yield of farm produce and shortage of farmland. Farmers in the communities presently earn between N35, 000 and N44, 000 monthly, which is seasonally determined and weather conditioned.

Infrastructural Facilities

Two major expressways pass through the State from Lagos to the Northern and Eastern parts of the Country, namely, the Lagos-Ibadan and Sagamu-Benin Expressways, while the third one from Sango-Ota to Abeokuta is under construction. Another Trunk “A” road links Abeokuta to Ibadan. There is also the Ota-Iroko Road and the Sagamu Interchange, Ilaro-Ohunbe Road which leads to the rest of West African countries. Most urban centres have water works but only Abeokuta has adequate water from the source. Other major settlements have between 25per cent and 70per cent of their present demand. Rural areas are generally poorly supplied with only about 50per cent having access to potable water.

There are many sources of power, but the primary source of power in the State is the national grid owned and operated by the Power Holdings Company of Nigeria Ltd, successors to the National Electricity Power Authority (NEPA). The installed capacity is 460KVA, and a large percentage of this serves Agbara and Ota industrial estates. Artificial demand is estimated at 350KVA. The major transmission lines in the State are 132KV lines, but the State is not yet fully covered by them. For example, the State Capital, Abeokuta, is supplied by only one leg, rendering it vulnerable whenever there are faults along this line. The distribution which is by 33KV lines has also not effectively covered the State, although all major towns have been connected. In general, while the urban areas can be said to have reasonable power supply, the rural areas are still in dire need. Telecommunications and postal Services are available in all the local government areas of the State. This is in addition to a modern Digital telephone exchange of the Global System for Mobile Communication (GSM) being provided by MTN, Airtel (formerly Celtel/VMobile), Globacom and NITEL. Other means of communication are Radio and Television Stations owned by Private Individual(s), the State and Federal Governments. These are the Gateway Broadcasting Corporation made up of OGTV and Gateway Radio (AM & FM), the Nigerian Television Authority (NTA) Abeokuta and Ijebu-Ode, as well as the Paramount FM of the FRCN including channels and other private broadcasting stations.

a. Educational Facilities

There are primary and secondary schools at the study area. Igere community, there is a primary school built in 1955 by the then government of Western Region headed by the Late sage, Chief Obafemi Awolowo. There are also Edun Secondary School and a technical college, Gateway Institute of Technology, Igbesa. Meanwhile, the Ihunsa community claimed that there are as much as 20 private and 1 government primary schools in its domain as well as 10 private post-primary schools, some of which are Mobe Oyin Primary and Secondary School and Christ the Lord Secondary.

b. Potable Water Supply and Sanitation

Generally the rural communities in Nigeria have been found to have less access to potable water supplies than their counterparts in the urban area. The riverine areas are particularly

worse off in this regard; less than 20% to 24% of the rural communities only have been found to have access to safe drinking water. There exist private boreholes from which residents derive their daily use of water supply in the study area.

c. Electricity

The communities in the study area have access to electricity supply, though not all the quarters are connected; they are all linked to the national grid. However, the incessant power outages have robbed the communities of the joy of the facility.

d. Transportation and Communication and Other Amenities

The communities are linked and accessible through numerous roads that entered Agbara Estate. The communities are still benefiting from the tarred roads and access routes constructed to easy movement into OPIC Estate Development Area.

The basic mode of transportation in and out of the study area is by private cars, commercial motorcycle operation and Keke-tricycle.

There are no Postal services in the study but available are telecommunication network signals of MTN, Etisalat and Airtel (Zain). Banking facilities are also absent in Adedigba community. There are several housing estates owned by OPIC Estates such as New Dawn, Clusters, New Terrace and Area 1 estates. The companies found in the area are Drury Chemicals (H₂SO₄), African Fertilizer (Silicates), Eko Supreme (Clean Detergent), Natural Prime, US & K Plastics, Sunflag, Golden Pasta Flourmill, etc.

Perception/Community Concerns and Expectations

During the consultation meetings and socio-economic survey several concerns and expectations were expressed. Respondents and consultation forum were pleased with the proposed project. Proponent also engaged indigenes in pre-site preparation of the acquired site among others. They are particularly not happy that they could not see the outcome of an early EIA carried out by other Companies, especially, GZI, hoping that this particular one should not go the same way.

They did not object to the proposed project, rather they pray that the proponent should maintain its steadfastness and not slacken in doing good for the communities as the year progresses. They nonetheless stated that the following requirements should be attended

- Proper management of its waste stream to avoid pollution of surrounding environment.
- Allot the position of the CLO to the community i.e an indigene;
- Give communities priority in employment opportunities.
- Welfare package to the traditional rulers and community representatives to facilitate control of the area
- Comprehensive Corporate Social Responsibility

4.6.3 Health Studies

Primary data on the health status of the communities were collected from Adedigba, Igere and Ihunsa. The data was complemented with data from Testimony Maternity Center, Ihunsa.

1. Disease prevalence and Vital statistics in the Communities

The major diseases prevalent in the surveyed communities were: malaria 20 – 29.7%, gastrointestinal tract diseases 25 – 42% and upper respiratory tract infections 9 – 15% (Table 4.14). This shows that communicable diseases were the leading causes of ill-health in the communities. This observation corroborates the health center records in the last 6 months that reported that malaria, diarrhea diseases, and respiratory tract infections had the highest proportional morbidity rates within the proposed project communities.

Table 4.14: Common Diseases in the Communities from Survey

Diseases	Communities			
	Adedigba		Ihunsa	
	Frequency	Proportional morbidity	Frequency	Proportional morbidity
Malaria	30	24.0	12	26.6
Gastrointestinal tract diseases	46	32	16	35.5
Upper respiratory tract infection	12	10	7	15

Source: Field Survey, 2024

Other less common health problems include anaemia, hypertension and diabetes mellitus. Farm work followed by road traffic accident was the commonest cause of injury. Children, pregnant women and the elderly were the most vulnerable groups.

Health records from the Testimony Maternity Center indicated that the commonest illnesses seen at the outpatient department were malaria (26.2%), respiratory tract infections (19.4%), diarrhea diseases (15.3%), hypertension (10.5%) and arthritis (5.1%). This is comparable with the findings of the community survey.

2. Mortality Rates

It was hard to convince respondents to give information on mortality rate as it is seen as trying to call back bad memories and calamity, though widely accepted as one of the most useful single measures of the health status of any community. Infant, under-five and maternal mortality rates for the communities are shown in Table 4.15 below. Malaria was the commonest illness and commonest cause of death among infants and under-fives. The mortality rates in the communities were comparable to national figures.

Table 4.15: Mortality rates in the Communities

Rate (per 1000)	National data (2003)	Igere	Ihunsa
Infant mortality rate	100	11.2	7
Under-five mortality rate	201	32	19

Maternal mortality rate	10	5.1	4
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Source: Field Survey, 2024

3. Available Health facilities in the communities

The available orthodox health facilities in the communities are shown in Table 4.16. Patent medicine stores and traditional medicine homes abound in the communities and are patronized by the people side by side with the orthodox health facilities. Most of the Primary Health Centres are understaffed, ill-equipped and underutilized.

Most (60%) of the expectant women studied prefer to deliver in the Maternity, while 30% prefers to go to a hospital outside the study area, 10% do not mind to deliver at home supervised by Traditional Birth Attendants (TBA). The patent medicine stores in the community are most times the first point of call when they are ill. Patent and herbal medicine hawkers are most patronized in these communities.

4. Life Style / Habit

Common food taken in the communities have carbohydrate base with little amount of protein and fats. Majority (58.5%) of the male youth/adult take a unit of alcohol at least once a week in contrast to 22.3% of the adult females.

5. Nutritional status of Children

This was assessed by determining the prevalence of stunting, wasting, and underweight in the communities. The results are in Fig. 4.8. When compared with the 2003 National reference values (Underweight 28.7%, Stunting 38.3% and wasting 9.2%) the prevalence of the three indices were similar in all the communities (Underweight 29.1%, Stunting 40.3% and wasting 9.7%).

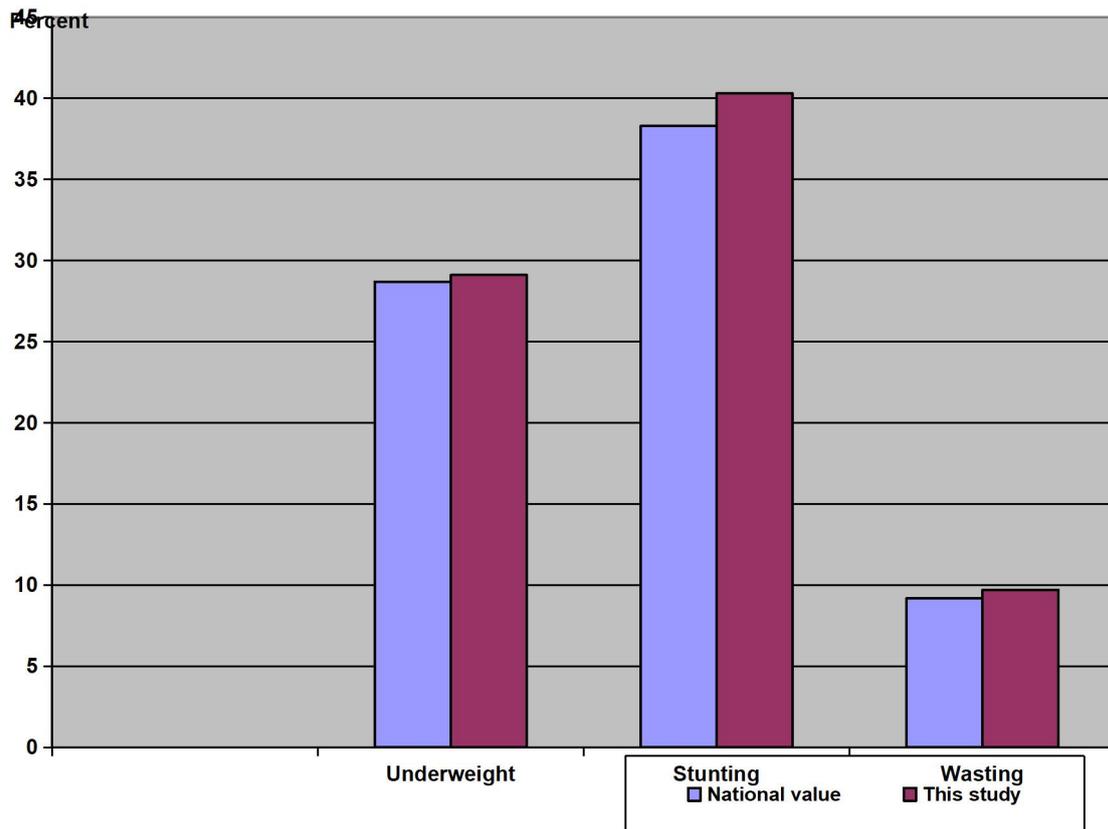


Figure 4.8: Nutritional status of under 5years in study communities

6. Immunization status

More than 50% of the children in the communities have been immunized against the childhood killer diseases including Tetanus and Diphtheria. The immunization coverage for Oral Polio and Measles vaccines among children (63%) was however below the reported national average of 77% as depicted in Fig. 4.9.

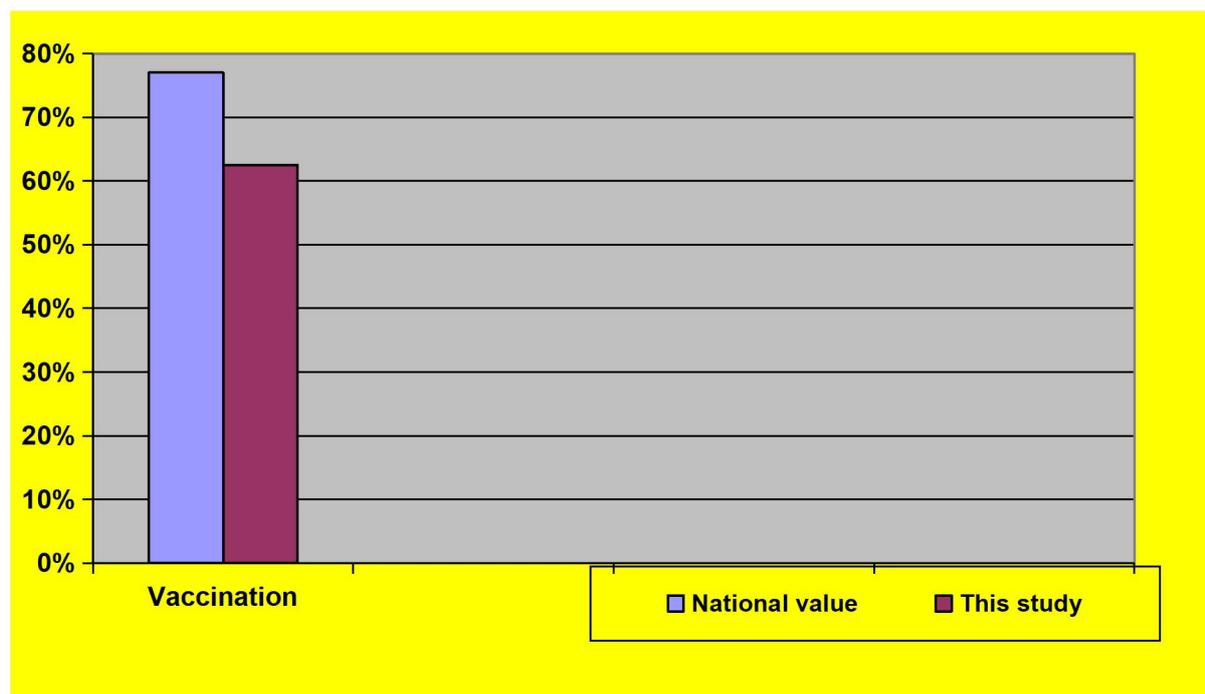


Fig. 4.9: Immunization status of children in study communities

7. Respiratory function test

The youths in the age bracket, 20-44 years, had a mean peak flow rate, which were within the normal limits, Table 4.17. The older adults (45 years and above) on the other hand had mean peak flow rate that was on the lower limit of normal. Possible causes might include long exposure to kitchen / domestic smoke.

Table 4.17: Mean Peak Flow Rate in the Communities

Age group(Years)	Standard Value(L/min)	Communities (L/min)
20-44	580 – 650	584.3
45 –70	500 – 560	486.4

8. Environmental Health

Environmental sanitation was poor as evidenced by indiscriminate disposal of domestic waste around the houses and available bush covers. Overgrown weeds abound around most (70%) of the houses. Many of the houses in the layout had water cistern or other means of sanitary disposal of faeces. People especially construction workers defecated into nearby bushes.

The environmental health condition with respect to source of water and waste disposal are summarized in Table 4.18.

Table 4.18: Water supply and Waste disposal system in Cluster I communities

Community	Source of Water	Sewage Disposal	Refuse Disposal
Igere	A & C	Bush, WC	Open air incineration, Bush
Ihunsa	A & C	Bush, WC	Open air incineration, Bush
Adedigba	A & C	Bush, WC	Open air incineration, Bush

KEY: A = Water Vendor, B = Pipe borne water, C = Bore hole; WC = Water cistern, + = mainly

Source: Field Survey, 2024

The standard of sanitation and water supply was similar in all the communities. The status of the communities with respect to sanitation and water quality is shown in Table 49.

9. Disease vectors

The disease vectors identified in the area were:

- Mosquitoes (particularly *Anopheles* spp., *Aedes* spp. and *Culex* spp). These were abundant in the communities especially in surrounding bushes where they breed. They transmit *Plasmodium* sp., which causes malaria as well as other mosquito-borne infections.
- Tsetse fly (*Glossina* sp.). They transmit *Trypanosoma*, which causes sleeping sickness in human.
- Housefly (*Musca domestica*) and latrine fly (*Fannia canicularis*) are common in refuse dumps. They transmit a wide array of disease agents including those of diarrhoea and dysentery.
- Snails (*Bulinus* sp.) occur in the surrounding bush covers, and they are host of *Schistosoma haematobium*, which causes schistosomiasis, characterized by frequent, painful micturition and hematuria.

Table 4.19: Indicators for Safe Water and Sanitation

S/No.	Indicator	Unit of Measurement	Communities Status	WHO Standards
1	Quantity of water	No of litres per person per day	>10 litres	50 litres / day / person
2	Quantity of water (access)	No of users per point (Tap or Well)	<10% of the population used a point (Tap or Well)	
3	Proportion of households without safe drinking water supply	Percentage	70% - 80%	< 5%
4	Access to safe water	Proportion with access to water within 200 m of a standing tap or well	<10%	Pipe borne water should be within 200 m of reach.
5	Sanitary Toilet	Proportion of household without sanitary toilet	>80%	
6	Morbidity from diarrhea diseases	No of cases treated at Sentinel Hospitals and Clinics	High prevalence of diarrhoea diseases in the area.	
7	Housing	Average no of persons per room (Adult and children)	>3 persons/room	Maximum of two adults of opposite sex/room No more than one adult and a child less than 12 years old.
8	Mosquito Breeding places	No. of sites/geographic area	All communities (100%)	
		Proximity to populated area	100%	

10. Knowledge, Attitude and Practice to Common Health Conditions

Common health conditions include malaria, respiratory tract infections and diarrheal diseases. 74.3% of the respondents in majority have heard of these conditions and are aware of their occurrence. About 56.2% attribute the conditions to insanitary conditions and a few believe they are due to close contacts with persons with the conditions, for example, hugging while the rest says they come from inadequate feeding and excessive intake of alcohol.

Knowledge, Attitude and Practices of Sexually Transmitted infections (STI) including HIV/AIDS

Up to 83.5% of the respondents have heard of diseases transmissible through sexual intercourse, 28% have wrong knowledge of the cause and mode of transmission of HIV/AIDS, while, 72% have correct knowledge. Majority of the respondents (60.4%) will not agree to share food / drinks with or stay in the same house with someone with an STI especially HIV/AIDS. However, 85.5% will, if they have any of the illness, seek appropriate treatment in a health facility.

11. Sexual Behaviour

The highest number of sexual partners kept by an individual respondent was six as shown in Fig. 4.10. However, keeping of two sexual partners was the most commonly practiced sexual behaviour relating to sexual partnering. It is a taboo among the Ogus or Eegu to indulge in sexual intercourse with condom. Surprisingly, no one claimed to have had STI/HIV/AIDS. Negative social habits like the use of stimulants such as alcohol (found to be in use in these communities) were risk factors in STIs and HIV/AIDS transmission. Alcohol is known to limit inhibitions and increase sexual urge. These factors encourage unprotected sexual practice and having multiple sexual partners.

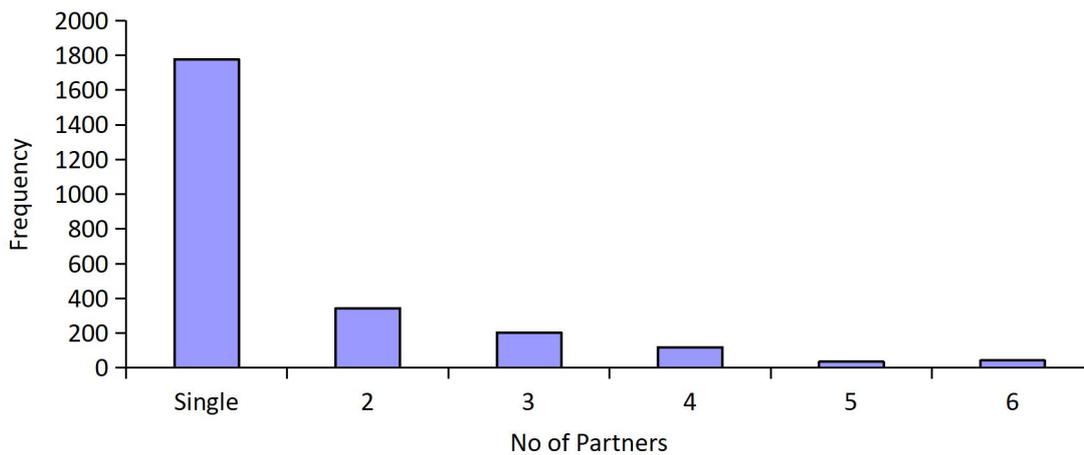


Fig. 4.10: Frequency Distribution of Sexual Partners among Respondents.

12. Perceived Health Problems from Coal power Activities

The communities perceived that air, land and underground water pollution are the potential negative environmental consequences of Coal power likely operations that could have adverse implications on health. They wanted these negative consequences to be carefully addressed through provision of well-staffed health centers, potable water, best available effluent treatment plant and good waste disposal system.

a. Health Determinants

The following were noted as health determinants in the study area and could have contributed to the overall burden of diseases.

- Healthcare facility, where available, lacked proper staffing, functional medical equipment and had inadequate drug supply.
- Personal Health practices such as defecation into surrounding bushes resulted in faecal pollution and spread of disease through flies.
- Physical Environment such as improper domestic waste disposal methods and overcrowding in houses.
- Healthy Child Development for example non-consumption of balanced diet in children.

b. Community Health Needs

The health related needs in the communities in order of preference are:

- Health services/facilities
- Safe drinking water
- Extension of good roads
- Vocational center

CHAPTER FIVE

POTENTIAL AND ASSOCIATED IMPACT ASSESSMENT

5.1 Introduction

This Chapter identifies and evaluates the actual and potential environmental consequences of the proposed project activities, with the potential for mitigation of negative impacts and enhancement of positive impacts. The assessment process involved looking at the environmental baseline features, uniqueness, potential vulnerabilities and the nature, location, and duration of construction activities, and project design features in effect throughout operation. Internationally and locally proven acceptable methods of impact prediction and evaluation were used as basis for developing the assessment process for the proposed project associated and potential impacts. The assessment of the potential and associated impacts of the Proposed Establishment of a Coal Power Plant Project in Adedigba Community, OPIC Industrial Estate, Agbara, Ado Odo/Ota L.G.A., Ogun State is presented hereunder.

5.2 Impact Assessment Methodology

The methodology adopted in the assessment of impacts entailed identification of aspects and impacts using source reference materials; defining impacts criteria and determination of mitigation measures followed by the formulation of impact management plan.

In general, the assessment of impacts has proceeded through an iterative Process considering Four(4) Key elements:

1. **Identification** or prediction of potential impacts and their magnitude i.e. the consequences of the proposals on the natural and social environment and associated cumulative impact.
2. **Evaluation** of the importance (or significance) of impacts taking the sensitivity of the environmental resources of human receptors into account.
3. Development of **Mitigation** measures to avoid, reduce or manage the impacts
4. Assessment of **Residual** significant impacts after the application of mitigation measures. Where significant residual impacts remain, further options for mitigation may be considered and impacts re-assessed until they are as low as reasonably practicable for the project.

The first two (items 1 & 2) process are core aspects of this Chapter 5, the last two (items 3 & 4) are core aspects of the next chapter on Mitigation Measures

The guidelines of ISO 14001:2015 were used for impact prediction and evaluation. This allow for interactive and descriptive analysis of relationships between the proposed project activities and the various environmental components (biophysical, health and social). The pathway followed in the identification / assessment and evaluation of the potential and associated impacts of the proposed project is illustrated in the Figure 5.1 below.

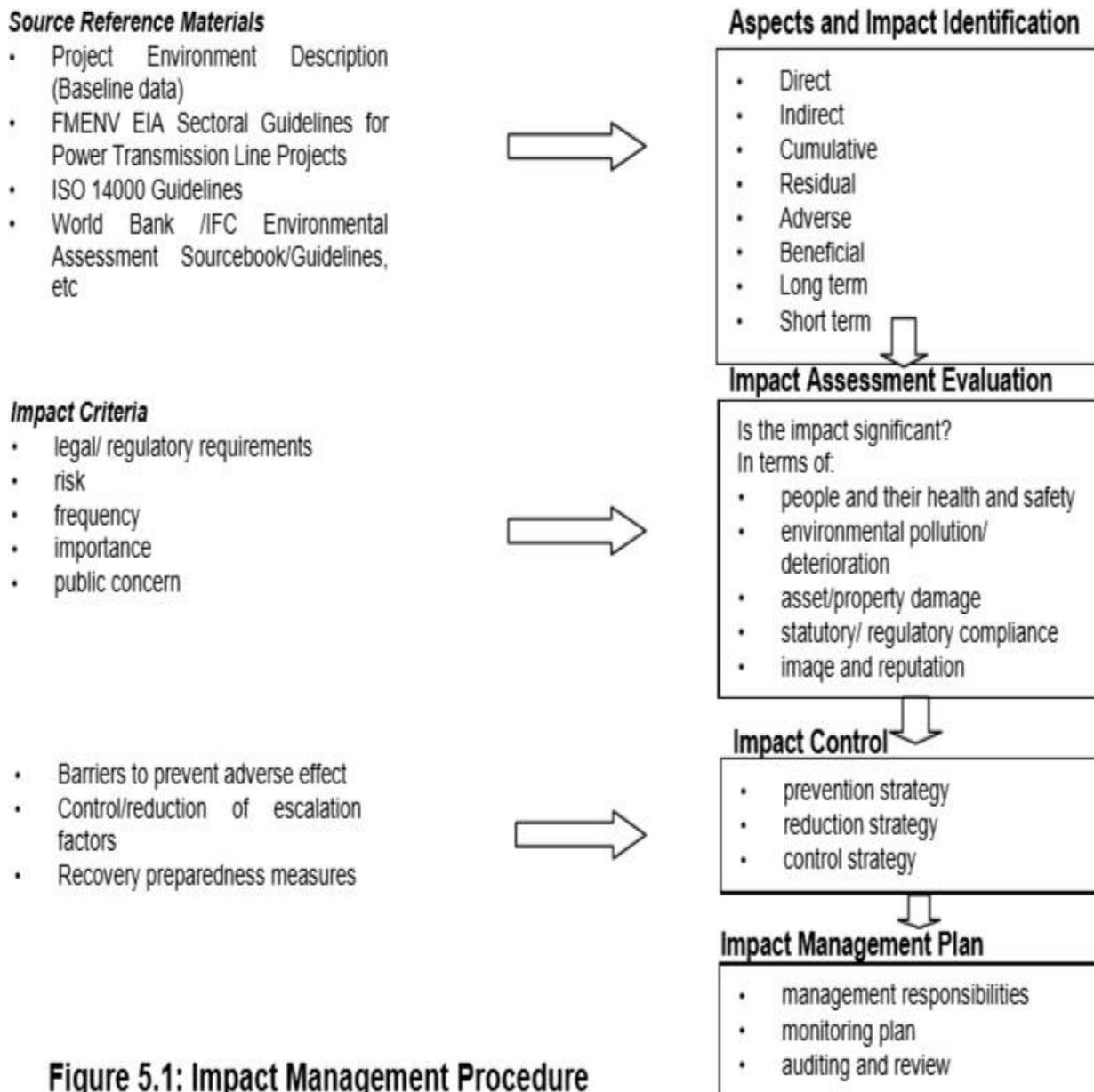


Figure 5.1: Impact Management Procedure

5.3 Impact Identification

The environmental aspects of the proposed project were teased out from the planned Project Activities description (*Chapter 3*). These aspects were then matched with the existing baseline description of the Project Environment (*Chapter 4*) and used to develop a checklist of potential and associated impacts of the proposed project.

5.3.1 Project Activities

The process adopted in the identification and assessment of the potential and associated impacts of the proposed Establishment of a Coal Power Plant Project considered various phases of the project, namely

- **Pre-construction phase:**
This will include mobilisation of materials and personnel, community engagement, permit to work, site preparation activities etc.;
- **Construction phase:**

Construction/Installation activities includes foundation works, fabrication of storage tanks, erection of plant-machineries, Site preparation and development, Civil construction work, Vehicular movement, Loading and unloading civil items and plant machineries, On site storage of civil items and plant machineries, Installation of plant and civil structures, Power supply, Maintenance of construction machinery, Disposal of solid wastes.

- **Operationphase:**

Operation activities will include: Manufacturing activities of various plants including production plant for production of coal power; Storage and handling of raw material and products; Transportation of raw materials, products and personnel; Generation of solid wastes, liquid waste and Gaseous emissions; project inspection, commissioning as well as operations and subsequent maintenance activities;

Decommissioning phase: - Disusing/abandoning of projectfacilities

5.3.2 Project Activities Interaction with Environmental Component (Interaction – Matrix)

Impacts are identified based on the project aspects. An *adopted* „checklist approach“ (*Interaction – Matrix*) have been developed and populated to identify the proposed project activities and components of the physical, biological and social environment that may be affected as a result of planned and unplanned project activities. This involved categorising the project into activities/phases and then the project environment into various components. The interaction between these two elements (the project and environment) may lead to changes in the environment. i.e.: **[Environment] + [Project] = {Changed Environment}**

This change may be direct or indirect, adverse or beneficial, cumulative or residual, long term or short term as described in Impact Characterization below.

The checklist (matrix interaction below; Table 5.1) shows the various project activities that generate impact.

Key: x = „impact is identified“ in the specified activity; as shown in the table below.

Table 5.1: Project Activities – Environmental Indicators Interaction Matrix

Project Activities	Pre-Construction			Construction & Installation							Operation/Maintenance							Decommissioning							
				Planned Activities				Unplanned			Planned Activities			Unplanned											
Environmental Indicators	Mobilization of construction elements	Recruitment/community Engagement	Site preparation (access & camping)	Plant Installation and Onsite fabrication	Construction of access roads	Installations of Project Utilities	Waste management	Fuel /hazardous materials handling	Painting and coating	Occupational health hazards from handling of machineries	Fires / explosions	Incidents / Accidents	Commissioning / Testing	Production of finished Product	Access road maintenance/Transport	System failure of plant operations	Waste management	Logistics (support, supply & servicing)	workplace accidents	Fire outbreak	Incidents and Accidents	Geo-hazards	Decommissioning of facilities	Abandonment / Restoration	
Air Quality																									
Particulates and Dust	x		x	x	x					x	x				x			x		x		x	x	x	
NOx, SOx, COx, etc.	x		x	x	x					x								x				x	x	x	
Gaseous Hydrocarbons										x								x				x			
Water Quality																									
Physio-chemical characteristics (BOD, COD, Turbidity, pH, etc.)			x		x										x		x						x	x	
Microbial characteristics	x		x		x	x	x								x		x						x		
Physical Characteristics (Color, Taste, Odor, Temperature,			x		x	x											x						x		
Aquatic Ecology																									
Plankton, benthos					x		x	x									x							x	
Fishes, hydrobiology							x	x									x					x			
Terrestrial Ecology																									
Vegetation/Flora species			x		x		x	x							x		x							x	
Avifauna and Mammals	x		x		x	x				x	x			x	x			x					x	x	x
Soil Quality																									
Physic-chemistry			x		x	x	x	x	x							x	x							x	
Topography / Natural Drainage	x		x		x	x				x					x			x					x	x	x
Sensory Perceptions																									
Noise Disturbance	x		x	x	x	x				x	x			x	x			x						x	
Visual Intrusions			x		x	x							x						x					x	x
Socio-Economics / Human Health																									
Existing / Planned infrastructures	x		x		x	x	x			x	x	x		x	x		x	x	x	x			x		
Employment Opportunities		x	x	x	x	x	x		x	x					x		x	x						x	x
Worker Safety / Occupational Health	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Public Health			x				x							x	x		x		x				x		
Land-use			x		x			x			x		x											x	
Traffic on local roads	x		x		x	x				x														x	
Macro & Micro Economics	x	x	x	x	x	x	x						x	x	x	x		x						x	x

5.4 Impact Characterization

The identified impacts of the proposed project were further characterized as explained in the definitions in Table 5.2 below. The characterization was based on the nature, characteristics and duration of the various project activities on the ecological components of the environment as well as human health and safety as necessary.

The character of the identified impacts from the project activities is as presented afterward in Table 5.3: (In the color boxes of the Table: Green color means 'Positive impact', while Red color means 'Negative impact').

Table 5.2 Impact Characterization

Impact Characterization	Definition
Beneficial Impacts	Impacts that would produce an overall positive effect on the well-being of the people as well as the environment.
Adverse Impacts	Impacts that may result in: <ul style="list-style-type: none"> • irreversible and undesirable change(s) in the biophysical environment; • decrease in the quality of the biophysical environment; • limitation, restriction or denial of access to or use of any component of the environment to others, including future generations; and • sacrifice of long term environmental viability or integrity for short term economic goals
Direct Impacts	Impacts resulting directly (direct cause-effect consequence) from a project activity
Indirect Impacts	Impacts that are at least one step removed from a project activity. They do not follow directly from a project activity.
Normal Impacts	Impacts that will normally be expected to follow a particular project activity
Abnormal Impacts	An impact is considered to be abnormal when it follows a project activity as against sound predictions based on experience.
Short-term Impacts	Impacts that will last only within the period of a specific project activity.
Long-term Impacts	Impacts whose effects remain even after a specific project activity.
Reversible Impacts	Impacts whose effects can be addressed on application of adequate mitigation measures
Irreversible Impacts	Impacts whose effects are such that the subject (impacted component) cannot be returned to its original state even after adequate mitigation measures are applied
Cumulative Impacts	Impacts resulting from interaction between ongoing project activities with other activities, taking place simultaneously
Incremental Impacts	Impacts that progress with time or as the project activity proceeds.
Residual Impacts	Impacts that would still remain after mitigation measures have been applied

Table 5.3: Impact Characterization for the Coal Power Plant Project

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
Pre-Construction Phase									
Permitting & Land Acquisition • Consultations • Acquisition of Social license cooperate • Stakeholder identification • Project-Sitemapping	Acceptance and co-operation/ participation from stakeholders (communities and government) leading to peaceful and timely execution of the project	Green	White	Green	Green	Green	Green	Green	Green
	Uncertainty and increased perturbation due to a lack of information and communication.	White	Red	Red	Red	Red	Red	Red	Red
	Perception of the local people (host communities) and stakeholders	Green	White	Green	Green	Green	Green	Green	Green
	Integration of men and women concerns into the project design	Green	White	Green	Green	Green	Green	Green	Green
	Exclusion of vulnerable groups from consultations which may lead to strife	White	Red	Red	Red	Red	Red	Red	Red
	Community agitations over compensations, land disputes, wrong stakeholder identification, leadership tussles, etc	White	Red	Red	Red	Red	Red	Red	Red
	Conflict over land ownership amongst natives and payment of compensation for acquired land.	White	Red	Red	Red	Red	Red	Red	Red
	Improvement in quality of life for adequately compensated individuals	Green	White	Green	Green	Green	Green	Green	Green
Transport of Personnel and Construction Elements • Abuja – Lokoja Highway	Increased traffic during mobilisation on road with risks of accidents leading to injury/death and loss of asset.	White	Red	Red	Red	Red	White	Red	White
	Risks of armed robbery and Militant/youth attack and hostage taking leading to injury/ death of personnel	White	Red	Red	White	Red	White	Red	White
	Nuisance (noise and vibrations) due to movement from heavy duty equipment and vehicles affecting public and wildlife.	White	Red	Red	Red	Red	White	Red	White
	Increase of dust particles and vehicular emissions (SOx, NOx, COx etc)	White	Red	Red	Red	Red	White	Red	White
	Work place accidents/incidents from the use of cranes, forklifts, etc. during loading and offloading of materials/equipment.	White	Red	Red	Red	Red	White	Red	White
	Obstruction of/damage to existing roads due to increased usage during mobilisation.	White	Red	White	Red	Red	White	Red	White
	Interference with other road users along mobilisation route.	White	Red	Red	Red	Red	White	Red	White
	Interference with public utilities (electric wires and poles), market activities along mobilisation route	White	Red	White	Red	Red	White	Red	White
	Movement of workers into host communities and resultant increase in population.	White	Red	White	Red	Red	Red	Red	Red
	Leakage of fuel or lube oil on land or into water bodies during transportation and storage may lead to increased chemical toxicity	White	Red	White	Red	Red	Red	Red	Red
Recruitment of Labour	Employment opportunities arising from recruitment of technical and non-technical workers for the project	Green	White	Green	Green	Green	Green	Green	White

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
	Skill acquisition and enhancements to local indigenes and workforce.	Green		Green	Green	Green	Green	Green	
	Influx of people (migrant workers, subcontractors and suppliers) and increased pressure on existing social infrastructure		Red		Red	Red		Red	
	Increase of communicable diseases due to influx of people and poor living conditions around pre-construction sites		Red		Red		Red	Red	
	Increase in social vices (like theft, prostitution) resulting from increased number of people		Red		Red	Red	Red	Red	
	Recruitment of Local hands/labour.	Green		Green	Green			Green	
	Conflicts/community agitations over employment issues (quotas and methods)		Red		Red	Red		Red	
Site Preparation • Site Survey • Removal of vegetation and de-stumping • Access to site • Service roads • Camping and campsites	Business opportunities for local contractors through sub contracting activities	Green		Green	Green	Green		Green	
	Local support services from road side supply markets and shops etc	Green		Green	Green			Green	
	Creation of job and job opportunities	Green		Green	Green			Green	
	Contamination of (<i>potential</i>) surface water as a result of siltation caused by increased erosion, during site preparation.		Red		Red		Red	Red	
	Loss of topsoil. Decreased soil fertility and agricultural production		Red	Red	Red		Red	Red	
	Disturbance of the vegetation cover / loss of forest products (fuel wood, timber, medicinal plants) due to site clearing and preparation.		Red	Red	Red		Red	Red	
	Loss/disturbance of wildlife due to habitat loss/fragmentation from vegetation clearing along access roads		Red		Red		Red	Red	
	Soil compaction, destabilisation from excavation and runoff erosion resulting in sedimentation problems.		Red		Red		Red	Red	
	Fragmentation of wildlife habitats/increase in poaching due to an easier access for the local population and non-resident workers.		Red		Red		Red	Red	
	Alteration of natural drainage patterns		Red		Red		Red	Red	
	Personnel injury/death resulting from malfunction and mal-operation of equipment etc.		Red		Red		Red	Red	

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
	Wildlife attack (e.g snake bite, bee sting)		■		■		■	■	
	Pollution (dust) from soil surface.		■		■		■	■	
	Increased demand on existing local infrastructures (road, housing etc) due to influx of workers and job seekers.		■		■	■		■	
	Influx of predominantly male population (job seekers) into stakeholder’s communities leading to increased extramarital sexual activity, and introduction of commercial sex workers		■		■	■		■	
	Potential effects on air quality from emission of pollutants from engines e.g. bull-dozers and support equipment.		■	■		■		■	
	Waste generation/disposal		■	■		■		■	

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
	<ul style="list-style-type: none"> scrap metal, wood, sand, concrete, paper, domesticwaste Waste from laydown area from grubbingof site creation (Material andwood) 								
Construction Phase									
Installation of the Production Plant and Fabrication and Metal works <ul style="list-style-type: none"> Cutting, bending and welding steelcomponents Handling of conductor wires, strings, insulatorsand fittings 	Workplace accidents from burns, cuts, bruises, trips and falls, objects at height, leading to injury or fatalities.								
	Employment of local labour and skills acquisition for workers taking advantage of new opportunities								
	Influx of (predominantly male population) job seekers into stakeholder’s community leading to increased extramarital sexual activity, and introduction of commercial sex workers								
	Risk of electrocution and burns (to onsite workers) from welding flashes and high currents during welding								
	Possibility of vision impairment from exposure to light emitted from welding sparks and foreign particles/objects entering the eyes.								
	Noise and attendant vibration effects from fabrication and associated welding equipment								
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding of steel components								
	Generation of metal scraps from conductor wires, strings and steel elements associated with fabrication of steel components.								
Foundation / Earth Works <ul style="list-style-type: none"> On-sitegeotechnical testings Plant installationworks 	Increased business and economic activities as well as diversification of income sources due to supply contracting and subcontracting								

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
<ul style="list-style-type: none"> • Pilings and trenching,etc • Land Clearing 	increase in revenue opportunities for local population due to presence of non-resident workers and travellers (technical workers)								
	Interruption of surface water flows and potentials for salt-water intrusion in identified tidal zones of the project areas during construction.								
	Soil / groundwater contamination resulting from accidental leakages and spills of hazardous substances (diesel, cleaning agents, lubricants, hydraulic oil)								
	Increased jobs and job opportunities from local labour hire and sub-contracting to indigenous suppliers.								
	Generation of dust and automobile / heavy duty equipment emissions from construction earth works.								
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along								

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
	access roads and at project site								
	Fragmentation (i.e destruction and disturbance) of habitat								
	Fauna disturbance and displacement as a result of migration away from construction activity area (this include impact on bird life)								
	Introduction of Alien Invasive Plant Species (AIPS)								
	Potential collapse of plant structures as a result of unsuitable geotechnical conditions								
	Reduction in wildlife population as a result of poaching due to easier access created by access road clearing								
	Temporary obstruction of movement of wild-Herbivores								
	Aquatic Habitat Alteration								
	Exposure to Electromagnetic Field (EMF)								
	Noise nuisance (including impulsive noise) from construction activities (e.g. piling) resulting to temporary migration of sensitive mammals and rodents.								
Coal Power Plant Installations and Associated utilities“ Constructions • Bolts and nutstightening • Anti climbing guardsand step bolts • Insulators andfittings • Conductor wirestringing • Connectorsfixing, • Visual &landscape	Pollution of soil/water as a result spilled fuel and other waste oil discharge during Facility construction and installation processes								
	Traffic diversion and congestion along local roads during installation at road crossings.								
	Workplace accidents / incidents (trip/falls etc) from heights during conductor wire stringing and bolt/nuts tightening project activities.								

