ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES (SAPZ) PROGRAM, BORNO STATE, NIGERIA

Presented by:

BORNO STATE GOVERNMENT

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ACRONYMS AND ABBREVIATIONS

μSm^{-1}	Micron siemen per meter
AAS	Atomic Absorption Spectrophotometer
AfDB	African Development Bank
AIH	Agro-Industrial Hub
Al	Aluminium
Ar	Argon
ATC	Agricultural Transformation Centre
Ba	Barium
BOSG	Borno State Government
BOD	Biochemical Oxygen Demand
BADP	Borno State Agricultural Development Program
BSEPA	Borno State Environmental Protection Agency
BTS	Base Transceivers Station
Ca	Calcium
Cd	Cadmium
CEC	Cation Exchange Capacity
CFC	Chlorofluorocarbon
Cfu/g	Colony forming units per gramme
CH_4	Methane
CL^-	Chlorine ion
CLS	Core Labor Standards
Cm	Centimeters
CO	Carbon (II) Oxide
Co	Cobalt
COD	Chemical Oxygen Demand
Cond.	Conductivity
COx	Oxides of Carbon
Cr	Chromium
Cu	Copper

dB(A)	decibel (Scale A)
DCD	Development Control Department
DO	Dissolved Oxygen
DS	Dissolved Solids
E&S	Environmental and Social
EA	Environmental Audit
EAR	Environmental Audit Report
Ec	Electrical Conductivity
EIA	Environmental and Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMP	Environmental Monitoring Plan
EMS	Environmental Management Systems
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
Fe	Iron
FEPA	Federal Environmental Protection Agency
FGN	Federal Government Nigeria
FMAFS	Federal Ministry of Agriculture and Food Security
FMEnv	Federal Ministry of Environment
g	gramme
GDP	Gross Domestic Product
H_2S	Hydrogen Sulphide
HIA	Health Impact Assessment
HIV\AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
HSE	Health Safety and Environment
IFAD	International Fund for Agricultural Development
IsDB	Islamic Development Bank
ISO	International Organization for Standardization

K	Potassium
Kg	Kilogramme
KHz	Kilohertz
KPA	Kilopaschal
KVA	Kilo Volts (amp)
LGA	Local Government Area
m	Meter
m/s	Meter per second
MDAs	Ministries, Departments and Agencies
Mg/Kg	Milligram per kilogram
mg/l	Milligram per litre
MHz	Mega Hertz
ml	Millimeter
Mn	Manganese
Na	Sodium
NAFDAC	National Agency for Food and Drug Administration and Control
NBS	National Bureau of Statistics
ND	Not Detected
NGO	Non- Governmental Organization
NH_3	Ammonia
Ni	Nickel
NO	Nitrogen Oxide
NO_3^-	Nitrate ion
NOx	Oxides of Nitrogen
NPC	National Population Commission
NTU	Nephelometric Turbidity Unit
^oC	Degree celsius
OP	Operational Policies
PAD	Project Appraisal Document
PAR	Programme Appraisal Report

Pb	Lead
PCB	Polychlorobiphenyls
pH	Hydrogen Ion Concentration
PO_4^-	Phosphate ion
PPE	Personal Protective Equipment
SAPZ	Special Agro-industrial Processing Zones
SEP	Stakeholder Engagement Plan
SHE	Safety Health and Environment
SIA	Social Impact Assessment
SO_2	Sulphur Oxide
SOM	Skidmore, Owings &Merrils
SON	Standard Organisation of Nigeria
SOx	Oxides of Sulphur
SP	Suspended particle
SPM	Suspended particulate matter
STD	Sexually Transmitted Diseases
THC	Total Hydrocarbon
THC	Total Hydrocarbon Content
TOC	Total Organic Compound
ToR	Terms of Reference
TSP	Total Suspended Particles
VOC	Volatile Organic Compound
WHO	World Health Organization
Zn	Zinc

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EXECUTIVE SUMMARY

ES.1 Background Information

The Federal Government of Nigeria (FGN) requested for the support of the African Development Bank (AfDB) to finance the Special Agro-Industrial Processing Zones (SAPZ) in Nigeria. The SAPZs are integrated development initiatives designed to concentrate agro-processing activities within areas of high agricultural potential to boost productivity, integrate production, processing and marketing of selected commodities. These zones will enable agricultural producers, processors, aggregators and distributors to operate in the same vicinity to reduce transaction costs and share business development services for increased productivity and competitiveness. By bringing adequate infrastructure (energy, water, roads, ICT, skilled personnel etc.) to rural areas of high agricultural potential, SAPZs will attract investments from private agro-industrialists / entrepreneurs to contribute to the economic and social development of rural areas and bridge the gross employment demand in the country.

The SAPZs aim to develop competitive processing capacity by promoting private sector investment, enabled by investment in public goods, policy interventions and the provision of desirable support services and skills development. The Federal Government and host State Governments will facilitate the backbone infrastructure leading to the SAPZ. Simultaneously, the operator of the SAPZ will provide and manage infrastructure within the zone to attract a wide range of private sector investors' investments in agricultural production, processing, and the entire ecosystem from farm inputs to ancillary industries. It is expected that SAPZs will help reduce food imports, assure food security and nutrition, boost competitiveness and revenue from agricultural exports, create wealth for rural farming communities, create new sustainable jobs, especially for the youth and, reduce restlessness and crime, boost rural livelihoods and reduce rural-urban drift.

The SAPZs will be developed for immediate impact, primarily around existing or already programmed projects with outstanding catalytic potential and areas with existing desirable infrastructure. They will also be made to take maximum

advantage of the FGN and the States' relevant ongoing development programs. A Governing Committee of Ministers will coordinate the development of SAPZs to support and ensure the enabling environment for SAPZ development and forge strategic investment-driven partnerships with the private sector. The State Governments in host States will promote private sector investment and general inclusivity, including the youth's engagement in all SAPZ activities.

Engineering Seven Integrated Konsult Ltd was appointed as an Consultant to conduct an Environmental and Social Impact Assessment (ESIA) in accordance with the Nigerian Environmental Impact Assessment Act No 86 of 1992 amended as EIA Act CAP E12 Law of the Federal Republic of Nigeria (LFN) 2004, in compliance with Terms of Reference (ToR), in compliance with the African Development Bank (AfDB), SAPZ's Environmental and Social Management Framework (ESMF), and the National Legislation. This process aims to identify the environmental and social impacts arising from project activities during the construction and operation phases, determine mitigation measures via Environmental and Social Management Plan (ESMP) to prevent or minimize potential impacts and risks, create a Stakeholder Engagement Plan (SEP) to ensure effective stakeholder participation in the process, and prepare Environmental and Social (E&S) management plans for guiding contractors' environmental and social performance during the project's construction period. The ESIA covers the entire life cycle of the proposed Project i.e. pre-construction, construction, commissioning, operation and decommissioning and it shall be carried out in line with the relevant requirements of the Federal Ministry of Environment (FMEnv).

ES.2 The Proposed Project

The Special Agro-Industrial Processing Zones (SAPZ) program is a flagship African Development Bank initiative. The zones bring together the production, processing, storage, transport, and marketing of commodities. The program has four broad components:

1. support for the development of enabling climate-adapted infrastructure for agro-industrial hubs;

2. improving agricultural productivity and enterprise development to enhance value chains and job creation in the SAPZ catchment areas;
3. supporting agro-industrial zone policy and institutional development,
4. program coordination and management.

ES.3 Project Location

The proposed ATC site is located at Njimtilo village along Kano-Maiduguri road, in Konduga LGA of Borno State with coordinates; longitude 11°51′03′′N, Latitude 12°59′46′′E, and elevation 1,102ft above the sea level. The proposed project site is a settlement bordering Maiduguri, the Borno State capital, and it is also Borno state Industrial park established by former governor and the current vice president of Nigeria Shettima, where network of metal and food processing industries are located, including the housing estates, Borno State University and Auno settlement that was designed to eventually expand to link up with Maiduguri. The Borno Industrial park where the AIH is been proposed sits on 200ha, and over 100ha is been allocated for the AIH project. Table below highlights the proposed ATCs locations with coordinates. The proposed ATC centers are identified and based on the availability connectivity in the identified locations.

Proposed ATCs locations

S/N	Community	LGA	Coordinates
1.	Baga community	Kukawa LGA	Longitude 13°06′22′′N Latitude 13°48′55′′E
2.	Ngaranam community	Mafa LGA	longitude 11°54′46′′N Latitude 13°35′05′′E
3.	Amarwa community	Konduga LGA	Longitude 11°39′10′′N Latitude 13°24′42′′E
4.	Briyel community	Bayo LGA	longitude 10°20′02′′N Latitude 11°35′23′′E

Source: Field work, 2024

ES.4 ESIA Objectives

The key objectives of this ESIA study are to generate environment and social baseline information within the study environment and affected communities before the implementation of this project implementation. In line with statutory requirements for environmental protection in Nigeria. Also to assess the potential environmental and social impacts of the proposed works as described in the scope of work and prepare an Environmental and Social Impact Assessment (ESIA) that will include detailed Environmental and Social Management Plans (ESMP) along all value chains.

ES.5 ESIA Scope of Work

The scope of study includes:

- Review existing ESMF prepared for SAPZ and incorporate AfDB requirements into the operationalization of the ESIA final report and ESMP developed;
- Review Environmental Safeguards instruments of the World Bank Safeguards policies triggered by the project;
- Describe the proposed project by providing a synthetic description of the project relevant components and presenting plans, maps, figures and tables;
- 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;
- 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;

- Development of best conceivable plans for restoring the environment after decommissioning of the proposed project
- EIA reporting following Federal Ministry of Environment (FMEnv) guidelines and procedures as well as public disclosure.

ES.6 Approaches and Methodology

A multidisciplinary approach was employed in order to holistically address all pertinent aspects of the proposed project on the bio-physical and socio-economic environment. Accordingly, the bio-physical and socio-economic environment of the proposed project was characterized and assessed using a number of survey instruments, field studies including broad-based community consultations to determine the likely environmental and social impacts of the proposed project and thereafter formulated specific, measurable, achievable, relevant and time-based mitigation measures (SMART).