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
	Risks of injury / death and loss of assets resulting from accidents associated with road transportation to and from construction sites		Red	Red	Red	Red		Red	
	Risks of fire/explosions resulting from accidental ignition of onsite diesel storage tanks		Red		Red	Red		Red	
	Waste generation/disposal <ul style="list-style-type: none"> • scrap metal, wood, sand, concrete, paper, domesticwaste • used oil and replaced/obsolete equipment parts that may contaminatesoil/groundwater • Waste from lay-down area and project sites from grubbing of accessroads 		Red	Red		Red		Red	
	Localised economic benefits from materials supplies by local contractors	Green		Green	Green	Green		Green	
	Induced secondary development within the neighbouring host communities from increased economic activities.	Green		Green	Green	Green	Green	Green	
	Socio-cultural conflicts between the construction team and indigenous populace due to contrasts in believes and traditions		Red		Red	Red	Red	Red	
	Visual intrusion as a result of alterations to normal landforms and aesthetic beauty of construction sites		Red		Red	Red	Red	Red	Red

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
	Aesthetic value of project site location due to encroachment of natural vegetation/flora		Red		Red		Red	Red	Red
	Increased demand on existing infrastructure (roads, housing, medical facilities, etc) due to influx of workers / induced secondary development in the area during construction activities resulting in squatter settlements.		Red		Red	Red		Red	
	Permanent loss of land (some with arable potentials) potentials along the access route		Red	Red			Red	Red	
	Site conditions leading to increased malaria epidemic from uncontrolled mosquito breeding in swamp areas, snake bites, as well as water borne diseases e.g. diarrhoea and cholera associated with poor sanitary Conditions		Red		Red	Red		Red	
Demobilisation • Demobilisation after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, objects at height, leading to injury or fatalities.		Red	Red		Red		Red	
	Soil / groundwater contamination resulting from accidental leakages and spills of hazardous substances (diesel, cleaning agents, lubricants, hydraulic oil)		Red		Red		Red	Red	
	Traffic congestion during transportation of demobilised equipment and personnel		Red		Red	Red		Red	
	Generation of dust and automobile / heavy duty equipment emissions.		Red	Red		Red		Red	
	Reclamation of marshalling yards, facility sites, access roads (to prevent unauthorised access) and lay-down areas	Green			Green	Green	Green		
	Waste disposal (scrap metal, wood, sand, concrete, paper, domestic waste)		Red	Red		Red		Red	
	Loss of employment and business opportunities due to completion of construction phase		Red	Red	Red	Red	Red	Red	
	Illegal access to project facility leading to accident, sabotage, asset damage, and loss		Red		Red	Red		Red	
	Soil runoff and erosion resulting in sedimentation problems		Red		Red		Red	Red	
Operation Phase									
Operations • Commissioning and testing • Testing and handover	Community dissatisfaction regarding the conduct of DPL on compensation issues may lead to strife before full operations of the project		Red		Red	Red		Red	
	Development of agricultural land due to easier access and consequent discovery of new arable lands for farming	Green			Green		Green	Green	

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
Operations • coal power productions.	Increased availability of coal power for energy efficiency	Green		Green			Green	Green	Green
	Increase in infrastructural development within project location	Green		Green	Green		Green	Green	
	Increased business opportunities and quality of life (small, medium, large scales) due to enhanced product availability outputs	Green		Green	Green	Green	Green	Green	
	Improvement in socioeconomic status due to	Green		Green	Green	Green	Green	Green	

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
	social/welfare development of the area.	Green		Green	Green	Green	Green	Green	
	Increased Job opportunities and employment.	Green			Green	Green	Green	Green	
	Risk of electricity shocks from power source for the proposed plant operation.		Red		Red		Red		Red
	Electric shock and burns to members of the public in the event of damage to electric Wires		Red		Red		Red		Red
	Unchecked encroachment on the project site, leading to land-use conflicts and accident.		Red		Red		Red	Red	
	Noise from plant operations		Red		Red		Red	Red	
	Distortion of power supply signals and electrostatic circuit due to electromagnetic induction from power source.		Red		Red		Red	Red	
	Use of site corridors for other facilities (clinic, security posts, communication cables as well as water pipes etc)	Green		Green		Green		Green	
	Mortality of birds, due to collision with earth wires on power supply line to Plant.		Red		Red		Red	Red	
	Development of new infrastructures or improvement to existing ones.	Green		Green	Green	Green	Green	Green	
Maintenance • Facility inspection and checks • Project components “ replacements • Access routemaintenance • Plantmaintenance	Proliferation of weeds around project site		Red		Red		Red	Red	
	Disturbance of bird habitats and avifauna from activities of maintenance crew.		Red		Red		Red	Red	
	Development of local maintenance activities to encourage employment and empowerment within the communities.	Green			Green	Green		Green	
	High level of Job creation in the overall infrastructural sector	Green			Green	Green		Green	

Interference with local traditional festivals or activities by unscheduled maintenance work and failure to keep to management plans may lead to community strife.								
Maintenance activities may lead to creation of additional adverse impacts on local soils, geology, flora or fauna.								
Maintenance onsite may lead to collision of wildlife with the stays that are not visible in the dense vegetation								
Limited knowledge on safety measures and behaviours associated with line operation that can lead to accidents								

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
Production Processes, Machineries and Hazardous Chemical Handling	Localized increase in the ambient concentration of air pollutants due to chemical fumes								
	Possibility of injury to skin due to burns resulting from chemicals.								
	Surface water contamination from chemical spills								
	Risk of injury / death of personnel as a of industrial accident								
	Waste generation/discharge (packaging materials/ containers, food wastes/pigging wastes etc) and associated environmental effects.								
	Possibility of fire explosion								
	Employment opportunities during operation and maintenance								
	Incineration of hazardous waste								
Coal Power Production (Production Plant Processes)	Production of Coal Power								
	Increased atmospheric heat (high level of hot air)								
	Exposure to mechanical and electrical risks								
	Physical hazards and accidents from handling of plant machineries, equipment and tools								
	Occupational health and safety of workers								
	Respiratory hazards from inhalation of toxic Gases								
	Heat (high temperature) effect on human Health								
	Required high level of Energy Input								
Emission of toxic gases and Release of greenhouse gases on air quality and climate									

	change							
	Noise generation from Plant operation							
	Generation of solid waste							
	Increased vehicular movement and traffic congestions							
Decommissioning/Abandonment Phase								
Decommissioning / Abandonment • Plant / facilities removal • Waste generation	Increased sedimentation process of <i>potential</i> water bodies close to project sites.							
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages and wastes from decommissioning.							
	Release of SO _x , NO _x , CO _x , etc from exhausts of decommissioning vehicles and equipment which could lead to atmospheric pollution / GHG emission							
	Increased dust and vehicular emissions during transport.							
	Increase in ambient noise levels above							

Project Activities	Potential and Associated Impacts	IMPACT CHARACTER							
		Beneficial	Adverse	Direct	Indirect	Short-term	Long-term	Local	Regional
	baseline conditions from movement and activities of decommissioning equipment and automobiles.								
	Traffic obstruction from transportation of decommissioned structures and equipment to receiving hub.								
	Risk of accident and injury to worker during demolition of structures								
	Incident/accident resulting from the movement of materials and equipment On low loader								
	Loss of lives due to accident/incident caused by abandoned structures left at site								
	Risks of pirate/militant/youth attacks and possible hostage taking which may lead to injury or fatality of personnel.								
	Interference with public utilities (electric wires and poles), market activities along demobilisation route								
	Return of land to Owners								
	Availability of land for alternative uses								

5.5 Impact Evaluation: *Quantification and Ranking of Impact Significance*

Evaluation process is based on professional judgment and use of clearly defined criteria (legal/ risk, frequency of occurrence, importance and public concern) to determine the significances or otherwise of the impacts. The evaluation of impact followed a process of firstly ascertaining the magnitude of the impact, determining the level of sensitivity and then evaluating the significance level of the impact.

At this stage, the potential and associated impacts identified and characterized (*in Sections 5.3 and 5.4 respectively*) in the previous stage of the assessment process were evaluated (quantified and given significance ranking). The evaluation which was based on clearly defined criteria (Legal/regulatory requirement (**L**), Risk (**R**), Frequency of occurrence (**F**), Importance (**I**) and Public interest/concern (**P**)) was used to determine the significance or otherwise of the impacts.

After which, the significance of the potential impacts from the proposed project aspects was categorized as **“High”, “Medium” or “Low”**.

The criteria and weighing scale adopted for the evaluation are described as follows

Legal/Regulatory Requirements (L)

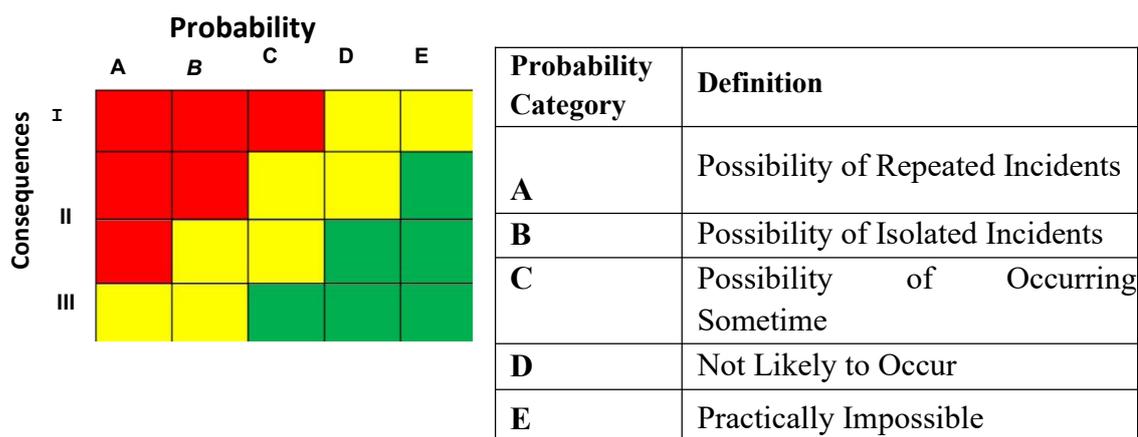
Here, the proposed project activities that resulted in impacts were weighed against existing legal / regulatory provisions to determine the requirement or otherwise for permits prior to the execution of such activities. Such legal/regulatory requirements were identified from the laws/guidelines, which have been reviewed in Chapter 1. The weighting scale used was as follows:

Legal/Regulatory Requirements Criterion:

Condition	Rating
No legal / regulatory requirement for carrying out project activity	Low =1
Legal / regulatory requirement exist for carrying out activity	Medium =3
A permit is required prior to carrying out project activity which may result in impact on the environment	High =5

Risk Posed by Impact (R)

The health, safety and environmental risks associated with each impact were assessed and ranked as “low”, “medium” or “high”, using the Risk Assessment Matrix (RAM). Reference was also made to the source references listed in the previous sections. Three criteria (consequence, probability of occurrence and severity) were used as basis for ranking the risks of the impacts. These were determined using the RAM as shown in **Figure 5.2** below.



Consequence Category	Considerations			
	Safety / Health	Public Disruption	Environmental Aspects	Financial Aspects
I II III IV	Fatalities / Serious Impact on Public	Large Community	Major/Extended Duration/Full Scale Response	High =5
	Serious Injury to Personnel / Limited Impact on Public	Small Community	Serious / Significant Resource Commitment	Medium =3
	Medical Treatment for Personnel / No Impact on Public	Low	Moderate / Limited Response of Short Duration	Low =1
	Low Impact on Personnel	Minimal to None	Minor / Little or No Response Needed	None

Figure 5.2: Risk Assessment Matrix

The risks (measure of the likelihood and magnitude of an adverse effect) associated with such project operations were evaluated in terms of:

- 5.5.1 risk to human health;
- 5.5.2 risk to asset (commercial and economic risk);
- 5.5.3 risk to the biophysical environment; and
- 5.5.4 risk to the DPL's reputation.

Based on the matrix above, the weighting used was as follows:

Risk Criterion

Risk	Attribute – Environmental, Human Health, Safety and Reputation
1= Low 	<ul style="list-style-type: none"> This means that no further mitigation may be required
3= Medium 	<ul style="list-style-type: none"> This means that the impact can be mitigated with additional controls and modifications
5=High 	<ul style="list-style-type: none"> This means that the impact requires avoidance or major control/mitigation

Frequency of Impacts Occurrence (F)

Evaluation of the frequency of occurrence of each impact was also carried out. Frequency of occurrence was rated as “high”, “medium” or “low” based on the historical records of accidents/incidents, consultation with experts and professional judgment. The frequency criterion is summarised below.

Frequency Criterion

Frequency	Attribute – Environmental, Human Health and Safety
High = 5	<ul style="list-style-type: none"> Major degradation in quality in terms of scale (>1% of study area or habitat within the study area), appearance, duration (beyond duration of project) Irreversible or only slowly recoverable (change lasting more than 1 year) degradation of environmental ecosystem level (population, abundance, diversity, productivity) High frequency of impact (occur continuously and almost throughout the project execution period (<4 months)) Geographic extent of impact (e.g. encompassing areas beyond study area)
Medium = 3	<ul style="list-style-type: none"> Degradation in quality in terms of scale (>0.1% of study area, habitat), appearance, duration (a few months) Effect beyond naturally occurring impacts variability Slow reversibility (change lasting a few months before recovery), lasting residual impact Potential for cumulative impact Intermittent frequency of impact (occur in only a few occasions during the project execution period) Limited geographic extent of impact (large area within study area)
Low = 1	<ul style="list-style-type: none"> Low degradation in quality in terms of scale (<0.1% of study area, habitat, very localized), appearance, duration (a few days to a month) Effect within range of naturally occurring impacts, changes, dynamics Rapid reversibility (change lasting only a few weeks before recovery), no lasting residual

	<ul style="list-style-type: none"> • impact of significance • • No potential for significant cumulative impact • • Low frequency of impact (occur in just about one occasion during the project execution period) • Only very localized geographic extent of impact (e.g. not more than a few meters from impact source point)
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Importance of Impact (I)

The importance of target environmental component in respect of identified potential impact was also determined and rated as “high”, “medium” or “low”. The ratings were based on consensus of opinions among consulted experts including project engineers and other stakeholders in the proposed project. The importance criterion is summarized below.

Importance Criterion:

Importance	Attribute – Environmental, Human Health and Safety
High = 5	<ul style="list-style-type: none"> • Highly undesirable outcome (e.g., impairment of endangered, protected habitat, species) • Detrimental, extended flora and fauna behavioral change (breeding, spawning, molting) • Major reduction or disruption in value, function or service of impacted resource • Impact during environmentally sensitive period • Continuous non-compliance with international best practices
Medium = 3	<ul style="list-style-type: none"> • Negative outcome • Measurable reduction or disruption in value, function or service of impacted resource • Potential for non-compliance with international best practices
Low = 1	<ul style="list-style-type: none"> • Imperceptible outcome • Insignificant alteration in value, function or service of impacted resource • Within compliance, no controls required

Public Interest/Perception (P)

Here, the interest/perception of the public on the proposed project and the identified potential/associated impacts were determined through consultation with proposed project stakeholders. The ratings of “high”, “medium” or “low” were assigned based on consensus of opinions among consulted known stakeholders.

The public perception/interest criterion is summarised below.

Public perception /interest criterion

Public Perception	Attribute – Environmental and Human Health
High (5)	<ul style="list-style-type: none"> • Elevated incremental risk to human health, acute and/or chronic • Possibility of life endangerment for community inhabitants and site personnel • Major reduction in social, cultural, economic value • Continuous non-compliance with international best practices • Any major public concern among population in the project region
Medium (3)	<ul style="list-style-type: none"> • Limited incremental risk to human health, acute and/or chronic • Unlikely life endangerment for community inhabitants and site personnel • Some reduction in social, cultural, economic value • Possibility of adverse perception among population • Potential for non-compliance
Low (1)	<ul style="list-style-type: none"> • No known risk to human health, acute and/or chronic • No known risk of life endangered for community inhabitants and site personnel • Low reduction in social, cultural, economic value • Unlikely adverse perception among population

The impact significance rating will be determined, using the matrix provided in *Figure 5.3 below*.

		<i>Sensitivity of Resource/Receptor</i>		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Figure 5.3 Impact Significance Criteria for Environmental Impacts

Result of Impact Evaluation

The results of the impact assessment exercise as discussed in this **Section (5.5)** are presented in **Table 5.4**. The various project phases, planned project activities, the environmental aspects of the proposed project as well as the identified associated and potential impacts are reflected. Also included in Table 5.4 are impact significance evaluation criteria: (legal/regulatory

requirements (**L**), risk posed by impact (**R**), frequency of occurrence (**F**), importance of affected environmental component (**I**) and public perception (**P**).

In addition, the overall ratings of impact significance (**High** or **Medium** or **Low**) of each impact considered have been included.

The overall significance ratings were based on the following considerations:

5.5.4.1 High = (L+R+F+I+P) ≥ 15 or (F+I) ≥ 6 or P = 5

5.5.4.2 Medium = (L+R+F+I+P) ≥ 8 but <15

5.5.4.3 Low = (L+R+F+I+P) <8

Table 5.4: Potential and Associated Impact Assessment and Significance Quantification of the Proposed Coal Power Project

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
Pre-Construction Phase								
Permitting & Land Acquisition • Consultations • Acquisition of Social license to operate • Stakeholder identification • Project-Site mapping	Acceptance and co-operation/participation from stakeholders (communities and government) leading to peaceful and timely execution of the project	-	-	-	-	-	-	Beneficial
	Uncertainty and increased perturbation due to a lack of information and communication.	1	3	2	4	4	14	Medium
	Perception of the local people (host communities) and stakeholders	2	2	2	4	4	14	
	Integration of men and women concerns into the project design	-	-	-	-	-	-	Beneficial
	Exclusion of vulnerable groups from consultations which may lead to strife	1	3	2	4	4	14	Medium
	Community agitations over compensations, land disputes, wrong stakeholder identification, leadership tussles, etc.	3	3	2	4	4	16	High
	Conflict over land ownership amongst natives and payment issue of compensation for acquired land.	3	4	2	4	4	17	High
	Improvement in quality of life for adequately compensated individuals.	-	-	-	-	-	-	Beneficial
Transport of Personnel and Construction Elements	Increased traffic during mobilisation on road with risks of accidents leading to injury/death and loss of asset.	3	3	3	3	3	15	High

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
through highway	Risks of armed robbery and Militant/youth attack and hostage taking leading to injury/ death of personnel	2	3	3	4	3	15	High
	Nuisance (noise and vibrations) due to movement from heavy duty equipment and vehicles affecting public and wildlife.	3	3	2	3	2	13	Medium
	Increase of dust particles and vehicular emissions (SOx, NOx, COx etc)	2	2	2	2	2	10	Medium
	Work place accidents/incidents from the use of cranes, forklifts, etc. during loading and offloading of materials/equipment.	3	3	1	3	3	13	Medium
	Obstruction of/damage to existing roads due to increased usage during mobilisation.	2	3	3	3	3	14	Medium
	Interference with other road users along mobilisation route.	2	3	3	3	3	14	Medium
	Interference with public utilities (electric wires and poles), market activities along mobilisation route	2	3	1	3	3	12	Medium
	Movement of workers into host communities and resultant increase in population.	2	3	3	3	3	14	Medium
	Leakage of fuel or lube oil onto land or into water bodies during transportation and storage may lead to increased chemical toxicity.	2	2	2	3	3	12	Medium
Recruitment of Labour	Employment opportunities arising from recruitment of workers	-	-	-	-	-	-	Beneficial

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
	Skill acquisition and enhancements to local indigenes and workforce.	-	-	-	-	-	-	
	Influx of people (migrant workers, subcontractors and suppliers) and increased pressure on existing social infrastructure	2	3	3	3	3	14	Medium
	Increase of communicable diseases due to influx of people and poor living conditions around pre-construction sites	2	3	2	3	3	13	Medium
	Increase in social vices (like theft, prostitution) resulting from increased number of people	2	3	2	3	3	13	Medium
	Recruitment of Local hands/labour.	-	-	-	-	-	-	Beneficial
	Conflicts/community agitations over employment issues (quotas and methods)	3	3	2	4	4	16	High
SitePreparation • SiteSurvey • Removal of vegetation andde-stumping • Access tosite • Serviceroads • Camping andcampsites	Business opportunities for local contractors through sub contracting activities	-	-	-	-	-	-	Beneficial
	Local support services from road side supply markets and shops etc	-	-	-	-	-	-	Beneficial
	Creation of job and job opportunities	-	-	-	-	-	-	Beneficial
	Contamination of (<i>potential</i>) surface water as a result of siltation caused by increased erosion, during site preparation.	4	2	1	3	2	12	Medium
	Loss of topsoil. Decreased soil fertility and agricultural production	3	3	2	3	2	13	Medium
	Disturbance of the vegetation cover / loss of forest products (fuel wood, timber, medicinal	3	3	2	3	2	13	Medium

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation					SUM	Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)		
	plants) due to site clearing and preparation.							
	Loss/disturbance of wildlife due to habitat loss/fragmentation from vegetation clearing along access roads	3	3	2	3	2	13	Medium
	Soil compaction, destabilisation from excavation and runoff erosion resulting in sedimentation problems.	3	3	2	3	2	13	Medium
	Fragmentation of wildlife habitats/increase in poaching due to an easier access for the local population and non-resident workers.	3	3	2	3	2	13	Medium
	Alteration of natural drainage patterns	3	3	2	3	2	13	Medium
	Personnel injury/death resulting from malfunction and mal-operation of equipment etc.	3	3	3	4	3	16	High
	Wildlife attack (e.g. snake bite, bee sting)	1	2	1	3	2	10	Medium
	Pollution (dust) from soil surface.	2	2	2	2	2	10	Medium
	Increased demand on existing local infrastructures (road, housing etc) due to influx of workers and job seekers.	2	3	3	4	3	15	High
	Influx of predominantly male population (job seekers) into stakeholder's communities leading to increased extramarital sexual activity, and introduction of commercial sexworkers	2	3	3	4	3	15	High
	Potential effects on air quality from emission of pollutants from engines e.g. bulldozers and	1	1	2	2	1	7	Low

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
	support equipment.							
	Waste generation/disposal <ul style="list-style-type: none"> scrap metal, wood, sand, concrete, paper, domesticwaste Waste from laydown area from grubbingof site creation (Material and wood) 	3	2	2	3	3	13	Medium
ConstructionPhase								
Installation of the Plant and Fabrication and Metal works <ul style="list-style-type: none"> Cutting, bending and welding steelcomponents Handling of conductor wires, strings, insulatorsand fittings 	Workplace accidents from burns, cuts, bruises, trips and falls, objects at height, leading to injury or fatalities.	3	3	3	4	4	17	High
	Employment of local labour and skills acquisition for workers taking advantage of new opportunities	-	-	-	-	-	-	Beneficial
	Influx of predominantly male population) job seekers) into stakeholder's community leading to increased extramarital sexual activity, and introduction of commercialsex workers	2	2	3	4	5	16	High
	Risk of electrocution and burns (to onsite workers) from welding flashes and high currents during welding	2	3	2	4	5	16	High
	Possibility of vision impairment from exposure to light emitted from welding sparks and foreign particles/objects enteringthe eyes.	2	3	3	4	5		High
	Noise and attendant vibration effects from	2	1	1	2	1	7	

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
	fabrication and associated welding equipment							Low
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding of steel components	2	2	2	2	2	10	Medium
	Generation of metal scraps from conductor wires, strings and steel elements associated with fabrication of steel components.	2	2	2	3	2	11	Medium
Foundation / Earth Works • On-site geotechnical testings • Plant installation works • Pilings and trenching, etc • Land Clearing	Increased business and economic activities as well as diversification of income sources due to supply contracting and subcontracting	-	-	-	-	-	-	Beneficial
	increase in revenue opportunities for local population due to presence of non-resident workers and travellers (technical workers)	-	-	-	-	-	-	Beneficial
	Interruption of surface water flows and potentials for water intrusion in identified tidal zones of the project areas during construction.	2	2	1	3	2	10	Medium
	Soil / groundwater contamination resulting from accidental leakages and spills of hazardous substances (diesel, cleaning agents, lubricants, hydraulic oil)	3	3	3	3	3	15	High
	Increased jobs and job opportunities from local labour hire and subcontracting to indigenous suppliers.	-	-	-	-	-	-	Beneficial

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
	Generation of dust and automobile / heavy duty equipment emissions from construction earth works.	1	2	1	1	1	6	Low
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and at project site.	3	3	3	3	3	15	Medium
	Fragmentation (i.e. destruction and disturbance) of habitat	3	3	3	3	3	15	Medium
	Fauna disturbance and displacement as a result of migration away from construction activity area (this include impact on bird life)	3	3	3	3	3	15	Medium
	Introduction of Alien Invasive Plant Species (AIPS)	1	1	1	1	1	5	Low
	Potential collapse of plant structures as a result of unsuitable geotechnical conditions	2	3	1	3	3	12	Medium
	Reduction in wildlife population as a result of poaching due to easier access created by access road clearing	2	2	2	3	3	12	Medium
	Temporary obstruction of movement of wild-herbivores	1	2	2	2	2	9	Medium
	Aquatic Habitat Alteration	2	1	1	1	1	5	Low
	Noise nuisance (including impulsive noise) from construction activities (e.g. piling) resulting to temporary migration of sensitive mammals and rodents.	2	1	1	1	1	6	Low

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
Coal Power Plant Installations and Associated utilities" Constructions <ul style="list-style-type: none"> • Crane lifting and erections • Bolts and nuts tightening • Anti climbing guards and stepbolts <ul style="list-style-type: none"> • Insulators and fittings • Conductor wire stringing • Connectors fixing, • Visual & landscape 	Pollution of soil/water as a result of spilled fuel and other waste oil discharge during Facility construction and installation processes	3	3	3	3	3	15	High
	Traffic diversion and congestion along local roads during installation at road crossings.	1	1	1	1	3	7	Low
	Workplace accidents / incidents (trip/falls etc) from heights during conductor wire stringing and bolt/nuts tightening project activities.	3	3	2	4	3	15	Medium
	Risks of injury / death and loss of assets resulting from accidents associated with road transportation to and fro construction sites	2	2	2	3	3	12	Medium
	Risks of fire/explosions resulting from accidental ignition of onsite diesel storage tanks	2	5	2	3	3	15	High
	Waste generation/disposal <ul style="list-style-type: none"> • scrap metal, wood, sand, concrete, paper, domestic waste • used oil and replaced/obsolete equipment parts that may contaminate soil/groundwater <ul style="list-style-type: none"> • Waste from lay-down area and project sites from grubbing of access roads 	2	2	3	2	3	12	Medium
	Localised economic benefits from materials supplies by local contractors	-	-	-	-	-	-	Beneficial
	Induced secondary development within the neighbouring host communities from	-	-	-	-	-	-	

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation					SUM	Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)		
	increased economic activities.							
	Socio-cultural conflicts between the construction team and indigenous populace due to contrasts in beliefs and traditions	2	2	2	4	4	14	Medium
	Visual intrusion as a result of alterations to normal landforms and aesthetic beauty of construction sites	1	1	1	1	1	5	Low
	Aesthetic value of project site location due to encroachment of natural vegetation/flora	2	1	1	1	7	7	Low
	Increased demand on existing infrastructure (roads, housing, medical facilities, etc) due to influx of workers / induced secondary development in the area during construction activities resulting in squatter settlements.	2	2	2	3	3	12	Medium
	Permanent loss of land (some with arable potentials) potentials along the access route	1	2	2	3	4	12	Medium
	Site conditions leading to increased malaria epidemic from uncontrolled mosquito breeding in swamp areas, snake bites, as well as water borne diseases e.g. diarrhoea and cholera associated with poor sanitary conditions	3	3	3	4	3	16	High
Demobilisation	Workplace accidents from burns, cuts, bruises, trips and falls, objects at height, leading to injury or fatalities.	2	2	2	3	4	13	Medium
Demobilisation after construction phase	Soil / groundwater contamination resulting	4	3	2	4	3	16	

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation					SUM	Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)		
	from accidental leakages and spills of hazardous substances (diesel, cleaning agents, lubricants, hydraulic oil)							High
	Traffic congestion during transportation of demobilised equipment and personnel	1	1	1	1	2	6	Low
	Generation of dust and automobile / heavy duty equipment emissions.	2	1	1	1	2	7	Low
	Reclamation of marshalling yards, project sites, access roads (to prevent unauthorised access) and lay-down areas	-	-	-	-	-	-	Beneficial
	Waste disposal (scrap metal, wood, sand, concrete, paper, domestic waste)	3	2	2	3	3	13	Medium
	Loss of employment and business opportunities due to completion of construction phase	1	2	2	3	4	12	Medium
	Illegal access to project facility leading to accident, sabotage, asset damage, and loss	2	3	2	5	5	17	High
	Soil runoff and erosion resulting in sedimentation problems	2	2	2	3	2	11	Medium
Operation Phase								
Operations • Commissioning and testing • Testing and handover	Community dissatisfaction regarding the conduct of DPL on compensation issues may lead to strife before full operations of the project	1	0	0	0	0	0	Low
	Development of agricultural land due to easier access and consequent discovery of	-	-	-	-	-	-	Beneficial

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
	new arable lands for farming							
Operations • Production of Coal Power	Increased availability of coal power for energy efficiency for customers	-	-	-	-	-	-	Beneficial
	Increase in infrastructural development within project location	-	-	-	-	-	-	Beneficial
	Increased business opportunities and quality of life (small, medium, large scale) due to enhanced finished product outputs	-	-	-	-	-	-	Beneficial
	Improvement in socioeconomic status due to social/welfare development of the area.	-	-	-	-	-	-	Beneficial
	Increased Job opportunities and employment.	-	-	-	-	-	-	Beneficial
	Unchecked encroachment on the project site, leading to land-use conflicts and accident.	2	2	2	4	2	12	Medium
	Noise from plant operations	1	1	1	1	2	6	Low

	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
	Use of site corridors for other facilities (clinic, security posts, communication cables as well as water pipes etc)	-	-	-	-	-	-	Beneficial
	Local fauna disturbances from around the project site	3	3	2	3	3	14	Medium
	Effectively contribute to the nations need for final products.	-	-	-	-	-	-	Beneficial
	Development of new infrastructures or improvement to existing ones.	-	-	-	-	-	-	
Maintenance • Facility inspection and checks • Project components replacements • Access route maintenance • Plant maintenance	Proliferation of weeds around project site	2	1	1	1	1	6	Low
	Disturbance of bird habitats and avifauna from activities of maintenance crew.	3	2	3	2	4	14	Medium
	Development of local maintenance activities to encourage employment and empowerment within the communities.	-	-	-	-	-	-	Beneficial
	High level of Job creation in the overall industrial and energy sector.	-	-	-	-	-	-	Beneficial

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation					SUM	Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)		
	Interference with local traditional festivals or activities by unscheduled maintenance work and failure to keep to management plans maylead to community strife.	2	3	3	4	5	17	High
	Maintenance activities may lead to creation of additional adverse impacts on local soils, geology, flora or fauna.	2	2	2	3	2	11	Medium
	Maintenance onsite may lead to collision of wildlife with the stays that are not visible in the dense vegetation	1	2	2	3	2	10	Medium
	Limited knowledge on safety measures and behaviours associated with line operation that can lead to accidents	2	2	4	3	2	12	Medium
Production Processes, Machineries and Hazardous Chemical Handling	Localized increase in the ambient concentration of air pollutants due to chemical fumes	1	2	1	2	1	7	Low
	Possibility of injury to skin due to burns resulting from chemicals.	2	3	2	4	4	15	High
	Surface water contamination from chemicalspills	1	1	1	1	1	5	Low
	Risk of injury / death of personnel as a result of industrial accident	3	3	3	3	3	15	High
	Waste generation/discharge (packaging materials/ containers, food wastes/pigging wastes etc) and associated environmentaleffects.	2	2	2	2	2	10	Medium

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
	Possibility of fire explosion	3	2	4	4	4	17	High
	Employment opportunities during operation and maintenance	-	-	-	-	-	-	Beneficial
	Incineration of hazardous waste	2	2	2	3	3	13	Medium
Coal Power Production <ul style="list-style-type: none"> • Production Plant Processes • Loading, Hauling, Crushing and grinding 	Production of Coal Power end-products	-	-	-	-	-	-	Beneficial
	Atmospheric pollutants emissions (SO _x , CO _x , NO _x , etc.) into the atmosphere from generator exhaust	0	5	5	0	3	13	High
	Exposure to mechanical and electrical risks	4	4	4	5	5	22	High
	Physical hazards and accidents from handling of plant machineries, equipment and tools	3	3	2	3	3	14	Medium
	Occupational health and safety of workers	3	3	2	3	3	14	Medium
	Respiratory hazards from inhalation of toxic gases	3	3	2	4	4	16	High
	Heat (high temperature) effect on human health	3	3	3	3	3	15	High
	Risks of chronic health diseases (asbestosis, silicosis etc.) to personnel and natives from inhalation of dust released from crushing.	0	5	5	0	3	13	High
	Emission of toxic gases and Release of greenhouse gases on air quality and climate change	4	4	3	5	4	20	High
	Noise generation from Plant operation	3	1	2	3	2	11	Medium
Generation of solid waste.	4	2	3	5	4	19	High	

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation						Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)	SUM	
	Increased vehicular movement and traffic congestions, Workplace accidents during loading / offloading.	4	4	3	5	4	20	High
Decommissioning/Abandonment Phase								
Decommissioning / Abandonment • Plant/ Facilities removal • Wastegeneration	Increased sedimentation process of <i>potential</i> water bodies close to project sites.	2	1	1	3	2	9	Medium
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages and wastes from decommissioning.	2	2	2	3	3	12	Medium
	Release of SO _x , NO _x , CO _x , etc from exhausts of decommissioning vehicles and equipment which could lead to atmospheric pollution / GHG emission	2	2	2	3	2	11	Medium
	Increased dust and vehicular emissions during transport.	2	1	2	1	1	7	Low
	Increase in ambient noise levels above baseline conditions from movement and activities of decommissioning equipment and automobiles.	2	1	2	1	1	7	Low
	Traffic obstruction from transportation of decommissioned structures and equipment to receiving hub.	3	2	3	3	3	14	Medium

Project Activities	Potential and Associated Impacts	Impact Significance Evaluation					SUM	Significance Ranking
		Legal (L) Requirement	Risk (R)	Frequency (F)	Importance (I)	Perception (P)		
	Risk of accident and injury to worker during demolition of structures	3	2	3	3	3	14	Medium
	Incident/accident resulting from the movement of materials and equipment on low loader	3	2	3	4	4	16	High
	Loss of lives due to accident/incident caused by abandoned structures left at site	3	3	3	4	4	17	High
	Risks of pirate/militant/youth attacks and possible hostage taking which may lead to injury or fatality of personnel.	2	3	3	4	4	16	High
	Interference with public utilities (electric wires and poles), market activities along demobilisation route	3	3	2	3	3	14	Medium
	Return of land to Owners	-	-	-	-	-	-	Beneficial
	Availability of land for alternative uses	-	-	-	-	-	-	Beneficial

5.6 Impact Discussion from Proposed Project Activities

The identified, evaluated and ranked impacts are further discussed in this section. Discussions made here are intended to provide an insight into the significance or otherwise of identified impacts. The likely impacts of the proposed project on the physical, biological, and socio-cultural components in the study area are as follows:

5.6.1 Land use

Land acquisition for the proposed project will impact on land use. These activities involve significant land take, which would have otherwise have been used for settlement and agriculture. This impact will be most significant at the acquired area. The impact would be direct, irreversible and of long-term duration. There is no ecologically sensitive area within the project area of influence under land use pattern.

5.6.2 Vegetation

Site clearance for the establishment of the coal power production and construction activities in green-field areas will result in removal of vegetation and habitat. Trees, shrubs and herbs will be permanently removed. Stands of more obvious and viable economic species such as *Elaeis guineensis*, *Dioscorea rotundata*, *Manihot esculentus* and *Ananas comosus* will be lost, thus resulting in an impact on terrestrial fauna.

The habitats of these species and homes of animal wildlife will also be lost. These impacts will however, be restricted to the acquired area. The impact would be direct and of long-term duration.

5.6.3 Biodiversity

The impact on plant biodiversity will be direct and adverse as species will be lost permanently as a result of site clearing. The impact will also be limited to the acquired area. The impact would be direct and of long-term duration.

The clearing of vegetation cover is planned to accommodate the manufacturing plant and ancillary structures. There would be loss of flora species in the site as well as migration of fauna species that make use of the plants for food and shelter further away into the forest. Generally, the impacts on flora and fauna species are termed Low significant considering the area of land to be cleared. DPL shall clear area required for the construction of plant development as well as additional areas required for access to site. There is no ecologically sensitive area within the project area of influence under land use pattern.

5.6.4 Water and Soil

Soil will be exposed to direct sunlight rays due to removal of vegetation. This may elicit erosion, high temperature and changes in soil moistures regimes. This will lead to changes in soil physical and chemical characteristics and subsequent death of soil organisms; promotion of run-off and may impact nearby water body. These impacts will be direct and long term but localized.

The operational phase of the project is expected to have effect or bearing on the water aquifer of the area and soil over time. Water for drinking and domestic use will be sourced from the ground using constructed boreholes. Over time the recharge rate of the water level beneath the soil may be disrupted.

Also, diesel and oil leakage from vehicle movement, stored oil, maintenance workshops and from plant are likely to sip into the soil if not handled properly and may find its way to nearby river where they become nuisance. The possibility of this occurring is rather low, hence has been ranked Low significant.

5.6.5 Air Quality

Project activities like vegetation clearing, etc. will impact on the air quality due to generation of dust and gaseous emission as a result of movement of heavy machineries. The particulate matters that would be released into the air could reduce visibility. The particles may settle on the surface of leaves thereby blocking the stomatal pores through which gaseous exchange occur during respiratory/photosynthetic activities. The exhaust fumes from the heavy equipment may contain gaseous hydrocarbons and noxious oxides like CO_x, NO_x and SO_x. The impact would be direct, reversible and of short term duration.

5.6.6 Noise and vibration

During site preparation and construction activities, work equipment will result in increased noise level and vibration in the area, although noise would not cause a major disturbance to the local inhabitants. However, workers at the site and facilities close by would be impacted.

Increased noise level during site construction activities from movement of heavy trucks, earth moving equipment and other machinery during plant operation. Noise may cause a major disturbance to fauna species such as birds and mammals in the area, as they would move further into the forest.

5.6.7 Socio-Economics

The likely effects of the planned project and related activities on the communities and its total environment are enumerated below:

Demographic Changes

The proposed project activities, which will involve movement of job seekers, could lead to a temporary net increase in population and moderately affect the demographic pattern. This impact is expected to be direct and indirect, reversible, of short-term duration and rated low.

Increase in social vices

The job opportunities created by the project activities and the expected monetary gains could encourage some social vices such as drunkenness, violence and drug abuse. It could also attract commercial sex workers (CSW) and teenage girls to the area. The influx of these categories of people to the area has the potential to increase teenage pregnancies. The impact would be direct, irreversible/reversible, long-term, and rated high.

Pressure on existing infrastructure

The relatively large labour force required for project activities could lead to an increase in overall population of the communities. Population increase due to the labour force and migrants could lead to overcrowding and its consequent pressure on existing housing, educational and recreational facilities. The impact would be direct, reversible, short-term, and rated medium.

Community Agitation

Land acquisition, destruction of farmlands and other areas of interest and supply of labour could attract third party agitation involving inter- and intra-communal conflicts and human rights issues. The impact would be direct, reversible, short-term, and rated high.

Increase in cost of living/inflation

The increase in population which is likely to occur as a result of the movement of people to the project site could overstretch available food supplies, healthcare and other social facilities such as housing, water and power supply. The shortage of these goods and services could result in increase in cost of living and attendant inflation. This impact would be direct, reversible, short-term, and rated medium.

Improvement in Local Economy

Positively, the proposed project is expected to benefit the local economy of the host community employment opportunities, the opportunities for contract works and welfare improvements in the host community. All these are capable of having a beneficial multiplier effect on the local economy.

5.6.8 Health

Emergence of new communicable diseases

The movement of a large number of people (workers and job) into the hitherto isolated, discrete communities could introduce new diseases in the communities if good hygiene is not ensured. This impact would be direct, reversible, of short-term duration.

Sexually transmitted infections (STIs), skin and respiratory diseases

There could be an increase in STIs (including HIV/AIDS), due to anticipated movement of commercial sex workers and increase in sexual risk behaviours. Skin and respiratory diseases could also occur from overcrowding and poor ventilation (poor housing conditions) due to anticipated marginal increase in population. This impact would be direct, irreversible, of long-term duration and rated high.

Soft tissue injury and poisoning

There could be an increase in soft tissue injuries and poisoning from exposure of field workers and community members to poisonous plants and dangerous animals (snakes, bees,

etc.) that have been displaced from their habitats. This impact would be direct, reversible, of short-term duration and rated medium.

Trauma and deaths

This could result from work-related accidents involving field workers. This impact would be direct, irreversible, of long-term duration and rated high.

Respiratory disorders

Gaseous discharges and dust particles from vegetation clearing, excavation and heavy machinery/vehicles used during construction, could impair lung functions could lead to or aggravate respiratory disorders such as bronchitis and asthma. This impact would be direct, irreversible, of long-term duration and rated high.

Productions require high level of energy input, thus increased heat is generated, with attendant atmospheric effect on air quality; and higher temperature above normal for human health condition. And rated medium.

5.6.9 Waste generation

Solid Waste

Solid wastes generated can be hazardous or non-hazardous in nature. Improper handling of these wastes or their discharge into the surrounding environment without proper treatment would increase the level of micro-organisms (bacteria, viruses and fungi) that could be pathogenic to staff working in the area or to aquatic organisms. Solid waste discharged into waterways may become marine debris, and pose as threat to marine organisms, coastal communities and industries that utilise marine waters. They can also injure or kill marine mammals, fish and birds from entanglement with plastics and other solid waste. DPL intends to manage these wastes by a combination of source reduction, waste minimisation and recycling.

Liquid Wastes

Liquid wastes (wastewater) discharges contain a variety of substances that can cause pollution and they include detergents, oil and grease, organic compounds, hydrocarbons, nutrients, etc. Untreated greywater (sewage) from the plant facility during operation are known to contain strains of fecal coliform bacteria several times greater than is typically found in treated domestic sewage. Greywater has the potential to cause adverse environmental effects because of concentrations levels of nutrients and other oxygen-demanding materials it contains. DPL intends to put in measures to handle liquid waste that will be generated.

Gaseous Emissions

Air pollutant gases contribute to global emission load leading to global warming and increased greenhouse effect. The use of aerosols during painting or spraying of plant

components would also lead to the release of chlorofluorocarbons (CFCs), also a chief contributor to global warming.

Impact of waste discharge and gaseous emission on the environment are high significant especially when not properly managed. They could cause problem to aquatic life and human health. Hence should be treated with great priority.

5.6.10 Traffic

It is envisaged that movement of personnel and equipment along the local road leading to the site would increase once the project commences. The road within the community is slightly busy during the day and as such may lead to intermittent traffic build up which may not last long with proper coordination.

5.6.11 Visual/ aesthetic

The project development will no doubt bring about change in visual look of the project site. If the structures are architecturally well-designed it could be aesthetically pleasing. On the other hand, if the project is partially developed and then abandoned, its visual impression could be negative. Project abandonment may also lead to resentment and frustration from community inhabitants and as such should not be considered.

CHAPTER SIX

MITIGATION MEASURES

6.1 Introduction

Environmental Impact Assessment (EIA) has as its principal and most important objective the development and establishment of suitable procedures (mitigation measures) for the identified significant and adverse impacts of a proposed project. Equally identified is the aim of enhancing the potentially beneficial aspects of the development. Project activities established in *Chapter 3* and evaluated in *Chapter 5* show that the various components of the environment will be impacted positively or negatively, as well as some mitigation measures. *This Chapter 6*, therefore, presents the detailed mitigation (preventive, reduction and control) measures proffered for the associated and potential impact of the *proposed Establishment of a Coal Power Plant Project in Agbara, Ado Odo/Ota L.G.A., Ogun State* on the ecological and socio- economic environment to eliminate or reduce to As Low As Reasonably Practicable (*ALARP*), thus preserving the ecological integrity of the existing environment as captured in *Chapter 4*.

Mitigation measures are developed to avoid, reduce, remedy or compensate for any negative impacts identified, and to create or enhance positive impacts such as environmental and social benefits. In this context, the term “mitigation measures” includes operational controls as well as management actions.

These measures are often established through industry standards and may include:

- Changes to the design of the project during the design process (e.g. changing the development approach);
- Engineering controls and other physical measures applied (e.g. waste water treatment facilities);
- Operational plans and procedures (e.g. waste management plans); and
- The provision of like-for-like replacement, restoration or compensation

In determining the specific mitigation measures for each impact, the following were put into consideration:

- Available resources and competencies;
- On-site conditions;
- Regulatory Requirements; and
- Public concerns and available technology.

6.2 Approaches to Impact Mitigation

The approaches to the mitigation measures include enhancement (for the positive impacts), prevention, reduction, avoidance and compensation (for the significant negative impacts). The mitigation measures for each (significant and adverse) impact of the proposed project

activities were generally identified based on the associated effect to the environment and human health/safety. The significance of the impact, probability or likelihood that the impact would occur and the severities of its consequence (as determined from the risk assessment matrix) were indices used for determining the mitigation requirements as illustrated in Figure 6.1.

Subsequently, the frequency, severity, sensitivity, scale, magnitude and nature of the impacts were taken into consideration during these assessments.

The framework for determining the form of mitigation measures to be applied for the significant impacts identified for the project is presented below (Figure 6.1).

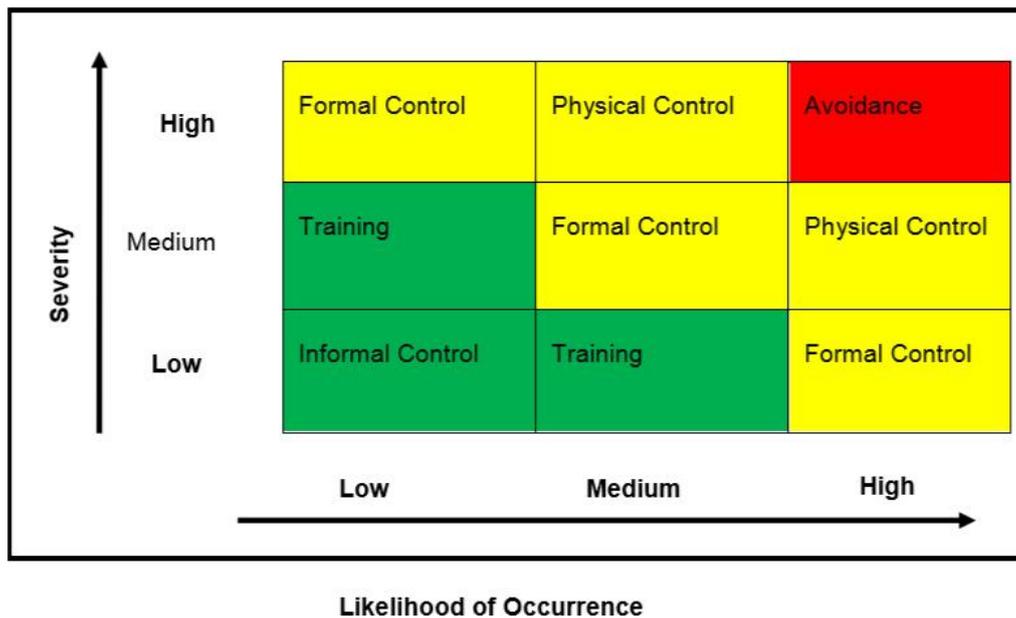


Figure 6.1: Matrix for Determination of Mitigation Measures

The definitions of the various approaches to impact mitigation (which are the primary objectives in proffering mitigation measures) considered are presented below.

Enhancement: These are measures proffered to ensure that significant beneficial impacts of the existing facilities and proposed project are encouraged.

Prevention: These are measures proffered to ensure that significant and adverse potential impacts and risks do not occur.

Reduction: These are measures proffered to ensure that the effects or consequences of those significant associated and potential impacts that cannot be prevented are reduced to a level as low as reasonably practicable.

Formal control: This involves the application of documented policy, process or procedure in mitigating the impacts of the project activities.

Informal Control: This involves the application of sound judgment and best practice in mitigating the impacts of project activities.

Physical control: This involves the application of physical processes or instruments (pegs, flags, sign post etc), not necessarily requiring any special technology, in order to mitigate the

impacts of a project or impacts.

Avoidance: This involves the modification of plans, designs or schedules in order to prevent the occurrence of an impact or impacts.

Training: This involves personnel awareness in specific / specialized areas.

6.3 Management Procedure for Mitigation Measures

The management procedures employed for the establishment of mitigation measures for the identified impacts is presented in **Figure 6.2**. Mitigation measures were subsequently proffered for adverse significant potential impacts. These measures (prevention, reduction, control strategies) were developed for the adverse impacts through review of industry experience (past project experience), consultations and expert discussions with multi-disciplinary team of engineers and scientists.

A ‘hierarchy’ of mitigation measures for planned activities and unplanned events is outlined below

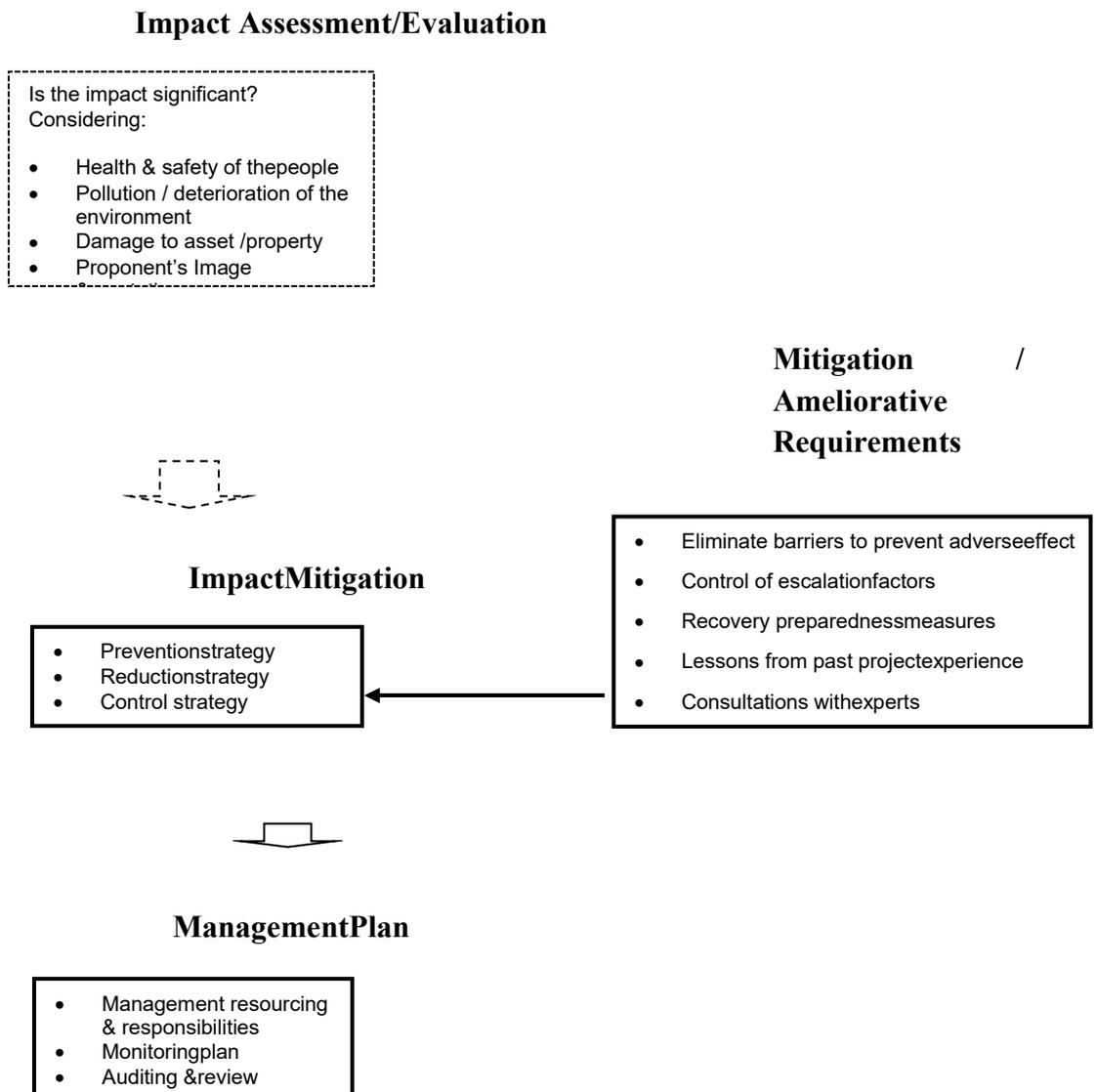


Figure 6.2: Management Procedure for Mitigation Measures

Mitigation Hierarchy for Planned Activities

Avoid at Source; Reduce at Source: avoiding or reducing at source through the design of the Project (e.g. avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity).

Abate on Site: add something to the design to abate the impact (e.g. pollution control equipment).

Abate at Receptor: if an impact cannot be abated on-site then control measures can be implemented off-site (e.g. traffic measures).

Repair or Remedy: some impacts involve unavoidable damage to a resource (e.g. material storage areas) and these impacts require repair, restoration and reinstatement measures.

Compensate in Kind; Compensate through Other Means where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate. It is emphasised that compensation to individuals with residual impacts to livelihood or quality of life will generally be non-financial and will have a focus on restoring livelihoods.

Mitigation Hierarchy for Unplanned Events

Control: this aims to prevent an incident happening or reduce the risk of it happening to ALARP through reducing the likelihood of the event (e.g. preventative maintenance regimes, traffic calming and speed limits, community road safety awareness training); Reducing the consequence (e.g. bunds to contain hazardous substance spills); and A combination of both of these.

Recovery/Remediation: this includes contingency plans and response, e.g. Emergency Response Plans and Procedures.

6.4 Proffered Mitigation Measures

For impacts that are assessed to be of *Major (High)* significance, a change in design is usually required to avoid or reduce these. For impacts assessed to be of *Moderate (Medium)* significance, specific mitigation measures such as engineering controls are usually required to reduce these impacts to ALARP levels. This approach considers the technical and financial feasibility of mitigation measures. Impacts assessed to be of *Minor (Low)* significance are usually managed through good industry practice, operational plans and procedures.

Accordingly, this section presents the mitigation measures proffered for the significant (medium and high) adverse impacts of the proposed project. These cost-effective measures have been proffered with reference to best industry practice and HSE considerations.

Impact prediction considers any mitigation, control and operational management measures that are part of the project design and project plan. A residual impact is the impact that is predicted to remain once mitigation measures have been designed into the intended activity.

Table 6.1 gives detailed/prescribed measures recommended as Mitigations to identified impacts. The Mitigation Measures have been designed to specifically mitigate reduce the project's impacts; thus, the following Mitigation Measures are intentionally planned and

prescribed to ensure the project's activities are environmental, health and socially sustainable. Based on the impact assessment matrix in the previous section, the overall ratings of impact significance **High** or **Medium** or **Low** was established for each identified impact. The proffered mitigation measures and the expected final residual impact rating for the identified potential significant impacts are presented in the **Table 6.1**

Table 6.1: Mitigation Measures for the Potential and Associated Impacts of the Proposed Project

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
Pre-Construction Phase				
Permitting & Land Acquisition • Consultations • Acquisition of Social license to operate • Stakeholder identification • Project-Site mapping	Acceptance and co-operation/participation from stakeholders (communities and government) leading to peaceful and timely execution of the project	Beneficial	Dahua Power Limited (DPL) and Project Contractor shall: • All relevant stakeholders are identified • Early stakeholders' engagement sessions are held, and all agreed issues properly documented and signed	Beneficial
	Uncertainty and increased perturbation due to a lack of information and communication.	Medium	DPL shall: • Early engagement of stakeholders • Establish and publicize grievance procedure • Provide the opportunities for all affected groups (women, youths, religious, etc) to participate in consultations and ensure that all concerns are duly addressed. • Plan and execute consultations to educate community members and stakeholders on project activities, schedules and potential impacts. • Ensure consultation throughout project lifespan.	Negligible
	Perception of the local people (host communities) and stakeholders			
	Integration of men and women concern into the project design	Beneficial	DPL and Project Contractor shall: • Due consultation of relevant groups at all phases of the project. • Provide the opportunities for all affected groups to participate in consultations and that all concerns are duly addressed. • Establish and publicize grievance procedure	Beneficial
	Exclusion of vulnerable groups from consultations which may lead to strife	Medium		Negligible
	Community agitations over	High	DPL and Project Contractor shall:	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	<p>compensations, land disputes, wrong stakeholder</p> <p>identification, leadership tussles, etc</p>		<ul style="list-style-type: none"> • Project will develop a community relations and engagement plan that identifies fair strategies of engagement for all communities • Project will also develop and implement a resettlement plan to ensure equitable settlement of all project affected persons • Early stakeholder's engagement sessions are held, and all agreed issues properly documented and signed. • Establish and publicize grievance procedure • Stakeholders (communities, Govt., land owners, etc.) are adequately consulted and relevant issues addressed • Agreed fair compensation/rent for land are paid to identified owners promptly as per set standards. • As far as possible employ persons from the surrounding communities during the construction phase of the development to reduce the numbers of persons that will migrate to the area seeking employment. This will also avoid any 	

			feelings of resentment and will ensure that the communities derive the most benefits from the development.	
	Conflict over land ownership amongst natives and payment of compensation for acquired land.	High	DPL shall liaise with local CDC (Community Development Committee), community head and relevant local organizations to identify actual land owners.	Medium
	Improvement in quality of life for adequately compensated individuals	Beneficial	Consulting all relevant stakeholders and legacy issues identified early, clearly defined, and agreed on Fair compensations in line with national standards are agreed upon and paid.	Beneficial

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
Transport of Personnel through Highway	Increased traffic during mobilisation on road with risks of accidents leading to injury/death and loss of asset.	High	DPL and its contractors shall ensure; <ul style="list-style-type: none"> • All vehicles and boats are certified road worthy prior to being mobilized for workactivities. • Compliance to all roads and water ways safety transport rules including speedlimits • Competency training and certification of drivers before mobilisation. • Limit movement to day timeonly. 	Negligible

<p>Risks of armed robbery and Militant/youth attack and hostage taking leading to injury/ death of personnel</p>	<p>High</p>	<p>Develop a project security plan that addresses all project related security concerns Ensure security procedures are strictly enforced and continually improved based on updated risk information. Consultation and good public relation with the stakeholder communities. Ensure government approved security personnel (navy/mopol/army) is used on transport vehicles and boats when warranted. • Limit movements of personnel and equipment to daytime only</p>	<p>Moderate</p>
<p>Nuisance (noise and vibrations) due to movement from heavy duty equipment and vehicles affecting public and wildlife.</p>	<p>Medium</p>	<p>DPL and Project Contractor shall: Machinery, vehicles and instruments that emit high levels of noise should be used on a phased basis to reduce the overall impact. These pieces of equipment such as drills, graders and cement mixers should also be used when the least number of residents can be expected to be affected. • Workers, especially those working with machinery, vehicles and instruments that emit high levels of noise should be supplied with ear plugs and ear muffs to reduce the risk of hearing</p>	<p>Negligible</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			impairment. Prolonged exposure to this impact should be reduced wherepossible. Plan work activities to avoid heavy duty movement during peakhours. Consult with host communities and plan project activities accordingly • Limit movement and work activities to daytimeonly • Ensure equipment are properlymaintained	
	Work place accidents/incidents from the use of cranes, forklifts, etc. during loading and offloading of materials/equipment.	Medium	DPL and its contractors shall ensure; All personnel are qualified and certified for their relevant works That approved safe work procedures are provided and complied with at alltimes Use of appropriate personal protective equipment (PPE) e.g. rubber hand gloves, hard hats, safety boots, etc. by all personnel at the projectsite • Limit work activities to daytimeonly	Negligible
	Obstruction of/damage to existing roads due to increased usage during mobilisation.	Medium	DPL and Project Contractors shall: Roads to be assessed prior to commencement of work to establish the status and its capability to safely handle material and personnel transportation, and after completion to determine extent of impact and where necessary, take steps	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			to reclaim areas damaged by project activities <ul style="list-style-type: none"> Plan work execution to reduce travels and restrict where necessary, use of access roads. 	
	Interference with other road users along mobilisation route.	Medium	DPL and its contractors shall ensure that Equipment, materials and personnel are mobilised after due consultation with relevant transportation authorities (FRSC, NMA, NURTW, etc) and other stakeholders to minimise interference along mobilisation routes. <ul style="list-style-type: none"> Travels to and from sites shall be planned to maximize each trip and minimize number of travels. Drivers shall be adequately trained 	Negligible
	Interference with public utilities (electric wires and poles), market activities along mobilisation route	Medium	DPL shall: <ul style="list-style-type: none"> use standard warning notice (e.g. side rides, signal lights and horn) to other road users; ensure a practicable journey management programme is developed and adhered to; carry out pre-mobilisation route survey and ensure that mobilization is carried out after due consultation with relevant authorities and other stakeholders to minimize interference along the route 	Low

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Movement of workers into host communities and resultant increase in population.	Medium	DPL shall <ul style="list-style-type: none"> • liaise with local CDC, community head and relevant local organizations to work out formula for recruitment from the host communities 	Low
	Leakage of fuel or lube oil onto land or into water bodies during transportation and storage may lead to increased chemical toxicity.	Medium	DPL and Project Contractor shall ensure: <ul style="list-style-type: none"> • Safe operating practices are enforced during mobilisation • Implementation of project specific spill and emergency response plan • hydrocarbon/chemical spill containment and prevention measures and equipment are functional and effective on site and for equipment and vehicles • hydrocarbon and chemical transfers in safely contained areas • Double handling to be avoided where possible • When transfer has to take place, ensure it is effected in line and secured areas where containment is possible • Educate personnel on hydrocarbon and chemical handling risks/hazards, through HSE briefings/tool box meetings 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
Recruitment of Labour	Employment opportunities arising from recruitment of technical and non-technical project workers	Beneficial	DPL and Project Contractor shall: enhance this beneficial impact by <ul style="list-style-type: none"> • Creating requirements for contractors to hire local labour • Ensure skills acquisition and development 	Beneficial
Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Skill acquisition and enhancements to local indigenes and workforce.			
	Influx of people (migrant workers, subcontractors and suppliers) and increased pressure on existing social infrastructure	Medium	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Brief all employees to ensure awareness of any sensitivity to the local cultures, traditions and lifestyles • Continuous consultation while project is inprogress • Implementation of community relations and engagementplan • Encourage hiring, as practicable, of appropriately qualified locals, 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			workers from areas in the vicinity of the project to discourage preventable influx of persons <ul style="list-style-type: none"> • Work with contractors to ensure that specialised skillworkers from outside the areas have access to proper accommodations and other basic infrastructure • Educate all workers to enhance their Health,Safety,Security, and Environment awareness, and performance on the job • Maintain medical emergency response plan so that allinjured or ill personnel can promptly access appropriate care 	
	Increase of communicable diseases due to influx of people and poor living conditions around pre-construction sites	Medium	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Projectwilldevelopahealthplantoaddresspotential health issues • Carry out health awareness program (malaria, AIDS program, etc) • Provision of site medical personnel to attend 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			to emergency situations • Engage the services of retainer clinics to manage health issues • Educate workforce on the prevention of malaria as well as	

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			encourage the use of mosquito nets in construction camps.	
	Increase in social vices (like theft, prostitution) resulting from increased number of people	Medium	DPL and Project Contractor shall: • Ensure its personnel and contractors undergo pre-employment background screening as required • Periodically discuss health and social education issues during toolbox/HSE meetings • Promptly deal with reported cases of misconduct to check recurrences	Negligible

<p>Recruitment of Local hands/labour.</p>	<p>Beneficial</p>	<p>These are beneficial impact and DPL shall seek to enhance them by:</p> <ul style="list-style-type: none"> • creating requirements for contractors to hire labour from the local area; • encouraging contractors to maintain a list of short-term employees for future call-ups when required; and • adopting procurement practices that favour local merchants and service providers where practicable consultation with the locals shall be carried out in terms of provision of jobs. 	<p>Beneficial</p>
<p>Conflicts/community agitations over employment issues (quotas and methods)</p>	<p>High</p>	<p>DPL and Project Contractor shall:</p> <p>Project will develop a community relations and engagement plan that identifies fair strategies of engagement for all communities</p> <p>Project will also develop and implement a resettlement action plan to ensure equitable settlement of all project affected persons</p> <ul style="list-style-type: none"> • Establish and publicize grievance procedure <p>Early stakeholders’ engagement sessions are held, and all agreed issues properly documented and signed.</p> <ul style="list-style-type: none"> • All affected stakeholders and legacy issues are identified early, 	<p>Low</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			<p>clearly defined and agreed on.</p> <p>Stakeholders (communities, Govt., land owners, etc.) are adequately consulted and relevant issues addressed</p> <p>Agreed fair compensation/rent for land are paid to identified owners promptly as per set standards.</p> <p>As far as possible employ persons from the surrounding communities during the construction phase of the development to reduce the numbers of persons that will migrate to the area seeking employment. This will also avoid any feelings of resentment and will ensure that the communities derive the most benefits from the development.</p>	
<p>Site Preparation</p> <ul style="list-style-type: none"> • Site Survey • Removal of vegetation and de-stumping • Access to site • Service roads 	<p>Business opportunities for local contractors through sub contracting activities</p> <p>Local support services from road side supply markets and shops etc</p>	<p>Beneficial</p> <p>Beneficial</p>	<p>DPL and Project Contractor shall:</p> <p>Encouraging indigenous contractors and suppliers providing them opportunities to supply materials of acceptable standards</p> <ul style="list-style-type: none"> • Encourage contractors to hire and to develop local labour • Workers are paid promptly as at when due 	<p>Beneficial</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
• Camping and campsites	Creation of job and job opportunities	Beneficial	These are beneficial impact and DPL shall seek to enhance them by: <ul style="list-style-type: none"> • creating requirements for contractors to hire labour from the local area; • encouraging contractors to maintain a list of short-term employees for future call-ups when required; and • adopting procurement practices that favour local merchants and service providers where practicable consultation with the locals shall be carried out in terms of provision of jobs. 	Beneficial

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Contamination of <i>(potential)</i> surface water as a result of siltation caused by increased erosion, during site preparation.	Medium	DPL and Project Contractor shall: <ul style="list-style-type: none"> Employ appropriate industry practices in coal power plant construction and ancillary facilities in order to avoid adverse alteration drainage pattern Implement where appropriate sediment run-off controls and visually inspect after rainfall events Lay down areas/Marshalling yards are 	Negligible

			<p>designed to include erosion control</p> <ul style="list-style-type: none"> • Reclaim as practicable topography of excavated or compacted upland areas upon completion of activities. 	
	Loss of topsoil. Decreased soil fertility and agricultural production.	Medium	DPL shall keep to area approved for the project, with minimal clearance as stipulated in the construction procedures.	Low
	Disturbance of the vegetation cover / loss of forest products (fuel wood, timber, medicinal plants) due to site clearing and preparation.	Medium	<p>DPL and Project Contractor shall:</p> <p>Ensure inclusion of threatened and endangered species management strategies in the site-specific Environmental Management Plan to be developed by Project Contractor to ensure appropriate flora and fauna management.</p> <p>Vegetation clearing will be limited to minimum required for work</p> <p>Felling of trees of >30cm girth is to be minimized during vegetation clearing to only unavoidably necessary ones. This should be done with considerations to environmental protection.</p> <ul style="list-style-type: none"> • Utilisation of existing accessible tracks as much as possible <p>Establish a perimeter of protection around sensitive ecosystems and their unique habitats.</p>	Negligible
	Loss/disturbance of wildlife due to habitat loss/fragmentation from vegetation clearing along access roads.	Medium		

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Soil compaction, destabilisation from excavation and runoff erosion resulting in sedimentation problems.	Medium	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Implement where appropriate sediment run-off controls and visually inspect after rainfall events • Install siltation traps within the drainage design to collect silt and sediments ensuring that they do not end up in aquatic ecosystem • Construction on steep slopes and in soft or erodible material will require erosion control measures and correct grassing methods • Lay down areas/Marshalling yards are designed to include erosion control • Reclaim as practicable topography of excavated or compacted upland areas upon completion of activities 	Negligible
	Fragmentation of wildlife habitats/increase in poaching	Medium	<ul style="list-style-type: none"> • Where possible plan site clearing to allow species the opportunity to relocate to suitable nearby habitats and to reduce 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	due to an easier access for the local population and non-resident workers.		<p>the shock to the various habitats that may be disturbed.</p> <ul style="list-style-type: none"> • Relocate non-motile and weak species to safe grounds prior to commencement of work • Allow re-growth, within height restrictions, of native ground cover beneath lines (along project site, lay-down areas and access road • Prohibit poaching particularly by workers and educate workers on biodiversity conservation 	

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Alteration of natural drainage patterns	Medium	DPL shall <ul style="list-style-type: none"> • Ensure that site preparation is carried out in such a way as not to alter the natural topography of the project area. • sediment traps/screens shall be used to control runoff and sedimentation 	Low
	Personnel injury/death resulting from malfunction and mal-operation of equipment etc.	High	DPL shall ensure: <ul style="list-style-type: none"> • relevant personnel are trained on equipment. • daily HSE briefings/tool box meetings are carried out before commencement of work; • conduct of safety inspections of work activities; • equipment maintenance programme is developed and adhered to; • PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel. 	Low

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Wildlife attack (e.g. snake bite, bee sting)	High	DPL and its contractors shall ensure: <ul style="list-style-type: none"> • Work force are provided with and use appropriate PPE (cover all, safety boots, hard hats, hand gloves and safety goggles) before venturing into the bush; • Work force are provided assistants/experienced guides from the local communities to look out for signs of wild animals (including bees and wasps) in the bush; and trips into the work in inclement weather e.g., periods of low visibility, are avoided 	Low
	Pollution (dust) from soil surface.	Medium	DPL shall ensure that there is regular and frequent watering of the work way especially during the dry season.	Low

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Increased demand on existing local infrastructures (road, housing etc) due to influx of workers and job seekers.	High	DPL shall <ul style="list-style-type: none"> • Embark on community development programmes in line with the desires and needs of the people. • Establishment of base camps for workers with medical facilities. 	Low
	Influx of predominantly male population (job seekers) into stakeholder's communities leading to increased extramarital sexual activity, and introduction of commercial sex workers	High	DPL shall <ul style="list-style-type: none"> • Maintain regular medical examinations for all staff. • Abstinence/safe sex shall be encouraged • Employment of indigenes shall be encouraged 	Low
	Potential effects on air quality from emission of pollutants from engines e.g. bull-dozer and support equipment.	Low	DPL shall: <ul style="list-style-type: none"> • ensure vehicles, trucks and other heavy-duty engines are maintained at optimal working condition in accordance with operating manual; and • encourage the use of mufflers on equipment manifold where necessary to filter particulates and thus reduce its emission into the air. 	Low

	<p>Waste generation/disposal</p> <ul style="list-style-type: none"> • scrap metal, wood, sand, concrete, paper, domestic waste • Waste from laydown area from grubbing of site creation (Material and wood) 	<p>Medium</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Develop project specific Waste Management Plan (<i>Chapter 7</i>) and ensure proper implementation. • Provide adequate containers for wastecollection • Periodically assess contractor activities to check the level of compliance to regulatory and DPL waste management requirements. • Safe operating practices are enforced during construction 	<p>Negligible</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			<ul style="list-style-type: none"> • Recycling and reuse • Ensure use of only government approved waste management contractors 	
Construction Phase				
Installation of Plant, Fabrication and Metal works Cutting, bending and welding steel components Handling of conductor wires, strings, insulators and fittings	Workplace accidents from burns, cuts, bruises, trips and falls, objects at height, leading to injury or fatalities.	High	DPL and its contractors shall ensure; All personnel are qualified and certified for their relevant works That approved safe work procedures are provided and complied with at all times Use of appropriate personal protective equipment (PPE) e.g. rubber hand gloves, hard hats, safety boots, etc. by all personnel at the projectsite <ul style="list-style-type: none"> • Limit work activities to daytime only where practicable • conduct of safety inspections of work equipment prior to mobilization; • daily HSE briefings/tool box meetings are carried out before commencement of work; 	Negligible
	Employment of local labour and skills acquisition for workers taking advantage of	Beneficial	DPL and its contractors shall enhance this beneficial impact by <ul style="list-style-type: none"> • Creating requirements for contractors to hire local labour 	Beneficial

	new opportunities		<ul style="list-style-type: none"> • Ensure skills acquisition and development 	
	Influx of (predominantly male population) job seekers into stakeholder's community leading to increased extramarital sexual activity,	High	DPL shall <ul style="list-style-type: none"> • Maintain regular medical examinations for all staff. • Abstinence/safe sex shall be encouraged • Employment of indigenes shall be encouraged 	Low

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	and introduction of commercial sex workers			
	Risk of electrocution and burns (to onsite workers) from welding flashes and high currents during welding	High	DPL and its contractors shall ensure; <ul style="list-style-type: none"> • All personnel are qualified and certified for metalworks • That approved safe work procedures are provided and complied with at all times • Use of appropriate personal protective equipment (PPE) e.g. rubber hand gloves, hard hats, safety goggles, etc. by all metal works personnel 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Possibility of vision impairment from exposure to light emitted from welding sparks and foreign particles/objects entering the eyes.	High	DPL and its contractor shall ensure that <ul style="list-style-type: none"> • relevant personnel are trained on equipment. • daily HSE briefings/tool box meetings are carried out before commencement of work; • conduct of safety inspections of work equipment prior to mobilization; • equipment maintenance programme is developed and adhered to; • PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel; and activities are avoided when lighting is inadequate and as practicable in inclement weather e.g. periods of low visibility. 	Low
	Noise and attendant vibration effects from fabrication and associated welding equipment	Low	DPL and Project Contractor shall: Machinery, vehicles and instruments that emit high levels of noise should be used on a phased basis to reduce the overall impact. These pieces of equipment such as drills, graders and	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			<p>cement mixers should also be used when the least number of residents can be expected to be affected.</p> <p>Workers, especially those working with machinery, vehicles and instruments that emit high levels of noise should be supplied with ear plugs and ear muffs to reduce the risk of hearing impairment. Prolonged exposure to this impact should be reduced wherepossible.</p> <p>Ensure use of appropriate PPEs (ear plugs) by workers in areas with noise level above FMEnv (90dBA) hourly work arealimits.</p> <ul style="list-style-type: none"> • Conduct daily HSE briefings prior towork 	
	<p>Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding of steel components</p>	<p>Medium</p>	<p>DPL shall and its contractors shall:</p> <p>Utilise environmentally friendly electrodes, spray and paint liquids for welding as well aspainting.</p> <p>Use of appropriate personal protective equipment such as welding masks by welders shall beenforced.</p> <p>DPL shall also install fume expellers or blowers at confined welding areas.</p> <ul style="list-style-type: none"> • Implement appropriate work-sitepractices. 	<p>Negligible</p>

	<p>Generation of metal scraps from conductor wires, strings and steel elements associated with fabrication of steel components.</p>	<p>Medium</p>	<p>DPL and Project Contractor shall: Develop project specific waste management plan and ensure proper implementation • Provide adequate containers for waste collection Periodically assess contractor activities to check the level of compliance to regulatory and DPL waste management requirements. • Safe operating practices are enforced during construction • Ensure use of only government approved waste management</p>	<p>Negligible</p>
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<p>Project Activities / Environmental Aspects</p>	<p>Potential and Associated Impacts</p>	<p>Significance Before Mitigation</p>	<p>Mitigation / Enhancement Measures</p>	<p>Residual Ranking</p>
			<p>contractors • Comprehensive waste management is being developed to help in minimizing waste accumulation onsite. • Oil spill handling strategy especially mopping up oil immediately after spill, engine maintenance particularly oil change off site plan should help avoid pollution due to oils. • Old transformers should be changed on time to minimize leakages. They should be stored in concrete floors and rooms with roofs to</p>	

			avoid precipitation.	
Foundation / Earth Works <ul style="list-style-type: none"> • On-site geotechnical testings • Plant installation works • Pilings and trenching, etc • Land Clearing 	Increased business and economic activities as well as diversification of income sources due to supply contracting and subcontracting	Beneficial	DPL shall enhance this by: Encouraging indigenous contractors and suppliers providing them opportunities to supply materials of acceptable standards <ul style="list-style-type: none"> • Encourage contractors to hire and to develop local labour 	Beneficial
	Increase in revenue opportunities for local population due to presence of non-resident workers and travellers (technical workers)	Beneficial		

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Soil / groundwater contamination resulting from accidental leakages and spills of hazardous substances (diesel, cleaning agents, lubricants, hydraulic oil)	High	DPL and Project Contractor shall: Plan and set on-site sanitary facilities for the disposal of wastewater. Maintain vehicles, machinery and equipment in good condition in order to avoid leaks and spill of hazardous materials (lube oils, chemicals, etc.) Ensure safe management of hazardous materials (chemicals, etc.) Ensure handling of fuels such as fueling of vehicles and machinery, and fuels transfers, take place in contained areas, where sufficient measures are in place to ensure containment of spills. • Plan emergency response measures and equipment are available, and personnel are capable of effectively using it for cases of accidental spill.	Low
	Increased jobs and job opportunities from local labour hire and sub-	Beneficial	DPL and Project Contractor shall enhance this by: • Encouraging indigenous contractors and suppliers by providing them opportunities to	Beneficial

	contracting to indigenous suppliers.		supply materials of acceptable standards	
	Generation of dust and automobile / heavy duty equipment emissions from	Low	DPL and Project Contractor shall: Ensure that all vehicles involved in the transport of construction material and staff and machinery are adequately protected and sound technically	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	construction earth works.		<p>The vehicles shall be properly maintained and serviced.</p> <ul style="list-style-type: none"> • Extra care must be taken to reduce dust in periods when wind speed is greatest and the rainfall amounts are lowest which is between November and February (dry season), e.g. This will involve extra wetting of the construction area to suppress dust particles. • Ensure that all material (sand and aggregate) stockpiled along the site to be used in construction activities are regularly sprayed to reduce the effects of windwhipping. • All staff employed at the construction site must be provided with dust masks and be 	

			<p>asked to use them.</p> <ul style="list-style-type: none"> • Implement a traffic system that involves appropriate signals and signs to ensure the smooth flow of traffic. This will reduce the idling of vehicles that may occur and therefore reduce the emissions in the area. • Reduce speed along earthroads • Plan journey to reduce travel times • Advanced filters and techniques are incorporated in the project design to reduce gas and dust emissions • Vehicles carrying earth materials should be covered • Install and operate air pollution control equipment e.g. mufflers. 	
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and at project site	Medium	<p>DPL and Project Contractor shall:</p> <p>Ensure inclusion of threatened and endangered species management strategies in the site specific Environmental Management Plan to be developed by Project Contractors to ensure appropriate flora management.</p>	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			<ul style="list-style-type: none"> • Limit vegetation clearing to footprint required for construction purposes; i.e. minimize disturbances around project site and accessroad. • Much of the low-lying distinct vegetation will not be cleared and will be covered with constructionmaterial; • provision of adequate culverts to maintain natural drainage channels and tidal flushing along the distinct vegetation paths as much as practicable; • Clear briefings and instructions to Project Contractor regarding the clearance procedures will be undertaken to minimise any distinct vegetation area that may be disturbed; • Allow re-growth, within height restrictions, of native ground cover beneath lines (around project site, lay-down areas and access roads) <ul style="list-style-type: none"> • Destruction of woody grassland during construction should be minimized. • Destruction of riparian habitats and water pansduring construction and operation should not be allowed 	