ES.7 Administrative and Legal Framework

The EIA study was carried out in accordance to FMEnv's relevant policies, laws, regulations and guidelines particularly the EIA Procedural Guidelines. The applicable legal and administrative framework, including the relevant international standards and guidelines to the Project and the EIA study, includes, amongst others:

- National Policy on the Environment, 1989
- Environmental Impact Assessment (EIA) Act. Cap E12, LFN 2004.
- The Nigerian Urban and Regional Planning Act Cap N138, LFN 2004
- National Environmental Standards and Regulations Enforcement Agency (NESREA) Act, No. 25, 2007
- Land Use Act, Cap 202, LFN 2004
- National Environmental Protection (Effluent Limitations) Regulations (S.1.8) 1991;
- National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) (S.1.9) 2004;

- National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations (S.1.15) 1991;
- Guidelines and Standards for Environmental Pollution Control in Nigeria 1991;
- Sectoral Guidelines for EIA 1995
- Harmful Wastes (Criminal Provisions) Act No. 42, 1988;
- Environmental Impact Assessment Procedural Guidelines 2011;
- National Guidelines and Standards for Water Quality 1999
- National Guidelines on Environmental Management Systems (EMS) 1999
- National Guidelines on Environmental Audit in Nigeria 1999.
- Borno State Ministry of Environment
- Borno State Environmental Protection Agency 1997
- Standards Organization of Nigeria (SON) Act CAP 412 LFN 1990
- Nigeria Export Processing Zones Act (CAP N107 LFN 2004)
- Nigerian Investment Promotion Commission (NIPC) Act, 1995
- UN Framework Convention on Climate Change, 1992
- African Convention on the Conservation of Nature and Natural Resources
- WHO Health and Safety Component of EIA, 1982
- WHO Health for All Strategy and Policy, 1978
- SAPZ's Policy on Safety Health and Environment
- World Health Organisation (WHO) Health and Safety Component of EIA (1987)
- International Union for Conservation of Nature and Natural Resources;
- Basel Convention on the Control of Trans-Boundary Movements of Hazardous wastes and their Disposal
- Convention concerning the protection of the World Cultural and National Heritage Sites (World Heritage Convention)
- The Rio Declaration on Environment and Development
- United Nations Guiding Principles on the Human Environment

International Standards

The international safeguard polices to be applied here are Operational Policies (OP) of the World Bank. These policies contain the statements of the World Bank

regarding the manner of implementation of development projects being financed by it and demonstrates its commitment to the eradication/reduction of poverty and promotion of social equality in the world.

ES.8 Project Justification, Alternatives and Benefits

Needs for the Project

Nigeria is the most populous country on the African continent with over 223,000,000 million people, and a population growth estimated at 2.41% per year. Like other middle-income countries, Nigeria faces significant and persistent poverty and inequality. Major factors contributing to rural poverty include low agricultural production and productivity, limited opportunities for value-addition, challenges of marketing capacity, poor yields in quality and quantity, and significant deficits in support systems such as infrastructure, access to productivity-enhancing inputs, financial backing, commercial orientation, and effective policies, as well as environmental degradation and the effects of climate change.

With the launch of the Special Agro-industrial Processing Zone (SAPZ) programme, Nigeria can, in less than a decade, banish food insecurity, while radically improving export earnings from agriculture, creating millions of lucrative agro-industrial jobs and opportunities for its citizens. The SAPZ is the flagship for Nigeria's agriculture, which entails the development and operation of agro-industrial processing clusters in areas of high food production across the country, to engender the competitiveness in agro-industrial production and processing that is critical to further unlock the potentials of Nigeria's agriculture, to improve food and nutrition security, to reduce post-harvest losses, create jobs for women and youth, as well as create wealth for the rural community.

ES.9 Value of the Project

The African Development Bank (AfDB), with support from other development partners, has launched $520 million Special Agro-Industrial Processing Zones (SAPZs) in Nigeria with seven States as pioneer beneficiaries. The African Development Bank is providing $210 million for the development of the SAPZs in

Nigeria, in partnership with the Islamic Development Bank (IsDB) which is co-financing with $150 million, and with the International Fund for Agricultural Development (IFAD), which is co-financing with $160 million.

ES.10 Envisaged Project Sustainability

This proposed development project shall be sustained in broad and diverse ways. There will be harmonization and balance between this project and social, environmental, socio-economy of the project area of Borno State, and the entire country. Borno State Government intends to achieve the project sustainability by ensuring that the project environment is not abused; that the project meets viability content of the feasibility earlier carried out; that the project is integrative in the sense that social harmony will be enhanced among Nigerian occupants of the project; that technically, the project shall be executed using the best available technology in urban development, with regards to professionals, materials, construction, equipment, finishing, etc.

ES.11 Project Options and Alternatives

Project options and alternatives were well analyzed by the project proponent and her arrays of consultants and investors; haven decided to go ahead with the project option, a number of alternatives were also analyzed; alternative site/location, technology, waste management, materials, design and implementation schedule. In the end time tested technology, waste management, materials based on experience and quality were chosen. Since the site have been provided without encumbrances from governments at all levels and the community, no further alternative decision than to proceed with the project was acceptable by the proponent.

ES.12 Project Description

Component 1- Infrastructure Development and Management for Agro-Industrial Hubs

The SAPZ program will comprise an Agro-Industrial Hub (AIH) and a number of Agricultural Transformation Centres (ATCs), strategically located within the

production area to serve as aggregation points to accumulate products from the community to supply the Agro-Industrial Hub for further value addition or send to centres of great demand for distribution and retail to consumers. During this Phase, the FGN and AfDB will support the set-up of the AIHs. Support for this component is AfDB- led and fully developed in the AfDB's Programme Appraisal Report (PAR).

Component 2- Agricultural Productivity, Production, Market Linkages and Value Addition in SAPZ Catchment Areas

Under this component, SAPZ's objective is threefold: (i) support smallholder farmers and small operators to increase their productivity/production and capacity to add value to raw materials on a profitable and environmentally sustainable basis; and (ii) link them to the additional market outlets offered by the AIHs, off-takers supplying the local and national market who operate in the target area, and small processors/traders supplying the local markets, including primary processors operating in the ATCs; iii) enhance the resilience and adaptive capacity of smallholder farmers to climate change. Activities under component 2 will be organized around three sub-components: (2.1) Agricultural market linkages and value addition; (2.2) Smallholder productivity/production enhancement; and (2.3) Access to finance and financial inclusion, including access to green agricultural investments facilitated through Inclusive Green Financing initiative (IGREENFIN) to support farmers in adopting and implementing climate change adaptation and mitigation best practices and solutions.

Component 3- Policy and Institutional Development Support

The objective of component 3 is to support the development of enabling policies, legislation, and regulation for SAPZs in Nigeria to create conducive business environment for private sector investment and to address inefficiencies and market failures in agricultural value chains. AfDB will support the development of enabling policies and regulatory framework for Agro-Industrial Zones. Through support for the setup of Commodity Alliance Forums, IFAD will focus on: i) facilitating local policy dialogue and influencing local investments for inclusive and conducive

market linkages; ii) strengthening quality control, grading and standardization systems; and iii) supporting the establishment and strengthening of community conflict management mechanisms for sustainable investments.

Component 4 - Programme Coordination and Management

This component will ensure that the programme is efficiently and effectively managed to achieve expected results.

ES.13 Baseline Data of the Study Area

Site visits were carried out from 29th to 30th May 2024, to collect primary data relevant to the site assessment and for the generation of baseline information used in assessing potential impacts. During the site visit, site assessment was carried out (strengthened by secondary data gotten from desk studies), samples for environmental assessment were collected, socio-economic data was collected through administration of questionnaires and conduction of semi-formal interviews, and stakeholder meetings were held.

The sampling strategy for this study was based on the report of site verification exercise by FMEnv dated 29th May, 2024; fourteen (14) sample locations and one (1) control were measured for air quality and noise level and soils, one (1) sample was taken for groundwater. Data gathering took place between 27th and 28th May, 2024. Both primary and secondary data resources were relied upon for the report. The primary data were those sourced during field exercise: sampling for in-situ and ex-situ analysis, consultation, interviews and questionnaire administration; secondary data and information were sourced through desktop, National Bureau of Statistics (NBS), World Health Organisation (WHO), National Population Commission (NPC), Borno State government websites.

The baseline characteristics of the project environment were determined from site reconnaissance and site visits. In-situ measurements were done with portable, handheld, calibrated equipment and tools; ex-situ measurements were done at Abuja Environmental Protection Board (AEPB) Laboratory, Abuja. Socio-economic

data were sourced by direct interview, questionnaire distribution, consultation with community members and stakeholders.

Weather and Meteorology

Borno state falls within the Guinea Savannah vegetation zone with distinct dry and wet seasons. The area experiences a tropical savanna climate which is strongly influenced by the tropical maritime air mass and the tropical continental air mass like in most part of West Africa. The tropical maritime air mass which originates from the southern high pressure belt is humid in nature and is attended with on-shore south-western winds. The tropical continental air mass on the other hand is dry and accompanied by north-east trade winds.

The annual rainfall of Borno state has an average of between 787.53mm and 112.21mm across the state. Rainfall is a climatic resource in the state, which aids agricultural production. The rainy season occurs between mid-May and mid-September of the year, while the dry season occurs for a period of seven months. The temperature of Borno state has an annual variation between 650F and 1040F. The cloud of Borno state is clearer around November to March of the succeeding month, while the state is usually cloudy between March and November at 68% annually. There is a relatively high humidity between seven months, April and November of every year, with high winds from November to July.

Air and Noise Quality

Fifteen (15) different locations including control were considered for measured of air quality, both within and outside the proposed AIH project site. Measurements were conducted on the 27th May 2024, which is for dry season. Ambient noise level measurements were also carried out. These measurements were done in situ using Extech Digital Sound Level Meter at fifteen points including control. Particulates in sizes of P.M2.5 and P.M10 were detected in all the locations measured. Measured concentrations of both PM2.5 and PM10 were within withing the FMEnv limit of 250ppm at all the points measured.

Geology of the Area

Borno state sits on the Bornu Basin which is the Nigerian section of the Chad Basin, a sedimentary formation believed to have been formed during the Cretaceous era while the Chad Basin is believed to have been formed during the late Aptian (between 125 – 113 million years ago) and Albian (113 – 100 million years) period. Borno state it is characterized by rugged terrain provided by the Mandara (Pulka-Gwoza-Chibok) mountains and the Biu plateau. The geology of southern Borno is typified by vast occurrence of Precambrian Basement Complex rocks in its eastern region, whereas the western flank of the area is underlain by the Tertiary-Quaternary basaltic rock of the Biu Plateau. Sedimentary rock of Albian-Tertiary age underlies the extreme western region and locally associated with volcanic intrusions.

Soil Study

There are two different types of soil namely the clay and sandy soil found in northern and southern part of the local government. There is also lateritic soil and alluvial soil which is mainly found along the coast of Yadzaram River and streams. The clay is suitable for cultivation of crops like guinea corn, beans, groundnuts and even cotton while the sandy loam soil, on the other hand is more suitable for the cultivation of tree crops such as orange, mango, guava and various types of vegetables. The predominant soils textures are sandy loam to silty clay and are observed in some areas along the corridor. The land use is arable farming (under the bush fallow/rotation system) and crops grown include maize, guinea corn, millet, groundnut and beans.

Groundwater study

There was no surface water between 1km of the project site. Ground water sample was collected from a borehole in Njimtilo which is closest to the proposed AIH project site. These samples were collected using 750ml plastic bottles, labeled appropriately, preserved in ice pack and transported to AEPB Laboratory in Abuja for laboratory analysis.

Vegetation

The vegetation cover of the study area is typical of Sudan savannah, comprising of shrubs, grassland and trees, the vegetation cover is floristically diverse, with few tree species and short shrubs.

ES.14 Socio-Economic Environment

The Proposed Njimtilo-AIH Project is situated in Konduga Local Government Area of Borno State. The people of the communities under study (Njimitilo, Baga, Briyel, Mafa and Konduga) are homogenous in their origin, culture and religion. Maiduguri is the state capital. Borno State has an area of 57,798.2 square kilometres. It lies roughly at latitude 11°30' North and longitude 13°00' East. Its population is 4,171,104 (2006 census) being 2,163,358 males and 2,007,746 females. Its 2022 population projection is put at 6,111,500 at an annual growth rate of 2.4%. The state accounts for 2.9% of Nigeria's total population.