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			<ul style="list-style-type: none"> The activities of the construction and operations staff must be restricted to the way leave and immediate surrounds 	
			<ul style="list-style-type: none"> The impact could influence the decision to develop in the area unless it is effectively mitigated. Avoid grading in areas with high slope angles to avoid future possible erosion Minimize grading of rugged areas by looking for alternative passage within the 60 m wayleave. 	
	Fragmentation (i.e. destruction and disturbance) of habitat Fauna disturbance and displacement as a result of migration away from construction activity area (this include impact on bird life)	Medium	DPL and Project Contractor shall: Ensure inclusion of threatened and endangered species management strategies in the site-specific Environmental Management Plan to be developed by Project Contractorsto ensure appropriate floramanagement. Plan and execute construction work to minimize interference onwildlife <ul style="list-style-type: none"> Maintain construction equipment to optimal function conditions Monitor presence of wildlife species during construction activities	Negligible

			<ul style="list-style-type: none">• Birds should not be exposed to more disturbance than is	
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			inevitably brought about by construction and operations activities.	
	Introduction of Alien Invasive Plant Species (AIPS)	Low	DPL and Project Contractor shall: <ul style="list-style-type: none"> • That the equipment to be used is decontaminated e.g. washing equipment to remove soil potentially carrying AIPS propagates • Avoid importing soils/gravels to use for level grounds for vehicles to pass onsite. If brought from outside, the surface of the soil should be removed to avoid mixing of soils potentially harbouring AIPS propagates with the lower soil profiles. • Ensure that since AIPS appears later after soil disturbance, aftermath proliferation of AIPS should be controlled by reducing their population and recruitment 	Low
	Potential collapse of Plant structures as a result of unsuitable geotechnical conditions	Medium	DPL and Project Contractor shall: Carry out side by side geotechnical investigations during construction to determine suitability of soil to carry structures Recommendations from geotechnical appraisals shall be appropriately	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			implemented <ul style="list-style-type: none"> • Construction of Plant foundations shall follow good industry engineering practices 	
	Reduction in wildlife population as a result of poaching due to easier access created by access road clearing	Medium	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Prohibit poaching by personnel • Periodically educate workforce on good principles of biodiversity conservation • Limit workforce concentration to project area and prohibit the possession of fire arms by members of workforce 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			<ul style="list-style-type: none"> • Practice wildlife conservation principles (e.g. release back into the wild any wildlife incidentally caught by dug-up foundations or tranches. • Excessive clearing of vegetation should be avoided to prevent incidences of wild herbivores congregating in the area. • In case there will be possible electric 	

			<p>inductions on wire fences, rubber breaks should be introduced on wires to avoid possible conduction of electric domains.</p>	
	<p>Temporary obstruction of movement of wild-herbivores</p>	<p>Medium</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Ensure speed of vehicles is controlled at a maximum limit of 40 km/h. Once a driver notices a herd of gazelles is crossing s/he should wait until all have crossed or slow down to avoid hitting individuals. • Avoid grading or clearing of vegetation where the mounds of moles and Aardvark holes occur. These are probably their hidings from predators and severe climate conditions. • Ensure construction activities are restricted to day time from 6am to 6pm. This provides time for foraging for nocturnal animals. This group is normally sensitive to presence of human activities and flood lights at night. • Ensure that during dry season the upland is dry of grasses but the lowland still has grass, herbs and shrub reserves. Most of herbivores migrate to this area thus construction activities during dry season can affect utilization of this area. • Ensure that construction is therefore scheduled after the onset of rainfall. Generally, vegetation in the area responds quickly 	<p>Low</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			<p>to rainfall hence herbivores will disperse to avoid any adverse impacts.</p> <ul style="list-style-type: none"> • Impact on the species will be localized. Disturbance of their habitats would affect negatively the hidings of geckos and lizards in the area. • Ensure the implementation of operation times, speed limit and driver’s keenness can potentially reduce this impact. 	
	Aquatic Habitat Alteration	Low	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Ensure sedimentation is not caused in the drainagesystem. • Ensure the minimization of activities that disturb soil layer near the river valley would contribute to the conservation of thesystem 	Low
	Exposure to Electromagnetic Field (EMF)	Medium	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Ensure that residents limit their exposure by staying away from the wayleave. 	Low

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Noise nuisance (including impulsive noise) from construction activities (e.g. piling) resulting to temporary migration of sensitive mammals and rodents.	Low	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> Machinery, vehicles and instruments that emit high levels of noise should be used on a phased basis to reduce the overall impact. These pieces of equipment such as drills, graders and cement mixers should also be used when the least number of residents can be expected to be affected. Workers, especially those working with machinery, vehicles and instruments that emit high levels of noise should be supplied 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			with ear plugs and ear muffs to reduce the risk of hearing impairment. Prolonged exposure to this impact should be reduced where possible. <ul style="list-style-type: none"> • Regularly maintain construction equipment to optimal function • Limit heavy duty construction works to day hours only where practicable <ul style="list-style-type: none"> • Ensure that silencers are fitted to the engines could significantly reduce impact of noise • Switch off engines not in use can also reduce noise duration and intensity 	
Coal power Plant Installations and Associated utilities** Constructions <ul style="list-style-type: none"> • Crane lifting and erections • Bolts and nut tightening • Anti climbing guards and step bolts <ul style="list-style-type: none"> • Insulators and fittings • Conductor wire stringing • Connectors fixing, • Visual & landscape 	Pollution of soil/water as a result spilled fuel and other waste oil discharge during facility construction and installation processes	High	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Develop and implement spill response plan • maintain storage facilities at optimal holding condition • train personnel in safe fuel handling procedures of chemicals and hydrocarbons • ensure all fuel storage facilities are bonded and lined with impermeable materials • vehicle and equipment maintenance activities implemented using proper containment or other strategies to guard against spills <ul style="list-style-type: none"> • Monitoring during maintenance of equipment to ensure that there is no discharge to the environment 	Low

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Workplace accidents / incidents (trip/falls etc) from heights during conductor wire stringing and bolt/nuts tightening project activities.	Medium	<ul style="list-style-type: none"> • DPL shall ensure HSE briefings prior to commencement of work activities • Develop standard work procedures where work hazards are identified and addressed • DPL shall ensure personnel use appropriate PPE • DPL shall design work area to internationally acceptable standards • Ensure availability of first aid facilities on site • Ensure retainer clinics are engaged and site medical personnel are available in case of accidents • Maintain medical emergency response plan so that injured or ill personnel can promptly access appropriate care. 	Negligible
	Risks of injury / death and loss of assets resulting	Medium	<p>DPL and its contractors shall ensure;</p> <ul style="list-style-type: none"> • All vehicles are certified road worthy prior to 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	from accidents associated with road transportation to and fro construction sites		being mobilized for work activities • Compliance to all roads safety transport rules includingspeed Limits • Competency training and certification of drivers before mobilization • Limit movement to day time only	

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Risks of fire/explosions resulting from accidental ignition of onsite diesel storage tanks	High	DPL and its contractors shall ensure; All fuel storage tanks are kept at safe distances from work areas Educate workforce on risks associated around storage areas and prohibit activities (such as smoking) that can ignite storage tanks • Designate no-smoking and smoke areas • Hold HSE meetings and talks on fire hazard	Negligible

<p>Waste generation/disposal</p> <ul style="list-style-type: none"> • scrap metal, wood, sand, concrete, paper, domestic waste • used oil and replaced/obsolete equipment parts that may contaminate soil/groundwater • Waste from lay-down area and power sites from grubbing of access roads 	<p>Medium</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Develop and implement a waste management plan • Provide adequate containers for waste collection • Periodically assess contractor activities to check the level of compliance to regulatory and DPL waste management requirements. • Ensure engagement of government approved waste management contractors. • Recycle and reuse of metal scraps 	<p>Negligible</p>
<p>Localised economic benefits from materials supplies by local contractors</p>	<p>Beneficial</p>	<p>DPL and its contractors shall enhance this by:</p> <ul style="list-style-type: none"> • Encouraging indigenous contractors and suppliers by providing them opportunities to supply materials of acceptable standards • Encourage contractors to hire and to develop local labour 	<p>Beneficial</p>
<p>Induced secondary development within the neighbouring host communities from increased economic activities.</p>			

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Socio-cultural conflicts between the construction team and indigenous populace due to contrasts in beliefs and traditions	Medium	DPL and its contractors shall <ul style="list-style-type: none"> • Brief all employees to ensure awareness of any sensitivity to the local cultures, traditions and lifestyles • Establish and publicize grievance procedure • Continuous consultation while project is in progress • Implementation of community relations and engagement plan 	Negligible
	Visual intrusion as a result of alterations to normal landforms and aesthetic beauty of construction sites	Low	<ul style="list-style-type: none"> • Where practically possible, provide a minimum of 1 km buffer area between the project sites and sensitive visual receptors; and • Rehabilitate disturbed areas around pylons as soon as practically possible after construction. This should be done to restrict extended periods of exposed soil. • Existing facilities might be used for lay-down and campsite areas 	Negligible
	Aesthetic value of project site location due to encroachment of natural vegetation/flora	Low	DPL shall operate its proposed project in line with regulatory framework and the administrative guidance for the proposed project to minimize the cumulative impact on the aesthetic value of the project area, in	Low

		consideration of other existing infrastructures in the project location.	
Increased demand on existing infrastructure (roads, housing, medical facilities, etc) due to influx of workers / induced secondary development in the area during construction activities resulting in squatter settlements.	Medium	<p>DPL shall</p> <p>Encourage hiring, as practicable, of appropriately qualified workers from areas in the vicinity of the project</p> <p>Work with contractors to ensure that specialised skill workers from outside areas have access to proper accommodations and other basic infrastructure</p> <p>Educate all workers to enhance their Health, Safety, Security, and Environment awareness, and performance on the job</p> <ul style="list-style-type: none"> • Maintain medical emergency response plan so that injured or 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	<p>Permanent loss of land (some with arable potentials) potentials along the access route</p>	<p>Medium</p>	<p>ill personnel can promptly access appropriate care</p> <ul style="list-style-type: none"> The access route shall traverse in an existing disturbance corridor like other power line or access roads, where farming activities have already been impacted. In this way negative agricultural economic impacts would be minimised. 	<p>Negligible</p>
	<p>Site conditions leading to increased malaria epidemic from uncontrolled mosquito breeding in swamp areas, snake bites, as well as water borne diseases e.g. diarrhoea</p>	<p>High</p>	<p>DPL shall ensure:</p> <ul style="list-style-type: none"> Develop project health and safety plan to address all potential health issues DPL shall ensure personnel use appropriate PPE Provide on-site emergency response plan Ensure availability of first aid facilities on site 	<p>Low</p>

	<p>and cholera associated with poor sanitary conditions</p>	<ul style="list-style-type: none"> • Ensure retainer clinics are engaged and site medical personnel are available to attend to emergency cases • Ensure that workers are provided with training on health risks, exposure, and management • Provide appropriate domestic water supply to address additional needs • Facilitate the implementation of appropriate latrines and other sanitation facilities • Provide information, education and communication about safe uses of water and occupational safety. • Environmental management for vector control; avoidance via settlement location and design and use of bed nets and repellents; rapid diagnosis and treatment; focal insecticide and 	
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			molluscicide application. • Safe food storage and handling.	
Demobilisation • Demobilisation after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, objects at height, leading to injury or fatalities.	Medium	DPL shall ensure: • HSE briefings prior to commencement of workactivities • Develop standard work procedures where work hazards are identified andaddressed • DPL shall ensure personnel use appropriatePPE • DPL shall design work area to internationally acceptable standards • Ensure availability of first aid facilitiesonsite • Ensure retainer clinics are engaged and site medical personnel are available in case ofaccidents • Maintain medical emergency response plan so that injuredorill personnel can promptly access appropriate care.	Negligible
	Soil / groundwater contamination resulting from accidental leakages and spills of hazardous substances	High	DPL shall: enforce good environmental demobilisation procedures (e.g. cleaning sites and restoring to originalstatus) Use of drip pans during transfer of fuels and	Negligible

	(diesel, cleaning agents, lubricants, hydraulic oil)		hazardous substances <ul style="list-style-type: none"> • Reclaim storage tank areas or contaminated soils Carry out internal environmental assessment to check activities of construction team and status of lay-down areas, marshalling yards, project sites, etc prior to demobilisation.	
	Traffic congestion during transportation of demobilised equipment and personnel	Low	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Coordinate demobilisation activities to avoid heavy traffic periods • Use warning signs and traffic wardens/directors 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			Ensure activities causing blockages at road crossings are carried out within shortest time practicable <ul style="list-style-type: none"> • Consult with affected communities prior to demobilisation to provide warnings and alternatives. 	
	Generation of dust and automobile / heavy duty equipment emissions.	Low	Ensure that all vehicles involved in the transport of construction material and staff and machinery involved in the construction is properly maintained and serviced. Extra care must be taken to reduce dust in	Negligible

			<p>periods when wind speed is greatest and the rainfall amounts are lowest which is between November and February (dry season), e.g. This will involve extra wetting of the construction area to suppress dust particles.</p> <p>Ensure that all material (sand and aggregate) stockpiled along the site to be used in construction activities are regularly sprayed to reduce the effects of windwhipping.</p> <p>All staff employed at the construction site must be provided with dust masks and be asked to use them.</p> <p>Implement a traffic system that involves appropriate signals and signs to ensure the smooth flow of traffic. This will reduce the idling of vehicles that may occur and therefore reduce the emissions in the area.</p> <ul style="list-style-type: none"> • Reduce speed along earthroads <p>Advanced filters and techniques are incorporated in the project design to reduce gas and dust emissions</p> <ul style="list-style-type: none"> • Plan journey to reduce travel times • Vehicles carrying earth materials should be covered • Install and operate air pollution control equipment such as 	
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			mufflers. • Ensure the construction can be timed when the ground is not too dry and dusty	
	Reclamation of marshalling yards, project sites, access roads (to prevent unauthorised access) and lay-down areas	Beneficial	DPL shall enhance this by: Where possible contractor shall reclaim de-vegetated areas withtopsoil, Where possible, reclaim compacted floors with native plant species,etc. • Audit Project Contractor to verify reclamation of worksites, marshalling yards, lay-down areas etc	Beneficial
	Waste disposal (scrap metal, wood, sand, concrete, paper, domestic waste)	Medium	DPL and Project Contractor shall: • Provide adequate containers for wastecollection • Ensure all waster are removed fromsite • Recycling andreuse • Audit contractor on waste disposal activities to check the level of compliance to regulatory and DPL waste management requirements before leavingsite.	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Loss of employment and business opportunities due to completion of construction phase	Medium	DPL and Project Contractor shall Shall ensure skills acquisition and enhancement programs to further empower the workforce for meaningful employment opportunities after the project • Establish and publicize grievance procedure • Pay due wages for worked period and settle all financial commitments to workforce before demobilisation	Negligible
	Illegal access to project facility leading to accident, sabotage, asset damage, and loss	High	DPL and Project Contractor shall: • Provide warning signs at access roads created to warn against dangers associated with safety issues	Low

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			<ul style="list-style-type: none"> • Through consultations, sensitize stakeholders and members of the communities on need to stay clear of the plants and hazards associated with it • As much as practicable provide restrictions (e.g. anticlimbers) to unauthorised access to project facilities 	
	Soil runoff and erosion	Medium	<p>DPL shall:</p> <ul style="list-style-type: none"> • Construction on steep slopes and in soft or erodible material will require erosion control measures and correct grassing methods. • Where possible contractor shall reclaim de-vegetated areas with topsoil, reclaim compacted floors with native plant species, etc. 	Negligible

		<ul style="list-style-type: none">• Appropriate flow diversion and erosion control structures i.e. earth embankments must be put in place where soil may be exposed to high levels of erosion due to steep slopes, soil structure etc.• Auditing Project Contractor to verify reclamation of worksites, marshalling yards, lay-down areas etc	
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
Operations • Production of Coal power	Increased availability of coal power for energy efficiency for Customers	Beneficial	<ul style="list-style-type: none"> Ensure the timely completion of the project so that associated benefits such as availability of power for domestic and industrial uses, business opportunities, quality of life, etc shall take effect. 	Beneficial
	Increased business opportunities and quality of life (small, medium, large scale) due to enhanced product availability outputs	Beneficial		
	Improvement in socioeconomic status due to social/welfare development of the area.	Beneficial		
	Increased Job opportunities and employment.	Beneficial		
	Risk of electricity shocks from power source for the	High	DPL and Project Contractor shall: <ul style="list-style-type: none"> Alternate analysis of the installation options to ensure minimal interference with 	Negligible

	proposed plant operation.		air traffic and human.	
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			provide Warning spheres and caution signs in areas where human traffic might occur in order to minimize risk of running to unsafe project components.	
	Electric shock and burns to members of the public in the event of damage to electric wires	High	DPL and Project Contractor shall: Ensure plant installations are following the best engineering standard Ensure that Plant is tested to prove the project design is in line with the DPL requirements Carry out routine inspection of facility in order to allow early detection of damaged components • Report cases of damaged parts to promptly attend to it and ensure adequate and automatic fault/damage detection system is installed. • Ensure that personnel are trained on the detection/handling of such emergencies arising from accidental damage	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Unchecked encroachment on the project site, leading to land-use conflicts and accident.	Medium	DPL and Project Contractor shall: Provide warning signs at access roads to warn against unauthorised entry • Through consultations, sensitize stakeholders and members of the communities on government policies for the project	Negligible
	Noise from plant operations	Low	DPL and Project Contractor shall: Design of the project in line with standards observed by national and International bodies are complied with.	Negligible
	Use of site corridors for other		DPL shall enhance this:	
Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	facilities (clinic, security posts, communication cables as well as water pipes etc)	Beneficial	• By providing platform for consultation and communication to future developments along the project area	Beneficial

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Local fauna disturbances from around the project site	Medium	DPL and Project Contractor shall: Design the project in line with standards observed by national and International bodies are complied with.	Negligible
	Mortality of birds, due to collision with earth wires on power supply line to Plant.	Medium	DPL and Project Contractor shall: <ul style="list-style-type: none"> • That the routine line patrols by DPL maintenance crew will look out for any bird collisions. If any collision “hot spots” are identified, these can be mitigated reactively • Provide artificial bird safe perches and nesting platforms placed at a safe distance from the energized parts • Cross-arms, insulators and other parts of the power lines can be constructed so that there is no space for birds to perch where they can be proximate to energized wires. • Ensure that all terminal structures (power transformers) is constructed with sufficient insulation on jumper wires and surge arrestors • Keep cables far apart >60cm and will certainly minimize or eliminate this risk of electrocution along the lines. 	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			<ul style="list-style-type: none"> • Ensure that where wide spacing of electric cables is not practical then insulation is recommended 	

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	<p>Effectively contribute to construction and engineering projects due to provisions of required finished products.</p> <p>Effectively contribute to the nations need for final products.</p> <p>Development of new infrastructures or improvement to existing ones.</p>	Beneficial	DPL and Project Contractor shall ensure that impact is beneficial and enhanced by sustaining the project life span, through adequate and effective maintenance activities as well as complying with federal government’s policies, laws and regulations in the energy and industrial sector.	Beneficial
<p>Maintenance</p> <ul style="list-style-type: none"> • Facility inspection and checks • Project components” replacements • Access route maintenance • Plant maintenance 	<p>Proliferation of weeds around project site</p> <p>Disturbance of bird habitats and avifauna from activities of maintenance crew.</p>	<p>Low</p> <p>Medium</p>	<p>DPL shall to extent practicable periodically carry out project site maintenance activities to manage growths of weeds and other creeping plants on the Plant bases in a manner that minimizes adverse impacts on vegetation.</p> <p>DPL and Project Contractor shall: ensure disturbance of grassland during construction and operation is kept to a minimum. ensure that the activities of the construction and operations staff are</p>	<p>Negligible</p> <p>Negligible</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			restricted to the project site and immediate surroundings. • Develop policies that prohibiting hunting by staffs	
	Development of local maintenance activities to encourage employment and empowerment within the	Beneficial	DPL and Project Contractor shall ensure the participation of men and women in local maintenance activities such as weeding of the project site.	Beneficial

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	communities.			
	High level of Job creation in the overall manufacturing sector	Beneficial	DPL shall, in addition to implementing a proper ‘Sourcing and Recruitment Programme’ that diligently attends to workers employment and management, encourage other related manufacturing companies that will purchase the finished product to increase the level of employment in the sector.	Beneficial

<p>Interference with local traditional festivals or activities by unscheduled maintenance work and failure to keep to management plans may lead to community strife.</p>	<p>High</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Plan activities to minimize work activities during localevents • Ensure that operators will obtain information about planned local activities and avoid disturbing them by shifting maintenance activities to other days wheneverpossible • Give formal notice of any maintenance work in advance to the communities along the area. Access to the line must be via the approved access roads and corridors (agreed with the host communities). • Ensure that the notice will give details of the purpose of the access, the contact person and number of people to be involved, time frames and machinery that will beused. <p>Community Relations and Engagement Plan and approved work procedures</p>	<p>Low</p>
<p>Maintenance of facilities within sensitive environments may lead to disturbance of hydrological regime (micro scale) impacts</p>	<p>Medium</p>	<p>DPL and Project Contractor shall:</p> <p>Ensure appropriate flow diversion and erosion control structures i.e. earth embankments is be put in place where soil may be exposed to high levels of erosion due to steep slopes, soil structure etc.</p> <ul style="list-style-type: none"> • Areas to be rehabilitated should be identified and reclaimed. 	<p>Negligible</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Maintenance onsite may lead to collision of wildlife with the stays that are not visible in the dense vegetation	Medium	DPL and Project Contractor shall ensure that anchors are marked with material that will be visible to animals and also shall ensure that regular clearance of vegetation takesplace around the project site.	Negligible
	Limited knowledge on safety measures and behaviours associated with line operation that can lead to accidents	Medium	DPL and Project Contractor shall plan information, education and communication activities during and after project implementation to increase awareness of all users (men and women) on dangerous behaviours and safety measures required.	Negligible
Production Processes, Machineries and Hazardous Chemical Handling	Localized increase in the ambient concentration of air pollutants due to chemical fumes	Low	DPL and Project Contractor shall ensure: <ul style="list-style-type: none"> • Advanced filters and techniques are incorporated in the plant design to reduce emissions • Incorporate ‘Ventilation design’ during plant installation. • Good general ventilation throughout the plant and Local Exhaust Ventilation (LEV) wherever substantial quantities of dust and 	Low

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			fumes are generated is inplace. <ul style="list-style-type: none"> • There is creation of airflow such as exhaust ventilation or air blowers. • Implementation of the Air Quality Management Plan • Installation of wet scrubbers 	
	Possibility of injury to skin due to burns resulting from exposure to chemicals.	High	DPL and its contractor shall ensure that <ul style="list-style-type: none"> • relevant personnel are trained on equipment. • daily HSE briefings/tool box meetings are carried out before commencement of work; • conduct of safety inspections of work equipment prior to mobilization; 	

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
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			<ul style="list-style-type: none"> • equipment maintenance programme is developed and adhered to; • PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel; and activities are avoided when lighting is inadequate and as practicable in inclement weather e.g. periods of low visibility. 	Low
	Surface water contamination from chemical spills	High	<p>DPL shall:</p> <ul style="list-style-type: none"> • develop an appropriate Waste Management Plan before project commencement • Ensure that as a minimum all operational waste is separated at source to enhance efficiency in waste handling and disposal • Also ensure training on waste management is conducted for project site personnel 	Low

	<p>Risk of injury / death of personnel as a result of industrial accident</p>	<p>High</p>	<p>DPL and its contractor shall ensure that</p> <ul style="list-style-type: none"> • relevant personnel are trained on equipment handling and maintenance • daily HSE briefings/tool box meetings are carried out before commencement of work; • Provision of safety and warning signals • conduct of safety inspections of work equipment prior to mobilization; • equipment maintenance programme is developed and adhered to; • PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel; and activities are avoided when lighting is inadequate and as practicable in inclement 	<p>Low</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			weather e.g. periods of low visibility.	
	Waste generation/discharge (containers, food wastes/pigging wastes etc) and associated environmental effects.	Medium	DPL shall develop an appropriate Waste Management Plan before project commencement <ul style="list-style-type: none"> • As a minimum all operational waste shall be separated at source to enhance efficiency in waste handling and disposal • Also, training on waste management will be conducted for project site personnels 	Low
	Possibility of fire explosion	High	DPL shall enforce the Principles of Safety Management	Medium
	Employment opportunities during operation and maintenance	Beneficial	These are beneficial impact and DPL shall seek to enhance them by: <ul style="list-style-type: none"> • creating requirements for contractors to hire labour from the local area; • encouraging contractors to maintain a list of short-term employees for future call-ups when required;and • adopting procurement practices that favour local merchants andserviceproviderswherepracticableconsultationwiththe locals shall be carried out in terms of provision of jobs. 	Beneficial

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Incineration of hazardous waste	Medium	DPL shall develop an appropriate Waste Management Plan before project commencement <ul style="list-style-type: none"> • As a minimum, all operational waste shall be separated at source to enhance efficiency in waste handling and disposal • Generated dusts shall be recycled appropriately to produce bricks • Also, training on waste management will be conducted for project site personnel. NO INCINERATION SHALL BE CONDUCTED AT SITE	Low
Coal power Production <ul style="list-style-type: none"> • Production Plant Processes 	Production of Coal power end-products	Beneficial	One of the objectives of the DPL project is to produce coal power to meet the energy demand for powering Customer's facilities.	Beneficial

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
<ul style="list-style-type: none"> • Required high level of Energy Input/Consumption • Loading, Hauling, Crushing and Grinding 	Localized increase in the ambient concentration of hot air due to high level of heat (energy input)	High	DPL and Project Contractor shall ensure: <ul style="list-style-type: none"> • Advanced filters and techniques are incorporated in the plant design to reduce gas and dust emissions • Application of wet scrubbers to prevent escape of VOC and particulate matters into the surrounding • Wetting systems shall be installed at the coal storage bay • Incorporate ‘Ventilation design’ during plant installation. 	Medium
	Risks of chronic health diseases (asbestosis, silicosis etc.) to personnel and natives from inhalation of dust released from crushing.	Medium	<ul style="list-style-type: none"> • Good general ventilation throughout the plant and Local Exhaust Ventilation (LEV) wherever substantial quantities of dust and fumes are generated is in place. • There is creation of airflow such as exhaust ventilation or air blowers. • Implementation of the Air Quality Management Plan 	Medium
	Exposure to mechanical and electrical risks	High	DPL shall ensure that: <ul style="list-style-type: none"> • Training is conducted by experts and should make use of effective audio- 	Medium

	Physical hazards and accidents from handling of plant machineries, equipment and tools	Medium	visualaids. • Appropriate ergonomic studies to investigate conditions workers are carrying out various operations is made and also explore the impact of the environment on the worker and the functional design of the machinery used.	Low
	Occupational health and safety of workers	Medium	<ul style="list-style-type: none"> • All dangerous parts of machinery and equipment, including lifts, conveyors, long travel shafts and gearing on overhead cranes, is securely guarded • A regular system of inspection, examination and maintenance is done for all machinery and equipment of the plant, particularly for cranes, lifting tackle, chains and hooks. • Safety meetings or contacts are held regularly for all persons to reinforce safety training and awareness. 	Low

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
			<ul style="list-style-type: none"> • Workers are provided with proper PPEs, with enforcement strategies to wear/use them. • There are effective controls for the storage and safe handling 	

			of raw materials, products, by-products and wastes.	
	Respiratory hazards from inhalation of toxic gases	High	<p>DPL shall ensure:</p> <ul style="list-style-type: none"> • Ensure the use of respiratory protection equipment (atmosphere-supplying respirators) • Ensure there are engineering controls (such as local exhaust ventilation) • Develop and implement a written respiratory protection program; • provide worker medical evaluations and respirator fittesting; • provide worker training about respiratory hazards and proper respirator use; 	Medium

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Heat (high temperature) effect on human health	Medium	DPL shall ensure: <ul style="list-style-type: none"> • Workers are permitted to distribute the workload evenly over the day and incorporate work-rest cycles. • Cool rest area in hot work environments is provided considerably to reduce the stress of working in those environments. • There is thorough medical supervision. Pre-employment and concurrent medical examination of workers 	Medium

	<p>Emission of toxic gases and Release of greenhouse gases on air quality and climate change</p>	<p>High</p>	<p>DPL shall ensure:</p> <ul style="list-style-type: none"> • Installation of appropriate pollution abatement devices to prevent the pollution of the surrounding ecosystem. • Installation automated pollution monitoring devices at the plant. • Monthly environmental monitoring of the facility and submission of report to regulatory bodies by accredited environmental consulting firms • Provision of buffer zone around the facility • installation of large enclosures over the entire production area to control emissions during production. • routine inspection, maintenance and repair for proper containment of emissions • uniform collector-main pressure adequate to convey the emissions • to check the particles by installing fabric filter collectors or electrostatic precipitators. 	<p>Medium</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Effluent generation (discharge of waste water)	Medium	DPL shall ensure: <ul style="list-style-type: none"> • The reuse of waste water before it leaves the plant • Instal effluent treatment plant • Recycling of effluent where possible • That effluent stream is kept separately • That proper drainage system is provided 	Low
	Noise generation from Plant operation	Medium	DPL shall: <ul style="list-style-type: none"> • Use equipment, which emit low levels of noise with acceptable exhaust gases, which conform to national standards and specifications. • Ensure that sound proof design is employed during the installation and planning stage of the plant. 	Low

	<p>Generation of solid waste</p>	<p>Medium</p>	<p>DPL shall ensure that:</p> <ul style="list-style-type: none"> • There must be containment and enclosure of screening, and conveying systems • The solid wastes and sludge generated in the plant are recycled back in the plant feed material. • There is the use of dry dust collection and removal systems 	<p>Medium</p>
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	<p>Increased vehicular movement and traffic congestions</p>	<p>High</p>	<p>DPL shall ensure:</p> <ul style="list-style-type: none"> To provide separate entry and exit gateways for vehicles; Car and van parking for the workforce and visitors away from the work area is provided; That vehicles reverse is avoided where possible as reversing is a major cause of traffic fatal accidents. That all drivers know and understand the routes and traffic rules onsite. The use of standard road signs where appropriate That induction training for drivers, workers is provided. That vehicles are maintained so that they are mechanically in good condition. That Clamps, special bolts, steel-wire ropes, chains, webbing harnesses, sheets, nets, ropes and shoring bars are all suitable to secure loads, but it is essential to make sure that they are strong enough for the weight of the loads carried to provide a plan of the workplace at the entrance (and at other appropriate points) showing vehicle routes, one-way systems and implementation of the Traffic Management Plan of the EMP. 	<p>Medium</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
Decommissioning/Abandonment Phase				
Decommissioning / Abandonment • Plant / facilities removal • Wastegeneration	Increased sedimentation process <i>potential</i> water bodies close to project sites.	Medium	DPL and Project Contractor shall: • Ensure that excavated and stockpiled soil material is stored on the higher lying areas of the site and not in any storm water run-off channels or any other areas where it is likely to cause erosion or where water would naturally accumulate. • ensure that decommissioning activities are preferably take place during the dry season months to prevent soil erosion caused by heavy thunderstorms associated with the rainy season in the project area. • ensure that the area is graded and re-vegetated to ensure that rainwater drains gradually over the site without creating erosion gullies.	Negligible

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages and wastes from decommissioning.	High	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Ensure that no wastes and hazardous materials generated on the site are dumped or deposited on adjacent/surrounding surface waters including roads or public places during or after the decommissioning period. • Enforce proper waste management policies in line with FMEnv standards and requirements. • Ensure that all project associated wastes and hazardous materials are disposed off in line with project waste management plan. 	Negligible
	Release of SO _x , NO _x , CO _x , etc from exhausts of decommissioning vehicles and equipment which could	Low	DPL shall: <ul style="list-style-type: none"> • ensure vehicles, trucks and other heavy-duty engines are maintained at optimal working condition in accordance with operating manual; and 	Low

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	lead to atmospheric pollution / GHG emission		<ul style="list-style-type: none"> encourage the use of mufflers on equipment manifold where necessary to filter particulates and thus reduce its emission into the air. 	
	Increased dust and vehicular emissions during transport.	Low	DPL and Project Contractor shall ensure: <ul style="list-style-type: none"> to wet all unprotected cleared areas and stockpiles with water to suppress dust pollution. to cover materials such as sand and other rubble during transport to and from the site with a tarpaulin. use of road worthy vehicles and equipment as well as skilled operators and drivers Limit Speed Limit	Negligible
	Increase in ambient noise levels above baseline conditions from movement and activities of decommissioning equipment and automobiles.	Low	DPL and Project Contractor shall ensure: <ul style="list-style-type: none"> Limit work activities to daytime only Ensure maintenance of vehicles and equipment Provide and encourage use of PPEs. 	Negligible

	<p>Traffic obstruction from transportation of decommissioned structures and equipment to receiving hub.</p>	<p>Medium</p>	<p>DPL and Project Contractor shall ensure: Plan decommissioning activities is in consideration of peak traffictimes. Ensure that the handling of equipment and materials is supervised. The use of signs, posts, and guides to manage traffic and direct users accordingly • A practicable Traffic Management Plan (journey management programme) is developed and adhered to.</p>	<p>Negligible</p>
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<p>Project Activities / Environmental Aspects</p>	<p>Potential and Associated Impacts</p>	<p>Significance Before Mitigation</p>	<p>Mitigation / Enhancement Measures</p>	<p>Residual Ranking</p>
	<p>Risk of accident and injury to worker during demolition of structures</p>	<p>Medium</p>	<p>DPL and Project Contractor shall: • Develop a work plan for safedemolition • Ensure hazards are identified and addressed prior to commencement of work. • Provide and enforce the use ofPPE • Ensure that decommissioning and demobilisation vehicles are under the control of competent personnel. • Provide adequate facilities on site to treat emergencies to staff.</p>	<p>Negligible</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Significance Before Mitigation	Mitigation / Enhancement Measures	Residual Ranking
	Incident/accident resulting from the movement of materials and equipment on low loader	High	DPL and its contractor shall ensure that <ul style="list-style-type: none"> • relevant personnel are trained onequipment. • daily HSE briefings/tool box meetings are carried out before commencement of work; • conduct of safety inspections of work equipment prior to mobilization; • equipment maintenance programme is developed and adhered to; • PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel; and activities are avoided when lighting is inadequate and as practicable in inclement weather e.g. periods of low visibility. 	Low
	Loss of lives due to accident/incident caused by abandoned structures left at site	High	DPL and Project Contractor shall ensure appropriate warning signs are used to alert residents of the presence of such machines/equipment	Low

CHAPTER SEVEN

ENVIRONMENTAL MANAGEMENT PLAN

7.1 Introduction

This chapter presents the Environmental Management Plan (EMP) developed for the Proposed Establishment of a Coal power Plant Project in Agbara, Ado Odo/Ota L.G.A., Ogun State by Dahua Power Limited (DPL). An Environmental Management Plan (EMP) is essentially a management tool and standalone component of an EIA that provides the assurance that the mitigation measures developed for the significant impacts of a proposed project are implemented and maintained throughout the project lifecycle. It outlines management strategies for safety, health and environment stewardship in the proposed project implementation. It states in specific terms how the project proponent's commitments will be implemented to ensure sound environmental practice.

EMP is developed to ensure that the mitigation measures as described in chapter six of this report and monitoring requirements as outlined in this EIA and any environmental compliance review shall be carried out in subsequent stages of the project. EMP is therefore an important management tool which sets out conditions and targets to be met during project implementation.

Dahua Power Limited (DPL) has designed the EMP of the proposed project in line with its Health, Safety and Environment (HSE) policy and in accordance with ISO 14001 Environmental Management System specifications. The EMP for the proposed project shall be a "life document" which shall be reviewed periodically with the incorporation of various mitigation measures for potential impacts and shall form the basis for the actual project implementation.

EMP contains among others the following key items:

- ✚ Summary of potential impacts
- ✚ Planned mitigation measures
- ✚ Planned environmental monitoring
- ✚ Planned public consultation process
- ✚ Responsibilities and authorities for implementation of mitigation measures and monitoring requirements
- ✚ Mechanisms for feedback and adjustment

Compliance with the legal standards on safety and environment is regarded as the minimum requirement and must be satisfied during all phases of the Project development. In order to reduce the risk of an adverse effect on the environment to the lowest level that is reasonably practicable, an objective of the engineering design will be to apply the ALARP principle.

Thus, this chapter provides the EMP for the DPL Proposed Coal power Project. Elements of this plan will be taken forward and incorporated into a comprehensive project Environmental and Social Management System (ESMS) that will be used to deliver the Project's EHS regulatory compliance objectives and other related commitments.

This EMP is a delivery mechanism for environmental and social mitigation measures made in the EIA Report. The purpose of the EMP is to ensure that these recommendations are translated into practical management actions which can be adequately resourced and integrated into the Project phases. The EMP is, therefore, an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of construction, operation and decommissioning are prevented and that the positive benefits of the Projects are enhanced.

7.2 EMP Objectives

The EMP is essential for successfully implementing the Project's social and environmental performance throughout the life of the Project. Having this framework in place ensures a systematic approach to bringing environmental and social considerations into decision making and day-to-day operations. It establishes a framework for tracking, evaluating and communicating environmental and social performance and helps ensure that environmental risks and liabilities are identified, minimised and managed. The EMP will be a living document and will continue to develop during the design and construction phase to enable continuous improvement of the Project's social and environmental performance.

In particular, the objectives of the EMP are to:

- ✚ promote environmental management and communicate the aims and goals of the EMP;
- ✚ ensure that all workers, subcontractors and others involved in the Project meet legal and other requirements with regard to environmental management;
- ✚ incorporate environmental management into project design and operating procedures;
- ✚ address concerns and issues raised in the EIA's stakeholder consultation process and those that will likely continue to arise during the Project's lifetime;
- ✚ serve as an action plan for environmental management for the Project;
- ✚ provide a framework for implementing project environmental commitments (i.e mitigation measures identified in the EIA); and
- ✚ Prepare and maintain records of project environmental performance (i.e monitoring, audits and non-compliance tracking).

Thus, the EMP is designed to:

- ✚ ensure that all mitigation measures prescribed in the EIA document for eliminating, minimizing, and enhancing the project adverse and beneficial impacts are fully implemented; and
- ✚ provide part of the basis and standards needed for overall planning, monitoring, auditing and review of environmental and socio-economic performance throughout the project activities.

This has been developed to manage negative impacts/effects, enhance benefits and ensure good standards of practice are used throughout the project. These objectives shall be achieved by:

- ✚ ensuring compliance with all stipulated legislation on protection of the biophysical and socio-economic environment and DPL HSE policy;

- ✦ integrating environmental and socio-economic issues fully into the project development and operational philosophies;
- ✦ promoting awareness on the management of the biophysical and socio-economic environment among workers;
- ✦ rationalizing and streamlining existing environmental activities to add value to efficiency and effectiveness;
- ✦ ensuring that only environmentally and socially sound procedures are employed during the project implementation; and
- ✦ Continuous consultations with the relevant regulatory bodies, community leaders (local heads/chiefs, clan heads, etc), youth leaders, community-based organizations (CBOs), and other stakeholders throughout the project lifecycle.

7.3 Scope and Core-Elements of the EMP

The EMP has been developed to meet international standards on environmental and social management performance, specifically those set out by the WB and IFC. This EMP will be incorporated into the Company's Environmental Management System (EMS), which DPL will develop before the Project becomes operational.

The EMP is intended to cover those activities described in *Chapter 3* of this EIA report. It covers project activities during construction, operation and decommissioning and will be subject to thorough reviews prior to the commencement of activities to ensure completeness. The EMP does not include measures for activities related to equipment and facility fabrication being done offsite. It should be noted that this provides the outline requirements for environmental management. Provision will be made for updating the outline EMP once the detailed project design is complete and for adapting the EMP to relevant project stages as part of the overall EMS.

The plan details the mitigation and enhancement measures NDSPL has committed to implement through the life of the Project and includes desired outcomes; performance indicators; targets or acceptance criteria; and timing for actions and responsibilities. NDSPL will have principal responsibility for all measures outlined in the EMP, but may delegate responsibility to its contractors, where appropriate. In cases where other individuals or organisations have responsibility for mitigation measures, this is clearly indicated within the EMP table.

Capacity building and training requirements are also described, where these relate to specific skills required to deliver the EMP action in question. General training, which will be provided to staff (and contractors' staff as appropriate), is not indicated in the plan. An example of training that is not listed here is the general worker health and safety training that all staff will receive.

Preliminary EMP guidelines have been developed to cover the entire project activities. These include: waste management, consultation, noise minimization, overall safety philosophy, emergency/contingency plan, communication plan, security plan, training and awareness, environmental monitoring etc.

In line with the objectives summarized in section 7.2 above, the main elements of this EMP are:

- ✚ Overall project organizational chart (including HSE) organogram;
- ✚ Preliminary EMP guidelines;
- ✚ Guidelines for waste management;
- ✚ Guideline for Consultation;
- ✚ Noise Minimization Guideline;
- ✚ Overall safety philosophy/guidelines;
- ✚ Emergency/Contingency plan;
- ✚ Communication plan;
- ✚ Security plan;
- ✚ Plan for Training and Awareness;
- ✚ Environmental monitoring plan;
- ✚ Guidelines for audit and review;
- ✚ Guidelines on maintenance and facility management; and
- ✚ Guidelines for decommissioning and abandonment

7.4 Framework for Implementing the EMP

The framework for the implementation of this EMP is strongly based on a repeated process of continuous improvement which comprises of eleven (11) elements, each with underlying principle and set expectations. Overview of each of the eleven primary elements is presented as follows.

- ✚ Management Leadership, Commitment, and Accountability: Ensures that the workers understand the goals and management commitment to excellence in safety, health, environment, and operational integrity.
- ✚ Risk Assessment and Management: Ensures that risks involved in operations are recognized so that they can be appropriately addressed through facility design and/or operating practices.
- ✚ Facilities Design and Construction: Ensures elements for the protection of people and the environment are incorporated into the design of facilities and the plans for installation and operation.
- ✚ Process and Facilities Information/Documentation: Ensures that the systems designed to protect people and the environments are appropriately documented.
- ✚ Personnel and Training: Ensures that personnel understand the systems that are in place and are appropriately trained to perform required roles with respect to their functions.
- ✚ Operations and Maintenance: Ensures that facilities are maintained and operated in ways that ensure the protection of people and the environment.
- ✚ Management of Change: Ensures that new personnel are informed of existing systems that all affected personnel are informed of changes in the systems, and that safety and environmental aspects are considered when making changes.
- ✚ Third Party Services: Through contract, oversight and other mechanisms, third party contractors are held to the same standards as DPL.
- ✚ Incident Investigation and Analysis: Seeks to understand the causes of any incidents

so that effective controls or systems can be implemented to prevent recurrence.

- ✚ Community Awareness and Emergency Preparedness: Ensures appropriate outreach and awareness programmes are implemented to establish effective emergency procedures and to allay concerns.
- ✚ Operations Integrity Assessment and Improvement: Ensures that the safety and environmental performance is monitored against targets to ensure DPL meets its goals to protect people and the environment and seeks the means to improve the systems and processes, particularly when goals are not being met.

7.5 Organizational Structure and Responsibility

Dahua Power Limited (DPL) is committed to provide resources essential to the implementation and control of the EMP. This commitment includes providing an Organogram (*Figure 7.1 below*) that presents the managerial positions of responsible persons to Environmental Management System, which include the appropriate human resources and specialised skills.

Dahua Power Limited will strive to push the optimization of the industrial structure and improvement of the product level; will consistently stick to the principles of people-oriented, technology-first, quality and customers- satisfaction to meet needs of our customers. The company improves the corporate management mechanism by continuously establishing and completing a good employment system and fair performance evaluation system to create a space for the personnel's talents.

Thus, DPL will have dedicated personnel competent on the basis of appropriate education, training, and experience that will manage and oversee the HSE aspects of project construction. The roles and responsibilities, presented in this section, for the proposed establishment of Coal power Project is for the Implementation of the EMP (as provided in Table 7.1 below).

Supervision of subcontractor activities will be conducted by the DPL's General Manager and the Operations Manager. This will be accomplished through management controls over strategic project aspects and interaction with subcontractor staff where project activities take place. The DPL organisation will be staffed at a level to allow for continuous effective supervision of subcontractor activities and work products.

The Construction Manager and HSE Coordinator will be placed locally at the Project site to supervise subcontractors during construction while the Operations Manager and HSE Coordinator will supervise subcontractors during operational activities. The HSE Coordinator plays a crucial role to the successful implementation of the EMP and the continuation of liaison with the local community.

The Project Management shall retain the primary responsibility of ensuring that environmental commitments are met throughout the life cycle of this project. The authority shall establish a schedule for responsibility matrix and training on matters relating to the environment. Environmental issues shall be a line responsibility for which all levels of personnel are accountable. Top management shall ensure that all environmental considerations are integrated into project execution.

The Project Management shall appoint an Environmental Monitoring Team (EMT) to ensure

effective implementation of the recommendations of the EIA and its management plan. This team shall be made up of representatives of the project team and Security Departments. The project team and Security Team Leader shall additionally provide leadership to the EMT. However, final environmental responsibility lies with the Project Manager. The EMT shall liaise at a predetermined interval with contractors, engineers, quality assurance officers, supervisors and relevant departments on all environmental matters. The Project Manager and Security Team Leader assisted by the EMT shall be the focal point for all environmental matters relating to detailed design and monitoring of construction, operation and maintenance of the Project. The EMT shall verify the effectiveness of the EMP implementation in liaison with regulators and other stakeholders as appropriate.

Notwithstanding, all action parties within the project team shall demonstrate compliance directly from their line through to the Project Manager. In this way, the Project Management shall take responsibility for all environmental matters and ensure that all contractors involved in this project comply with all applicable environmental laws, regulations and policies. The contractors shall in principle be responsible for implementing those aspects of the EIA recommendations that pertain to the various phases of this DPL Project.

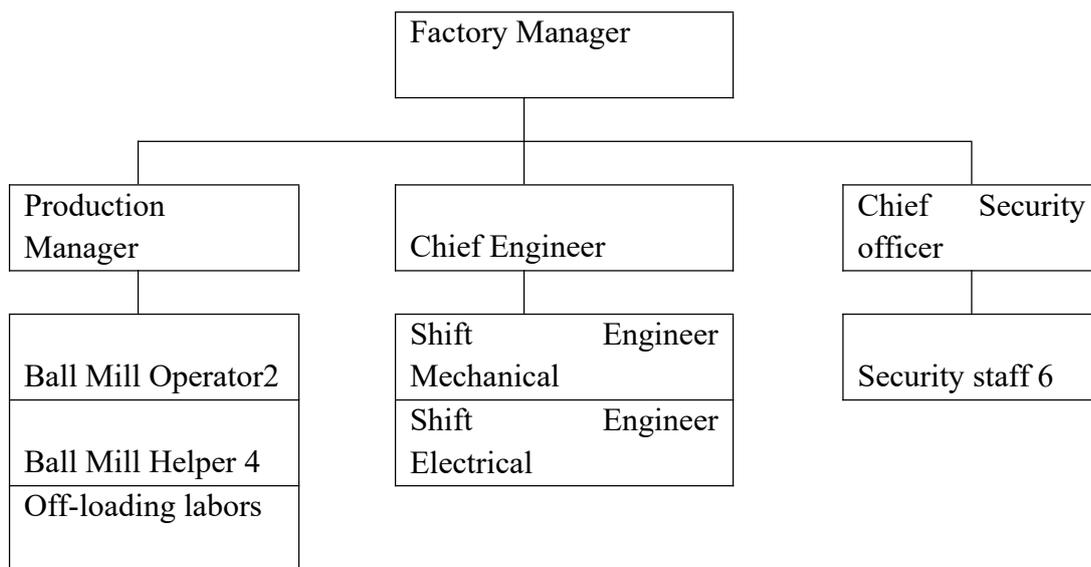


Figure 7.1: Organizational Chart

7.6 Environmental Management Guideline

DPL management through HSE engineer shall be responsible for implementing the mitigation measures for environmental aspects/impacts of the proposed solar power plant and associate transmission line.

This shall be within the scope of relevant HSE policies and regulatory requirement as well as standard industry practice.

At construction phase however, the contractor shall be responsible for ensuring that all HSE requirements are met. The contractor shall report to the DPL management through the HSE engineer.

The Environmental Aspects that are likely to be significantly impacted by all the phases of the project such as pre-construction, construction, operation, and decommissioning have been identified and addressed in the environmental management plan.

In addition to this, project specific plans that will incorporate implementation of recommended measures for each work phase and aspect will be developed by the contractors to ensure that all health, safety, and environmental concerns are fully covered for the entire project.

Since these plans will be developed at stages where specific project details are available, they will therefore present comprehensive steps for the implementation, monitoring, and reporting from inception to projects completion and decommissioning.

Environmental Management Plan (EMP)

The EMP for the respective project phases are presented *Tables 7.1* below:

Table 7.1: EMP Guidelines for Mitigation Measures Implementation

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
Pre-Construction Phase				
Permitting & Land Acquisition • Consultations • Acquisition of Social license to operate • Stakeholder identification • Project-Sitemapping	Acceptance and co-operation/ participation from stakeholders (communities and government) leading to peaceful and timely execution of the project	Dahua Power Limited (DPL) and Project Contractor shall: • All relevant stakeholders are identified • Early stakeholder’s engagement sessions are held, and all agreed issues properly documented and signed	During Project Planning	Project Manager (PM), GM, SMEnv
	Uncertainty and increased perturbation due to a lack of information and communication.	DPL shall: • Early engagement of stakeholders • Establish and publicize grievance procedure • Provide the opportunities for all affected groups (women, youths, religious, etc) to participate in consultations and ensure that all concerns are	During Project Planning	PM, GM (General Manager), SMEnv (Ogun State Ministry of Environment),

Perception of the local people (host communities) and stakeholders	dulyaddressed. • Plan and execute consultations to educate community members and stakeholders on project activities, schedules and potential impacts. • Ensure consultation throughout project lifespan.		Ministry of Lands and Survey, Ogun Local Government Authority
Integration of men and women concerns into the project design	DPL and Project Contractor shall: • Due consultation of relevant groups at all phases of the project. • Provide the opportunities for all affected groups to participate in consultations and that all concerns are duly addressed.	Prior to Construct ion	PM, GM, SMEnv, Ogun Local Government Authority, host Community Leaders
Exclusion of vulnerable groups from consultations which may lead to strife	• Establish and publicize grievance procedure		
Community agitations over compensations, land disputes, wrong stakeholder identification, leadership tussles, etc	DPL and Project Contractor shall: Project will develop a community relations and engagement plan that identifies fair strategies of engagement for all communities Project will also develop and implement a resettlement action plan to ensure equitable settlement of all project affected persons • Early stakeholders“engagement sessions are held,and all	Prior to Construct ion	PM, GM, SMEnv, Ogun Local Government Authority, host Community Leaders

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		<p>agreed issues properly documented and signed.</p> <ul style="list-style-type: none"> • Establish and publicize grievance procedure • Stakeholders (communities, Govt., land owners, etc.) are adequately consulted and relevant issues addressed • Agreed fair compensation/rent for land are paid to identified owners promptly as per set standards. • As far as possible employ persons from the surrounding communities during the construction phase of the development to reduce the numbers of persons that will migrate to the area seeking employment. This will also avoid any feelings of resentment and will ensure that the communities derive the most benefits from the development. 		

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
Transport of Personnel and Construction equipment	Increased traffic during mobilisation on road with risks of accidents leading to injury/death and loss of asset.	DPL and its contractors shall ensure; <ul style="list-style-type: none"> • All vehicles are certified road / water worthy prior to being mobilized for workactivities. • Compliance to all roads safety transport rules including speed limits • Competency training and certification of drivers before mobilisation. • Limit movement to day time only. 	During Mobilization to Site	GM, PM, CM (Construction Manager), HSE Coordinator, Third party Security Officers
	Risks of armed robbery and Militant/youth attack and hostage taking leading to injury/death of personnel	<ul style="list-style-type: none"> • Develop a project security plan that addresses all project related securityconcerns • Ensure security procedures are strictly enforced and continually improved based on updated risk information. • Consultation and good public relation with the stakeholder communities. • Ensure government approved security personnel (navy/ mopol/army) is used on transport vehicles when warranted. • Limit movements of personnel and equipment to daytime only 	During Mobilization to Site	GM, PM, CM (Construction Manager), HSE Coordinator, Third party Security Officers

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	<p>Nuisance (noise and vibrations) due to movement of heavy duty equipment and vehicles affecting public and wildlife.</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Machinery, vehicles and instruments that emit high levels of noise should be used on a phased basis to reduce the overall impact. These pieces of equipment such as drills, graders and cement mixers should also be used when the least number of residents can be expected to be affected. • Workers, especially those working with machinery, vehicles and instruments that emit high levels of noise should be supplied with ear plugs and ear muffs to reduce the risk of hearing impairment. Prolonged exposure to this impact should be reduced where possible. • Plan work activities to avoid heavy duty movement during peak hours. • Consult with host communities and plan project activities 	<p>During Mobilization to Site</p>	<p>GM, PM, CM (Construction Manager), HSE Coordinator, third-party Security Officers</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		<p>accordingly.</p> <ul style="list-style-type: none"> • Limit movement and work activities to daytime only • Ensure equipment are properly maintained 		
	<p>Increase of dust particles and vehicular emissions (SO_x, NO_x, CO_x etc)</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Ensure that all vehicles involved in the transport of construction material and staff and machinery involved in the construction is properly maintained and serviced. • Extra care must be taken to reduce dust in periods when wind speed is greatest and the rainfall amounts are lowest which is between November and February (dry season), e.g. This will involve extra wetting of the construction area to suppress dust particles. • Ensure that all material (sand and aggregate) stockpiled along the site to be used in construction activities are regularly sprayed to reduce the effects of wind whipping. • All staff employed at the construction site must be provided with dust masks and be asked to use them. • Implement a traffic system that involves appropriate signals and signs to ensure the smooth 	<p>During Mobilization to Site</p>	<p>GM, PM, CM, HSE Coordinator, third-party Security Officers</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		<p>flow of traffic. This will reduce the idling of vehicles that may occur and therefore reduce the emissions in the area.</p> <ul style="list-style-type: none"> • Reduce speed along earth roads • Plan journey to reduce travel times • Air emissions are expected to be short term and minimal at this stage of the operation • Advance filters and techniques are incorporated in the design to reduce dust emission • Vehicles carrying earth materials should be covered • Install and operate air pollution control equipment e.g. mufflers. 		
	<p>Work place accidents/incidents from the use of cranes, forklifts, etc. during loading and offloading of materials/equipment.</p>	<p>DPL and its contractors shall ensure;</p> <ul style="list-style-type: none"> • All personnel are qualified and certified for their relevant works • That approved safe work procedures are provided and complied with at all times • Use of appropriate personal protective equipment (PPE) e.g. rubber hand gloves, hard hats, safety boots, etc. by all personnel at the project site • Limit work activities to daytime only 	<p>During Mobilization to Site</p>	<p>GM, PM, CM, HSE Coordinator, third-party Security Officers</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Obstruction of/damage to existing roads due to increased usage during mobilisation.	DPL and Project Contractors shall: Roads to be assessed prior to commencement of work to establish the status and its capability to safely handle material and personnel transportation, and after completion to determine extent of impact and where necessary, take steps to reclaim areas damaged by project activities Plan work execution to reduce travels and restrict where necessary, use of accessroads.	During Mobilization to Site	GM, PM, CM, HSE Coordinator, third-party Security Officers
	Interference with other road users along mobilisation route.	DPL and its contractors shall ensure that Equipment, materials and personnel are mobilised after due consultation with relevant transportation authorities (FRSC, NMA, NURTW, etc) and other stakeholders to minimise interference along mobilisation routes. Travels to and from sites shall be planned to maximize each trip and minimize number of travels.	During Mobilization to Site	GM, PM, CM, HSE Coordinator, third-party Security and FRSC Officers

<p>Interference with public utilities (electric wires and poles), market activities along mobilisation route</p>	<p>DPL shall:</p> <ul style="list-style-type: none"> • use standard warning notice (e.g. side rides, signal lights and horn) to other roadusers; • ensure a practicable journey management programme is developed and adheredto; • carry out pre-mobilisation route survey and ensure that mobilization is carried out after due consultation with relevant authorities and other stakeholders to minimizeinterference along the route 	<p>During Mobilization to Site</p>	<p>GM, PM, CM, HSE Coordinator, third-party Security and FRSC Officers</p>
<p>Movement of workers into host communities and resultant increase in population.</p>	<p>DPL shall</p> <ul style="list-style-type: none"> • liaise with local CDC, community head and relevant local organizations to work out formula for recruitment from the hostcommunities 	<p>During Mobilization to Site</p>	<p>GM, PM, CM, HSE Coordinator</p>
<p>Leakage of fuel or lube oil onto land or into water bodies during transportation and storage may lead to increased chemical toxicity.</p>	<p>DPL and Project Contractor shall ensure:</p> <ul style="list-style-type: none"> • Safe operating practices are enforced duringmobilisation • Implementation of project specific spill and emergency responseplan • hydrocarbon/chemical spill containment and prevention measures and equipment are functional and effective on site and for equipment and vehicles 	<p>During Mobilization to Site</p>	<p>GM, PM, CM, HSE Coordinator</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		<ul style="list-style-type: none"> • hydrocarbon and chemical transfers in safely contained areas • Double handling to be avoided where possible • When transfer has to take place, ensure it is effected in lined and secured areas where containment is possible • Educate personnel on hydrocarbon and chemical handling risks/hazards, through HSE briefings/tool box meetings 		
Recruitment of Labour	<p>Employment opportunities arising from recruitment of project workers</p> <p>Skill acquisition and enhancements to local indigenes and workforce.</p>	<p>DPL and Project Contractor shall: enhance this beneficial impact by</p> <ul style="list-style-type: none"> • Creating requirements for contractors to hire local labour • Ensure skills acquisition and development • Recognise and commend personnel with outstanding performance 	During Mobilization to Site	GM, PM, CM, HR (Human Resource) head

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	<p>Influx of people (migrant workers, subcontractors and suppliers) and increased pressure on existing social infrastructure</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Brief all employees to ensure awareness of any sensitivity to the local cultures, traditions and lifestyles • Continuous consultation while project is in progress • Implementation of community relations and engagement plan • Encourage hiring, as practicable, of appropriately qualified workers from areas in the vicinity of the project to discourage preventable influx of persons • Work with contractors to ensure that specialised skill workers from outside the areas have access to proper accommodations and other basic infrastructure • Educate all workers to enhance their Health, Safety, Security, and Environment awareness, and performance on the job • Maintain medical emergency response plan so that all injured or ill personnel can promptly access appropriate care 	<p>During Mobilization to Site</p>	<p>GM, PM, HSE Coordinator, CM, HR (Human Resource) head</p>

<p>Increase of communicable diseases due to influx of people and poor living conditions around pre-construction sites</p>	<p>DPL and Project Contractor shall: Project will develop a health plan to address potential health issues Carry out health awareness program (malaria, corporate stop AIDS program,etc) Provision of site medical personnel to attend to emergency situations Engage the services of retainer clinics to manage health issues Educate workforce on the prevention of malaria as well as encourage the use of mosquito nets in construction camps</p>	<p>During Mobilization to Site</p>	<p>GM, PM, HSE Coordinator, CM, HR (Human Resource) head</p>
<p>Increase in social vices (like theft, prostitution) resulting from increased number of people</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Ensure its personnel and contractors undergo pre-employment background screening as required • Periodically discuss health and social education issues during toolbox/HSE meetings • Promptly deal with reported cases of misconduct to check recurrences 	<p>During Mobilization to Site</p>	<p>GM, PM, HSE Coordinator, CM, HR (Human Resource) head</p>

<p>Recruitment of Local hands/labour.</p>	<p>These are beneficial impact and DPL shall seek to enhance them by:</p> <ul style="list-style-type: none"> • creating requirements for contractors to hire labour from the local area; • encouraging contractors to maintain a list of short-term employees for future call-ups when required; and • adopting procurement practices that favour local merchants and service providers where practicable <p>consultation with the locals shall be carried out in terms of provision of jobs.</p>	<p>Prior to Construction</p>	<p>GM, PM, HSE Coordinator, CM, HR (Human Resource) head</p>
<p>Conflicts/community agitations over employment issues (quotas and methods)</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Project will develop a community relations and engagement plan that identifies fair strategies of engagement for all communities • Project will also develop and implement a resettlement action plan to ensure equitable settlement of all project affected persons • Establish and publicize grievance procedure • Early stakeholder's engagement sessions are held, and all agreed issues properly documented and signed. • All affected stakeholders and legacy issues are identified early, clearly defined, 		

	<p>and agreed on.</p> <ul style="list-style-type: none"> Stakeholders (communities, Govt., land owners, etc.) are adequately consulted and relevant issues addressed Agreed fair compensation/rent for land are paid to identified owners promptly as per set standards. As far as possible employ persons from the surrounding communities during the construction phase of the development to reduce the numbers of persons that will migrate to the area seeking employment. This will also avoid any feelings of resentment. 		
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
SitePreparation • Site Survey • Removal of vegetation and de- stumping	Business opportunities for local contractors through sub-contracting activities Local support services from road side supply markets and shops etc	DPL and Project Contractor shall: Encouraging indigenous contractors and suppliers providing them opportunities to supply materials of acceptable standards • Encourage contractors to hire and to develop local labour • Workers are paid promptly as at	During Mobilization to Site	GM, PM, HSE Coordinator, CM, HR (Human Resource) head

	whendue		
Creation of job and job opportunities	<p>These are beneficial impact and DPL shall seek to enhance them by:</p> <ul style="list-style-type: none"> • creating requirements for contractors to hire labour from the local area; • encouraging contractors to maintain a list of short-term employees for future call-ups when required; and • adopting procurement practices that favour local merchants and service providers where practicable <p>consultation with the locals shall be carried out in terms of provision of jobs.</p>	During Mobilization to Site	GM, PM, CM, HR (Human Resource) head
Contamination of <i>(potential)</i> surface water as a result of siltation caused by increased erosion, during site preparation.	<p>DPL and Project Contractor shall:</p> <p>Employ appropriate industry practices in coal power plant construction and ancillary facilities in order to avoid adverse alteration drainage pattern</p> <p>Implement where appropriate sediment run-off controls and visually inspect after rainfall events</p> <p>Lay down areas/Marshalling yards are designed to include erosion control</p> <p>Reclaim as practicable topography of excavated or compacted upland areas</p>	During Mobilization to Site	GM, PM, HSE Coordinator, CM

		upon completion of activities.		
	Loss of topsoil. Decreased soil fertility and agricultural production	DPL shall keep to area approved for the project, with minimal clearance as stipulated in the construction procedures.	Prior to Constru ction	GM, PM, CM,
	Disturbance of the vegetation cover / loss of forest products (fuel wood, timber, medicinal	DPL and Project Contractor shall: Ensure inclusion of threatened and endangered species management strategies in the site specific Environmental	Prior to Constru ction	GM, PM, HSE Coordinator, CM

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	<p>plants) due to site clearing and preparation.</p> <p>Loss/disturbance of wildlife due to habitat loss/fragmentation from vegetation clearing along access roads</p>	<p>Management Plan to be developed by Project Contractors to ensure appropriate flora and fauna management.</p> <p>Vegetation clearing will be limited to minimum required for work</p> <p>Felling of trees of >30cm girth is to be minimized during vegetation clearing to only unavoidably necessary ones. This should be done with considerations to environmental protection.</p> <ul style="list-style-type: none"> • Utilisation of existing accessible tracks as much as possible <p>Establish a perimeter of protection around sensitive ecosystems and their unique habitats.</p> <p>Plan work activities to minimise presence and duration of work in ecologically sensitive areas.</p>		

<p>Soil compaction, destabilisation from excavation and runoff erosion resulting in sedimentation problems.</p>	<p>DPL and Project Contractor shall: Implement where appropriate sediment run-off controls and visually inspect after rainfall events Construction on steep slopes and in soft or erodible material will require erosion control measures and correct grassing methods. Lay down areas/Marshalling yards are designed to include erosion control Reclaim as practicable topography of excavated or compacted upland areas upon completion of activities</p>	<p>Prior to Construction</p>	<p>GM, PM, HSE Coordinator, CM</p>
<p>Fragmentation of wildlife habitats/increase in poaching due to an easier access for the local population and non-resident workers.</p>	<p>Where possible plan site clearing to allow species the opportunity to relocate to suitable nearby habitats and to reduce the shock to the various habitats that may be disturbed. Relocate non-motile and weak species to safe grounds prior to commencement of work Allow re-growth, within height restrictions, of native ground cover beneath lines (along project site, lay-down areas and access roads) • Prohibit poaching particularly by workers and educate workers on good biodiversity conservation policies.</p>	<p>Prior to Construction</p>	<p>GM, PM, HSE Coordinator, CM</p>
<p>Alteration of natural drainage patterns</p>	<p>DPL shall Ensure that site preparation is carried out in such a way as not to alter the natural topography of the project area.</p>	<p>Prior to Construction</p>	<p>GM, PM, HSE Coordinator, CM</p>

	sediment traps/screens shall be used to control runoff and sedimentation		
Personnel injury/death resulting from malfunction and mal-operation of equipment etc.	DPL shall ensure: relevant personnel are trained on equipment. daily HSE briefings/tool box meetings are carried out before commencement of work; conduct of safety inspections of work activities; equipment maintenance programme is developed and adhered to; PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel.	Prior to Construction	GM, PM, HSE Coordinator, CM
Wildlife attack (e.g. snake bite, bee sting)	DPL and its contractors shall ensure: Work force are provided with and use appropriate PPE (cover all, safety boots, hard hats, hand gloves and safety goggles) before venturing into the bush; Work force are provided assistants/experienced guides from the local communities to look out for signs of wild animals (including bees and wasps) in the bush; and trips into the work in inclement weather e.g., periods of low visibility, are avoided	Prior to Construction	GM, PM, HSE Coordinator, CM

Pollution (dust) from soil surface.	DPL shall ensure that there is regular and frequent watering of the work way especially during the dry season.	Prior to Construction	GM, PM, HSE Coordinator, CM
Increased demand on existing local infrastructures (road, housing etc) due to influx of workers and job seekers.	DPL shall <ul style="list-style-type: none"> • Embark on community development programmes in linewith the desires and needs of thepeople. • Establishment of base camps for workers withmedical facilities. 	Prior to Constructi on	GM, PM, HSE Coordinator, CM
Influx of predominantly male population (job seekers) into stakeholder’s communities leading to increased extramarital sexual activity, and introduction of commercial sex workers	DPL shall <ul style="list-style-type: none"> • Maintain regular medical examinations for allstaff. • Abstinence/safe sex shall beencouraged • Employment of indigenes shall beencouraged 	Prior to Constructi on	GM, PM, HSE Coordinator, CM

<p>Potential effects on air quality from emission of pollutants from engines e.g. bull-dozers and support equipment.</p>	<p>DPL shall:</p> <ul style="list-style-type: none"> • ensure vehicles, trucks and other heavy-duty engines are maintained at optimal working condition in accordance with operating manual;and • encourage the use of mufflers on equipment manifoldwhere necessary to filter particulates and thus reduce its emission into the air. 	<p>Prior to Construction</p>	<p>GM, PM, HSE Coordinator, CM</p>
<p>Waste generation/disposal</p> <ul style="list-style-type: none"> • scrap metal, wood, sand, concrete, paper, domestic waste • Waste from laydown area from grubbing of site creation (Material andwood) 	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Develop and implement Waste ManagementPlan. • Provide adequate containers for wastecollection • Periodically assess contractor activities to check the level of compliance to regulatory and DPL waste management requirements. • Recycling andreuse • Ensure use of only government approved waste management contractors 	<p>Prior to Construction</p>	<p>GM, PM, HSE Coordinator, CM</p>

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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
Construction Phase				

<p>Installation of the Plant and Fabrication, Metal works Cutting, bending and welding steel components Handling of conductor wires, strings, insulators and fittings</p>	<p>Workplace accidents from burns, cuts, bruises, trips and falls, objects at height, leading to injury or fatalities.</p>	<p>DPL and its contractors shall ensure;</p> <ul style="list-style-type: none"> • All personnel are qualified and certified for their relevant works • That approved safe work procedures are provided and complied with at all times • Use of appropriate personal protective equipment (PPE) e.g. rubber hand gloves, hard hats, safety boots, etc. by all personnel at the project site <ul style="list-style-type: none"> • Limit work activities to daytime only where practicable • conduct of safety inspections of work equipment prior to mobilization; • daily HSE briefings/tool box meetings are carried out before commencement of work; 	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator,</p>
	<p>Employment of local labour and skills acquisition for workers taking advantage of new opportunities</p>	<p>DPL and its contractors shall enhance this beneficial impact by</p> <ul style="list-style-type: none"> • Creating requirements for contractors to hire local labour • Ensure skills acquisition and development 	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>
	<p>Influx of (predominantly male population) job seekers into stakeholder's community leading to increased extramarital sexual activity, and introduction of commercial sex</p>	<p>DPL shall</p> <ul style="list-style-type: none"> • Maintain regular medical examinations for all staff. • Abstinence/safe sex shall be encouraged • Employment of indigenes shall be encouraged 	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator, HR head.</p>

workers			
Risk of electrocution and burns (to onsite workers) from welding flashes and high currents during welding	<p>DPL and its contractors shall ensure;</p> <ul style="list-style-type: none"> • All personnel are qualified and certified for metalworks • That approved safe work procedures are provided and complied with at alltimes • Use of appropriate personal protective equipment (PPE) e.g. rubber hand gloves, hard hats, safety goggles, etc. by all metal works personnel 	Throughout Construction	GM, PM, CM, HSE Coordinator, HR head
Possibility of vision impairment from exposure to light emitted from welding sparks and foreign particles/objects entering the eyes.	<p>DPL and its contractor shall ensure that</p> <ul style="list-style-type: none"> • relevant personnel are trained on equipment. • daily HSE briefings/tool box meetings are carried out before commencement of work; • conduct of safety inspections of work equipment prior to mobilization; • equipment maintenance programme is developed and adhered to; • PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel; and activities are avoided when lighting is inadequate and as 	Throughout Construction	GM, PM, CM, HSE Coordinator, HR head

	<p>practicable in inclement weather e.g. periods of low visibility.</p>		
<p>Noise and attendant vibration effects from fabrication and associated welding equipment</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Machinery, vehicles and instruments that emit high levelsof noise should be used on a phased basis to reduce the overall impact. These pieces of equipment such as drills, graders and cement mixers should also be used when the least number of residents can be expected to be affected. <p>Workers, especially those working with machinery, vehicles and instruments that emit high levels of noise should be supplied with ear plugs and ear muffs to reduce the risk of hearing impairment. Prolonged exposure to this impact should be reduced wherepossible.</p> <p>Ensure use of appropriate PPEs (ear plugs) by workers in areas with noise level above</p>	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator, HR head</p>

		FMEnv (90dBA) hourly work arealimits. Conduct daily HSE briefings prior towork		
Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding of steel components	DPL shall and its contractors shall: Utilise environmentally friendly electrodes, spray and paint liquids for welding as well as painting. Use of appropriate personal protective equipment such as welding masks by welders shall be enforced. DPL shall also install fume expellers or blowers at confined welding areas. • Implement appropriate work-site practices.	Throughout Construction	GM, PM, CM, HSE Coordinator, HR head

<p>Generation of metal scraps from conductor wires, strings and steel elements associated with fabrication of steel components.</p>	<p>DPL and Project Contractor shall: Develop project specific waste management plan and ensure proper implementation</p> <ul style="list-style-type: none"> • Provide adequate containers for wastecollection <p>Periodically assess contractor activities to check the level of compliance to regulatory and DPL waste management requirements.</p> <ul style="list-style-type: none"> • Safe operating practices are enforced during construction <p>Ensure use of only government approved waste management contractors</p> <ul style="list-style-type: none"> • Comprehensive waste management is being developed to help in minimizing waste accumulation onsite. • Oil spill handling strategy especially mopping up oil immediately after spill, engine maintenance particularly oil change off site plan should help avoid pollution due to oils. • Old transformers should be changed on time to minimize leakages. They should be stored in concrete floors and rooms 	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		with roofs to avoid precipitation.		
Foundation / Earth Works • On-site geotechnical testings • Plant installation works • Pilings and trenching, etc • Land Clearing	Increased business and economic activities as well as diversification of income sources due to supply contracting and subcontracting Increase in revenue opportunities for local population due to presence of non-resident workers and travellers (technical workers)	DPL shall enhance this by: Encouraging indigenous contractors and suppliers providing them opportunities to supply materials of acceptable standards • Encourage contractors to hire and to develop local labour	Through out Construction	GM, PM, CM, head, HR

<p>Soil / groundwater contamination resulting from accidental leakages and spills of hazardous substances (diesel, cleaning agents, lubricants, hydraulic oil)</p>	<p>DPL and Project Contractor shall: Plan and set on-site sanitary facilities for the disposal of wastewater. Maintain vehicles, machinery and equipment in good condition in order to avoid leaks and spill of hazardous materials (lube oils, chemicals,etc.) Ensure safe management of hazardous materials (chemicals, etc.) Ensure handling of fuels such as fuelling of vehicles and machinery, and fuels transfers, take place in contained areas, where sufficient measures are in place to ensure containment of spills. • Plan emergency response measures and equipment are</p>	<p>Through out Construction</p>	<p>GM, PM, CM, HSE Coordinator, third-party Environmental Consultant</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		available, and personnel are capable of effectively using it for cases of accidental spill.		
	Increased jobs and job opportunities from local labour hire and sub-contracting to indigenous suppliers.	DPL and Project Contractor shall enhance this by: <ul style="list-style-type: none"> • Encouraging indigenous contractors and suppliers by providing them opportunities to supply materials of acceptable standards 	Throughout Construction	GM, PM, CM
	Generation of dust and automobile / heavy duty equipment emissions from construction earth works.	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Ensure that all vehicles involved in the transport of construction material and staff and machinery involved in the construction is properly maintained and serviced. • Extra care must be taken to reduce dust in periods when wind speed is greatest and the rainfall amounts are lowest which is between November and February (dry season), e.g. This will involve extra wetting of the construction area to suppress dust particles. • Ensure that all material (sand and aggregate) stockpiled along the site to be used in construction activities are regularly sprayed to reduce the 	Throughout Construction	GM, PM, CM, HSE Coordinator, third-party FRSC Officer

	<p>effects of windwhipping.</p> <ul style="list-style-type: none"> • All staff employed at the construction site must be provided with dust masks and be asked to use them. • Implement a traffic system that involves appropriate signals and signs to ensure the smooth flow of traffic. This will reduce the idling of vehicles that may occur and therefore reduce the emissions in the area. • Reduce speed along earthroads • Plan journey to reduce travel times • Advanced filters and techniques are incorporated in the project design to reduce gas and dust emissions • Vehicles carrying earth materials should be covered • Install and operate air pollution control equipment e.g. mufflers. 		
Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads	<p>DPL and Project Contractor shall:</p> <p>Ensure inclusion of threatened and endangered species management strategies in the site specific Environmental Management Plan to be developed by Project Contractors to</p>	Throughout Construction	GM, PM, CM, HSE Coordinator, third-party Environmental Consultant

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	and at project site	<p>ensure appropriate flora management.</p> <ul style="list-style-type: none"> • Limit vegetation clearing to footprint required for construction purposes; i.e. minimize disturbances around project site and accessroad. • Much of the low-lying distinct vegetation will not be cleared and will be covered with constructionmaterial; • provision of adequate culverts to maintain natural drainage channels and tidal flushing along the distinct paths as much as practicable; • Clear briefings and instructions to Project Contractor regarding the clearance procedures will be undertaken to minimise any distinct vegetation area that may bedisturbed; • Allow re-growth, within height restrictions, of native ground cover beneath lines (around project site, lay-down areas and accessroads) <ul style="list-style-type: none"> • Destruction of woody grassland during construction should be minimized. • The activities of the construction and 		

		<p>operations staff must be restricted to the immediate surroundings.</p> <ul style="list-style-type: none"> • Care should be taken in sensitive areas such as grassland, wetland and valleys not to create more disturbance than is necessary. Access of machinery and vehicles to these areas should be carefully controlled and maintenance and construction activities must be restricted to the working areas where practical • Use of existing tracks and roads in the general as far as possible will help minimize construction of access roads to deliver materials. • The impact could influence the decision to develop in the area unless it is effectively mitigated. • Avoid grading in areas with high slope angles to avoid future possible erosion • Minimize grading of rugged areas by looking for alternative 		
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	<p>Fragmentation (i.e. destruction and disturbance) of habitat</p> <p>Fauna disturbance and displacement as a result of migration away from construction activity area (this include impact on bird life)</p>	<p>passage within the 60m way leave.</p> <p>DPL and Project Contractor shall: Ensure inclusion of threatened and endangered species management strategies in the site-specific Environmental Management Plan to be developed by Project Contractors to ensure appropriate floramanagement. Plan and execute construction work to minimize interference onwildlife • Maintain construction equipment to optimal functionconditions Monitor presence of wildlife species during construction activities • Birds should not be exposed to more disturbance than is inevitably brought about by construction and operations activities.</p>	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator,</p>

<p>Introduction of Alien Invasive Plant Species (AIPS)</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • That the equipment to be used is decontaminated e.g. washing equipment to remove soil potentially carrying AIPS propagates • Avoid importing soils/gravels to use for level grounds for vehicles to pass onsite. If brought from outside, the surface of the soil should be removed to avoid mixing of soils potentially harbouring AIPS propagates with the lower soil profiles. • Ensure that since AIPS appears later after soil disturbance, aftermath proliferation of AIPS should be controlled by reducing their population and recruitment 	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator, third-party Environmental Consultant</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Potential collapse of Plant structures as a result of unsuitable geotechnical conditions	DPL and Project Contractor shall: Carry out side by side geotechnical investigations during construction to determine suitability of soil to carry structures Recommendations from geotechnical appraisals shall be appropriately implemented Construction of Plant foundations shall follow good industry engineering practices.	Throughout Construction	GM, PM, CM, HSE Coordinator, third-party Environmental Consultant
	Reduction in wildlife population as a result of poaching due to easier access created by access road clearing	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Prohibit poaching by personnel • Periodically educate workforce on good principles of biodiversity conservation • Limit workforce concentration to project area and prohibit the possession of fire arms by members of workforce • Practice wildlife conservation principles (e.g. release back into the wild any wildlife incidentally caught by dug-up foundations or trenches. • Excessive clearing of vegetation should be avoided to prevent incidences of wild herbivores congregating in the area. • In case there will be possible electric 	Throughout Construction	GM, PM, CM, HSE Coordinator, head, HR

	<p>inductions on wire fences, rubber breaks should be introduced on wires to avoid possible conduction of electric domains.</p>		
Temporary obstruction of movement of wild-herbivores	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Ensure speed of vehicles is controlled at a maximum limit of 40 km/h. Once a driver notices a herd of gazelles is crossing s/he should wait until all have crossed or slow down to avoid hitting individuals. • Avoid grading or clearing of vegetation where the mounds of moles and Aardvark holes occur. These are probably their hidings from predators and severe climate conditions. • Ensure construction activities are restricted to day time from 6am to 6pm. This provides time for foraging for nocturnal animals. This group is normally sensitive to presence of human activities and flood lights at night. • 	Throughout Construction	GM, PM, CM, HSE Coordinator

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		<ul style="list-style-type: none"> • Ensure that construction is therefore scheduled after the onset of rainfall. Generally, vegetation in the area responds quickly to rainfall hence herbivores will disperse to avoid any adverse impacts. • Impact on the species will be localized. Disturbance of their habitats would affect negatively the hidings of geckos and lizards in the rock outcroparea. • Ensure the implementation of operation times, speed limit and driver’s keenness can potentially reduce thisimpact. 		
	Aquatic Habitat Alteration	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Ensure sedimentation is not caused in the drainagesystem. • Ensure the minimization of activities that disturb soil layer 	Throughout Construction	GM, PM, CM, HSE Coordinator

<p>Noise nuisance (including impulsive noise) from construction activities (e.g. piling) resulting to temporary migration of sensitive mammals and rodents.</p>	<p>DPL and Project Contractor shall: Machinery, vehicles and instruments that emit high levels of noise should be used on a phased basis to reduce the overall impact. These pieces of equipment such as drills, graders and cement mixers should also be used when the least number of residents can be expected to beaffected. Workers, especially those working with machinery, vehicles and instruments that emit high levels of noise should be supplied with ear plugs and ear muffs to reduce the risk of hearing impairment. Prolonged exposure to this impact should be reduced</p>	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		where possible. • Regularly maintain construction equipment to optimal function • Limit heavy duty construction works to day hours only where practicable <ul style="list-style-type: none"> • Ensure that silencers are fitted to the engines could significantly reduce impact of noise • Switch off engines not in use can also reduce noise duration and intensity 		
Coal power Plant Installations and Associated utilities“ Constructions <ul style="list-style-type: none"> • Crane lifting and erections • Bolts and nutstightening • Anti climbing guards and step bolts <ul style="list-style-type: none"> • Insulators and fittings • Conductor wirestringing • Connectors fixing, • Visual & landscape 	Pollution of soil/water as a result spilled fuel and other waste oil discharge during facility construction and installation processes	DPL and Project Contractor shall: <ul style="list-style-type: none"> • Develop and implement spill response plan • maintain storage facilities at optimal holding condition • train personnel in safe fuel handling procedures of chemicals and hydrocarbons • ensure all fuel storage facilities are bonded and lined with impermeable materials • vehicle and equipment maintenance activities implemented using proper containment or other strategies to guide against spills • Monitoring during maintenance of equipment to ensure that there is no discharge to the environment. 	Throughout Construction	GM, PM, CM, HSE Coordinator