ES.15 Community Consultations/Stakeholder Engagement

The consultations served to provide stakeholders with information about the Project and to gather information important to the ESIA. Stakeholder engagement is an ongoing process of sharing project information, understanding stakeholder concerns, and building relationships based on collaboration. Stakeholder engagement is an all-inclusive, interactive, systematic and continuous process, spanning the entire life cycle of a project, in which stakeholders are engaged as active partners in establishing the priorities and focus of a project, and not treated merely as the passive recipients of the project when completed.

Information disclosure and consultation will be carried out throughout the preparation period, construction period and operation period of the project, by laying primary focus on the requirements (inclusiveness) of directly affected and vulnerable groups, such as the elderly, women, physical challenged, etc. The list of categories of stakeholders consulted are the Federal Ministry of Environment, Borno State Ministry of Environment, Borno State Ministry of Agriculture.

The following were also identified as stakeholders consulted

- The paramount traditional Ruler in the identified Communities.
- The Council of Chiefs in the Communities.
- The Women Leader.
- The Representatives of the Youths.
- The Representative of the farmers.
- All the Project Affect People within the SAPZ project.
- The Honourable Councillor representing the political wards within the host communities
- The Representative of the host Local Government Areas

ES.16 Potential and Associated Impacts of the Project

Positive Project Impacts

- Provision of accommodation
- Increase in Income from Transportation
- Increase in Income from Employment
- Project Supporting Income Generating Service Activities
- Increased Trading of Local and National Materials
- Skills Acquisition and Training for Workers from Local Communities

Negative Impacts

➢ ***Influx Related Impacts***

- Increase in price of goods and services mostly during construction
- Changes in social and cultural structure/situation
- Increase in social pathologies (crime, prostitution and others)
- Interference with archaeological and cultural resources

➢ ***Surface Water***

Surface water contamination will arise from a number of sources including the following:

- Wash down of equipment during construction and operations

- Run off from the site during site preparation and construction
- Sanitary waste discharges from construction camp
- Oil leaks from machinery and vehicles

➢ ***Groundwater***

Groundwater resources within the project area support the fresh water habitats in the area and are a source of drinking water. Identified sources of contamination include wash-down from equipment during site preparation and construction.

➢ ***Noise and Air Pollution***

There will be increased noise and air pollution during general site preparation and construction activities such as movement of workers and materials, operation of combustion engines and various work site machinery.

➢ ***Solid and Liquid Wastes***

Pre-operations activities will lead to generation of solid and liquid wastes, which have the potential to exacerbate the existing poor waste management condition in most of the project areas. Excavated materials also need to be handled properly to avoid environmental pollution.

➢ ***Heavy Plant Operations***

Adverse impacts associated with plant operations include: Increased air emissions, increased ambient noise and Increased effluent discharge into the water bodies

Public and Community Health

Public and community health impacts of the project are mostly pollution- related such as air emissions and noise, and those associated with influx.

Influx related impacts of concern are traffic, psychosocial factors, accidents spills and fires.

➢ ***Occupational Health***

A number of potential and associated occupational health impacts were also identified. These include: Over-exertion, Slips and Falls, Working at Heights, Struck by Objects, Moving Machinery, Confined Spaces, Excavations, chemicals

and dust.

- ***Cumulative Impacts***

  Cumulative impacts of concern are those associated with air emissions, ambient noise, and effluent discharge.

ES.17 Mitigation Measures

Mitigation for Influx Related Impacts

- Employ casual, unskilled labour primarily from local communities;
- Give priority consideration to qualified local communities for hiring of workers;

Mitigation for Transportation Impacts

- Ensure that as much as possible, all heavy duty trucks working on the project move at off peak hours;
- Implement a Journey Hazard Management Plan for both road and water transportation associated with the project;

Mitigation for Impacts on Surface Water

- Store oil and grease and other chemicals in leak proof containers within an effective contained area;
- Construct drainage lines where necessary on the site;
- Ensure that runoff from the site is channeled through sediment/ silt traps before discharge into nearby water bodies;

Mitigation for Physical and Economic Displacement

- Notify potentially affected persons of project activity and affected routes;
- Implement livelihood compensation and enhancement programme for any project affected persons (PAP). The program shall also include a grievance mechanism.
- Integrate the people on the project

Mitigation for Vibration and Noise Impacts

- Adopt noise attenuation measures such as installation of acoustic mufflers on large engines and equipment;
- Provide sound-insulated control rooms with noise levels below 60 dBA;
- Provide hearing protection to all workers on site; and

Mitigation for Air Emission Impacts

- As much as possible ensure the use of modern equipment that minimize emission of air pollutants; service equipment regularly.
- Ensure that excavation, handling and transport of erodible materials shall be avoided under high wind conditions;
- Where possible, ensure that soil stockpiles shall be sheltered from the wind;

Mitigation for Solid Waste Impacts

- Pursue a waste minimization and utilization strategy;
- Engage government approved and reputable waste management firms in waste handling and disposal;

Mitigation for Liquid Wastes and Discharge impacts

- Ensure sewage generated at the temporary construction camps are collected in a closed system comprising a conservancy tank to separate solid materials from liquid wastes. The liquids would then be piped to a holding tank;
- Ensure that the Contractor(s) on site engage the service of a certified third- party waste disposal contractor to collect waste from the tanks on a regular basis and treat the sanitary waste offsite;

Mitigation for Health Impacts of Sanitary and Solid Waste

- Implement a Contractors Sanitation Plan for the project;
- Require its contractors to provide HSE induction training to all workers engaged on the project.

Mitigation for Communicable and Non-Communicable Diseases impacts

- Conduct periodic health awareness campaigns for STDs especially AIDS, and support safe sex initiatives;
- Provide adequate medical facilities for all construction workers.

Mitigation for Psychosocial Impacts

- Inculcate induction training into employment programme to intimate new intake with the culture and religious belief of the people;
- Maintain and implement a Drug and Alcohol Policy for all aspects of the project,
- Support anti-drug crusades and campaigns in the area;

Mitigation for Occupational Health Impacts

- Requires that all its Contractors develop and implement HSE Plans for their activities;
- Review all contractor HSE plans prior to contract award;
- Ensure all contractors staff are trained on basic safety procedures and emergency response procedures and environmental issues;
- Require that contractors maintain emergency and first aid facilities at strategic locations throughout the project area;

Mitigation for Moving Machinery impacts

Project managers shall require that contractors implement the following prevention and protection measures for all work areas with exposure to hazards of moving ***machinery:***

- Plan segregate location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes;
- Establish and enforce speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic;
- Ensure moving equipment is outfitted with audible back-up alarms;

ES.18 Environmental Management Plan (EMP)

The goal of this EMP is to ensure full compliance with project's HSE Policy and with mitigation and other commitments made in the ESIA. It outlines the actions necessary to attain this goal, and describes the means, time frames, and designation of responsibility required for compliance and conformance. The project managers shall execute the comprehensive EMP to achieve health, safety, and environmental (HSE) regulatory compliance objectives, institutional responsibilities and other related commitments for the proposed activities.

Estimated cost for the required ESMP actions

Generally, this ESMP provides a roadmap for implementation of enhancement and mitigation measures of the impacts identified by this ESIA. It comprises of the expected effectiveness of the proposed mitigations measures, the frequency of which they are to be applied, the responsible parties involved, and the minimum estimated cost for the required actions as presented in chapter seven. The estimated cost summary for the ESMP implementation are as follows:

1. Environmental and Social Management Plan for the proposed HUB Project ₦73,000,000.00
2. Environmental and Social Management Plan for the proposed ATC Projects ₦48,000,000.00
3. Proposed Training Program for the Implementation of ESMP ₦19,000,000.00

ES.19 Decommissioning Plan

Before decommissioning, project managers shall develop plans that include the following:

- Identification of components of the project that shall be removed;
- The choice of environmentally sound methods for removal, re-use, recycling or disposal of special wastes that may arise from the decommissioning process;
- Expressly outline the time frame/schedule for the decommissioning and post-decommissioning process, and communicate the same to BSEPA and other

relevant regulatory agencies as well as the affected or concerned persons and groups;

ES.20 Conclusions and Recommendations

Based on the assessments, the Borno SAPZ Project is predicted to have economic and social positive impacts at the site preparation, site development, and operational stages which include job creation, improvement of local economy, profitable use of land and land resources, capacity building, communal participation, capacity building, increased infrastructure development, reduced loss of farm yield, increase in revenue generation, attraction of FDIs, contribution to FOREX, increased urbanisation, CSR to host community, improvement in food security, and improvement of state's brand. Recommendations to enhance these positive impacts are contained in the report.

On the other hand, the negative impacts predicted by the assessment are mostly environmental and social. They include impacts on the ecosystem, pollution, waste generation, increase in storm water run-off, predisposition of soil to erosion, risk of accidents, noise generation, traffic generation, increased pressure on community infrastructure, increased risk of diseases, occupational/industrial hazards to workers, increased water demand, increased power demand, increased risk of gender based violence and harassment, increased risk of crime and juvenile delinquency, threat to community culture, and risk of child labour. Mitigation measures to mitigate these negative impacts are proposed in the report.

The ESIA also proposes the following recommendations:

1. The establishment of adequate institutional capacity, including the recruitment and training of a competent Environmental Control Officer, to ensure compliance with the proposed ESMP as well as the daily operations during the site preparation and development stages of the Processing Hub and to form part of the Hub Management during the operation stage.
2. The conduction of Livelihood Restoration Plan for Ngaranam ATC site in Mafa LGA

3. The requirement of all other farm holdings and industries that shall operate within the SAPZ to present site-specific EIA reports in accordance with national legislations.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

The Federal Government alongside the African Development Bank (AfDB), the Islamic Development Bank (IsDB) and the International Fund for Agricultural Development (IFAD) has launched the Special Agro-industrial Processing Zones (SAPZ) initiative for Nigeria. The SAPZ launch is focused on reinforcing Nigeria's commitment to significantly reform its agricultural sector, create jobs, attain food security, and generate economic revenue. The Program development objective is to support inclusive and sustainable agro-industrial development in Nigeria. The Program has four broad components namely:(i) Support the development of enabling climate adapted infrastructure for Agro-Industrial Hubs (AIHs), (ii) Improve agricultural productivity and enterprise development to enhance agricultural value chains and job creation in the SAPZ Catchment Areas, (iii) Support Agro-Industrial Zone Policy and Institutional Development, and (iv) Program Coordination and Management.

The key expected outputs of the SAPZ Program are: development infrastructure for Agro-Industrial Processing Hubs (AIHs), Agricultural Transformation Centers (ATCs), irrigated lands and farm to market access roads; supply of certified agricultural inputs and extension services; skills development for farmers and Micro, Small and Medium Scale Enterprises (MSMEs).