<p>Traffic diversion and congestion along local roads during installation at road crossings.</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Coordinate power sources and stringing activities to avoid heavy traffic periods • Use warning signs and traffic wardens/directors • Ensure activities causing blockages at road crossings are carried out within shortest time practicable • In the case of longer road blockages, divert traffic to approved alternate routes in liaison with appropriate authorities • Consult with affected communities prior to closures to provide warnings and alternatives. 	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>
<p>Workplace accidents / incidents (trip/falls etc) from heights during conductor wire stringing and bolt/nuts</p>	<p>DPL shall ensure HSE briefings prior to commencement of work activities</p> <ul style="list-style-type: none"> • Develop standard work procedures where work hazards are identified and addressed 	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	tightening project activities.	<ul style="list-style-type: none"> • DPL shall ensure personnel use appropriate PPE • DPL shall design work area to internationally acceptable standards • Ensure availability of first aid facilities on site • Ensure retainer clinics are engaged and site medical personnel are available in case of accidents • Maintain medical emergency response plan so that injured or ill personnel can promptly access appropriate care. 		
	Risks of injury / death and loss of assets resulting from accidents associated with road transportation to and from construction sites	<ul style="list-style-type: none"> • DPL and its contractors shall ensure; • All vehicles and boats are certified road worthy prior to being mobilized for work activities. • Compliance to all roads safety transport rules including speed limits • Competency training and certification of drivers before mobilisation. • Limit movement to day time only 	Throughout Construction	GM, PM, CM, HSE Coordinator
	Risks of fire/explosions resulting from accidental ignition of onsite diesel storage	<ul style="list-style-type: none"> • DPL and its contractors shall ensure; • All fuel storage tanks are kept at safe distances from work areas • Educate workforce on risks associated around storage areas and prohibit activities (such as 	Throughout Construction	GM, PM, CM, HSE Coordinator

tanks	<p>smoking) that can ignite storagetanks</p> <ul style="list-style-type: none"> • Designate no-smoking and smokeareas • Hold HSE meetings and talks on firehazard 		
<p>Waste generation/disposal</p> <ul style="list-style-type: none"> • scrap metal, wood, sand, concrete, paper, domestic waste • used oil and replaced/obsolete equipment parts that may contaminate soil/groundwater • Waste from lay-down area and projectsites from grubbing of access roads 	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Develop and implement a waste managementplan • Provide adequate containers for wastecollection • Periodically assess contractor activities to check the level of compliance to regulatory and DPL waste management requirements. • Ensure engagement of government approved waste managementcontractors. <ul style="list-style-type: none"> • Recycle and reuse of metalscraps 	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator, third-party Waste management services, State Waste Manage Agency</p>
<p>Localised economic benefits from materials supplies by</p>	<p>DPL and its contractors shall enhance this by:</p> <ul style="list-style-type: none"> • Encouraging indigenous contractors and suppliers byproviding 	<p>Throughout Construction</p>	<p>GM, PM, CM</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	<p>local contractors</p> <p>Induced secondary development within the neighbouring host communities from increased economic activities.</p>	<p>them opportunities to supply materials of acceptable standards</p> <ul style="list-style-type: none"> • Encourage contractors to hire and to develop local labour 		
	<p>Socio-cultural conflicts between the construction team and indigenous populace due to contrasts in beliefs and traditions</p>	<p>DPL and its contractors shall</p> <ul style="list-style-type: none"> • Brief all employees to ensure awareness of any sensitivity to the local cultures, traditions and lifestyles • Establish and publicize grievance procedure • Continuous consultation while project is in progress • Implementation of community relations and engagement plan 	<p>Throughout Construction</p>	<p>GM, PM, CM</p>
	<p>Visual intrusion as a result of alterations to normal landforms and aesthetic beauty of construction sites</p>	<ul style="list-style-type: none"> • Where practically possible, provide a minimum of 1 km buffer area between the project sites and sensitive visual receptors; and • Rehabilitate disturbed areas around as soon as practically possible after construction. This should be done to restrict extended periods of exposed soil. • Existing facilities might be used for lay-down 	<p>Throughout Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>

	and camp site areas		
Aesthetic value of project site location due to encroachment of natural vegetation/flora	DPL shall operate its proposed project in line with regulatory framework and the administrative guidance for the proposed project to minimize the cumulative impact on the aesthetic value of the project area, in consideration of other existing infrastructures in the project location.	Throughout Construction	GM, PM, CM, HSE Coordinator
Increased demand on existing infrastructure (roads, housing, medical facilities, etc) due to influx of workers / induced secondary development in the area during construction activities resulting in squatter settlements.	DPL shall Encourage hiring, as practicable, of appropriately qualified workers from areas in the vicinity of the project Work with contractors to ensure that specialised skill workers from outside areas have access to proper accommodations and other basic infrastructure Educate all workers to enhance their Health, Safety, Security, and Environment awareness, and performance on the job Maintain medical emergency response plan so that injured or ill personnel can promptly access appropriate care	Throughout Construction	GM, PM, CM, HSE Coordinator, head, HR

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Permanent loss of land (some with arable potentials) potentials along the access route	<p>The access route shall traverse in an existing disturbance corridor like other power line or access roads, where farming activities have already been impacted. In this way negative agricultural economic impacts would be minimized.</p> <ul style="list-style-type: none"> • Land owners shall be compensated for potential loss in revenue <p>Compensation shall be agreed between DPL and the landowner and implemented accordingly</p>	Throughout Construction	GM, PM, CM, HSE Coordinator,
	Site conditions leading to increased malaria epidemic from uncontrolled mosquito breeding in swamp areas, snake bites, as well as water borne diseases e.g. diarrhoea and cholera associated with poor sanitary conditions	<p>DPL shall ensure:</p> <ul style="list-style-type: none"> • Develop project health and safety plan to address all potential health issues • DPL shall ensure personnel use appropriate PPE • Provide on-site emergency response plan • Ensure availability of first aid facilities onsite <p>Ensure retainer clinics are engaged and site medical personnel are available to attend to emergency cases</p> <p>Ensure that workers are provided with</p>	Throughout Construction	GM, PM, CM, HSE Coordinator

		<p>training on health risks, exposure, and management</p> <ul style="list-style-type: none"> • Provide appropriate domestic water supply to address additional needs. • Facilitate the implementation of appropriate latrines and other sanitation facilities. • Provide information, education and communication about safe uses of water and occupational safety. • Environmental management for vector control; avoidance via settlement location and design and use of bed nets and repellents; rapid diagnosis and treatment; focal insecticide and molluscicide application. • Safe food storage and handling. 		
<p>Demobilisation</p> <ul style="list-style-type: none"> • Demobilisation after construction phase 	<p>Workplace accidents from burns, cuts, bruises, trips and falls, objects at height, leading to injury or fatalities.</p>	<p>DPL shall ensure:</p> <ul style="list-style-type: none"> • HSE briefings prior to commencement of work activities • Develop standard work procedures where work hazards are identified and addressed • DPL shall ensure personnel use appropriate PPE • DPL shall design work area to internationally acceptable standards 	<p>End of Construction</p>	<p>GM, PM, CM, HSE Coordinator, head, HR</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		<ul style="list-style-type: none"> • Ensure availability of first aid facilities on site • Ensure retainer clinics are engaged and site medical personnel are available in case of accidents • Maintain medical emergency response plan so that injured or ill personnel can promptly access appropriate care. 		
	<p>Soil / groundwater contamination resulting from accidental leakages and spills of hazardous substances (diesel, cleaning agents, lubricants, hydraulic oil)</p>	<p>DPL shall:</p> <ul style="list-style-type: none"> enforce good environmental demobilisation procedures (e.g. cleaning sites and restoring to original status) Use of drip pans during transfer of fuels and hazardous substances • Reclaim storage tank areas or contaminated soils Carry out internal environmental assessment to check activities of construction team and status of fly-down areas, marshalling yards, project sites, etc prior to demobilisation. 	<p>End of Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>

<p>Traffic congestion during transportation of demobilised equipment and personnel</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Coordinate demobilisation activities to avoid heavy traffic periods • Use warning signs and trafficwardens/directors <p>Ensure activities causing blockages at road crossings are carried out within shortest time practicable</p> <p>Consult with affected communities prior to demobilisation to provide warnings and alternatives.</p>	<p>End of Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>
<p>Generation of dust and automobile / heavy duty equipment emissions.</p>	<ul style="list-style-type: none"> • Ensure that all vehicles involved in the transport of construction material and staff and machinery involved in the construction is properly maintained and serviced. • Extra care must be taken to reduce dust in periods when wind speed is greatest and the rainfall amounts are lowest which is between November and February (dry season), e.g. This will involve extra wetting of the construction area to suppress dust particles. • Ensure that all material (sand and aggregate) stockpiled along the site to be used in construction activities are regularly sprayed to reduce the effects of wind whipping. 	<p>End of Construction</p>	<p>GM, PM, CM, HSE Coordinator, head, HR</p>

		<ul style="list-style-type: none">• All staff employed at the construction site must be provided with dust masks and be asked to use them.		
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation Enhancement Measures	Timeframe	Responsibility
		<ul style="list-style-type: none"> • Implement a traffic system that involves appropriate signals and signs to ensure the smooth flow of traffic. This will reduce the idling of vehicles that may occur and therefore reduce the emissions in the area. • Reduce speed along earthroads • Advanced filters and techniques are incorporated in the project design to reduce gas and dust emissions • Plan journey to reduce travel times • Vehicles carrying earth materials should be covered • Install and operate air pollution control equipment e.g. mufflers. • Ensure the construction can be timed when the ground is not too dry and dusty and dusts are not desperate 		

<p>Reclamation of marshalling yards, project sites, access roads (to prevent unauthorised access) and lay-down areas</p>	<p>DPL shall enhance this by:</p> <ul style="list-style-type: none"> • Where possible contractor shall reclaim de-vegetated areas with topsoil, • Where possible, reclaim compacted floors with native plant species, etc. • Audit Project Contractor to verify reclamation of work sites, marshalling yards, lay-down areas etc 	<p>End of Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>
<p>Waste disposal (scrap metal, wood, sand, concrete, paper, domestic waste)</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Provide adequate containers for waste collection • Ensure all waste are removed from site • Recycling and reuse • Audit contractor on waste disposal activities to check the level of compliance to regulatory and DPL waste management requirements before leaving site. 	<p>End of Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>

<p>Loss of employment and business opportunities due to completion of construction phase</p>	<p>DPL and Project Contractor shall Shall ensure skills acquisition and enhancement programs to further empower the workforce for meaningful employment opportunities after the project • Establish and publicize grievance procedure Pay due wages for worked period and settle all financial commitments to workforce before demobilisation</p>	<p>End of Construction</p>	<p>GM, PM, CM, HSE Coordinator, head, HR</p>
<p>Illegal access to project facility leading to accident,</p>	<p>DPL and Project Contractor shall: • Provide warning signs at access roads created to warn against</p>	<p>End of Construction</p>	<p>GM, PM, CM, HSE Coordinator</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	sabotage, asset damage, and loss	dangers associated with safety issues Through consultations, sensitize stakeholders and members of the communities on need to stay clear of the power line and hazards associated with it As much as practicable provide restrictions (e.g. anticlimbers) to unauthorised access to project facilities		
	Soil runoff and erosion resulting in sedimentation problems	DPL shall: Install siltation traps within the drainage design to collect silt and sediments ensuring that they do not end up in adjacent aquatic areas. Construction on steep slopes and in soft or erodible material will require erosion control measures and correct grassing methods. Where possible contractor shall reclaim de-vegetated areas with topsoil, reclaim compacted floors with native plant species, etc. Appropriate flow diversion and erosion control structures i.e. earth embankments must be put in place where soil may be	End of Construction	GM, PM, CM, HSE Coordinator

		<p>exposed to high levels of erosion due to steep slopes, soil structure etc.</p> <p>Auditing Project Contractor to verify reclamation of work sites, marshalling yards, lay-down areas etc</p>		
Operation Phase				
<p>Operations</p> <ul style="list-style-type: none"> • Commissioning and testing • Testing and handover 	<p>Community dissatisfaction regarding the conduct of DPL on compensation issues may lead to strife before full operations of the project</p>	<p>DPL and Project Contractor shall ensure that:</p> <p>Project will develop a community relations and engagement plan that identifies fair strategies of engagement for all communities</p> <ul style="list-style-type: none"> • Establish and publicize grievance procedure <p>Early stakeholder's engagement sessions are held, and all agreed issues properly documented and signed.</p> <p>All affected stakeholders and legacy issues are identified early, clearly defined, and agreed on.</p>	<p>At inception of Operation</p>	<p>GM, PM, OM (Operations Manager)</p>
Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility

		<p>Stakeholders (communities, Govt., land owners, etc.) are adequately consulted and relevant issues addressed</p> <p>As far as possible employ persons from the surrounding communities during the construction phase of the development to reduce the numbers of persons that will migrate to the area seeking employment. This will also avoid any feelings of resentment and will ensure that the communities derive the most benefits from the development</p>		
	Development of agricultural land due to easier access and consequent discovery of new arable lands for farming	DPL and Project Contractor shall: Consider the various land uses while designing the project in order to minimise the loss of land, particularly productiveland.	At inception of Operation	GM, PM, OM
Operations • Production of Coal power	Increased availability of coal power for energy efficiency for DPL Kaduna plant	Ensure the timely completion of the project so that associated benefits such as provision of adequate and cheap energy to individual and corporate entities, business opportunities, quality of life, etc shall take effect.	During Operation	GM, PM, OM
	Increase in infrastructural development within project location			

<p>Increased business opportunities and quality of life (small, medium, large scale) due to enhanced product availability outputs</p>			
<p>Improvement in socioeconomic status due to social/welfare development of the area.</p>			
<p>Increased Job opportunities and employment.</p>			

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Unchecked encroachment on the project site, leading to land-use conflicts and accident.	DPL and Project Contractor shall: Provide warning signs at access roads to warn against unauthorised entry Through consultations, sensitize stakeholders and members of the communities on government policies for the project	During Operation	GM, PM, OM, HSE Coordinator
	Noise from plant operations	DPL and Project Contractor shall: Design of the project in line with standards observed by International bodies as well as NationalStandards. Ensure during plant component testing that national and international standards and limits are complied with.	During Operation	GM, PM, OM, HSE Coordinator
	Use of site corridors for other facilities (clinic, security posts, communication cables as well as water pipes etc)	DPL shall enhance this: • By providing platform for consultation and communication to future developments along the project area	During Operation	GM, PM, OM, HSE Coordinator
	Local fauna disturbances from around the project site	DPL and Project Contractor shall: Design of the project in line with standards observed by International bodies as well as NationalStandards. Ensure during plant component testing that	During Operation	GM, PM, OM, HSE Coordinator

		national and international standards and limits are complied with.		
	Effectively contribute to construction and engineering projects due to provisions of required finished product.	DPL and Project Contractor shall ensure that impact is beneficial and enhanced by sustaining the project life span, through adequate and effective maintenance activities as well as complying with federal	During Operation	GM, PM, OM, HSE Coordinator,
	Development of new infrastructures or improvement to existing ones	government's policies, laws and regulations in the energy sector.	During Operation	GM, PM, OM, HSE Coordinator

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
Maintenance • Facility inspection and checks • Project component s" replacements • Access route maintenance • Plant maintenance	Proliferation of weeds around project site	DPL shall to extent practicable periodically carry out project site maintenance activities to manage growths of weeds and other creeping plants on the Plant bases in a manner that minimizes adverse impacts on vegetation.	During Operation	GM, PM, OM, HSE Coordinator,
	Disturbance of bird habitats and avifauna from activities of maintenance crew.	DPL and Project Contractor shall: ensure disturbance of grassland during construction and operation is kept to a minimum. ensure that the activities of the construction and operations staff are	During Operation	GM, PM, OM, HSE Coordinator

	<p>restricted to the project site and immediate surrounds.</p> <ul style="list-style-type: none"> • Develop policies that prohibits hunting by staffs 		
<p>Development of local maintenance activities to encourage employment and empowerment within the communities.</p>	<p>DPL and Project Contractor shall ensure the participation of men and women in local maintenance activities such as weeding of the project site.</p>	<p>During Operation</p>	<p>GM, PM, OM</p>
<p>High level of Job creation in the overall industrial and energy sector</p>	<p>DPL shall, in addition to implementing a proper Sourcing and Recruitment Programme that diligently attends to workers employment and management, encourage other related manufacturing and production companies that will purchase the finished end-product to increase the level of employment in the sector.</p>	<p>During Operation</p>	<p>GM, PM, OM</p>

<p>Interference with local traditional festivals or activities by unscheduled maintenance work and failure to keep to management plans may lead to community strife.</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Plan activities to minimize work activities during localevents • Ensure that operators will obtain information about planned local activities and avoid disturbing them by shifting maintenance activities to other days wheneverpossible • Give formal notice of any maintenance work in advance to the communities along the area. • Ensure that the notice will give details of the purpose of the access, the contact person and number of people to be involved, time frames and machinery that will beused. • schedule and implement recommendations of the Community Relations and Engagement Plan and approved workprocedures 	<p>During Operation</p>	<p>GM, PM, OM HSE Coordinator</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Maintenance of facilities within sensitive environments may lead to disturbance of hydrological regime (micro scale) impacts	DPL and Project Contractor shall: • Ensure appropriate flow diversion and erosion control structures i.e. earth embankments is be put in place where soil may be exposed to high levels of erosion due to steep slopes, soil structure etc. • Areas to be rehabilitated should be identified andreclaimed.	During Operation	GM, PM, OM HSE Coordinator
	Maintenance onsite may lead to collision of wildlife with the stays that are not visible in the dense vegetation	DPL and Project Contractor shall ensure that anchors are marked with material that will be visible to animals and also shall ensure that regular clearance of vegetation takes place around the project site.	During Operation	GM, PM, OM, HSE Coordinator
	Limited knowledge on safety measures and behaviours associated with line operation that can lead to accidents	DPL and Project Contractor shall plan information, education and communication activities during and after project implementation to increase awareness of all users (men and women) on dangerous behaviours and safety measures required.	During Operation	GM, PM, OM HSE Coordinator

Production Processes, Machineries and Hazardous Chemical Handling	Localized increase in the ambient concentration of air pollutants due to industrial fumes	<p>DPL and Project Contractor shall ensure:</p> <ul style="list-style-type: none"> • Designated coal storage area shall be provided and wetting devices shall be installed • Noise attenuation device shall be installed at sections with embedded noise pollution • Advanced filters and techniques are incorporated in the plant design to reduce gas and dust emissions • Incorporate ‘Ventilation design’ during plant installation. • Good general ventilation throughout the plant and Local Exhaust Ventilation (LEV) wherever substantial quantities of dust and fumes are generated is in place. • There is creation of airflow such as exhaust ventilation or air blowers. • Implementation of the Air Quality Management Plan 	During Operation	GM, PM, OM, HSE Coordinator
	Possibility of injury to skin due to burns resulting from chemicals.	<p>DPL and its contractor shall ensure that</p> <ul style="list-style-type: none"> • relevant personnel are trained on equipment. • daily HSE briefings/tool box meetings are carried out before commencement of work; • conduct of safety inspections of work 	During Operation	GM, PM, OM, HSE Coordinator

		<ul style="list-style-type: none">equipment prior to mobilization;equipment maintenance programme is developed and adhered		
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		to; • PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel; and activities are avoided when lighting is inadequate and as practicable in inclement weather e.g. periods of low visibility.		
	Surface water contamination from chemical spills	DPL shall: • develop an appropriate Waste Management Plan before project commencement • effective wastewater management through recycling and reuse, installation of wastewater treatment plant • Avoidance of direct discharges of wastewater into drains • Ensure that as a minimum all operational waste are separated at source to enhance efficiency in waste handling and disposal • Also ensure training on waste management is conducted for project site personnel	During Operation	GM, PM, OM, HSE Coordinator

<p>Risk of injury / death of personnel as an industrial accident</p>	<p>DPL and its contractor shall ensure that</p> <ul style="list-style-type: none"> • relevant personnel are trained onequipment.handling • daily HSE briefings/tool box meetings are carried out before commencement ofwork; • conduct of safety inspections of work equipment prior to mobilization; • equipment maintenance programme is developed and adhered to; • PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel; and activities are avoided when lighting is inadequate and as practicable in inclementweather e.g. periods of low visibility. 	<p>During Operation</p>	<p>GM, PM, OM, HSE Coordinator</p>
<p>Waste generation/dischage (containers, food wastes/pigging wastes etc) and associated environmental effects.</p>	<p>DPL shall develop an appropriate Waste Management Plan before project commencement</p> <ul style="list-style-type: none"> • As a minimum all operational waste shall be separated at source to enhance efficiency in waste handling anddisposal • Also, training on waste management will be conducted for project sitepersonnel. 	<p>During Operation</p>	<p>GM, PM, OM, HSE Coordinator</p>
<p>Possibility of fire explosion</p>	<p>DPL shall enforce the Principles of Safety Management Appropriate automated fire fighting equipment shall be installed including potable fire extinguishers.Trained fire fighters shall</p>	<p>During Operation</p>	<p>GM, PM, OM, HSE Coordinator</p>

		be employed and well trained		
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Employment opportunities during operation and maintenance	<p>These are beneficial impact and DPL shall seek to enhance them by:</p> <ul style="list-style-type: none"> • creating requirements for contractors to hire labour from the local area; • encouraging contractors to maintain a list of short-term employees for future call-ups when required; and • adopting procurement practices that favour local merchants and service providers where practicable consultation with the locals shall be carried out in terms of provision of jobs. 	Throughout Operation	GM, PM, OM, HSE Coordinator, head HR
	Solid Waste Management	<p>DPL shall develop an appropriate Waste Management Plan before project commencement</p> <ul style="list-style-type: none"> • As a minimum, all operational waste shall be separated at source to enhance efficiency in waste handling and disposal • Accumulated industrial dust and particulate matter shall be recycled to produce bricks • Adequate containment system shall 	Throughout Operation	GM, PM, OM, HSE Coordinator, head HR

		<p>be provided for dust storage and evacuation</p> <ul style="list-style-type: none"> • Also, training on waste management will be conducted for project site personnel. 		
<p>Coal power Production</p> <ul style="list-style-type: none"> • Production Plant Processes • Loading, Hauling Crushing and grinding 	<p>Production of Coal power end-products</p>	<p>One of the objectives of the DPL project is to produce coal power to meet the energy demand for powering the surrounding facilities at Agbara</p>	<p>Throughout Operation</p>	<p>GM, PM, OM, HSE Coordinator</p>
	<p>Localized increase in the ambient concentration of hot air due to high level of heat (energy input)</p>	<p>DPL and Project Contractor shall ensure:</p> <ul style="list-style-type: none"> • Advanced filters and techniques are incorporated in the plant design to reduce gas and dust emissions • Incorporate Ventilation design during plant installation. • Good general ventilation throughout the plant and Local Exhaust Ventilation (LEV) wherever substantial quantities of dust and fumes are generated is in place. • There is creation of airflow such as exhaust ventilation or air blowers. • Implementation of the Air Quality Management Plan 	<p>Throughout Operation</p>	<p>GM, PM, OM, HSE Coordinator,</p>
	<p>Exposure to mechanical and electrical risks</p>	<p>DPL shall ensure that:</p> <ul style="list-style-type: none"> • Training is conducted by 	<p>Throughout Operation</p>	<p>GM, PM, OM, HSE Coordinator,</p>

Physical hazards and accidents from handling of plant machineries, equipment and tools	experts and should make use of effective audio-visual aids. <ul style="list-style-type: none">• Appropriate ergonomic studies to investigate conditions workers are carrying out various operations is made and also		
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Occupational health and safety of workers	<p>explore the impact of the environment on the worker and the functional design of the machinery used.</p> <ul style="list-style-type: none"> • All dangerous parts of machinery and equipment, including lifts, conveyors, long travel shafts and gearing on overhead cranes, is securely guarded • A regular system of inspection, examination and maintenance is done for all machinery and equipment of the plant, particularly for cranes, lifting tackle, chains and hooks. • Safety meetings or contacts are held regularly for all persons to reinforce safety training and awareness. • Workers are provided with proper PPEs, with enforcement strategies to wear/use them. • There are effective controls for the storage and safe handling of raw materials, products, by-products and wastes. 		

<p>Respiratory hazards from inhalation of toxic gases</p>	<p>DPL shall ensure:</p> <ul style="list-style-type: none"> • Ensure the use of respiratory protection equipment (atmosphere-supplying respirators) • Ensure there are engineering controls (such as local exhaust ventilation) • Develop and implement a written respiratory protection program; • provide worker medical evaluations and respirator fittesting; • provide worker training about respiratory hazards and proper respirator use; 	<p>Throughout Operation</p>	<p>GM, PM, OM, HSE Coordinator,</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Heat (high temperature) effect on human health	DPL shall ensure: <ul style="list-style-type: none"> • Workers are permitted to distribute the workload evenly over the day and incorporate work-restcycles. • Cool rest area in hot work environments is provided considerably to reduce the stress of working in those environments. • There is thorough medical supervision • Waste materials with available caloric content are used as fuel and reduce the energy demand satisfied by the primaryfuel • That a large fuel reduction is achieved by improving the ignition oven efficiency, to reduce heat increasedeffect. 	Throughout Operation	GM, PM, OM, HSE Coordinator,

<p>Emission of toxic gases and Release of greenhouse gases on air quality and climate change</p>	<p>DPL shall ensure:</p> <ul style="list-style-type: none"> • installation of wet scrubbers • Application of modern emission abatement devices • routine inspection, maintenance and repair for proper containment of emissions • automated emission monitoring • uniform collector-main pressure adequate to convey the emissions • to check the particles by installing fabric filter collectors or electrostatic precipitators. 	<p>Through out Operation</p>	<p>GM, PM, OM, HSE Coordinator,</p>
<p>Waste water</p>	<p>DPL shall ensure:</p> <ul style="list-style-type: none"> • Installation of wastewater treatment plant • Recycling of effluent where possible • Reuse and recycling of wastewater 	<p>Through out Operation</p>	<p>GM, PM, OM, HSE Coordinator,</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Noise generation from Plant operation	DPL shall: <ul style="list-style-type: none"> • Use equipment, which emit low levels of noise with acceptable exhaust gases, which conform to national standards and specifications. • Ensure that sound proof design is employed during the installation and planning stage of the plant. 	Throughout Operation	GM, PM, OM, HSE Coordinator,
	Generation of solid waste	DPL shall ensure that: <ul style="list-style-type: none"> • There must be containment and enclosure of screening, and conveying systems • The dusts generated are collected for recycling • The solid wastes generated in the plant are recycled to produce bricks • There is the use of dry dust collection and removal systems 	Throughout Operation	GM, PM, OM, HSE Coordinator,

	<p>Increased vehicular movement and traffic congestions</p>	<p>DPL shall ensure:</p> <ul style="list-style-type: none"> • To provide separate entry and exit gateways for vehicles; • Car and van parking for the workforce and visitors away from the work area is provided; • That vehicles reverse is avoided where possible as reversing is a major cause of traffic fatal accidents. • That all drivers know and understand the routes and traffic rules onsite. • The use of standard road signs where appropriate • That induction training for drivers, workers is provided. • That vehicles are maintained so that they are mechanically in good condition. • That Clamps, special bolts, steel-wire ropes, chains, webbing harnesses, sheets, nets, ropes and shoring bars are all suitable to secure loads, but it is essential to make sure that they are 	<p>Throughout Operation</p>	<p>GM, PM, OM, HSE Coordinator,</p>
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Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		<p>strong enough for the weight of the loads carried</p> <ul style="list-style-type: none"> • to provide a plan of the workplace at the entrance (and at other appropriate points) showing vehicle routes, one-way systems and • implementation of the Traffic Management Plan of theEMP. 		
Decommissioning/Abandonment Phase				
<p>Decommissioning / Abandonment</p> <ul style="list-style-type: none"> • Plant / facilitiesremoval • Wastegeneration 	<p>Increased sedimentation process <i>potential</i> water bodies close to project sites.</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Ensure that excavated and stockpiled soil material is stored on the higher lying areas of the site and not in any storm water run- off channels or any other areas where it is likely to cause erosion or where water would naturallyaccumulate. • ensure that decommissioning activities are preferably take place during the dry season months to prevent soil erosion caused by heavy thunderstorms 	<p>During Decommissioning</p>	<p>GM, PM, CM, HSE Coordinator,</p>

		associated with the rainy season in the project area.		
	Risk of soil and water contamination from accidental oil and hazardous substance leakages and wastes from decommissioning.	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Ensure that no wastes and hazardous materials generated on the site are dumped or deposited on surface waters including roads or public places during or after the decommissioning period. • Enforce proper waste management policies in line with FMEnv standards and requirements. • Ensure that all project associated wastes and hazardous materials are disposed off in line with project waste management plan. Hazardous waste management shall conform to regulations of FMEnv, NESREA and OGEPA 	During Decommissioning	GM, PM, CM, HSE Coordinator,
	Release of SO _x , NO _x , CO _x , e.t.c from exhausts of decommissioning vehicles and equipment which could lead to atmospheric pollution /	<p>DPL shall:</p> <ul style="list-style-type: none"> • ensure vehicles, trucks and other heavy-duty engines are maintained at optimal working condition in accordance with operating manual; and • encourage the use of mufflers on equipment manifold where 	During Decommissioning	GM, PM, CM, HSE Coordinator,

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	GHG emission	necessary to filter particulates and thus reduce its emission into the air.		
	Increased dust and vehicular emissions during transport.	DPL and Project Contractor shall ensure: <ul style="list-style-type: none"> • to wet all unprotected cleared areas and stockpiles with water to suppress dustpollution. • to cover materials such as sand and other rubble during transport to and from the site with atarpaulin. • use of road worthy vehicles and equipment as well as skilled operators anddrivers • to Limit speed of vehicles and travel time to and from decommissioningsite. 	During Decommissioning	GM, PM, CM, HSE Coordinator,
	Increase in ambient noise levels above baseline conditions from movement and activities of decommissioning equipment and automobiles.	DPL and Project Contractor shall ensure: <ul style="list-style-type: none"> • Limit work activities to daytimeonly • Ensure maintenance of vehicles andequipment • Provide and encourage use ofPPEs. 	During Decommissioning	GM, PM, CM, HSE Coordinator,

<p>Traffic obstruction from transportation of decommissioned structures and equipment to receiving hub.</p>	<p>DPL and Project Contractor shall ensure: Plan decommissioning activities is in consideration of peak traffictimes. Ensure that the handling of equipment and materials is supervised. The use signs, posts, and guides to manage traffic and direct usersaccordingly</p> <ul style="list-style-type: none"> • A practicable Traffic Management Plan (journey management programme) is developed and adheredto. 	<p>During Decommissioning</p>	<p>GM, PM, CM, HSE Coordinator,</p>
<p>Risk of accident and injury to worker during demolition of structures</p>	<p>DPL and Project Contractor shall:</p> <ul style="list-style-type: none"> • Develop a work plan for safedemolition • Ensure hazards are identified and addressed prior to commencement ofwork. • Provide and enforce the use ofPPE • Ensure that decommissioning and demobilisation vehicles are under the control of competentpersonnel. • Provide adequate facilities on site to treat emergencies tostaff. 	<p>During Decommissioning</p>	<p>GM, PM, CM, HSE Coordinator,</p>

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
	Incident/accident resulting from the movement of materials and equipment on low loader	DPL and its contractor shall ensure that <ul style="list-style-type: none"> • relevant personnel are trained on equipment. • daily HSE briefings/tool box meetings are carried out before commencement of work; • conduct of safety inspections of work equipment prior to mobilization; • equipment maintenance programme is developed and adhered to; • PPE as appropriate to the task (e.g., hard hats, coveralls, shoes, gloves, nose masks) are provided and appropriately used by work personnel; and activities are avoided when lighting is inadequate and as practicable in inclement weather e.g. periods of low visibility. 	During Decommissioning	GM, PM, CM, HSE Coordinator,
	Loss of lives due to accident/incident caused by abandoned structures left at	DPL and Project Contractor shall ensure appropriate warning signs are used to alert residents of the presence of such machines/equipment	During Decommissioning	GM, PM, CM, HSE Coordinator,

Site			
Risks of pirate/militant/youth attacks and possible hostage taking which may lead to injury or fatality of personnel.	DPL and contractors shall ensure: Ensure implementation of project security plan during decommissioning Approved procedures are strictly enforced and continually improved based on updated risk information. Maintain ongoing cordial relationships with the stakeholder communities. Certify government approved security guards (navy/mopol/army) are used on demobilisation vehicles when warranted when necessary DPL shall activate its emergency response procedure • Implement effective journey management plan.	During Decommissioning	GM, PM, CM, HSE Coordinator,
Interference with public utilities (electric wires and poles), market activities along demobilisation route	DPL shall: • use standard warning notice (e.g. side rides, signal lights and horn) to other road users; • ensure a practicable journey management programme is developed and adhered to;	During Decommissioning	GM, PM, CM, HSE Coordinator,

Project Activities / Environmental Aspects	Potential and Associated Impacts	Mitigation / Enhancement Measures	Timeframe	Responsibility
		<ul style="list-style-type: none"> carry out pre-mobilisation route survey and ensure that mobilization is carried out after due consultation with relevant authorities and other stakeholders to minimize interference along the route 		
	Return of land to Owners	-	After Decommissioning	GM, PM, CM
	Availability of land for alternative uses	This is a beneficial impact and DPL, relevant government agencies together with stakeholders shall work out processes for land relinquishment or alternative uses as at the time of Decommissioning.		

7.7 Environmental Management Plan (EMP) Schedule/Programme for the Project

Dahua Power Limited (DPL) has set objectives and targets in managing significant environmental aspects in line with ISO 14001 *Environmental Management System* (EMS) requirement for the proposed mining project during pre-construction, construction operation and decommissioning phases. Specific programme with commensurate resources shall be allocated to meet these plans. These plans shall be reviewed yearly by DPL top management. In addition, progress on the achievement of plan shall be part of the DPL Management meeting. Basically, the Project will involve the following Management Plans:

7.7.1 Air Quality Management Plan

Objective

To minimise the release of emissions (toxic gases and particulate/dust) to air at all phases of the project

Target:

Limit emissions of pollutant gases like NO_x, SO_x, CO, in addition to dust, smoke, and fumes, within acceptable standards through all construction phases of the project work activities

Action:

- The technology and design alternative for the proposed project shall apply BAT (Best Available Technique) during installation/operation of the project
- Maintenance programme shall be developed and implemented for all associated project facilities and (heavy duty) equipment.
- Controlling fuel consumption for all equipment and vehicles through prudent work execution and effective journey management.
- Implement basic environmental awareness management program.
- Limit use of diesel powered generators to minimum required to sustain uninterrupted operation.
- Vehicle speeds in working areas and unpaved local roads shall be limited to a maximum of 30km/h.
- Where practicable, vehicles and machinery that are used intermittently should not be left idling for long periods of time.
- Re-vegetate disturbed areas as soon as possible.
- Wet areas that have the potential of raising significant dusts during work activities.
- No open burning of waste to be undertaken.
- During construction, particulate matter (dust-generation) will be controlled by the use of water sprays and dust suppressants, as required.

Monitoring and Reporting:

- Visual inspection shall be undertaken by the HSE focal person/Contractors to check for evidence of excessive dust generation.
- If necessary, dust monitoring shall be undertaken in areas likely to generate dust that would affect nearby residents and workplaces to determine whether controls are being applied effectively.

- Maintenance schedule and records shall be kept. Maintain a log book for site fuel consumption and estimate emission from consumption.
- All issues shall be documented, acted on and reported in accordance with site procedures.

7.7.2 Noise Management Plan

Objective:

To minimise the generation of noise emissions during all phases of activities and to mitigate any potential noise impacts.

Target: Activities undertaken to comply with FMEnv recommended ambient noise level guidelines.

Actions:

- A one-page summary of applicable noise criteria that relate to relevant work practices and nearby receptors will be developed. This summary will be placed on a noticeboard so that all site operators can quickly reference noise information.
- Site managers will periodically check the site and nearby residences for noise related issues so that solutions can be efficiently and quickly applied.
- Where feasible and reasonable, the dropping of materials from height and metal-to-metal contact on equipment, mobile equipment clustering near residences and other sensitive land uses will be avoided.
- Ensure that periods of respite are provided in the case of unavoidable maximum noise level events. These respite periods will be negotiated with the relevant local stakeholders.
- All potentially impacted receptors will be informed of the nature of works to be carried out, the expected noise levels and duration, as well as contact details for a DPL representative that be contacted in the event of a complaint.
- Establish permanent signage around the site e.g. at site offices, that is visible to all personnel, which identifies the need to limit noise
- Where feasible and reasonable, equipment/machinery with lower sound power levels will take preference and Silencers will be installed on all fans if necessary.
- Suitable mufflers will be installed on engine exhausts and compressor components.
- Acoustic enclosures will be constructed for equipment radiating significant noise.
- Where necessary, noise emissions will be minimised and controlled through the installation of noise containments, with enclosures and curtains at or near the source equipment (e.g. crushers, grinders, etc).
- Noise emission levels for trucks in either sound pressure level at a given distance or sound power level will be sourced from the suppliers of the trucks.
- Additional or upgraded exhaust mufflers on the product haul trucks will be considered.
- Given that the truck will also be spending considerable amount of time unloaded, there is potential for noise to be generated from unladen suspension – such as spring

rattle and bounce over uneven surfaces. As such DPL will consider dampening springs and bushes or the use of airbag suspension to assist in the reducing noise from unladen trailers.

- Provide relevant personnel with training in noise control procedures and equipment operation.
- Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be periodically checked.
- DPL will provide relevant personnel with training in noise control procedures and equipment operation.
- Use of personal protective equipment (PPE) e.g. ear plugs for personnel working in areas where noise is a concern i.e. above 90dB(A)
- Define high noise level working areas by engineering analysis of equipment for which hearing protection is required and provide appropriate warningsigns

Monitoring and Reporting:

- Monitor high noise areas for proper use of PPE equipment in accordance with WHO / FMEnv guidelines andstandards.
- Schedule maintenance shall be undertaken for construction equipment and power generators to ensure an optimal workingcondition.
- All complaints shall be documented, acted on and reported in accordance with site procedures.

Responsibility:

Site Safety, Health and Environmental Officers

7.7.3 Water Quality ManagementPlan

Objective: Avoid the contamination of surface and ground water during all project phases.

Target: Surface and ground water is not contaminated during all project phases.

Actions:

- Implement controls such as berming, use of secondary containment and traysto ensure all transfer of fuels and chemicals are properly managed to prevent spillage outside of bundedareas.
- Provide bunded storage areas for fuels and hazardous substances with spill clean-up kits in accordance with FMEnvrequirements/standard.
- The project shall ensure that measures are adopted to avoid incursion into areas adjacent to the work site or any secondary effects from pollution, sedimentation, or accidentalspills.

- Suitable site drainage system to be constructed in lay-down areas and marshalling yards.

Monitoring and Reporting:

- Inspections of construction areas and assessment of the condition and operability of site drains shall be conducted.
- Weekly inspection of all fuels and chemicals storage areas, to ensure adequate containment and handling.
- Continuous groundwater level monitoring using water level loggers, as well as monthly manual groundwater level measurements;
- Quarterly groundwater quality monitoring (water sampling);
- Ongoing groundwater abstraction monitoring during the operational phase
- All complaints shall be documented, acted on and reported in accordance with site procedures. The document shall provide information on:

7.7.4 Soil-Contamination Management Plan

Action:

- Construct spill containment facilities (containment walls).
- Train operators on safe handling of chemicals and enforce the implementation of safe work practices/procedures.
- Develop and implement site specific emergency and spills response plan
- Provide emergency and spills response equipment and training of personnel on effective and timely use
- Use drip pans during fuel transfer operations
- Identified contaminated area shall be promptly cleaned up, reported and monitored in accordance with regulatory and project approved requirements
- Weekly inspection of all fuels and chemicals storage areas.

7.7.5 Biodiversity Management Plan

Construction Phase

The key impacts during the construction phase are associated with:

- Direct Loss and Degradation of Habitat – through infrastructure and possible increased human influx.
- Loss of Threatened Faunal Species – through inappropriate development of infrastructure and cultural alterations

Action Plans

- Avoid the Loss of Sensitive Habitats
- Containment of Construction Activities and Avoiding Footprint Creep
- Linear infrastructure (viz. roads, pipelines and any near underground cables) will be grouped to follow the same route adjacent to one another wherever possible and appropriate to minimise the footprint of these disturbances.

- Pipelines, roads and other linear infrastructure will include facilities that allow the underpass or overpass of fauna, such as culverts, so as to prevent unnecessary fragmentation of habitats
- Promote Ecologically Friendly Approaches to Project Construction;
- Establish Personnel Management and General Due Diligence for improved biodiversity conservation;
- Encourage External Collaboration and Data Dissemination;
- Introduce Consideration and Requirements for Biodiversity Offsets.

Operational and Decommissioning Phase

- The importance of the natural environment and the local biodiversity will be incorporated into Induction Programmes for all DPL staff and contractors working in the Project Area.
- A biodiversity Protection Statement to conserve plants and animals will be developed, and made applicable to all staff, contractors and other personnel associated with the Project.
- Maintenance Floral and Faunal Species Inventory
- A detailed inventory and photo library of plant and animal species present within and around the DPL concessions will be kept by the Environmental Department. The species within this inventory will be classified into taxonomic groups and families.
- Implement an Sustainable Action Plan
- Develop and Implement Awareness Programmes Focused on Biodiversity

7.7.6 Consultation and Public Involvement Plan

DPL always endeavours to maintain cordial community relations in its area of operation. The host communities shall be consulted with. During the various consultations, DPL anticipates that the host communities shall use the consultation meetings to familiarise themselves with their operations and also enumerate their interests. The consultation process shall be made functional and regular during project life span. Community development packages associated with the proposed project shall always be discussed at the meetings.

DPL shall achieve these objectives through the following Consultation Techniques:

- Holding informal field visits and courtesy calls on the community heads and other stakeholders to discuss the effectiveness of the addressed social issues on the lives of the stakeholder
- Direct contact with the affected population for their opinion (through questionnaire, interviews and visual observations) on the project
- Holding Focus Group Discussion to discuss welfare, clarify misconception and address new issues as regards the project and
- Holding Focus Group Discussion aimed at identifying new ways of rendering socio-economic assistance for the local people.

The consultation shall be by means of discussions in forums, oral interviews and by the use of questioners/checklists. This consultation programme that shall be adopted by DPL for the project is presented in Table 7.2 below.

Table 7.2: Consultation Programme

Body	Computational Goal	Duration	Responsibility
FMEEnv	Environmental procedures and standards	Throughout the Project life cycle	Federal Controller
State Ministry of Environment	Determine stakeholder concern	Throughout the Project life cycle	State Coordinator
Ogun Local Government Council	Determine stakeholder concern	Throughout the Project life cycle	State Coordinator
Host Community	Identification of concerns, areas of conflict and formation of appropriate mitigation	Throughout the Project life cycle	Project Manager

Managing Stakeholder Perceptions

Public interest is expected to be high. The project will have impacts on the surrounding communities through disturbance during construction and operation (e.g. noise, traffic, dust, emissions etc) and through the influx of workforce. Effective and realistic measures have been put in place to mitigate these impacts. Nevertheless, stakeholder's perceptions are bound to persist. This project shall manage these perceptions by employing and sustaining dialogue as well as involvement of the communities and other stakeholders in all phases of the project. In particular;

- The Project Management shall ensure that the Contractors fully involve stakeholder communities in the environmental monitoring and management plan for this project.
- Use available records on community development and other community-based activities as evidence of a good corporate neighbour.

Proposed Social Action Plan (SAP)

This is essentially concerned with the Socio-Economic Conditions of the host communities. SAP outlines measures designed to mitigate/ameliorate the identified adverse social impacts (as has been detailed in the project report).

The following measures (actions) are proposed as Social Management Plan:

- i.* In order to stem population growth due to immigration, DPL shall recruit and train locals/indigenes for the project employment.
- ii.* In order to reduce the potential for social crimes/youth restiveness, DPL shall provide employment opportunities, meet with social groups, promote public enlightenment and cultivate good community relations.

7.7.7 Sociocultural Management Plan

Objective:

- To ensure that there are no adverse effects on the region's cultural values.
- Minimise social and/or community impacts associated with all work activities.
- Maximise opportunities for local engagement and businesses opportunities during the various project phases especially during the construction period.

Target:

- Cultural values understood and protected by DPL
- Receive and respond to complaints about social or community management issues.

Action:

- Develop and implement community relations and engagement plan
- Develop a RAP in line with OP 4.12 for The World Bank's approval.
- No unauthorised disturbance of cultural activities by the manufacturing activities
- Plan activities in recognition of indigenous cultural activities.
- Continue to consult with the indigenous communities.
- Accommodation shall be provided for some construction workers (not from surrounding communities) to minimise pressure on existing infrastructure
- Basic health and medical services (first level assist, first aid) shall be available to reduce the demand on existing health facilities.
- Specify and implement the behaviour standards expected from all construction workers. This shall be formalised in a code of conduct that shall be agreed to and signed by every employee and sub-contractor.
- Complaints about unacceptable behaviour from construction workers shall be investigated and, appropriate action taken.
- Use a wide range of communication tools to ensure that community is kept informed of project progresses.
- Offer opportunities for the involvement of local businesses and for the employment of local residents

Monitoring and Reporting:

- Review feedback from the traditional rulers and the community groups and related Government/non-Governmental Organisations.
- Monitoring shall be by stakeholder feedback and by review of complaints.
- All complaints received shall be reported to the project manager.
- Monthly reports shall be prepared on social and cultural management issues and any corrective actions undertaken

Responsibility:

Community Relations Officer

7.7.8 Occupational Health and Safety (OH&S) Management Plan

The project is committed to maintaining the highest standards and performance of OH&S by all personnel associated with company's activities. The project considers safety, health and risk management performance objectives to be commensurate with all other business objectives. DPL has a Health & Safety Policy which forms the highest-level document in this system.

The project Occupational Health & Safety (OH&S) Plan is designed to ensure the effective management of workers health and safety by DPL. The plan contains the methods that shall be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.

This Plan has been developed to reflect the requirements of the international safety standard, OHSAS 18001. It is expected that the project will aim for certification to 18001 in the future and is being set up to reflect the requirements of this standard.

A. OH&S Purpose

The purpose of this Occupational Health & Safety Plan is to:

- define and communicate the Health & Safety objectives, principles, expectations and requirements for the Project;
- define the criteria against which Health & Safety performance will be judged;
- describe areas of Health & Safety responsibilities for the Project team, including Contractors;
- describe the Occupational Health & Safety Standard Operating Procedures (SOPs) that will ensure that Health & Safety activities are organised, managed and reported in a systematic and consistent manner;
- describe the development of the safety cases and safety plans;
- ensure that the Project provides inherently safe and secure facilities.

B. OH&S Objectives

The objectives of Health and Safety Plan are to:

- Ensure compliance with relevant national and international rules and regulations;
- Provide a safe, healthy and conducive working environment for all personnel and nearby community;
- Increase the awareness of all personnel to actively undertake safety measures and precautions to prevent workplace accidents;
- Develop and maintain regular inspections and reporting procedures; and
- Provide accident reporting and documentations of workplace accidents, for proactive and corrective measures of unsafe conditions and unsafe acts

C. OH&S Scope

This Occupational Health & Safety Plan is applicable to all Project-related activities. The practices and procedures for safety management referred to in the Plan are applicable to the design, construction, commissioning and decommissioning of the Project and include activities directly related to the Project. At the commencement of each major phase of the project, this document shall be reviewed to ensure it reflects the current policies of DPL.

D. OH&S Implementation

The project lead Contractor shall develop their own H&S Policy and implementation plan. This must be reviewed and approved by the Project HSE team. In the cases of inconsistency, the project OH&S Plan is the primary document. DPL will assist the Contractor to integrate their safety policies and practices with the Occupational Health & Safety Management Plan and will provide advice to, audit and assist the Contractor's project managers and site personnel to develop, implement and refine their safety management systems and procedures.

Operations at all work sites shall be subject to Government (FMEnv Sectoral Policies and Guidelines) and DPL Environmental Management Plans. Operations shall be in accordance to Regulatory Framework (FMEnv Guidelines). All DPL's workforce shall be well-informed and trained on the safety policies and guidelines. All facilities shall also be designed to enhance safety planning and activities shall be executed within the confines of relevant legislation and stakeholder's interests.

The implementation and co-ordination of Health, Safety and Environmental (HSE) Plan shall be the responsibility of all staff (administrative and operations) members. Reporting structures across DPL and individual sites and necessary contact arrangements shall be clearly defined for the members, from the Chief Executive to the ground's man. However, the HSE Manager/Officer shall be in charge of monitoring and control of the plan.

Major Responsibility for the HSE Plan Implementation lies with DPL's Community Relations Unit, Project HSE Manager, and Project Manager

The Contractor's Policy and plan shall:

- be consistent with project's OH&S Plan;
- reflect a commitment to safety and health equal to other business objectives;
- establish a commitment to reduce safety and health risks to be as low as reasonably practicable (ALARP);
- require compliance with legal requirements as a minimum requirement;
- commit to a process of continual improvement in its management systems; and to state when the policy will be reviewed and reissued.

The Contractor shall:

- translate the intent of the OH&S Policy into objectives and targets through the Contractor's work procedures and induction processes which enable the distribution of all relevant information to all personnel.
- discuss the intent of the OH&S Policy at all inductions and regularly at management meetings;
- develop and maintain an accountability system for all levels of the organisation for safety and health management (including KPIs for safety and health management at all levels);
- actively involve all personnel and sub-contractors in understanding and achieving the Health, Safety and Environment Policy objectives;
- provide a periodical report to the HSE team indicating compliance and/or non-compliance with the OH&S Policy and plan, and with legal requirements; and
- develop, implement and maintain an accessible management system which addresses all aspects of this OH&S Plan.

The Project H&S Manager may regularly review the resources within project itself and those of the Contractor to ensure compliance with the objectives as stipulated by the Project plans. The Project H&S Manager may arrange periodical audits to assess the compliance with this Plan and the Contractors health & safety management system including consideration of the adequacy of resources. The Contractor shall review its resources to ensure compliance with its safety management system on a scheduled basis as determined by an internal audit schedule. Every individual in the organisation will have defined and documented OH&S responsibilities.

E. Organisational Action Plans for OH&S

There will be periodic medical examinations that are supplemented by regular voluntary Worker Medical Screening Program onsite and a Monitoring and Evaluation (M&E) system.

- As a means to improve the health context in which the Project operates, DPL will collaborate with regional/local Government and relevant NGOs to support improvements to existing health services to handle the potential increase in population numbers and changes to the existing health profile of the area.

- DPL will develop and implement a Workforce Code of Conduct. The key health and safety elements of the code will include:
 - ✓ Zero tolerance of illegal activities by all personnel;
 - ✓ Forbidding prostitution;
 - ✓ Forbidding illegal sale or purchase of alcohol;
 - ✓ Forbidding the sale, purchase or consumption of drugs; and
 - ✓ Forbidding illegal gambling and fighting.
- In addition, the Project partnering with the local Government, community leaders and NGOs to promote an education and awareness programme targeted at managing antisocial behaviour. This programme will provide training and awareness raising events around the dangers and consequences of substance abuse, violence and others.
- During operations DPL will continue to monitor impacts to community health, safety and security including:
 - There shall be continuous monitoring of impacts to local livelihoods and the applicability of the livelihood restoration plan for managing impacts;
 - Continue to provide induction, training and voluntary testing facilities for communicable diseases and STIs including HIV / AIDS for new personnel;
 - Environmental pollution including impacts to air quality and noise pollution shall be managed (*The Air Quality and Noise Management Plan above has all the details*).

F. Guiding Principles of the Occupational Health and Safety Plan

All work activities shall be properly managed through careful planning and application of relevant HSE policies including the following:

- Inspection and frequency of: Vehicles, Plants and Machines, Work Tools, Safety Devices, Inflammable materials, Guarding, Electrical lines and devices, Pressure vessels and Pedestrian Routes.
- Controlling Risk from Vehicles by using the following measures: Driver Competence, Security, Use Restrictions, Speed Limits, Seat Belts.
- Conditions of Benches and Haul Roads by using the following measures: Width, Bends, Erosions, Traffic Routes, Edge Protection.
- Escape and Rescue Facilities
- Barriers
- Health and Safety drills
- Competence and Training Needs
- Establishment of a site Medical Clinic and Medical Practitioner
- Establishment of an on-site Health and Safety Manager
- Provision of a first aid kit, firefighting equipment, notice board and standby emergency Evacuation Vehicle
- Placement of directional indicators (signage)

- Provision of site information system
- Use of Permit-To-Work;
- Job hazard/ safety analysis and toolbox meetings;
- Use of PPE in designated hazard areas;
- Prohibition to drinking of alcohol during work hours and at work sites and within facilities;
- Prohibition to night trips;
- Regular emergency drills;
- Prohibition to smoking in plant (fire hazard) areas;

Integrity of Workplace Structures

- All plant surfaces, structures and installations would be design to enable easy cleaning and repair, and limit the accumulation of hazardous compounds;
- Plant buildings will be structurally safe, provide appropriate protection against climate change and have acceptable light and noise conditions;
- Plant design would ensure that fire resistant, noise-absorbing materials are used, to extent feasible, on ceilings and walls;
- Floors would be level, even, and non-skid to prevent trips and fall; and
- Plant heavy oscillating, rotating equipment would be in dedicated buildings or structurally isolated sections within the plant site.

Workspace and Exit

- Space to be provided for each worker would be adequate for safe execution of all activities, including storage of materials and products; and
- All emergency exits route would be unobstructed at all times. Exits would be clearly marked. The number and capacity of emergency exits would be sufficient for safe and orderly evacuation of the people during emergency situations.

Fire Precautions

- DPL shall equip the plant facility with fire detectors, alarm systems, and fire-fighting equipment. The equipment would be maintained in good working condition and be readily accessible; and
- Provision of manual fire-fighting equipment that is easily accessible and simple to use.

G. OH&S Monitoring and Reporting

- The security, safety, health, and environmental performance shall be monitored in accordance with the project and corporate procedures and reported to the project management team.
- Monthly/Quarterly audits shall be executed

- Monthly reports shall be prepared on health, security, environment and safety performance along incidents and corrective actions undertaken
- Regulatory bodies shall be part of the monitoring team during monitoring exercise.

General Guidelines of Assessment of the OH&S Management Plan shall include:

- The Risk Assessment procedure
- Environmental, Ecological and Health-impact Risk Assessment and Management
- The measures taken to control the risks
- The method and procedures of coordinating Health and Safety issues
- Management structure and clearly defined responsibilities
- The control plan for explosion risks
- The plan for control and protection against machine and plant accidents
- Procedures for inspection and maintenance
- Vehicles and trip rules
- Appraisal and assessment of performance

H. Use of JHA (Job Hazard Analysis) for Prevention of Workplace Accidents

Prevention of workplace accidents and incidents at all stages of the proposed project shall be achieved using the JHA tool and written work instructions. Consequently, the engineering team must conduct JHA for all HSE critical activities and develop written and explicit work instruction for such operations. The work instructions shall integrate the recommendations of the JHA. It is only upon submission of the written work instructions and the supporting JHA or risk assessment document that the Project Manager may consider the project activity for approval.

Project activities may only be approved if the officer in charge is objectively convinced that the work instructions are practical, safe and in accordance with regulatory requirements. However, a work permit will be required for all HSE critical jobs, throughout the lifecycle of the proposed projects.

I. Use of Personal Protective Equipment (PPE)

The contractors shall provide adequate health services as well as onsite First-aid services for its workforce. The First-aid services shall be extended to all visiting personnel.

All project activities shall be properly managed through careful planning and the application of relevant safety policies including the following:

- Job hazard analysis (JHA) before embarking on a job
- Use of appropriate Personal Protective Equipment (PPE)
- Prohibition of alcohol in the project area
- Prohibition of smoking in designated areas
- Proper journey management
- DPL's Handbook of safety rules and regulation.

DPL will provide and ensure the use of the following Personal Protective Equipment (PPE) especially during construction works: Coverall, Safety Boot, Helmet, Industrial Gloves, Nose Mask (disposable & non-disposable), Reflect Jacket, Eye Goggle, Rain boot, Rain Coat, Fire safety wears, Face shields, Welder flash etc.

Employee Involvement and Communication

It is key to have effective communications system in place at all levels of the Project so that employees and sub- contractors at all levels are informed and involved in health, safety and risk management. Thus, the project H&S Manager shall have regular scheduled meetings with DPL Construction Manager or their delegate, to review policies, objectives, targets, and performance standards and to audit findings. Project requires that the Contractor has a schedule of meetings and sets reporting frequencies, so that all of its employees, subcontractors and the client are informed of any new technical, operational, safety, health and environmental information. The Contractor is required by company to empower the Contractor's employees and sub-contractors with the ability to discuss any issue affecting their ability to work safely.

The Contractor will ensure the schedule of meetings and reports will include:

- documented weekly toolbox meetings conducted by the Contractor;
- monthly reports to DPL H&S Manager;

The DPL Project requires that a risk-based approach is adopted by the Contractor. To ensure this approach and to maintain effective communication and employee consultation the Contractor shall:

- provide training for the health, safety and environmental representatives and elect H&S
- representatives at different levels in the organisation;
- hold a weekly H&S briefing meeting;
- implement consultative processes to develop policies, procedures, work instructions, job safety assessments (JSAs), hazard identification, risk assessment and incident

investigations;

- have a formal issue resolution process that allows resolution of any health and safety issue quickly and effectively;
- establish and maintain effective communication processes and advise employees and sub- contractors of the outcome of audits, incident analysis, hazards identified and control measures.

7.7.9 Waste Management Plan(WMP)

WMPObjective:

Wastes that would be generated from both the proposed Project and the specific facilities situated in the DPL Project site would be controlled in accordance with regulatory requirements and bestpractice.

The objectives of DPL Waste Management Plan include the following:

- Progressive reduction of all waste with the target of having control over all emissions/discharges which have adverse impact on theenvironment;
- Ensuring that all activity planning address waste management issues for domestic and industrial wastes with the aim of recycling non-hazardous wastes as much as practicable;and
- Ensuring that staff and contractors are responsible for effective management and transportation of waste from source to disposal/recyclingfacilities.

Waste Inventory and Classification

Air, liquid and solid wastes would be generated during the construction and operational activities in DPL Project. An inventory of waste generated shall be maintained. Weighing scales or measuring devices shall be provided to measure quantities of waste generated/discharged.

During Construction, waste generated would include general construction wastes and the facility specific wastes will be addressed as per the project implementation schedule. Construction wastes will include the following: Domestic waste from camps (food, medical, sewage, etc); Packaging waste; Unused construction materials, off-cuts from piping and cabling bulks; Testing materials and fluids; Civil wastes (soils and gravels); Waste paints and solvent based products; Containers with residues; and Vehicle wastes (tyres, oils, etc.). These wastes will be segregated on site and will be transported to appropriate recycling, or reuse sites inNigeria.

During Operation, DPL Project will generate minimal quantity of waste. This includes dust and coal particles, plastics, food scraps, and sanitary sewage treatment sludge in addition to process related solid wastes. Appropriate systems are identified and used to address the management of the wastes generated ranging from sorting, to recycling, treatment and disposal. Impacts related to the construction of the outfall include air emissions, noise and general litter related to all project phase activities. Other forms of waste, which shall be treated as hazardous waste, include biohazard waste from any medical facilities on site or waste sources containing potentially toxic metals such as used batteries.

Waste-Management Structure and Responsibility

DPL Project Management would provide guidance and support for its departments and the specific located industrial facilities. The management of the located facilities will be responsible to develop project specific waste management plan that will align with the overall Project WMP. The designated Project Waste Management Coordinator will initiate periodic reviews and updates of waste management strategies to assist in ensuring compliance or adherence to Project waste management standards and legal requirements and ensures availability of suitable training programmes for staff and third party personnel.

Waste shall be managed in accordance with Federal Ministry of Environment guidelines and DPL waste management procedures. The principle of waste reduction, recycling, recovery and reusing shall be practiced. In addition to the regulations of FMEnv, the project will also comply with other national and international environmental standards that are binding on all staff and contractors involved in the proposed project. The EPC contractor is also expected to develop and submit for approval to DPL a comprehensive waste management plan to be used during the project. This waste management plan shall be in line with DPL HSE Management System and well as comply with national and international waste management standard

DPL recognizes the need for housekeeping hence has developed an effective Waste Management Programme that shall be adopted for the Project. The programme shall form part of the agenda to be discussed in HSE meetings thus creating awareness among personnel.

The management shall ensure that this commitment is translated into the necessary resources to develop, operate and maintain an effective Waste Management System.

The HSE coordinator shall ensure full implementation of the waste management policy objectives of DPL by overseeing the day to day handling and disposal of waste generated and shall ensure wastes are appropriately disposed at a government approved refuse site.

Waste Management

During Site Preparation, the top humus soil shall be carefully stripped and transported to erosion areas around the site. The top-soil, together with other lateritic material, shall be compacted on these erosion sites.

During Operational Phase, DPL shall be responsible for monitoring, controlling and disposal of all waste generated during operational phase.

During Abandonment, abandoned machines and equipment shall be sold as scrap metal or for re-use. Standing buildings shall be carefully disassembled with a view to salvaging reusable materials like doors, windows, metal and aluminium frames, blocks and roofing sheets.

Waste Management Guidelines

Waste Handling Guidelines

Wastes handling and disposal procedures shall be well defined at source and a waste inventory register kept. The waste contractor shall define, and document appropriately, all wastes generated and transferred in the course of his work.

For proper handling and disposal, wastes shall be well defined at source and the definition transmitted along with the waste to the final disposal points. EPC contractor and DPL personnel shall define and document all wastes generated during all operational processes.

The general information required, as a minimum, for adequate definition of wastes include:

- Waste stream identification;
- Proper waste categorization;
- Waste segregation;
- Appropriate handling and disposal practice; and
- Recommended Management practices.

Waste Minimization Guideline

Waste minimisation involves reduction to as low as practicably possible volume or toxicity of waste materials. The four principles of waste minimisation process; **recycle, reduce; reuse and recovery** shall be adopted as applicable, to ensure reduction to the possible extent, of the volume or relative toxicity of liquid or solid wastes. In order to achieve a significant reduction in waste volume during the proposed project, the functions of activity level, age depreciation and maintenance level of facilities and operating equipment would be closely monitored.

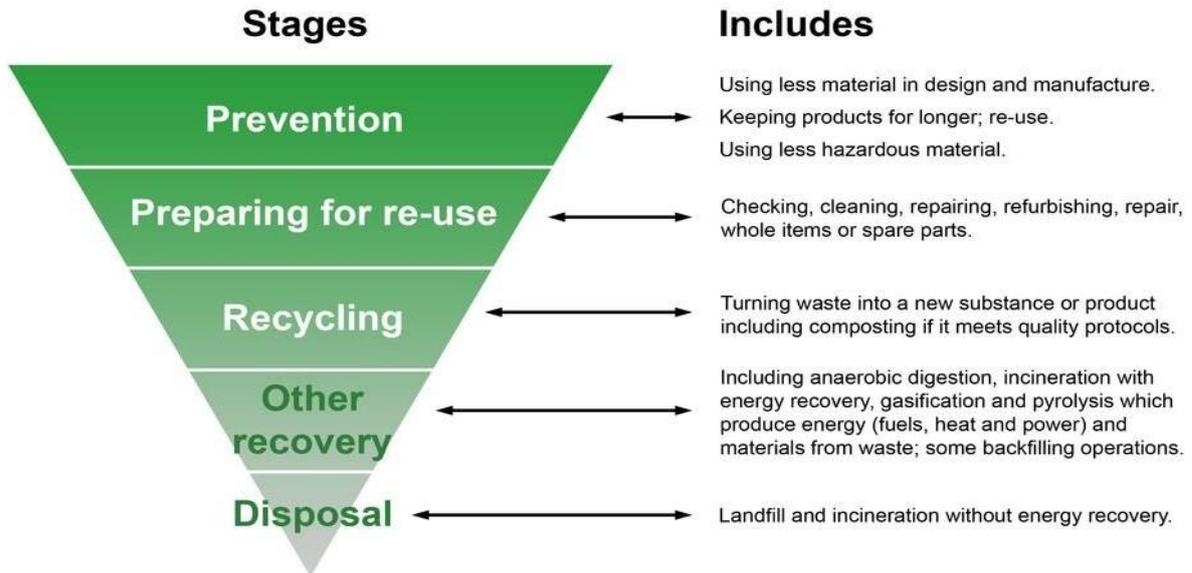


Figure 7.2: Waste Management Hierarchy

Waste Segregation Guidelines

All wastes to be generated from the proposed projects shall be segregated at source, into clearly designated bins at strategic locations.

Waste Disposal Guidelines

All debris, spoil materials, rubbish and other waste, except excavated soil, shall be cleared regularly from the site and disposed of accordingly at government designated sites for such wastes. Instructions on Material Safety Handling Sheet (MSDS) shall be strictly adhered to and shall form the basis for the disposal of wastes related to such products. The waste consignment note records shall be kept and should include as a minimum the following information:

- Date of dispatch.
- Type of waste
- Description of waste.
- Waste quantity/container type.
- Designated disposal site and method.
- Consignee /driver name and means of transportation.
- Confirmation of actual disposal (time and date).

Only government approved waste management contractors shall be engaged for the waste categories they are licensed to dispose. Waste management audit of contractor’s facilities shall be carried out in consultation with the concerned department of DPL, and findings shall be properly documented and followed up. Residence, catering services and work sites shall maintain acceptable standards of hygiene and good housekeeping.

Table 7.3 below presents a summary of waste handling and disposal method to be applied in implementation of the WMP.

Table 7.3: Waste Handling and Disposal Method

Waste Streams	Category	Frequency of Generation	Recommended Practice	Responsible Party
Bulbs and mercury tubes	Hazardous wastes	Monthly	Segregate and transport well bagged wastes to recycling center in OGWAMA dump site, Ogun State. Wastes must be clearly labelled	DPL / Contractor
Clinical wastes from first aid treatment	Hazardous wastes	Daily	Transport to DPL Retainer Clinic in sealed bags for incineration. Wastes must be clearly labelled	DPL / Contractor
Food wastes/ office sweepings, nylon bags etc.	Domestic wastes	Daily	Segregate and store in bags. Disposed-off by DPL waste disposal agent to be engaged; for future recycling process	DPL / Environmental Consultant
Glass	Office wastes	Monthly	Segregate and transport to recycling center in OGWAMA dump site.	DPL / Contractor
Pigging wastes	Hazardous wastes	Weekly	Weigh and store in watertight bags placed in drums with lid and transport to the approved dumpsite for incineration	DPL / Contractor
Crude oil/ oily sludge/ fuel filter cartridges	Hazardous wastes	Weekly	Transport to collection centre in OGWAMA dump site.	Contractor
Papers	Office wastes	Daily	Segregate (all confidential papers must be separated from non-confidential) shred at source and transported to a recycling depot	DPL / Contractor
Printer, cartridges, computer toners, photocopier toners	Office wastes	Weekly	Segregate and transport to recycling center	DPL / Contractor
Aerosol cans and spent lubricants	Hazardous wastes	Monthly	Collect, segregate and transfer to disposal centre in OGWAMA dump site for recycling	DPL / Contractor
Oily rags, sorbents; used protective clothing	Hazardous waste	Monthly	Transport to collection centre in OGWAMA dump site.	DPL / Contractor
Refrigerants (HCFC) from fridge and air condition units	Hazardous and Office wastes	Once spoilt	Safely contain in designated locations for return to manufacturer, or to recycling centre	DPL

Regulatory Compliance

Majority of the identified impacts would take place during preconstruction and construction phases. Impacts identified for the operation phase are minimal. Mitigation measures for each of the phases have been presented in Chapter 6.

Project-specific compliance requirements such as laws, regulations, permit and approval requirement and conditions, shall be identified and documented in a Regulatory Compliance Plan (RCP). This plan will comprise of a spreadsheet that lists the identified obligations along with responsible persons and timings. It will be approved by the Project manager while the site environmental officers will be responsible for its implementation, monitoring, and reporting.

All environment-related regulations as they apply to the proposed Projects have been documented and described in this EIA. The environmental management activities at each stage of this project have been guided by the environmental standards including national legislation, international conventions and agreements, and DPL Project's codes of practice. The Federal Ministry of Environment has responsibilities for environmental protection and the enforcement of environmental standards. Where standards and regulations are not present in Nigeria, standards issued by international bodies such as the World Health Organization (WHO), International Finance Corporation (IFC) and World Bank have been adopted. The DPL Project management (and all her contractors/subcontractors) shall ensure compliance with these regulations throughout the project's lifecycle in line with measures inherent in the Project Management.

7.8 Use and Maintenance of the EMP

The EMP shall be owned by the DPL Coal power Project team and shall remain a dynamic working tool to be reviewed with compliant and necessary changes in the event of new policies or guidelines from governmental agencies. Periodic reviews and updating shall also be carried out throughout the project lifespan, to incorporate better environmental technologies, management systems and economic policies. Constructive suggestions by users (Contractors, management, line and operating personnel) shall be assessed and integrated into the EMP. The maintenance officer to be employed by the contractors for the project shall develop a comprehensive maintenance programme. The maintenance schedule contained in the programme shall be designed in line with specifications for the DPL Coal power Project facility to ensure that it functions properly all year round.

7.8.1 Implementation of Mitigation and Enhancement Measures

The mitigation measures proposed for the significant negative impacts and the measures proposed to enhance the significant positive impacts presented in Chapter Five have been developed into an EMP that provides a detailed action plan with roles and responsibilities for their implementation. The DPL Project management and the project contractors shall ensure that these measures are complied with.

Prevention of workplace accidents and incidents during the construction and operation of the proposed project shall be achieved using a good hazard analysis procedure. Consequently, the Project Team Leader shall arrange for an analysis of the hazards involved in all the phases of the project and how these can best be averted or minimized. However, emergency situations could still occur as a result of equipment failure, weather, negligence and/or sabotage. Consequently, a contingency plan shall be developed as back up to other containment systems put in place to handle such occurrences. As a minimum, the contingency plans shall apply to both DPL Project Management and contractors and shall address the emergency situations like serious injury or illness and Land vehicle mishaps.

7.8.2 Checking for Corrective Action

Checking includes inspections and monitoring as well as audit activities to confirm proper implementation of checking systems as well as effectiveness of mitigations. Corrective actions include response to out-of-control situations, non-compliances, and non-conformances. Actions also include those intended to improve performance.

HSE inspections will be conducted weekly on an *ad hoc* basis and formally at least once every six months. The results of the inspection activities will be reported to DPL to be addressed. Investigating a 'near miss' or actual incident after it occurs can be used to obtain valuable lessons and information that can be used to prevent similar or more serious occurrences in the future.

DPL will implement a formal non-compliance and corrective action tracking procedure for investigating the causes of, and identifying corrective actions to, accidents or environmental or social non-compliances. This will ensure coordinated action between DPL and its subcontractors. The HSE coordinator will be responsible for keeping records of corrective actions and for overseeing the modification of environmental or social protection procedures and/or training programs to avoid repetition of non-conformances and non-compliances.

7.9 Managing Uncertainty Changes to Project Activities

Changes in the Project may occur due to unanticipated situations. Adaptive changes may also occur during the course of final design, commissioning or even operations. The Project will implement a formal procedure to manage changes in the Project that will apply to all project activities.

The objective of the procedure is to ensure that the impact of changes on the health and safety of personnel, the environment, plant and equipment are identified and assessed prior to changes being implemented.

The management of change procedure will ensure that:

- proposed changes have a sound technical, safety, environmental, and commercial justification;
- changes are reviewed by competent personnel and the impact of changes is reflected in documentation, including operating procedures and drawings;
- hazards resulting from changes that alter the conditions assessed in the EIA have been

identified and assessed and the impact(s) of changes do not adversely affect the management of health, safety or the environment;

- changes are communicated to personnel who are provided with the necessary skills, via training, to effectively implement changes; and
- the appropriate DPL person accepts the responsibility for the change.

As information regarding the uncertainties becomes available, the Project EMP will be updated to include that information in subsequent revisions. Environmental and social, as well as engineering feasibility and cost, considerations will be considered when choosing between possible alternatives.

Uncertainty in the development of the proposed project derives from a number of factors including: unconfirmed final design features; detailed data on geotechnical conditions; and unforeseen events.

A key element of ongoing environmental and social management is to address uncertainty through collecting information, additional assessment and, where necessary, the development of further mitigation and management measures.

The process of environmental assessment does not stop with submission of the reports to the authorities, or with government approval. This EMP shall require a mechanism to manage change. Sometimes these changes may be material ones that could influence the original findings of the environmental assessment and hence the basis for its approval. DPL shall therefore, implement a Change Management System to ensure that changes to the scope of the project, or any new information, are subjected to an assessment process.

All changes shall be evaluated for their degree of significance, and incorporated into the appropriate project documentation as follows: minor changes shall be reflected in updates to the EMP; and substantive changes that might potentially alter the environmental assessment findings (i.e. result in changes to the predicted significance of environmental and socioeconomic impacts) shall be subject to re-assessment, including the possibility of further stakeholder consultation, supplementary reporting and revision of the project's EMP.

There shall be a reporting system between DPL, the government and any other interested and affected parties.

7.10 Operational Control/Maintenance Procedures

To assist in maintaining the technical integrity of the DPL Coal power Project, a well-defined management system, which shall be approved by the DPL Project Management team, will ensure compliance with the plant's operational and maintenance policies.

Each potentially significant impact identified in the EIA will have an operational control associated with it that specifies appropriate procedures, work instructions, best management practices, roles, responsibilities, authorities, monitoring, measurement and record keeping for avoiding or reducing impacts. Operational controls are monitored for compliance and effectiveness on a regular basis through a monitoring and auditing procedure described in the

EMP.

Operational control procedures will be reviewed and, where appropriate, amended to include instructions for planning and minimising impacts, or to at least reference relevant documents that address impact avoidance and mitigation.

The maintenance system shall include plans and procedures for:

- Normal maintenance (routine and breakdown maintenance performed by the various departments);
- Preventive maintenance (activities carried out at pre-determined intervals);
- Predictive maintenance (as initiated by the DPL Project Management monitoring and assessment);
- Inspection (in accordance with a pre-defined programme and based on statutory requirements);
- Production and maintenance personnel shall be properly selected and trained to ensure safe and effective job performance. Ongoing competence training shall be undertaken.
- Routine maintenance and inspection activities shall be carried out for the DPL Project. Inspections shall be carried out to comply with statutory requirements and shall be based on “Risk Avoidance” rather than “Risk Management”.

7.10.1 Construction Procedures

Site preparation including clearance works shall be carried out within defined perimeters and only when necessary. The maximum permissible time lapse between site clearing and initiation of construction operations shall be reduced to the barest minimum necessary to permit safe operations. Trees felled from site shall be re-utilized for the benefit of the host communities or as otherwise requested by DPL Project in consultation with the host communities.

All transportation and construction works shall be executed in such a manner that interference with the use of public highways and access roads is minimal. However, if operational safety demands that public road be blocked, then the DPL Project’s Manager in conjunction with all regulatory authorities may approve such action only when temporary traffic control and diversion arrangements have been provided. Dumping or storage of litter, debris, tools and equipment in public or private highways and roads shall be prohibited. Contractors shall develop highway and road clearing strategies to ensure that public roads and highways are kept clear, safe and accessible.

7.10.2 Use of Personal Protective Equipment (PPE)

The contractors shall provide adequate health services as well as onsite first aid services for its workforce. The first aid services shall be extended to all visiting personnel. All project activities shall be properly managed through careful planning and the application of relevant safety policies including the following:

- Job hazard analysis (JHA) before embarking on a job
- Use of appropriate Personal Protective Equipment (PPE)

- Prohibition of alcohol in the project area
- Prohibition of smoking in designated areas
- Proper journey management

Operations at all work sites shall be subject to government, industry and DPL Project policies and guidelines. All DPL Project and contractor staff shall be well-informed and trained on the safety policies and guidelines. All facilities shall also be designed to enhance safety planning and activities shall be executed within the confines of relevant legislation and stakeholder's interests.

DPL Project will provide and ensure the use of the following Personal Protective Equipment (PPE) especially during construction works: Coverall, Safety Boot, Helmet, Industrial Gloves, Nose Mask (disposable & non-disposable), Reflect Jacket, Eye Goggle, Rain boot, Rain Coat, Fire safety wears, Face shields, Welder flash etc.

7.11 Environmental Monitoring Programme

DPL Coal power Project activities shall be monitored in order to: ensure that the EMP is implemented; assess the efficiency of mitigation actions; and provide updates where necessary. Environmental Monitoring will be conducted to ensure compliance with regulatory requirements as well as to evaluate the effectiveness of operational controls and other measures intended to mitigate potential impacts. Environmental Monitoring is in place in order to ensure the efficacy of the mitigation measures identified in the EIA.

The Monitoring Programme is established to address the following:

- alteration to the biological, chemical, physical, social and health characteristics of the recipient environment;
- alterations in the interactions between project activities and environmental sensitivities, and interactions among the various sensitivities;
- to monitor the effectiveness of the mitigation measures;
- determination of long term and residual effects; and
- identification of Project specific cumulative environmental effects.

Environmental Monitoring is a tool to ensure adherence to agreed actions, to assess compliance to environmental and social standards, to provide enhanced data for risk management purposes and also facilitate any needed project design or operational changes. It provides feedback to the management on what is working and what is not working.

All contractors shall be required to self-monitor their performance with respect to environmental and social performance. The DPL HSE Engineer shall also undertake quarterly environmental assessment and random walk throughs and spot checks throughout the project lifecycle. Assessment findings shall be reviewed by the project management team and where corrective actions are necessary, specific plans (with designated responsibility and timing) shall be developed to ensure continuous performance improvement.

The monitoring plans for the project including the environmental components, parameters and frequency of monitoring as well as responsibilities are presented in Table 7.4: The monitoring plan for the ecological and socio-economic components of the project.

Table 7.4 MONITORING PLAN (Schedule/Programme: during the project lifecycle)

S/N	Environmental Component	Impact/Aspect	Indicator Parameter	Monitoring method and Location	Frequency	Responsibility
1	Air quality	Air pollution	Gaseous emissions (SO ₂ , CO ₂ , NO ₂ , etc.), SPM	Use of Air-sampling instrument/ Point measurements at the plant area, office, residence etc.	Biannually	GM, PM, HSE Coordinator, FMEEnv/SMEnv, Consultant
2	Noise level and Vibration	high level of noise and earth-vibration effects	noise decibels and crack on walls of closest villagers	Use of Noise-monitoring meter at plant area. Nearby structures to be inspected for effects of vibration	Monthly	GM, PM, HSE Coordinator, FMEEnv/SMEnv, Consultant
3	Vegetation Status (Biodiversity) and Wildlife Status	Loss of flora and fauna	Presence or extinct of rare or native vegetation and wildlife	Vegetation (sample) collection by use of 10m by 10m quadrants around the entire project area; and Wildlife Sampling through interview of reputed hunters, and walk through the area to ascertain the presence of animals by sighting and correlation of cries and footprints	3-Yearly Audit	GM, PM, HSE Coordinator, FMEEnv/SMEnv, third-party Environmental Consultant, EMT (Environmental Monitoring Team)
4	Surface (and ground) water quality	Water pollution	Temp., pH, Turbidity, Nutrients (sulphate, nitrate, etc.), Heavy metals (Fe, Cu, Pb, etc.)	Sample collection (and analysis) from water sources (of closest surface water-body or borehole)	Quarterly	GM, PM, HSE Coordinator, FMEEnv/SMEnv, Consultant

5	Soil (and sediment) quality	Soil contamination	Heavy metals in soil, crop productivity	Soil-sample collection/analysis (esp. around fuel storage areas)	3-Yearly Audit	GM, PM, HSE Coordinator, FMEnv/SMEnv, Consultant
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S/N	Environmental Component	Impact/Aspect	Indicator Parameter	Monitoring method and Location	Frequency	Responsibility
6	Socio-cultural	Social-life Impact	Cultural conflicts, norms, social vices, project- perception of community leaders, hospitality of indigenes	Continuous effort of Consultations (at all levels); assessment of land compensation-homage; review of implementation of Community Dev. Agreement in the host community	Monthly	GM, PM, HSE Coordinator, FMEnv/SMEnv, Consultant
7	Community health	Health Impact	Common/prevalent diseases in the host communities	Use of questionnaires within the host communities as well as collection of health statistics from clinic and hospitals within the area	3-Yearly Audit	GM, PM, HSE Coordinator, FMEnv/SMEnv, Consultant
8	Demographic pattern	Economic Impact	Accommodation; markets; social infrastructure; industrialization;	Use of questionnaires within the host communities, as well as data-gathering from interviews, observations and consultation	3-Yearly Audit	GM, PM, HSE Coordinator, FMEnv/SMEnv, Consultant
9	Occupational health	Hazard-exposure to workforce	Frequent illness of workforce, workplace accident, medical fitness	Observation, interviews, and the use of Job-Hazard-Analysis report	Every 6 months	GM, PM, HSE Coordinator, FMEnv/SMEnv, Consultant
10	Environmental nuisance	Aesthetic/Visual impact	Dust-raise, waste littering, effluent discharge, degradation of land formation	Observations and findings during site audit of project operations	3-Yearly Audit	GM, PM, HSE Coordinator, FMEnv/SMEnv, Consultant

11	Hydro-biological components (plankton, fisheries, benthos)	Marine life impact	Abnormalities of indicators of Water arameters	Sample collection of closest water source and analysis	3-Yearly Audit	GM, PM, HSE Coordinator, FMEnv/SMEnv, Consultant
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7.12 Traffic Management Plan

Implementation of the Traffic Management Plan (TMP) will ensure regulatory compliance and the reduction of the significance of impacts related to transport during the construction and operation of the Project. The objectives of this plan are therefore:

- Ensure compliance with all legislation regulating traffic and transportation within Nigeria;
- Avoid incidents and accidents;
- Raise greater safety awareness in each driver;
- Avoid the deterioration of roads; and
- Avoid pollution that can be created from noise and emissions related to transport.