In compliance with the Environmental Impact Assessment (EIA) Act Cap E12 LFN 2004, the World Banks Operational Policy 4.01: Environmental Assessment (1999), revised April 2012) among others, an Environmental and Social Impact Assessment (ESIA) study becomes an obligation for the approval of the proposed Special Agro-Industrial Processing Zones project. In view of the above, Borno State Government (BOSG) engaged Engineering Seven Integrated Konsult Ltd - an Environmental consulting company duly registered and accredited by the Federal Ministry of

Environment (FMEnv) to carry out an Environmental and Social Impact Assessment (ESIA) for the proposed special Agro-Industrial Processing Zones, Borno State.

1.2 Project Components

The SAPZ has four components as captured by the Project Appraisal Document (PAD) and the Environmental & Social Management Framework (ESMF). The project components and key activities under each of them are:

Component 1- Infrastructure Development and Management for Agro-Industrial Hubs

The SAPZ program will comprise an Agro-Industrial Hub (AIH) and a number of Agricultural Transformation Centres (ATCs), strategically located within the production area to serve as aggregation points to accumulate products from the community to supply the Agro-Industrial Hub for further value addition or send to centres of great demand for distribution and retail to consumers. During this Phase, the FGN and AfDB will support the set-up of the AIHs. Support for this component is AfDB- led and fully developed in the AfDB's Programme Appraisal Report (PAR).

Component 2- Agricultural Productivity, Production, Market Linkages and Value Addition in SAPZ Catchment Areas

Under this component, SAPZ's objective is threefold: (i) support smallholder farmers and small operators to increase their productivity/production and capacity to add value to raw materials on a profitable and environmentally sustainable basis; and (ii) link them to the additional market outlets offered by the AIHs, off-takers supplying the local and national market who operate in the target area, and small processors/traders supplying the local markets, including primary processors operating in the ATCs; iii) enhance the resilience and adaptive capacity of smallholder farmers to climate change. Activities under component 2 will be organized around three sub-components: (2.1) Agricultural market linkages and value addition; (2.2) Smallholder productivity/production enhancement; and (2.3) Access to finance and financial inclusion, including access to green agricultural investments facilitated through Inclusive Green Financing initiative (IGREENFIN) to

support farmers in adopting and implementing climate change adaptation and mitigation best practices and solutions.

Component 3- Policy and Institutional Development Support

The objective of component 3 is to support the development of enabling policies, legislation, and regulation for SAPZs in Nigeria to create conducive business environment for private sector investment and to address inefficiencies and market failures in agricultural value chains. AfDB will support the development of enabling policies and regulatory framework for Agro-Industrial Zones.

Component 4 - Programme Coordination and Management

This component will ensure that the programme is efficiently and effectively managed to achieve expected results.

1.3 The Proponent

Borno State Government is the proponent of the proposed Special Agro-Industrial Processing Zones Program.

1.4 Geographic Location and Description of Borno State

The project site is located in Njimtilo community in Konduga LGA of Borno State. The State has an area of 61, 435sq km shares borders with Republic of Niger to the north, Republic of Chad to the northeast and Cameroon Republic to the east. It also shares borders with Adamawa State to the south, Gombe State to the southwest and Yobe State to the West. Borno State was created out of the defunct North Eastern Nigeria in 1976 and it is divided into twenty-seven (27) local government areas which include Abadan, Askira-Uba, Bama, Bayo, Biu, Chibok, Damboa, Dikwa, Gubio, Guzamala, Gwoza, Hawul, Jere, Kaga, Kala/Balge, Kukawa, Konduga, Kwaya-Kusar, Mafa, Maiduguri, Magumeri, Marte, Mobbar, Monguno, Ngala, Nganzai and Shani.

The proposed Agro-Industrial Hub (AIH) site is located at Njimtilo village along Kano-Maiduguri road, in Konduga LGA of Borno State with coordinates; longitude 11°51′03′′N, Latitude 12°59′46′′E, and elevation 1,102ft above the sea level. The proposed project site is a settlement bordering Maiduguri, the Borno State capital, and it

is also Borno state Industrial park established by former governor and the current Vice President of Nigeria His Excellency Kashim Shettima, where network of metal and food processing industries are located, including the housing estates, Borno State University and Auno settlement that was designed to eventually expand to link up with Maiduguri. The Borno Industrial park where the AIH is been proposed sits on 200ha, and over 100ha is been allocated for the AIH project.

There facilities within the Industrial site: Brimarg Global Services on the west; Jitech/Energy Solution East; and other food processing Industries on the south, across the Maiduguri-Kano highway. While outside the Industrial site a farm called Inuwa farm is located on the East at 300m, on the south across the highway is Borno State University Maiduguri at 250m.

The proposed ATCs centers are distributed in four (4) Local Government Areas of Borno State as highlighted in Table 1.1 below.

Table 1.1: Proposed ATCs location

S/N	Community	LGA	Coordinates
1.	Baga community	Kukawa LGA	Longitude 13°06′22′′N Latitude 13°48′55′′E
2.	Ngaranam community	Mafa LGA	longitude 11°54′46′′N Latitude 13°35′05′′E
3.	Amarwa community	Konduga LGA	Longitude 11°39′10′′N Latitude 13°24′42′′E
4.	Briyel community	Bayo LGA	longitude 10°20′02′′N Latitude 11°35′23′′E

Source: Field work, 2024

Kukawa Local Government Area

Kukawa (previously Kuka) is a town and Local government area in the northeastern Nigeria Borno state, close to Lake Chad. It is one of the sixteen LGAs that constitute the Borno Emirate. Kukawa is known for large scale production of beans, millet, and maize and water melon. Farming in Kukawa is all year round. People farm on the shores of the Lake Chad regardless of whether it is raining season or not. Kukawa LGA boarders Lake Chad, Lake Chad is an important wetland in the semi-arid Sahel corridor. It provides the basis of many thousands of

livelihoods which depend on its seasonal fluctuations to renew fish stocks, farmland and rangeland.

Mafa Local Government Area

Mafa is a local government area of Borno state, Nigeria. It has its headquarters in the town of Mafa. It has a total landscape area of 2,869 km^2, The weather throughout the year fluctuates greatly, with the dry season being oppressively hot and humid and the wet season being hot and partially cloudy. It has a total population of 103,518 at the 2006 census. Districts & villages under Mafa LGA, Abbari, Anadua, Gawa, Koshebe, Laje, Limanti, Loskuri, Ma'afa, Mafa, Masu, Mujigine, Tamsu Ngamdua, Anadua, Kajari, Loslari, Mafa-Nguranna, Mafa Abbari, Mbuta, Mijigine, Siguabuya, Umarari, Zannari. It is one of the sixteen LGAs that constitute the Borno Emirate.

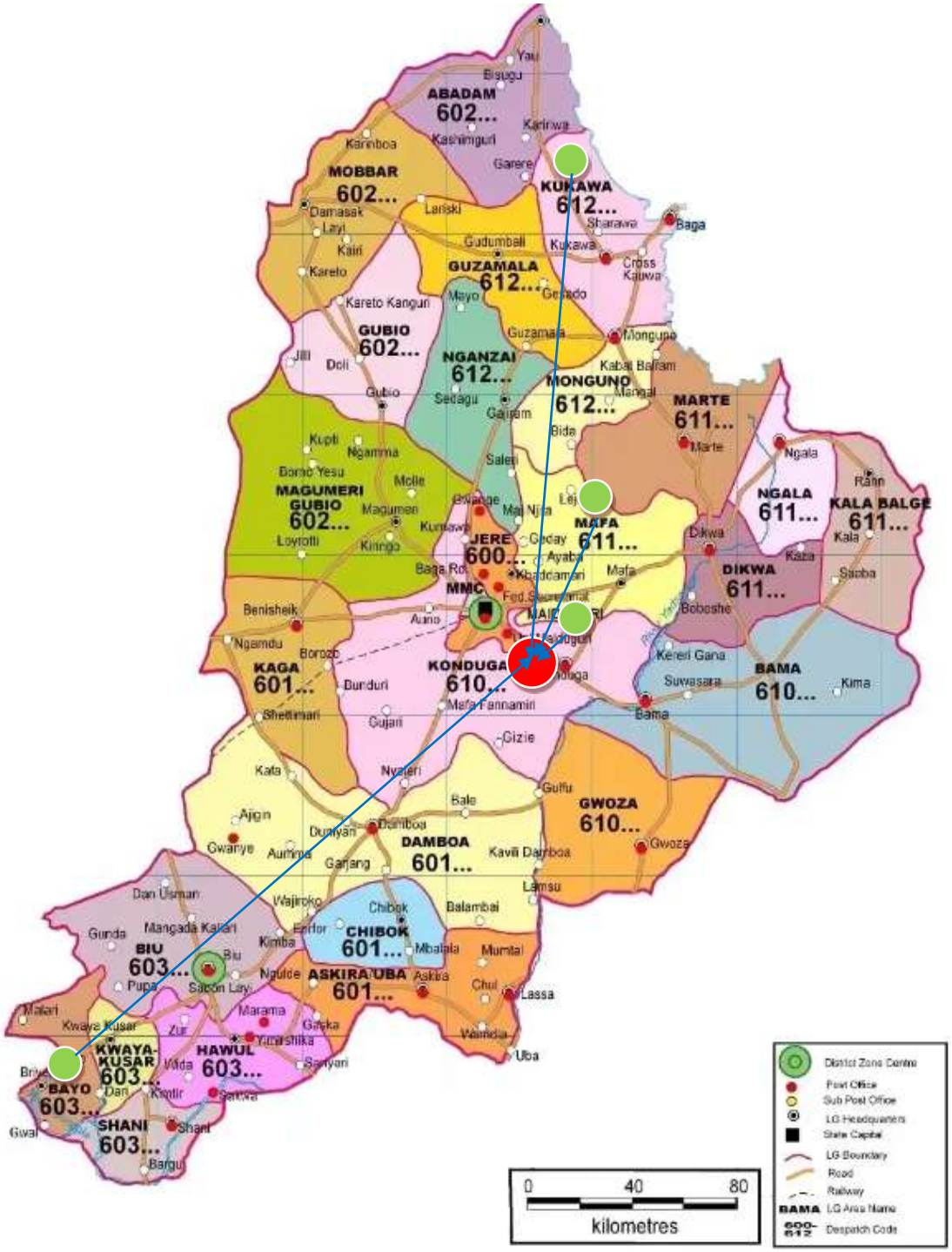
Konduga Local Government Area

Konduga Local Government Area of Borno State has an area of about 6,000 square kilometers with a population of 375,000. It is about 25km to the southeast of Maiduguri, Borno state, situated on the north bank of the Ngadda river. The ethnic groups in the local government are: Kanuri, Shuwa Arab, Marghi, Mulgwai, Wula, Gamargu, Fulani and Hausa. The main occupation of the people is subsistence farming combined with livestock rearing, fishing and trading.

Bayo Local Government Area

Bayo Local Government Area of Borno State is domiciled in Biriyel town and consists of the wards and communities of Bayo, Balbaya, Fikayel, Gamadadi, Jara Dali, Jara Gol, Limanti, Teli, Wuyo and Zara. It has an area of 956 km^2 and a population of 78,978 at the 2006 census. It is one of the four LGAs that constitute the Biu Emirate, a traditional sate located in Borno State, Nigeria.

Figure 1.1: Map of Nigeria showing Borno State



Map of Borno State showing AIH and ATC's locations

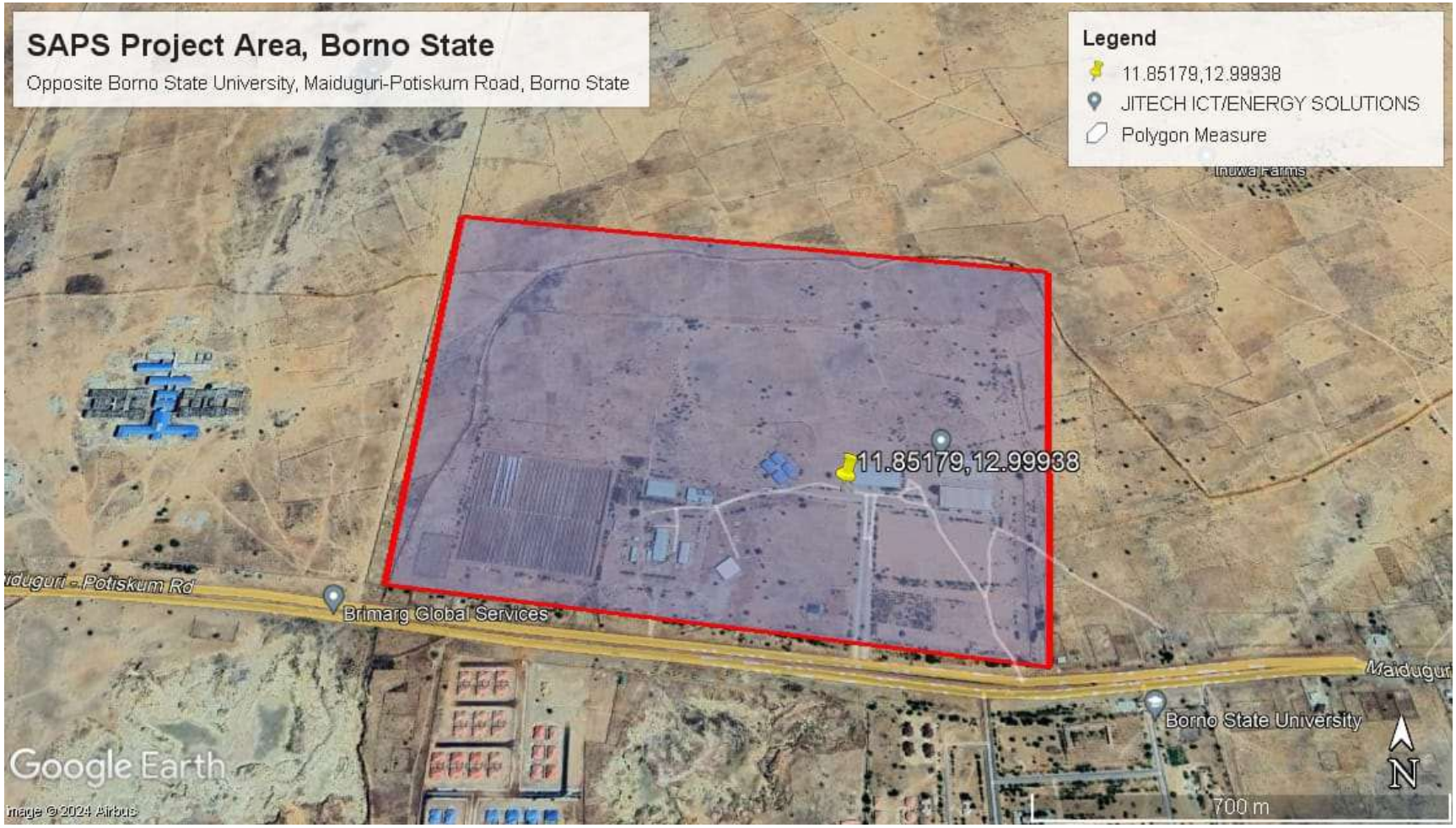


Figure 1.2: Satellite image of the proposed AIH Site showing surrounding features

1.5 ESIA Objectives

The key objectives of this ESIA study are to generate environment and social baseline information within the study environment and affected communities before the implementation of this project implementation. In line with statutory requirements for environmental protection in Nigeria, the proposed ESIA study has been carried out to:

- To gather all necessary data from secondary sources, field survey and sampling on socio-economic, health, biophysical and cultural components of the host communities for establishing the environmental baseline condition of the project area.
- Satisfy Federal, State and Local Governments as well as stakeholders, that proactive environmental actions shall be incorporated in project design, installation, construction and operation phases of the project;
- 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;
- To achieve a positive mutual trust and understanding between host communities and the proponent.
- To achieve positive public perception about this project through effective communication as a necessary tool to avoid conflicts (legal and physical).
- To comply with all the relevant sections of national and international environmental laws, regulations and guidelines on project development.
- Provide all necessary data/ evidence that will form basis for the preparation of the Environmental Impact Statement (EIS) of the project.

1.6 ESIA Scope of Work

The scope of 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;
- 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;
- Development of best conceivable plans for restoring the environment after decommissioning of the proposed project
- EIA reporting following Federal Ministry of Environment (FMEnv) guidelines and procedures as well as public disclosure.

1.7 Approach and Methodology

The methodology for preparation of the ESIA was in line with the World Bank Safeguard Policies - Operational Policy on Environmental Assessment (OP/BP 4.01) as well as the Nigerian Environmental Assessment guidelines and procedures. The preparation of the ESIA was specifically guided by the Environmental and Social Management Framework (ESMF) prepared for the SAPZ project. A multidisciplinary approach was employed in order to holistically address all pertinent aspects of the proposed project on the bio-physical and socio-economic environment of the

project area. A summary of blend investigative method used to acquire the socio-economic data is as follows:

- Review of Existing data;
- Reconnaissance survey to identify project affected communities and to alert community's leaders on the activities of the proposed projects;
- In-depth interviews with leaders of communities as well as key investors in the value chains segments project areas;
- Focus Group Discussion (FGDs) with men, women, youths and project affected persons in the focal communities;
- Field observations using strategic instruments and devices to record and note observations and detections by the consultants and interviewers;
- Structured questionnaire to acquire needed baseline information and perceptions of people using simple random sampling techniques;
- Population assessment using combined field survey and 2006 census figures by the National Population Commission (NPC).

Well designed and sectionalized questionnaires were administered to households within the project communities and from it the socio-economic status of the people was deduced after analysis. A typical questionnaire has plain questions, which comprises issues of existing livelihood opportunities, income, gender characteristics and other demographic, physical and social infrastructure. Series of consultations were also held with stakeholders on issues of traditional administrative system, existing formal and informal redress mechanisms; concerns of the project affected persons using Focused Group Discussion (FGD). The minutes of the consultations were written and presented in the Annexure. All the communities and villages affected by the projects were considered in the socio-economic studies.

1.8 EIA Procedural Guidelines

This procedure prescribes the steps to be followed in the EIA process from project conception to commissioning and post commissioning impact mitigation, to ensure that the project is implemented with maximum consideration for environment. This ESIA study was conducted in compliance with this guideline. The Federal Ministry of Environment (FMEnv) developed guidelines to be used by project proponents in conducting ESIA, in compliance with the EIA Act. Accordingly, the EIA process, illustrated in figure 1.3 shall follow the following steps sequentially as outlined in the procedural guideline.

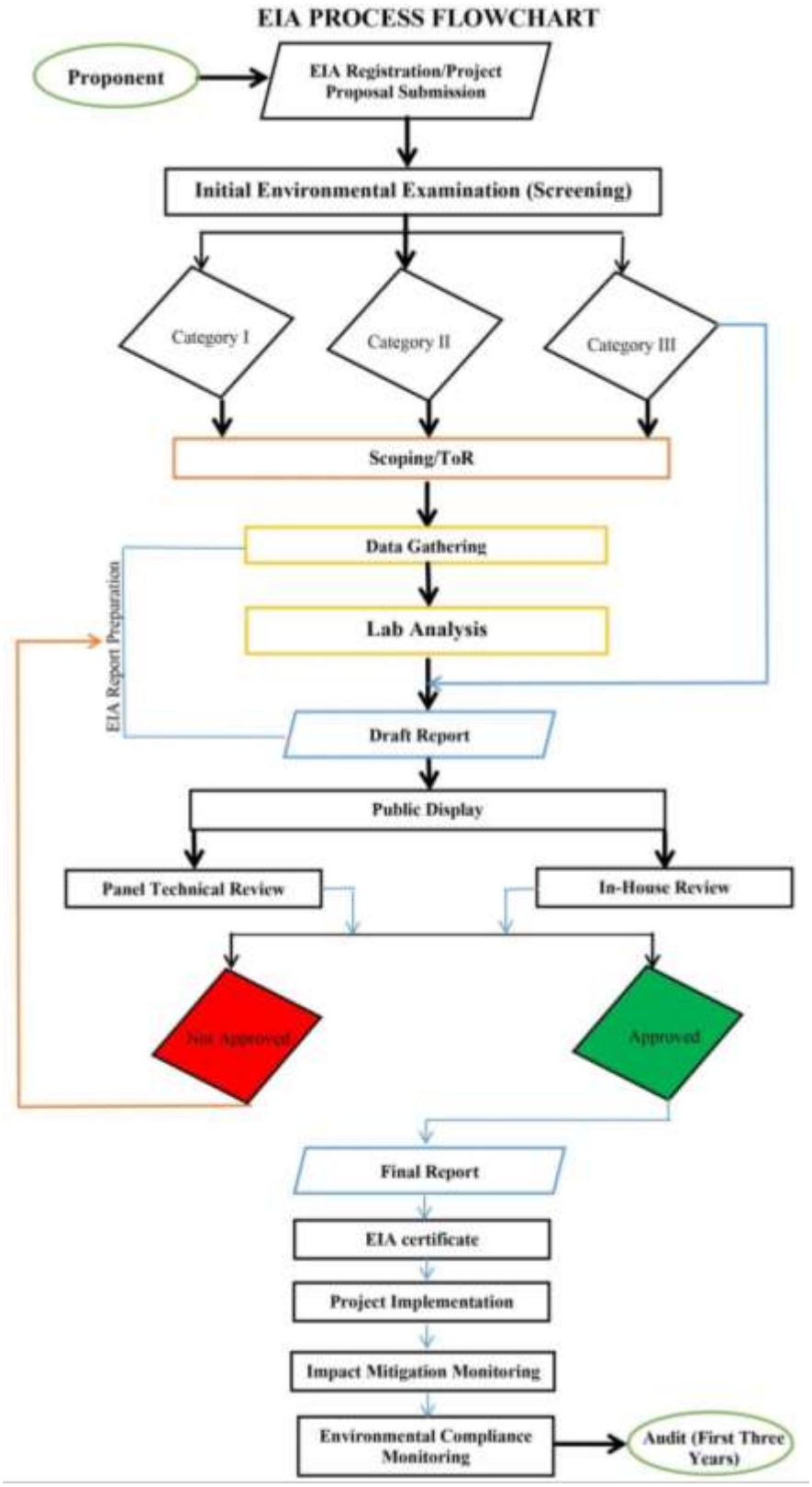


Figure 1.3: Overview of EIA Process in Nigeria

1.9 Administrative Institutions and Legal Framework

The study was carried out in accordance with the regulations, guidelines and standards of the Federal Ministry of Environment, Borno State legislations on the environment and all other applicable National legislations, and International Agreement and Convention to which Nigeria is a signatory. The synopsis below is some of the legal and administrative instruments on which the preparation of this ESIA was premised.