Traffic and Transport Management Principles

The following principles will be adhered to during the applicable phases of the Project:

- Conduct a road condition survey in order to gauge the damage to the road as a result of the intensive heavy traffic.
- The risk assessment of the proposed project improvements should be the subject of a Road Safety Audit (RSA).
- All employees must attend an environmental training programme which will include details of approved access roads and speed limits.
- Adjacent landowners must be notified of the construction and operation schedule.
- Flagging must be provided at access points to the site and must be maintained until construction is completed.
- All vehicles must be maintained in good condition.
- Speed restrictions must be established prior to commencement of construction and enforced over all construction traffic.
- The movement of all vehicles within the site must be on designated roadways.
- All necessary transportation permits to be applied for and obtained from the relevant authorities prior to construction.
- If abnormal loads are required, the appropriate arrangements will be made to obtain the necessary transportation permits and the route agreed with the relevant authorities to minimise the impact on other road users.
- A designated access point to the site must be created and clearly marked to ensure safe entry and exit.
- Signs must be placed along construction roads and at the entrance to the site to identify speed limits, travel restrictions and other standard traffic control information and road markings.
- Where possible, construction vehicles to avoid travelling on the public roadway during the morning and late afternoon commute time, to reduce the impact on other road users.
- Public transport embayments will be provided downstream of the entrance to the plant.

- All internal and access roads that will be used during the operational phase of the Project must be maintained.
- The TMP entails that the proposed site be organized so that vehicles and pedestrians using site routes can move around safely.
- The routes need to be suitable for personnel's or vehicles using them, in suitable positions and sufficient in number and size.
- Site vehicle incidents can and should be prevented by the effective management of transport operations throughout the project phases.
- Keeping pedestrians and vehicles apart
- Vehicle operations during construction and operations must be controlled.
- Provide separate entry and exit gateways for pedestrians and vehicles
- Where walkways cross roadways, a clearly signed and lit crossing point where drivers and pedestrians can see each other clearly should be provided;
- There should be barrier installation between the roadway and walkway.
- Good planning can help to minimize vehicle movement around a site. For example, landscaping to reduce the quantities of fill or spoil movement.
- Provide car and van parking for the workforce and visitors away from the work area;
- Storage areas should be provided so that delivery vehicles do not have to cross the site.
- Employers should take steps to make sure that all workers are fit and competent to operate the vehicles, machines and attachments they use on site,
- Training drivers and operators should be made compulsory
- People who direct vehicle movements (signalers) must be trained and authorized to do so.
- The need for vehicles to reverse should be avoided where possible as reversing is a major cause of fatal accidents.
- A turning circle should be installed so that vehicles can turn without reversing.
- Mirrors, or reversing alarms that can help drivers can see movement all round the vehicle should be used;
- Care should be taken to make sure that all drivers know and understand the routes and traffic rules on site. Use standard road signs where appropriate
- Employers and managers should ensure all employees and visiting drivers are made aware of the company's site layout and follow the site traffic route.
- Drivers should always be competent. In particular, drivers should be instructed and monitored in the way they use vehicles.
- Limiting the speed that vehicles move around the workplace is a very important part of controlling traffic. The best way to do this is to use fixed features that mean drivers cannot move too quickly.
- Operators should make sure they have the correct securing equipment for the types of load carried, checks that they are clean and are in a good working order.

- Clamps, special bolts, steel-wire ropes, chains, webbing harnesses, sheets, nets, ropes and shoring bars are all suitable to secure loads, but it is essential to make sure that they are strong enough for the weight of the loads carried. Packing should be used as necessary where the load has sharp edges.
- Lifting equipment and load securing accessories need to be suitable for its use, marked with its safe working load, properly maintained, inspected appropriately and thoroughly examined regularly.
- It may be useful to provide a plan of the workplace at the entrance (and at other appropriate points) showing vehicle routes, one-way systems and so on. This would be particularly useful at workplaces that have visiting drivers.
- Loading and unloading areas should be:
 - Clear of other traffic, pedestrians and people not involved in loading or unloading.
 - Clear of overhead electric cables so there is no chance touching them, or of electricity jumping to 'earth' through machinery, loads or people.
 - Vehicles must never be overloaded. Overloaded vehicles can become unstable, difficult to steer or be less able to brake.
 - Checks must be made before unloading to make sure loads have not shifted during transit and are not likely to move or fall when restraints are removed.

DPL shall ensure effective management of all transport operations and give utmost priority to safe conditions. DPL place very high premium on the lives of all our employees hence is committed to manage the land, air and water transport operations in a manner that will minimize and control the associated Health and Safety hazards.

Other Traffic/Transportation Management Measures include;

Vehicle Pre-Checks: All vehicles for conveyance of personnel as well as equipment at all stages of the project shall be pre-checked by the HSE coordinator and maintenance officer. This is to confirm the road worthiness and fitness for purpose of the vehicles. Also, all contractors shall ensure that their vehicles are pre-checked and confirmed fit for use.

Transport Plan: During movement of DPL vehicles/trucks, the responsible driver shall produce a Transport Management Plan for approval by the HSE coordinator. The plan shall include the following details: mobilization date; routes, cargo description as well as the details of the Job Hazard Analysis (JHA) conducted for the trip. The HSE coordinator may only approve the trip and he can confirm that all necessary precautions have been made to forestall transport accidents/incidents. As a minimum, movements of heavy equipment shall be much as possible be limited to right hours in order to reduce traffic on the roads while the appropriate speed limits shall be complied with.

Communication: Communication shall be an integral part of the Transport Management System. The head corporate office as well as the various liaison offices shall be constantly briefed on the status of any trip. This is to keep the management informed on the event of any eventuality.

Consignation: DPL shall ensure trucks coming into the facility are well parked and in a single file to avoid road traffic. Also, trucks with chippings during construction phase leaving the facility shall be covered to avoid stones flying on the road.

Monitoring: Contractors and the DPL must ensure that all vehicles adhere to the speed limits. A speeding register should be maintained which details the offending drivers and the offence.

7.13 Training and Awareness Programme

All Contractor employees and subcontractors involved in the project will be given a comprehensive induction before work commences. This environmental training will take place in conjunction with safety awareness training.

The environmental aspects will include:

- An overview of the Environmental Management Plan, goals and objectives.
- Awareness in relation to the risk, consequences and methods of avoiding noise pollution, oil/diesel spills, disturbance to wildlife etc.
- Awareness of individual environmental responsibilities and environmental constraints to specific jobs.
- Location and sensitivity of the proposed project area.

All personnel who have attended the Environmental Induction will sign a Register which will be kept on the Project Files. Toolbox talks, based on the specific activities being carried out, will be given to personnel by the nominated project representative. These will be based on the specific activities being carried out.

During all activity phases of the project, the following environmental awareness and training programs shall be conducted:

Induction Briefing: An induction briefing shall be a requirement for every worker to be engaged in the project and shall be provided by the contractors.

The briefing shall include: the proposed tasks for new workers, safe work procedures, use of personal protective equipment, emergency responses and warning notices, personal hygiene and site sanitation issues, environmental protection; and, hazard recognition and incident reporting.

Weekly Safety and Environmental Forum: There shall be a weekly environmental and safety awareness forum for workers during the work activities at the project site. DPL shall be responsible for coordinating these meetings.

7.14 Communications Guideline

Environmental issues will be communicated to the workforce on a regular basis. Daily project meetings, which follow a set agenda incorporating Health, Safety and Environmental issues, will be held and a daily report will be generated and distributed.

All staff and sub-contractors involved in all phases of the project will be encouraged to report environmental issues.

EPC contractor shall be required to provide monthly reports on environmental and social monitoring and performance. The report shall include compliance status of the mitigation and monitoring requirements of the project EMP as well as other project related regulatory requirements. DPL shall also develop a system of internal reporting that provides robust internal communication on the full range of environmental and socio-economic issues and monthly assessments of the effectiveness of the management programme.

DPL will maintain a formal procedure for communications with the regulatory authorities and communities. The HSE Coordinator is responsible for communication of HSE issues to and from regulatory authorities whenever required. Meetings will be held, as required, between DPL and the appropriate regulatory agencies and community representatives to review HSE performance, areas of concern and emerging issues. Dealings will be transparent and stakeholders will have access to personnel and information to address concerns raised.

The HSE Coordinator will also be responsible for disseminating information and coordinating community communications through the course of the Project.

The Project will develop and implement a grievance mechanism whereby community members can raise any issues of concern. Grievances may be verbal or written and are usually either specific claims for damages/injury or complaints or suggestions about the way the Project is being implemented. When a grievance has been brought to the attention of the Project team, it will be logged and evaluated. The personnel or group with the grievance is required to present grounds for making a complaint or claiming loss so that a proper and informed evaluation can be made.

Where a complaint or claim is considered to be valid, then steps are required to be undertaken to rectify the issue or agree compensation for the loss. In all cases the decision made and the reason for the decision will be communicated to the relevant stakeholders and recorded. Where there remains disagreement on the outcome then an arbitration procedure may be required to be overseen by a third party (e.g. government official). Local community stakeholders will be informed on how to implement the grievance procedures.

7.15 Documentation and Reporting

DPL will control HSE documentation, including management plans; associated procedures; and checklists, forms and reports, through a formal procedure. All records will be kept on site and

will be backed up at several offsite locations (including secure cloud storage facilities). Records will be kept in both hard copy and soft copy formats. And all records will be archived for the life of the project. Furthermore, the document control procedure will describe the processes that the Project will employ for official communication of both hardcopy and electronic (through the internet) document deliverables. In addition, it will describe the requirement for electronic filing and posting and for assignment of document tracking and control numbers (including revision codes).

The HSE Coordinator is responsible for maintaining a master list of applicable HSE documents and making sure that this list is communicated to the appropriate parties. The HSE Coordinator is responsible for providing notice to the affected parties of changes or revisions to documents, for issuing revised copies and for checking that the information is communicated within that party's organisation appropriately.

The subcontractors will be required to develop a system for maintaining and controlling its own HSE documentation and describe these systems in their respective HSE plans.

Environmental Reporting: The contractor will report the status of project environmental activities to DPL on a regular basis. These reports will summarize the key environmental issues in the period and identify any non-conformances and the status of corrective actions.

Communication of Initiatives and Project Information: Communication of initiatives and project information will be developed as the project progresses. Typically, these will include campaigns to raise environmental awareness, circulars to inform staff of key environmental issues such as lessons learnt from incidents or accidents and the impact of any new legislation.

Subcontractor Environmental Reporting: All external communications with local interest groups, external agencies and also the response to any complaints will be conducted by DPL. Contractors shall notify the onsite the company's representative if any communications are received from external stakeholders.

Throughout the Project, DPL will keep the regulatory authorities informed of the Project performance with respect to HSE matters by way of written status reports and face-to-face meetings. DPL will prepare a report on environmental and social performance and submit it to FMEnv. The frequency of this reporting will be agreed upon between DPL and FMEnv.

If required, DPL will provide appropriate documentation of HSE related activities, including internal inspection records, training records, and reports to the relevant authorities. Subcontractors are also required to provide HSE performance reporting to DPL on a regular basis through weekly and monthly reports. These will be used as inputs to the above.

7.16 Environmental Audit and Review

DPL shall conduct periodic HSE audits (monthly / quarterly / annually, etc) of the facility construction activities in the project area in order to ascertain extent of compliance with policy and regulatory requirements. The audits shall be carried out by FMEnv and in accordance with ISO 14001 guidelines.

The scope of the audits must include the following, as a minimum:

- compliance with all regulatory requirements, codes, standards and procedures;
- examine line management systems, plant operations, monitoring practices etc.;
- identify current and potential environmental problems especially during the operational phase of the project;
- check the predictions in EIA and assure implementations and application of recommended practices and procedures; and
- make recommendation for the improvement of the management system of the operation.

After every audit exercise, the environmental auditor shall produce an Environmental Audit Report (EAR) which shall be submitted to regulatory bodies for review and certification. Also, as part of audit and review this EMP shall be reviewed annually to determine its adequacy/suitability for continuous process.

7.17 Emergency and Contingency Plan

The implementation and operation of any project is faced with possible hazards irrespective of the good intentions of the operator. DPL recognizes this fact and has put in place all necessary plans and measures to ensure compliance with standards, codes and specifications, operations and maintenance activities associated with the proposed project. The probable causes of accidents in the execution of this project are equipment failure, run-away reactions, explosion, negligence and sabotage. A contingency plan has been put in place to handle such emergency and accidental situations. Such emergency plans, consistent to identified hazardous conditions of DPL would include the following conditions:

- Fire/explosion
- Evacuation
- Serious accidents/fatalities
- Equipment failures
- Infringement of safety zone

The contingency plan would also include:

- The response procedures to the abovesituations
- Reportingrequirements
- Post incidentmonitoring
- Procedures for personnel briefing exerciseand,
- Mechanisms for updating the emergency/contingency plan (ifnecessary).

Emergency Response Plan

In order to safe guard the lives of personnel and contractors during emergency situation, Contractor shall develop and implement an emergency response plan in addition to the following.

- Emergency training shall be conducted by the HSE Manager to enhance workers preparedness to respond appropriately toemergencies.
- Emergency drill shall be conducted periodically and such drill shall include fire, oil spill, abandon as well as first aidemergencies.
- Response time and roll call shall be monitored and recorded by the HSE Manager, supervisor or fire warden as required, at each drill/training to ensurecompliance.
- All drills and training exercise shall be documented by the HSE Manager or the supervisor
- In situations where evacuation of personnel is necessary as a result of fire or any other related accidents, DPL shall follow the emergency medical evacuation procedure with responsibleparties.
- All incidents will be registered by DPL.
- All incidents will be investigated for identification of causes and preventativeactions.
- All employees and contractors in this project must be trained in emergency response procedures within one month of theirstart-date.

Table 7.5: Personnel Responsibilities during Emergency Evacuation

Action Party	Responsibility
Personnel at scene of incident	<ul style="list-style-type: none"> • Maintain calmness and alert people around • Contact site nurse or first aider/supervisor/safety officer • Begin mustering action
Medical personnel on site	<ul style="list-style-type: none"> • Arrange and administer first aid for sick/injured
Site supervisor/safety officer	<ul style="list-style-type: none"> • Contact project engineer / safety manager and report the following; • Precise location and time of incidence; • Site condition • Patient(s)/injured or casualty; and • Other pertinent information
Site Supervisor	<ul style="list-style-type: none"> • Arrange for medical evacuation after due consultation with management
HSE Manager	<ul style="list-style-type: none"> • To liaise with management to arrange for medical evacuation • Furnish management with available particulars/report about the emergency as provided by the site supervisor/safety officer • Conclude medical evacuation by ensuring the casualty is transferred from the first aid clinic (after a lifesaving treatment) to DPL's retainer clinic.

Fire Prevention/Contingency Plan-

The overall goal of the fire prevention system shall be to:

- Continuously monitor all areas of the installation where either a fire hazard may exist or an accumulation of flammable gas may occur;
- Alert personnel at the location of the presence, location and nature of the fire or emergency;
- Automatically activate fixed fire protection systems, and
- Reduce the risk to personnel by implementing executive automated systems.
- Ensure that all personnel are safely evacuated
- Fire detectors (smoke, heat, flame, gas, etc) shall be installed at appropriate areas.

CHAPTER EIGHT

DECOMMISSIONING AND ABANDONMENT PLANS

Decommissioning and Abandonment Plan

DPL shall set up strategies to checkmate project abandonment. In the unfortunate event of abandonment, a project abandonment plan shall be prepared in line with applicable national and international legislative requirements, in addition to implementing measures to mitigate the impact of such abandonment. The design of the facilities shall take due recognition of the need to decommission any ancillary facilities at the end of their operational life.

At the end of the project lifespan (of 30 years), a decommissioning team shall be set up and implement the guidelines for decommissioning/abandonment to ensure that the best and practicable methods available are employed to clean up the project site.

Decommissioning would involve removal of all site facilities that are no longer relevant for the operation of the project which may pose some degree of safety hazards to the general public and personnel within the base. The hazards and safety risks posed by the abandoned facilities shall have long-term effect. However, decommissioning shall make the acquired equipment/material available for alternative uses.

Consequently, the following measures are to be ensured during the decommissioning aspect of the project;

- DPL shall develop a detailed abandonment programme, which shall address the use and management of the equipment/materials after decommissioning and abandonment.
- Facilities that cannot be removed from site shall be clearly marked as danger zone to warn people.
- DPL shall ensure the decommissioning and abandonment are done with the same care and respect for the environment with the project was designed, constructed and operated.
- Temporary structures (camp, storage yard, site offices, etc.) installed at the construction phase to support construction activities shall be cleared, cleaned and safely disposed or reuse.
- Restoring the environment to original condition; e.g. for every tree (>60cm girth) cut

down as a result of construction, at least one tree will be planted in replacement.

- After restoration has been effected, the site shall be routinely monitored by the DPL Project Management, community representatives and environmental consultants.
- Soil, surface and ground water samples shall be assessed regularly to ascertain quality and extent of site recovery. On successful restoration, the DPL Project Management shall handover the site to the community and a close-up report prepared for future reference. Management actions should focus on the rehabilitation of disturbed areas and the removal of infrastructure.

CHAPTER NINE

CONCLUSION AND RECOMMENDATION

9.1 CONCLUSION

The Environmental Impact Assessment (EIA) Study of the area for the proposed Establishment of a Coal Power Plant Project is based on information from site survey, extensive literature review and field sampling and measurements/testing, which were used to carefully establish and assess the status and sensitivities of the various ecological and socioeconomic components of the project area, in line with the Federal Ministry of Environment (FMEnv) Regulatory framework (Terms of Reference). Data acquisition from terrestrial, aquatic and socio-economic environment as well as the assessment of the sensitivities of the various biophysical and socio-economic parameters involved a multi-disciplinary approach. Consultations with the host community, local government authority as well as regulatory authorities are ongoing and shall continue throughout the project life cycle.

The scope of the EIA Study includes gathering extensive baseline environmental data, identifying key stakeholders and stakeholder issues, assessing the potential impacts of the proposed project; proffering practical and cost-effective measures to mitigate identified negative impacts and enhance positive impacts, and development of a workable Environmental Management Plan.

The EIA was carried out (*in accordance with FMEnv EIA Report Writing Format*) in order to predict the impact of the proposed project activities on the various biophysical and socioeconomic components of the project environment and host communities and also to proffer adequate mitigation and enhancement measures for adverse and beneficial impacts respectively. The overall goal of the EIA is to ensure that potential environmental and social impacts of the proposed project are identified and evaluated and adequate mitigation measures proffered for significant impacts; in compliance with required Standards. The adverse impact of the proposed project on water, land use, vegetation wildlife air, socio-economics and health are localized and can be controlled and ameliorated if the recommended measures are strictly followed. This project would have only minimal impact on the immediate environment should the proposed monitoring plan and mitigation measures for the project be implemented in line with the regulatory bodies requirements.

Diskol Environmental Consulting Ltd, *the Environmental Consultant to this project*, is confident that every effort will be made by Dahua Power Limited to accommodate the mitigation measures recommended during the EIA process to the extent that is practically possible, without compromising the economic viability of the Project.

The implementation of the mitigation measures detailed in Chapters 6 and provided in the Environmental Management Plan (EMP) of Chapter 7, including monitoring, will provide a basis for ensuring that the potential positive and negative impacts associated with the establishment of the development are enhanced and mitigated to a level which is deemed adequate for the development to proceed. Although the results presented herein are an indication of a maximum environmental quality within acceptable standards prior to the project development, there is need for follow-up with the EMP described in Chapter 7, to ensure that procedures for managing the adverse potential impacts of the proposed project on the environment are developed, established and maintained throughout the life cycle of the project. Provided that adequate preventive and control measures are incorporated into the project design, no danger is posed to the environment and surrounding vegetation by the envisaged development project.

When all the factors discussed in the EIA are taken into consideration and the likely impacts adequately addressed and included in the project programme, then the project is recommended to commence. Considering the workable proffered mitigation measures for adverse impact, the benefits of the proposed project outweighs the negative impacts. In view of the foregoing, Dahua Power Limited, the project proponent of the Coal power Project at Agbara, Odo/Ota L.G.A of Ogun State, requests that the proposed project be approved for implementation.

9.2 RECOMMENDATION

It is believed that the following recommendations and those incorporated in the text of the report will enable the proponent to achieve environmentally friendly operations.

- Ensure the implementation of all mitigation measures incorporated in this report.
- Appropriate methodology should be employed in construction exercises and only skilled and well trained personnel should be allowed to operate within the project site.
- Adequate pollution abatement system must be installed
- Effective traffic management should be implemented during the project phases
- Only skilled and well trained personnel should be allowed to operate Coal Power Plant.
- Waste segregation at source, waste recycling, repair, reduction, recovery and reuse should be implemented.
- Contingency action plan should be in place and well communicated to all staff.
- Ensure strict adherence to existing regulations and plans of the project.

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APPENDIX 1

DETAILED LABORATORY METHODS

Temperature, pH and Conductivity of Soil Samples

20.0 g of fresh soil sample were weighed into a 50ml beaker and 20ml of distilled water added to the beaker. The mixture was thoroughly stirred and allowed to stand for 30minutes and the WTW multi-meter probes were then inserted to ensure the above parameters.

Particle Size Distribution of Soil Samples

Particle size distribution (PSD) was determined using the hydrometer method followed by sieving recommended for soil samples containing less than 35% fine particles i.e. clays and silts. The test method is based on the BS 1377 (Part 2; 1990) which is in accordance with the Dutch RAW and ASTM D422.

Total Microbial Count (Water and Soil Sample)

Indirect cell counts on water and soil samples were carried out to determine the total indirect microbial population. The test methods used are the ASTM D5465-93:

Determining Microbial Colony counts from Water Analyzed by Plating Methods, and APHA 907: Standard Plate Count

Total microbial colonies were calculated as follows:

$$\text{PlateCount(cfu/ml)} = (\text{No. of colonies on plate}) \times (\text{dilutionfactor})$$

Phosphate – Phosphorus in Soil Samples

Phosphate – phosphorus in soil samples were determined using UV/Visible spectrophotometer. The Stannous Chloride Reduction Method, based on the method described in the Chemical Analysis of Ecological Matter (2nd edition) and APHA 4500 PD, were applied.

Phosphate – phosphorus content of soil samples were calculated as follows:

$$\text{P} = \frac{C \times V}{V_s} \times W$$

Phosphorus content were calculated as follows:

$$\text{P} = \frac{C \text{ (mg/l)} \times \text{Solution Volume (l)}}{\text{Aliquot} \times \text{Sample Weight (g)}}$$

Phosphate –Phosphorus(mg/kg) =

Where C = mg phosphorus obtained from calibration graph using the UV/Visible spectrophotometer and Vision software version 3.

1000 = Conversion factor to kg

Phosphate – Phosphorus in Water Sample

The phosphate-phosphorus (PO_4^{3-} - P) content of water sample was determined by spectrophotometry based on APHA 4500-PD using Helios Zita UV/Vis Spectrophotometer (Thermo Scientific). Phosphate (mg/l) content was calculated as

$$\text{PO}_4^{3-} \text{ (mg/l)} = \frac{\text{mg PO}_4^{3-} \text{ (in approximately 104ml final volume) Sample}}{\text{volume (ml)}}$$

Nitrate - Nitrogen in Water Sample

The test method used to determine the nitrate-nitrogen content of water sample is the Brucine Colorimetric method in accordance with EPA 352.1. Nitrate-nitrogen (NO₃⁻ -N) content of water sample was calculated as follows:

$$\text{NO}_3^- \text{ (mg/l)} = (\text{mg/l NO}_3^- \text{ in sample from calibration graph}) - (\text{mg NO}_3^- \text{ in reagent blank})$$

Cations in Water Sample

Basic cations in water samples were determined using GBC Avanta Atomic Absorption Spectrophotometer (AAS). AAS measurements were carried out in accordance with the procedures described below.

Na, Mg and K: APHA 3111B (21st edition) / ASTM D3561 Ca:

APHA 3111D (21st edition) /

ASTMD3561 APHA 3111D (21st edition) / ASTMD3561

Cation contents were calculated

asfollow Cationconcentrations(mg/l) =
$$\frac{C \times Y}{X}$$

Where C = Concentration of cation determined from calibration curve (mg/l)

Y = Final volume made-up (ml)

X = Volume of sample (ml)

Metals in Soil Samples

Heavy metal contents of soil samples were determined using x-ray fluorescence spectrometer in accordance with USEPA 6200. Samples were oven dried at 110°C, unwanted material removed and samples reduced to <2µm diameter by crushing. Crushed samples were further powdered because of the in homogeneity of soil samples. The powder was processed into pressed pellets, transferred to clean prolene foil and then into a sample vial and labeled, ready for elemental analyses.

Results are calculated automatically by the software as the sample name, method, job, sample mass, sample diameter, sample type, sample state and prolene foil sizes has been computed in the software.

Heavy Metals in Water Samples

Heavy metal content of water samples was determined using GBC Avanta Atomic Absorption Spectrophotometer (AAS). AAS measurement of heavy metal content in water sample was carried out following the procedures indicated below:

Cd, Zn, Cu, Ni and Pb: APHA 3111B
 (20th edition) V: APHA 303C (15th edition)

Cr: APHA 3111C

Results were calculated as follows:

$$\text{Metal concentration (mg/l)} = \frac{C \times Y}{X}$$

Biochemical Oxygen Demand in Water

The respirometric method as described in APHA 5210D was used in water analysis based on manufacturer's instructions, reaction vessel type and volume, and instrument operating characteristics. The Biochemical Oxygen Demand (BOD) values were read from the equipment.

Chemical Oxygen Demand in Water

The titrimetric method of analysis was applied using APHA 5220D standard method.

The Chemical Oxygen Demand (COD) is calculated thus:

$$\text{COD as mg O}_2 \text{ /l} = \frac{(A - B) \times M \times 8000}{\text{Volume of sample, ml}}$$

Where: A = ml titrant used for blank
 B = ml FAS used for sample
 M = molarity of titrant, and
 8 = equivalent weight of oxygen
 1000 = conversion factor to litre

Quality Assurance

A quality assurance (QA) plan that covered all aspects of the baseline study was adopted. The plan covered sample collection, handling, laboratory analysis and data (results) management as described below:

Sample Collection/Handling

Generally, samples were collected in accordance with the recommendations contained in Federal Ministry of Environment guidelines and standards. *In-situ* measurement of unstable physico-chemical parameters e.g. pH, temperature, dissolved oxygen and turbidity was carried out to assure reliability and integrity of the results. All field instruments were

cleaned and re-calibrated after each use. Other QA measures adopted during sample collection have been discussed earlier.

Sample chain of custody forms were used for logging and tracking of samples from the point of collection in the field to the laboratory where analysis were carried out. Samples were preserved in accordance with the recommendations contained in the Federal Ministry of Environment guidelines and standards.

Laboratory Analysis

Quality Assurance (QA) measures adopted for laboratory analysis are in accordance with Federal Ministry of Environment recommendations and included collection and analysis of duplicate samples to establish analytical precision, and analysis of spiked and blank samples to determine analytical accuracy. Blank analyses were also used to establish analysis. Other QA measures adopted are:

- only adequately trained personnel were used at all phases of the study,
- written analytical standard operating procedures were followed during analysis, and
- routine auditing and checking of analysis results, including control solutions and mid-point standards were introduced into every batch or ten samples as applicable, and
- analysis for which deviation of these quality control/mid-point standards are outside 90 to 110% of expected value were repeated.

Data Management

Data management involved recording and transmitting of analytical results into standard data spreadsheets. Processing/calculation of results were done following written standard operating procedures. Final results were issued only after a general QA check and validation had been done.

Sample Handling, Tracking, Transportation

Prior to sampling and storage, an indelible label shall be attached to the containers identifying each sample. The label contained the following information:

- sample code;
- name and location of site;
- date and time of sampling;
- location of sampling;
- sample name and number;

- name of sampling personnel;
- type of sample; and
- type of preservative, if any.

All samples collected in the field were adequately labeled and recorded in the field notebook. Collected sub-samples were preserved in accordance with Diskol Environmental Consulting Limited standard work instructions.

Prior to departure from field, inventory of the samples collected were taken and sample IDs and all necessary information recorded in chain of custody forms.

Prior to departure for Diskol Environmental Consulting Limited Base from field, all samples transferred into well-protected coolers fortified with ice cubes, sealed and adequately labeled for transfer to the laboratory. Upon arrival of the samples in our laboratory, the information on the chain of custody was cross-checked to confirm appropriate and adequate recording. Physical counts of the samples were carried out. Upon confirmation of correctness of all information and deliverables, the samples were received in accordance with Diskol Environmental Consulting Limited sample procedure and stored appropriately.

The detailed sample handling procedure as contained in Diskol Environmental Consulting Limited work instruction and implemented to this field exercise is presented in the table below.

Sample Handling Protocol

Determination	Minimum Sample Vol.	Container	Preservative	Container Pre-treatment
Water				
Temp., pH, Conductivity	Measure on site. Collect 2L for check in the lab.	Plastic or glass	Cool	Rinsed with distilled water
Heavy Metals	1.0l	Plastic or glass	Add conc. HNO ₃ to pH <2	Rinsed with 1+1HNO ₃
Sulphide	2.0l	Plastic or glass	Cool, 4°C	Rinsed with distilled water
Hydrocarbon (THC, oil and grease)	1.0l 1.0l	Wide mouthed glass bottles	H ₂ SO ₄ to pH <2, & cool	Rinsed with solvent
COD	100ml	Plastic or glass	Add H ₂ SO ₄ to pH <2, & cool	-

Determination	Minimum Sample Vol.	Container	Preservative	Container Pre-treatment
Microbiology (HUF, HUB, etc)	200ml	Wide mouthed glass bottles	Cool	Sterilized
TPH	1.0l	Glass	Cool	Rinsed with solvent
Sediment / Soil				
Total hydrocarbon content	100g	Glass	Cool	Rinsed with solvent
Heavy metals	100g	Plastic	Cool	Rinsed with 1+1HNO ₃
Microbiology (HUF, HUB, etc)	50g	Plastic or glass	Cool	Sterilized

Sample Handling

Chain of custody forms were used for logging and tracking of samples from the point of collection in the field to the laboratory where analyses were carried out. Samples were preserved in accordance with FMEnv recommended procedures.

Laboratory Analyses

Quality Assurance and Quality Control (QA/QC) measures adopted for laboratory analysis were in line with standard practice and included collection and analysis of duplicate samples to establish analytical precision. Other QA/QC measures adopted include:

- only adequately trained personnel were used at all phases of the study;
- written analytical standard operating procedures were followed during analyses;
- routine auditing and checking of analyses results were carried out.

Data Management

Standard data spreadsheets were used for recording and transmitting analytical results. Presentation of results was carried out following written standard operating procedures. Final results were issued only after a general QA/QC check and validation had been carried out.

APPENDIX II

QUESTIONNAIRE/STRUCTURED INTERVIEW/FOCUS GROUP DISCUSSION FOR SOCIAL IMPACT ASSESSMENT (SIA)

1. Name of community.....
2. Language(s)spoken.....
- 3a Local GovernmentArea/State.....
- 3b Estimate the population of thecommunity.....

DEMOGRAPHIC DATA

4. Sex:.....
5. Age LastBirthday.....
6. What is yourreligion.....
7. Ethnic Group:.....
8. MaritalStatus.....
Single []
Married []
Separated []
Divorced []
Widowed []
- 8(b) If married, how many wives do you have:.....
9. Family Size (no. ofchildren) Small (1 –3)
Average (4 –6)
Large (above6)
10. What is your highest educationalqualification?
WASC/SSCE level [] Diplomallevel []
Degreelevel [] Masters/Ph.D. []
PrimarySchool [] Noneatall []
11. How many people in your householdwith:
- Secondary Education []
- Post-Secondary Education []
12. What is your occupation?.....

13 What is your average monthly income?

- Below N10,000 []
- N10,001 – 20000 []
- N20,001 – 50,000 []
- N50,001 – 80,000 []
- Above N80,000 []

14. Age Distribution/Composition of your household (including parents)

Male Female

- No. of persons 0-15 [] []
- No. of persons 16 – 24 [] []
- No. of persons 25 – 34 [] []
- No. of persons 35 – 50 [] []
- No. of persons above 51 [] []

15. In your household, how many persons are:

Male Female

- Students/Apprentice [] []
- Business/Contractor [] []
- Technicians [] []
- Farming/Fishing/Hunting [] []
- Civil Servants [] []
- Full housewives [] []
- Unemployed [] []
- Others [] []

On the average, how many persons live in a room here?

SOCIALINFRASTRUCTURE

Please complete the table on social infrastructure below:

Facility	Provided by Government	Provided by NGC	Provided by Others (specify)
Tarred Roads			
Electricity			
Portable Water			
Markets			
Primary Schools			
Secondary Schools			

Facility	Provided by Government	Provided by NGC	Provided by Others (specify)
Town Hall			
Health Centres			
Police Station			
Waste Disposal System			

ECONOMIC DATA

17. Which type of house do you live in?.....

18. Are you a tenant orLandlord?.....

19. How is land ownedhere?

By individuals [] Bycommunity []

20. How do you acquire land in thisarea?

Purchase [] Inheritance []

Lease [] Rent []

21. Which industries exist in your community that offer people jobs(FGD)

.....

22. What types of crops are grownhere?

.....

POLITICAL ORGANISATION

- 23. Who is the head of this community?(FGD).....
- 24. Describe the political structure of the community? (FGD)
.....
.....
- 25. How are disputes settled in this community?(FGD)
.....
.....

CULTURAL VALUES/LIFESTYLE

- 26. Please name the totem/animals you forbid in your communityhere
.....
.....
- 27. Name the traditional festivals you celebratehere.
.....
.....
- 28. Name the gods/deities worshipped in thecommunity.
.....
.....
- 29. List names of the shrines/traditional place of worship in thiscommunity.
.....
.....
- 30. In the past five years, has any of these shrines been moved or destroyed? Yes or No.Givereasons:
.....

SOCIAL/ENVIRONMENTAL PROBLEMS

31. Tick main environmental problems in this community

- Pollution
- Rainstorm/flooding
- Erosion
- Soil infertility
- Pest attack/invasion
- Water salinity
- Traffic congestion

32. Please list the diseases that are common in this area

.....

.....

.....

33. Which crimes occur here frequently (please list them)

.....

.....

.....

COMMUNITY CONCERNS

34. What do you think are lacking in the community that you would want provided?
(Please list them)

.....

.....

.....

HEALTH SURVEY (HIA)

A. List the names of available health institutions in your area.

.....

B. Assess the cost of goods and services in your locality
 (a) Cheap (b) Moderate (c) Expensive

LIFESTYLE/HEALTH BEHAVIOURAL CHARACTERISTICS

1. Common food types taken in the community

.....

2. Meal (24 hour recall)

	Fat	Protein	Carbohydrate	Minerals	Others
Yesterday morning					
Between Meals					
Yesterday Afternoon					
Between Meals					
Yesterday Evening					

3. During the last 4 weeks, how often have you had drinks containing alcohol?

Would you say:

- Everyday
- At least once a week
- Less than once a week
- None at all (don't take alcohol)

Units of alcohol

- 1 pint – 1 bottle of beer – 2 units
- 1 glass of wine – 1 unit
- 1 shot of brandy – 1 unit.

4. Smoking (Yes/No) If yes, how many sticks per day?.....

5. Sanitation: Any existing household regular clean-up exercise?.....howoften....
Any existing community regular clean-up exercise?... how often....
6. Useof Tobacco (Yes/No)
7. Exercises (Yes/No) (a) Type..... (b) Howoften.....
(c) Duration of walks per day.....
(d) How many hours perday/week:.....

C. COMMON HEALTH HAZARDS IN THECOMMUNITY

During the last 12 months, have you been admitted into a hospital on account of any ill health?(Yes/No)

2. If yes, for which of thefollowing:
 - * Infectious disease (list common conditions, such as malaria,RTI, Diarrhoea, TB, AIDS,etc.)
 - * Injuries/Accidents (Yes/No)
 - * Others(specify):.....
3. List all illness episodes in the last 12months:
.....
.....
4. Which of the following diseases/health conditions in your opinion poses the greatest Health threat to your community (Score 1-5) 1 = least threat; 5 = highestthreat:

	1	2	3	4	5
Malaria					
Respiratory tract infectious					
Diarrhoea disease					
Skin disease					
Injuries/accidents					
Sexually Transmitted diseases					
Others (specify)					

NB: Tick the correct box

5. How many people on the average died in your community within the last 12 months:
Adults Under 5.....less than one year.....
6. What in your opinion is the most important cause of death in thecommunity?
(a) Amongst children under oneyear.....

- (b) Amongst children under 5 years.....
- (c) Amongst adults.....
- (d) Death during childbirth:.....

E IMMUNISATION STATUS

1. Have you received any of the following vaccines?

	YES	NO
DPT		
BGG		
Oral Polio Vaccine (OPV)		
Typhoid		
Yellow fever		
Tetanus Toxoid		
Small pox		
Hepatitis Vaccine		
Others (specify)		

G. COMMUNITY HEALTH NEEDS

1. What in your opinion are the most important health needs of your community?

(Score in order of priority 1-5)

1 = least need, 5 = highest need

	1	2	3	4	5
Safe Drinking Water					
Food					
Health services/Clinics					
Electricity					
Good toilet system					
Waste disposal					
Others (specify)					

N.B: Tick the correct box

2. In order of preference, what do you think should be done to improve the health services in your community?

(i).....

(ii)

3. What health problems do you think may arise because of the central power plant projects in your community?

(i).....

- (ii)
4. In order of preference, what do you think should be done to minimize these anticipated health problems?
- (i)..... (ii).....

H. PERSONAL/HYGIENE PRACTICES

1. Source of water
- Tap
 - Well
 - River
 - Stream
 - Rainwater
2. Distance from source of water
- Within household
 - < 1km
 - 1 – 2km
 - 3 – 4km
 - > 5km
3. Nos of Baths/day/week
4. Brushing teeth Do you use
- Toothbrush
 - Chewingstick
 - Others(specify)
5. Frequency of mouthcleaning/day
6. Do you wash your hands after using the toilet
- Always
 - Sometimes
 - None
7. Type of Toilet
- Watercloset
 - Bush
 - Bucket

- River/Stream
- Publictoilet
- Others(specify)

8. Method of Refuse Disposal youpractice:

- Opendumping
- Landfill
- Bagging/dustbin
- Composting
- Incineration
- Others(specify)

I. KAP RELATING TO COMMON HEALTHCONDITION

1. Have you heard about these diseases? (Yes/No)

- Hypertension
- Diabetes
- Typhoid
- Malaria
- RespiratoryInfection
- Epilepsies
- DiarrhoeaDisease
- Sexually transmittedillness
- HIV/AIDS
- Tuberculosis
-

2. Do they occur in your community?(Yes/No)

3. What causes thisillness?

- Spiritual
- Germs/parasites
- Food/drink
- Overeating/undereating
- Bloodtransfusion
- Sexualcontacts

- Poor sanitary condition
4. Are these diseases transmissible from person to person?
(Yes/No)
5. If yes, how?
- Spiritual
 - Hugging/Kissing/sharing of plates/spoon
 - Living in the same house
 - Sexual contact
6. Are these diseases prevalence (Yes/No)
- Do you know anybody with these illnesses? Yes/No
 - Can you stay in the same house with persons with these illnesses
 - Can you share food/drinks/the same room with such persons
 - If you have these illnesses, where will you seek treatment?