1.9.1 National Environmental Legislation

In Nigeria, there are several national laws, regulations and standards, which seek to protect the natural environment and assure sustainable development in the country. A number of these regulatory instruments were developed following the Koko toxic waste episode of 1987, which led to the promulgation of the Harmful Waste Act No. 42 of 1988 and the establishment of the Federal Environmental Protection Agency (FEPA). Laws establishing some government agencies also contain provisions to ensure environmental protection as development progresses.

1.9.2 Federal Ministry of Environment Regulations

The Federal Government of Nigeria promulgated the Federal Environmental Protection Agency (FEPA) by Act No. 58, 1988, CAP. E12 L.F.N. 2004. The Act establishes the Federal Environmental Protection Agency with the responsibility of protecting and preserving the environment, monitoring and assisting in the enforcement of environmental laws and co-operating with relevant authorities on matters and facilities relating to environmental protection. The Federal Ministry of Environment, (FMEnv) upon establishment in 1999, took over the powers and functions of the Federal Environmental Protection Agency (FEPA).

The Minister for Environment is empowered to establish standards in certain environmental areas like water quality, effluent limitations, air quality, atmospheric protection, ozone protection, noise control, and control of hazardous and waste removal methods by virtue of the provisions of the defunct FEPA. In exercise of its

power, the Ministry had since made about 20 Guidelines by way of Regulations for different aspects of environmental protection and preservation.

National Policy on the Environment

Environmental management in Nigeria is based on the National Policy on the Environment (1989), revised in 1999 and 2017. The Policy states that Nigeria is committed to safeguarding the country's natural and built environment for the use of present and future generations. This commitment demands that efficient resource use and the reduction of environmental impacts be a core requirement of all developmental activities. The strategic objective of the Policy is to coordinate environmental protection and natural resources conservation for sustainable development.

National Guidelines and Standards for Environmental Pollution Control in Nigeria, 1991

This represents the basic instrument for monitoring and controlling industrial and urban pollution.

S. I. 9 National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations, 1991

This imposes restrictions on the release of toxic substances into the environment and stipulates requirements for pollution monitoring units, machinery for combating pollution and contingency plan by industries.

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

This Statutory Instrument regulates the collection, treatment and disposal of solid and hazardous wastes from municipal and industrial sources and gives a comprehensive list of chemicals and chemical waste by toxicity categories

EIA Act CAP E12 LFN 2004

The EIA Act is the primary Act governing EIA studies in Nigeria. It was promulgated to enable the prior consideration of an EIA on specified public or private projects. The Act sets out the procedure to be followed and methods to be used in undertaking an EIA.

Section 2(2) of the Act requires that where the extent, nature, or location of the proposed Project or activity is such that it is likely to significantly affect the environment, an EIA must be undertaken in accordance with the provisions of the Act.

Section 55 of the EIA Act provides for the maintenance of a Public Registry to facilitate public access to records relating to environmental assessments. Public review to which interested members of the public are invited to provide comments on the EIA of a proposed project is a key part of the approval process by the Federal Ministry of Environment.

National Environmental Impact Assessment Procedural and Sectoral Guidelines

In response to the promulgation of the EIA Act, the Federal Ministry of Environment developed National EIA Procedural Guidelines and other sets of guidelines on various sectors of the national economy. Applicable to this study is the EIA Sectoral Guidelines for Agricultural Sector.

The guidelines have been developed by the Federal Ministry of Environment to assist proponents in conducting a detailed environmental and social assessment of all new major projects within the agricultural sector in Nigeria. This EIA study has taken into consideration the relevant provisions of the guidelines, including the applicable mitigation measures.

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

Administered by the Ministry of Environment, the National Environment Standards and Regulations Enforcement Agency (NESREA) Act of 2007, repealed the Federal Environmental Protection Agency (FEPA) Act. It is the embodiment of laws and

regulations focused on the protection and sustainable development of the environment and its natural resources. The following sections are worth noting:

- Section 7 provides authority to ensure compliance with environmental laws, local and international, on environmental sanitation and pollution prevention and control through monitory and regulatory measures.
- Section 8 (1)(K) empowers the Agency to make and review regulations on air and water quality, effluent limitations, control of harmful substances and other forms of environmental pollution and sanitation.
- Section 27 prohibits, without lawful authority, the discharge of hazardous substances into the environment. This offence is punishable under this section, with a fine not exceeding, N1, 000,000 (One Million Naira) and an imprisonment term of 5 years. In the case of a company, there is an additional fine of N 50,000, for every day the offence persists.

This project will comply with NESREA regulations, including conducting EIA, environmental audit every three years after commissioning, obtain permit before disposing hazardous wastes, etc.

Regulations (under NESREA) - National Effluent Limitation Regulations

- Section 1 (1) requires industry facilities to have anti-pollution equipment for the treatment of effluent.
- Section 3 (2) requires a submission to the agency of a composition of the industry's treated effluents.
- National Environment Protection (Pollution Abatement in Industries and Facilities producing Waste) Regulations (1991).
- Section 1 Prohibits the release of hazardous substances into the air, land or water of Nigeria beyond approved limits set by the Agency.
- Section 4 and 5 requires industries to report a discharge if it occurs and to submit a comprehensive list of chemicals used for production to the Agency.

National Environmental Regulations

Section 34 of the NESREA Act, 2007 empowers the Minister of Environment to make regulations for safe and sustainable environment. In exercise of this power, the minster issued the national environmental regulations covering all sectors of development. The regulations relevant to the project are as follows:

- National Environmental Protection (Effluent Limitation) Regulations, 1999, makes it mandatory for industries to install anti-pollution and pollution abatement equipment on site. The regulation is specific for each category of waste generating facility with respect to limitations of solid and liquid discharges or gaseous emissions into the environment.
- National Environmental Protection (Management of Solid and Hazardous Waste) Regulations, 1999, defines the requirements for groundwater protection, surface impoundment, land treatment, waste piles, and landfills. It describes the hazardous substances tracking program with a comprehensive list of acutely hazardous chemical products and dangerous waste constituents. It also states the requirements and procedure for inspection, enforcement and penalty.
- Pollution Abatement in Industries Generating Wastes Regulations imposes restrictions on the release of toxic substances and stipulates requirements for pollution monitoring units, machinery for combating pollution and contingency planning by industries, submission of lists and details of chemicals used by industries to FMEnv, permits for the storage and transportation of harmful or toxic waste and the waste generator‘s liability.

The Act also provides regulations on strategies for waste reduction, permissible limits of discharge into public drains, protection of workers and safety requirements, environmental audit (or environmental impact assessment for new industries) requirements and penalties for contravention.

1.9.4 The Nigerian Urban and Regional Planning Act CAP N138, LFN 2004

The Urban and Regional Planning Act is aimed at overseeing a realistic, purposeful planning of the country to avoid overcrowding and poor environmental conditions. In this regard, the following sections become instructive:

- Section 30 (3) requires a building plan to be drawn by a registered architect or town planner.
- Section 39 (7) establishes that an application for land development would be rejected if such development would harm the environment or constitute a nuisance to the community.
- Section 59 makes it an offence to disobey a stop-work order. The punishment under this section, is a fine not exceeding N10,000 (Ten thousand naira) and in the case of a company, a fine not exceeding N50,000.
- Section 72 provides for the preservation and planting of trees for environmental conservation. The project shall be implemented in line with requirements of this Act, including obtaining development permit from Borno State Government.

1.9.5 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.

1.9.6 Land Use Act Cap L5, 2004

Land Use Act No. 6 was enacted in 1978 (revised in 1990 and 2004). The Act vests all land in the urban areas of each state under the control and management of the governor of the state. The governor of the state holds the land in trust for the people of the state and is solely responsible for the allocation of land in all urban areas to

individuals who reside in the state and to organizations for residential, agricultural and commercial purposes. All other land in the state subject to conditions under the Land Use Act is under the control and management of the local government. The Act divests traditional owners of land and vests such land in the state governor for the benefit and use of all Nigerians. It provides the processes through which land maybe acquired by the federal government.

1.9.7 Harmful Waste (Special Criminal Provisions) ACT CAP H1, 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.

The project will generate wastes including construction wastes and transformer oils at substations and other harmful wastes. These wastes shall be handled, treated, and disposed of in accordance with the relevant requirements of this Act.

1.9.8 The Forestry Act

The principal legislation in force for the regulation of the forest sector is the Forestry Act 1958. The Forestry Act CAP 51 LFN of 1994 prohibits any activity that may lead to the destruction of or cause injury to any forest produces, forest growth or forest property. The project area does not fall within any protected or reserved forest.

1.9.9 The 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 over exploitation. These sections are noteworthy:

- Section 1 prohibits, except under a valid license, the hunting, capture or trade in animal species, either presently or likely, 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.

Certain sections of the line route of this project, will pass through natural areas that serve as wildlife habitats which will be impacted by the project. Hence, the project activities shall be carried out to comply with relevant provisions of this Act.

1.9.10 The Factories Act, 1987 (Factory Act cap 126, LFN, 1990)

The factories Act, as contained in the Laws of the Federation of Nigeria 1990, seeks to legislate, and regulate the conduct of health and safety in the Nigerian workplaces. It was enacted in June1987 with the desire to protect the workers and other professionals against exposure to occupational hazards. The director of factories at the Federal Ministry of Employment, labor and productivity is responsible for the administration of the provisions or requirements of this Act. Section 13 allows an inspector to take emergency measures or request that emergency measures be taken by a person qualified to do so, in cases of pollution or nuisances.

This Act deals with working conditions at work sites, including construction sites, such as the type to be undertaken under the Project. Hence, the occupational health and safety requirements applicable to construction sites, as well as other work sites to be used by the project shall be subjected to the provisions of this Act.

1.9.11 Labour Act - CAP. L1 L.F.N. 2004

This Act deals with labour issues, including payment of wages, recruitment, discipline, employee welfare, employment of women and child labour. Sections 54

to 58 which deal with employment of women, prescribed period of absence from work for nursing mothers and allows her half an hour twice a day during her working hours to attend to the baby for a period of up to six months after she resumes work. Section 55 also exempted women from night work, except when they are employed as nurses. Sections 59-64 deal with employment of young people.

1.9.12 Public Health Law CAP 103 LFN 1990

Public Health Law (L.N47 of 1955, Cap 103) provides justification for the execution of developmental projects under guidelines that promote health by protecting the environment and safeguarding the health of humans.

1.9.13 Workers' Compensation Act, 1987

The Act to make provisions for the payment of compensation to workmen for injuries suffered in the course of their employment. The compulsory insurance covers employees for injury or death resulting in the course of work or in work places. All types of workers are covered including working under a contract of service or apprenticeship with an employer, whether by way of manual labour, clerical work or otherwise, and whether the contract is expressed or implied, is oral or in writing. The project will employ both skilled and non-skilled labour and shall be subject to this law as applicable.

1.9.14 Child Rights Act 2003

The Child's Rights 2003 was enacted by the National Assembly of the Federal Republic of Nigeria, 31st July 2003. It Is 'AN ACT TO PROVIDE AND PROTECT THE RIGHTS OF A NIGERIAN CHILD; AND OTHER RELATED MATTERS.' Focuses mainly on survival which includes the rights of the child to life, good health, balance nutrition and related matters, Key Household Practices (KHHP).

- **Development**, which include the development of the child, spirit, soul and body
- **Protection,** which include protection of the child from child labour, child trafficking, ritual killing, sexual, physical, emotional abuses and neglect.

- **Participation,** which include the right of the child to be involved in matters that concerns them.

1.9.15 National Gender Policy 2006

The main goals of this policy are:

- Commitment to gender mainstreaming as a development approach and tools for achieving the economic reform agenda, evidence based planning, value re-orientation and social transformation.
- Recognition of gender issues as central to and critical to the achievement of national development goals and objectives and a requirement for all policies to be reviewed to reflect gender implications and strategies as contained in the gender policy and implementation modalities specified in the National Gender Strategic Framework;
- Realization that effective and results focused policy implementation demands a cooperative interaction of all stakeholders. Promotion and protection of human rights, social justice and equity.

1.9.16 Federal Ministry of Agriculture and Food Security (FMAFS)

The Federal Ministry of Agriculture and Food Security (FMAFS), formerly known as the Federal Ministry of Agriculture and Rural Development (FMARD), was established in 1966 with a clear vision to ensure food security and promote agricultural sustainability in Nigeria. With a focus on empowering farmers, facilitating market access, and promoting sustainable practices, we strive to cultivate a resilient and prosperous agricultural sector.

The Federal Ministry of Agriculture and Food security is responsible for the formulation and implementation of policies and strategies in the Nigeria's agricultural sector, to sufficiently provide food for an increasing population, adequate supply of raw materials to a growing industrial sector, effectively expand the market for crop, livestock, agro and agro-allied products, continually create employment opportunities, and to widely diversify the economy, for national development.

The Ministry provides resources to the sector for the implementation of various projects and programmes. The efforts is complemented with the support and funding from donor

partners in the implementation of various agricultural projects and programmes in the country.

1.9.17 Federal Ministry of Agriculture and Rural Development (FMARD)

The Federal Ministry of Agriculture and Rural Development (FMARD) has the administrative power to regulate agricultural research, agriculture and natural resources, forestry and veterinary research all over Nigeria. Since its establishment in 1966, the Ministry has been mandated to optimise agriculture and integrate rural development for the transformation of the Nigerian economy, attain food security, and position Nigeria as a net food exporter for socio-economic development.

To carry out its mandate, the Ministry develops and implements policies that are directed toward the key areas of interest in the agricultural sector. These policies are the synthesis of the framework and action plans of the Government designed to achieve overall agricultural growth and development.

The current agricultural policy being adopted by FMARD is the Agriculture Promotion Policy (2016-2020).

Agriculture Promotion Policy (2016-2020)

The Agriculture Promotion Policy (APP), also referred to as The Green Alternative, is the outcome of an intensive consultative process between November 2015 and April 2016, which involved multiple stakeholders.

The Agriculture Promotion Policy (APP) Policy is founded on the following guiding principles:

- Agriculture as a business– focusing the policy instruments on a government-enabled, private sector-led engagement as the main growth driver of the sector.
- Agriculture as key to long-term economic growth and security—focusing policy instruments to ensure that the commercialization of agriculture includes technologies, financial services, inputs supply chains, and market linkages that directly engage rural poor farmers because rural economic

growth will play a critical role in the country's successful job creation, economic diversity, improved security and sustainable economic growth.

- Food as a human right – focusing the policy instruments for agricultural development on the social responsibility of government with respect to food security, social security and equity in the Nigerian society; and compelling the government to recognize, protect and fulfil the minimum degree of freedom of the people from hunger and malnutrition.
- Value chain approach – focusing the policy instruments for enterprise development across successive stages of the commodity value chains for the development of crop, livestock and fisheries sub-sectors, namely input supply, production, storage, processing/utilization, marketing, and consumption.
- Prioritizing crops – focusing policy on achieving improved domestic food security and boosting export earnings requires a measure of prioritization.
- Market orientation– focusing policy instruments on stimulating agricultural production on a sustainable basis, and stimulating supply and demand for agricultural produce by facilitating linkages between producers and off-takers, while stabilizing prices or reducing price volatility for agricultural produce through market-led price stabilization mechanisms (commodity exchanges, negotiated off-take agreements, extended farm-gate price undervalue chains coordination mechanisms, agricultural insurance, etc.).
- Factoring Climate change and Environmental sustainability – focusing policy instruments on the sustainability of the use of natural resources (land and soil, water and ecosystems) with the future generation in mind while increasing agricultural production, marketing, and other human activities in the agricultural sector.
- Participation and inclusiveness – focusing instruments on measures to maximize the full participation of stakeholders, including farmer's associations, cooperatives, and other groups, as well as Non-Governmental

Organizations (NGOs), Community Based Organizations (CBOs), Civil Society Organizations (CSOs), development partners and the private sector.

- Nutrition-sensitive agriculture– focusing policy instruments on addressing the issues of stunting, wasting, underweight and other manifestations of hunger and malnutrition with particular reference to the vulnerable groups, which include children under 5, nursing mothers and persons with chronic illness and disabilities.
- Agriculture's Linkages with Other Sectors– focusing policy instruments on the connected relationship between agriculture and other sectors at federal and state levels, particularly industry, environment, power, energy, works and water sectors.

1.9.18 National Agricultural Land Development Authority Act, 1992

This Act established the National Agricultural Land Development Authority with the following objectives:

- Provide strategic public support for land development which presently constitutes a major infrastructural development bottleneck hindering the development of viable economic farm holdings;
- Promote and support optimum utilization of Nigeria's rural land resources for accelerated production of food and fibre;
- Encourage and support economic-size farm holdings and promote consolidation of scattered fragment holdings to generate net income from agriculture which is aimed at sustaining living standards above the poverty line and thereby narrow rural-urban income inequalities;
- Provide gainful employment opportunities for rural people, raise rural incomes and improve on the general living standards in rural areas;
- Expand productive capacity in agriculture and regain export capability in traditional and non-traditional crops;
- Contribute significantly towards the attainment of a national food and fibre self-reliance, self-sufficiency and national food security through optimum utilization of available abundant land resources which ensures minimum soil

and environmental degradation, while simultaneously promoting sustainable agriculture;

- Facilitate appropriate cost-effective mechanization of agriculture.

1.9.19 Standards Organization of Nigeria (SON) Act CAP 412 LFN 1990

This organization was established to do the following:

- to organize tests and do everything necessary to ensure compliance with standards designated and approved by the Council;
- to undertake investigations as necessary into the quality of facilities, materials and products in Nigeria, and establish a quality assurance system including certification of factories, products and laboratories;
- to ensure reference standards for calibration and verification of measures and measuring instruments;
- to comply an inventory of products requiring standardization;
- to comply Nigerian standards specifications;
- to foster interest in the recommendation and maintenance of acceptable standards by industry and the general public;
- to develop methods for testing of materials, supplies and equipment including items purchased for use of departments of the Government of the Federation or a State and private establishments;
- to register and regulate standards marks and specifications;
- to undertake preparation and distribution of standards samples;
- to establish and maintain such number of laboratories or other institutions as may be necessary for the performance of its functions under this Act;

1.9.20 National Agency for Food and Drug Administration and Control (NAFDAC) Act, CAP N 1, LFN 2004

NAFDAC was officially established in 1992 to regulate and control the manufacture, importation, exportation, distribution, advertisement, sale and use of food, drugs, cosmetics, medical devices, packaged water, chemicals and detergents (regulated

products). The Agency was established by Decree No. 15 of 1993 as amended by Decree No. 19 of 1999 and now the NAFDAC Act CAP N1 LFN 2004.

1.9.21 Nigerian Free Trade Zone Act No. 63, 1992

In 1992, the Nigerian Free Zone Act (Act No. 63 of 1992) was passed establishing the Nigerian Export Processing Zone Authority (FMAFS). Free Trade Zones (FTZ), are expanses of land with improved ports and/or transportation, ware housing facilities, uninterrupted electricity and water supplies, advanced telecommunications services and other amenities to accommodate business operations. Under the FTZ system, enterprises are exempt from customs duties, local taxes, and foreign exchange restrictions, and qualify for incentives—tax holidays, rent-free land, no strikes or lockouts, no quotas in European Union (EU) and United Stated (US) markets, as long as end products are exported (although some portion can be sold in the domestic market). The FMAFS is responsible for the regulation of FTZ operations. Its tasks involve policy formulation, licensing and monitoring. The zones are governed by the FTZ Act which stipulates that an extensive EIA must be carried out before the commencement of any major projects.

Under Section 8 of the Act [Nigeria Export Processing Zones Act 63, 1992], approved enterprises operating within Free Zones shall be exempt from all Federal, State and Local Government taxes, levies and rate. Section 18 (1) further provides that all legislative provisions pertaining to taxes shall not apply within Free Zones.

1.9.22 Nigeria Export Processing Zones Act (CAP N107 LFN 2004)

The institutional framework that governs the establishment of Special Agro-Industrial Processing Zones falls under the jurisdiction of Nigeria Export Processing Zones Authority. “In exercise of the power conferred upon it by section 27 of the Nigeria Export Processing Zones Act, CAP N107 LFN 2004 and of all other power enabling it in that behalf, Nigeria Export Processing Zones Authority with the approval of the Honorable Minister of Industry Trade and Investments”. The objectives of these regulations will apply to the Special Agro-Industrial Processing Zones

- Complement and enhance the provisions of the Nigeria Export Processing Zones Act, 2004
- Provide details of regulatory and supervisory requirements necessary to promote efficient and profitable operations in Nigeria's Free Trade Zones
- Facilitate the attainment of goals for which Free Trade Zones are established in Nigeria.
- These regulations shall take precedence over the Investment Procedures, Regulations and Operational Guidelines for free zones in Nigeria, 2004

1.9.23: National Climate Change Policy for Nigeria (2021 – 2030)

The Federal Executive Council approved a comprehensive strategy policy on climate change: the overarching objective of the policy is to promote low-carbon, high-growth economic development and build a climate-resilient society through the achievement of the following targets.

- Implement mitigation measures that will promote low carbon as well as sustainable and high economic growth;
- Enhance national capacity to adapt to climate change;
- Raise climate change-related science, technology and R&D to a new level that will enable the country to better participate in international scientific and technological cooperation on climate change;
- Significantly increase public awareness and involve private sector participation in addressing the challenges of climate change; and
- Strengthen national institutions and mechanisms (policy, legislative and economic) to establish a suitable and functional framework for climate change governance

1.9.24: National Action Plan on Gender and Climate Change (2020)

This National Action Plan, based on a series of informed consultations with different stakeholders, using inclusive participatory approaches (Government Ministries, Departments and Agencies, women, youth, farmers, persons with disability, elderly persons), moves from the need to guide the implementation of gender and climate

change-related policies, strategies, programmes, negotiations and actions at Federal, State and Local Government levels, as the negative impact of climate change is considered a serious threat to the social and economic realities of people, especially women, living in Nigeria.

This Action Plan covers the period 2020-2025 and its priority sectors include: Agriculture, Forestry and Land Use; Food Security and Health; Energy and Transport; Waste Management; Water and Sanitation. The implementation of the Action Plan will be governed by a participatory research involving the government at all levels, academic and research institutions, women and youth groups, private sector and other non-state actors, as well as development partners. In line with Nigeria's intention to empower and respond to the needs of women in the context of climate change, this National Action Plan focuses on effective strategies for integrating gender into the implementation of national climate change initiatives, including the Paris Agreement and the Nationally Determined Contributions (NDC). The Action Plan presents milestones for ensuring that in building a climate-resilient Nigeria, the important and critical roles of women, youth and other vulnerable groups are carried along in the implementation of relevant national policies and strategies.

Concerning the implementation of the linkage between gender issue and climate change in its priority sectors, the Plan defines specific objectives, action steps and timeline, indicators, responsible institutions and outcomes. Main objectives regarding Agriculture, Forestry and Land Use are: improving agriculture related infrastructure to adapt to the effects of climate change; enhancing local communities' participation in forestry and agricultural sector; encouraging women to acquire education in agriculture and forestry and increasing their access to land; ensuring gender responsive budgeting. Food Security and Health's objectives focus on: integration of gender and climate change in national health policy and programs; ensuring alternative livelihood opportunities for women affected by climate change in urban and rural settings; promotion of gender sensitive health care delivery services related to climate change; improving disease surveillance programs. Energy sector points out: the need for awareness on the relationship between climate change, energy and gender; the importance of supporting women to gain knowledge in energy technologies; the reduction of emissions of greenhouse gases and

the increasing of budget allocation on climate change and gender programs. Waste Management objectives are: integrate climate change and gender in waste management system; promote effective waste management practices in communities; create access to finance women participation in waste management business. Water and Sanitation aims at: building technical capacity of women in water management; increase access to safe drinking water in rural and urban communities; development of gender-based programs for integrated water resources management.

1.9.25 State Ministry of Environment

The SMEnv is created to back up the mandates of Federal Ministry of Environment at State levels towards the objective of protecting public health and safety, and to restore and enhance environmental quality and efficient implementation of environmental programs. The SMEnv, therefore, gives direction to all issues concerning the environment, monitor and control pollution and the disposal of solid, gaseous and liquid wastes generated by various facilities in the State.

Borno State Environmental Law

The State EPA was also created to back up the mandates of Federal Ministry of Environment at State levels towards the objective of protecting public health and safety, and to restore and enhance environmental quality and efficient implementation of environmental programs. The SEPA, therefore, like the SMEnv gives direction to all issues concerning the environment, monitor and control pollution and the disposal of solid, gaseous and liquid wastes generated by various facilities at the local and community levels.

1.9.26 International Guidelines and Conventions

In addition to the national laws/regulations, Nigeria is signatory or party to several international conventions and treaties that support the use of EIA as the key tool for achieving environmentally sustainable development. The EIA shall be guided by the international environmental and social regulations from IFC/World Bank where applicable. All other relevant international guidelines and conventions, and industry best management practices shall also apply, including the international financing

community. The international conventions, to which Nigeria is a signatory, relevant to this project are as follows:

- African Convention on the Conservation of Nature and Natural Resources
- Convention on Biological Diversity
- Endangered Species (Control of International Trade and Traffic)
- Conservation of Migratory Species of Wild Animals (1973)
- Convention to Combat Desertification (1994)
- United Nation Framework Convention on Climate Change (UNFCCC) 1992.
- International Union for Conservation of Nature and National Resources (IUCN) Guideline, 1996.
- The "Equator Principle"
- World Bank Operational Policies.
- Public Health Legislations and Regulations.
- The Rio Declaration on Environment and Development
- The Kyoto protocol, Montreal Protocol on Substances that Deplete the Ozone Layer, 1987.
- The African Convention on the Conservation of Nature and Natural Resources, 1968.
- Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)
- Human and Peoples' Rights on the Rights of Women in Africa in 2005
- Civil and Political Rights Covenant
- Economic, Social and Cultural Rights Covenant
- Convention on the Elimination of All Forms of Violence against Women
- ILO Occupational Safety and Health Convention, 1981

<u>The African Development Bank Group's (AfDB) Integrated Safeguards System</u>

In 2013 the African Development Bank Group updated their policy on Involuntary Resettlement and created an Integrated Safeguards System (ISS) to improve clarity, coherence and consistency as well as overall operational effectiveness. Resettlement is covered under Operational Safeguard 2 (Involuntary Resettlement: Land

Acquisition, Population Displacement and Compensation), which includes comprehensive notions of livelihood and assets, accounting for their social, cultural, and economic dimensions. It also adopts a definition of community and common property that emphasises the need to maintain social cohesion, community structures, and the social interlinkages that common property provides. It furthermore stresses the importance of improving living conditions for PAPs through a RAP. OS 2 has the following specific objectives to:

- avoid involuntary resettlement where feasible, or minimize resettlement impacts where involuntary resettlement is deemed unavoidable after having explored all other alternative project designs;
- ensure that displaced people are meaningfully consulted and given opportunities to participate in the planning and implementation of resettlement programmes;
- ensure that displaced people receive significant resettlement assistance under the project, so that their standards of living, income-earning capacity, production levels and overall means of livelihood are improved beyond pre-project levels;
- mitigate the negative impacts of displacement and resettlement, actively facilitate social development and establish a sustainable economy and society; and
- set up a mechanism for monitoring the performance of involuntary resettlement programs and remedying problems as they arise so as to safeguard against ill-prepared and poorly implemented resettlement plans.

<u>African Convention on the Conservation of Nature and Natural Resources</u>

The African Convention on the Conservation of Nature and Natural Resources was adopted in Algiers, Algeria, on September 15, 1968, and entered into force on June 16, 1969. The Convention stipulates that the contracting States shall undertake to adopt the measures necessary to ensure the conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the best interests of the people.

Convention Concerning the Protection of the World Cultural and Natural Heritage

The Convention was adopted in Paris, France on October 17, 1972. The Convention sets aside areas of cultural and natural heritage for protection. It places obligations to each State Party to recognize that the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage situated on its territory, belongs primarily to that State.

Convention on the Conservation of Migratory Species of Wild Animals

This Convention also known as the Bonn Convention was adopted in 1979 and entered into force in 1983. It stipulates actions for the conservation and management of migratory species including habitat conservation.

Vienna Convention for the Protection of the Ozone Layer

The Vienna Convention was adopted in 1985 and entered into force on September 22, 1988. It places general obligations on countries to take appropriate measures to protect the environment against adverse effects resulting from human activities which tend to modify the ozone layer.

The Montreal Protocol on Substances that Deplete the Ozone Layer

The Protocol was adopted on September 16, 1987, as an international treaty to eliminate ozone-depleting chemicals production and consumption.

Basel Convention on the Control of Trans-boundary Movement of Hazardous Wastes and their Disposal

The Convention was adopted on March 22, 1989, and entered into force on May 1989. It focuses attention on the hazards of the generation and disposal of hazardous wastes. The Convention defines the wastes to be regulated and controlled in order to protect human and environmental health against their adverse effects.

The United Nations Convention on Biological Diversity

The convention was adopted in 1994. The objectives of the Convention include the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising out of the utilization of genetic resources.

The United Nations Framework Convention on Climate Change

The Convention on Climate Change was adopted in 1992 during the Rio Earth Summit in Rio De Janeiro, Brazil and entered into force in 1994 to limit Greenhouse Gas (GHG) emissions which cause global warming. Nigeria being a signatory to this framework has made it develop its Nationally Determined Contribution (NDC) which shows its global commitment towards embracing sustainable development measures that limit the rate of global warming and negative impacts of climate change. It shows the country's climate targets and measures to be adopted in actualizing them.

Solemn Declaration on Gender Equality in Africa 2004

The Solemn Declaration on Gender Equality in Africa was adopted by the AU Assembly in 2004, calling for member states' continual action toward achieving gender equality and reinforcing their commitment to international and regional women's rights instruments. In addition to calling for wider ratification of the Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa, it also addresses state responsibility for tackling violence against women and gender-based discrimination.

Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa, 2003

The Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa, better known as the Maputo Protocol, is an international human rights instrument established by the African Union was adopted in Maputo in July 2003 and went into effect in 2005. It guarantees comprehensive rights to women

including the right to take part in the political process, social and political equality with men, and improved autonomy in their reproductive health decisions.

Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), 1979

Adopted December 18, 1979, and entered into force on September 3, 1981, the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) is an international legal instrument that requires countries to eliminate discrimination against women and girls in all areas and promotes women's and girls' equal rights.

International Finance Corporation (IFC)

The IFC's Performance Standard 5: Land Acquisition and Involuntary Resettlement recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land and has the following key objectives:

- To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs;
- To avoid forced eviction;
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement 1 and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected;
- To improve, or restore, the livelihoods and standards of living of displaced persons, and
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.

Involuntary resettlement in IFC PS 5 refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or means of livelihood) as a result of project-related land acquisition. Resettlement is considered involuntary when affected individuals or communities do not have the right to refuse land acquisition which results in displacement. Where it is unavoidable, appropriate measures to mitigate adverse impacts on displaced persons and host communities must be carefully planned and implemented.

IFC Performance Standards for Investment

The Eight Performance Standards established by IFC for the life of an investment include:

Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts

Performance Standard 2: Labour and Working Conditions

Performance Standard 3: Resource Efficiency and Pollution Prevention

Performance Standard 4: Community Health, Safety, and Security

Performance Standard 5: Land Acquisition and Involuntary Resettlement

Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 7: Indigenous Peoples

Performance Standard 8: Cultural Heritage

1.9.25 AfDB Integrated Safeguards Systems

The AfDB's Integrated Safeguards System (ISS) is a set of policies, procedures, and guidelines established to identify, assess, and mitigate potential E&S risks and impacts associated with the Bank's funded projects and programs. The ISS were designed to ensure that the Bank's investments promote sustainable development and do not harm people or the environment. The updated ISS (April 2023) are comprised of the following:

- AfDB's Vision for Sustainable Development

- AfDB's E&S Policy
- Ten E&S Operational Safeguards (OS)
- E&S Guidance Notes (ISS Guidance notes)

There is a significant overlap between the AfDB operational safeguards and the IFC PSs; nevertheless, as the AfDB safeguards are also relevant to this Project the assessment of E&S performance is also assessed against these. A summary of the AfDB Safeguards is provided in Table below:

AfDB Safeguard	Description
E&S OS 1 (Assessment and Management of Environmental and Social Risks and Impacts)	The aim of this overarching OS, along with the nine other Oss that complement it, is to mainstream E&S considerations; including those related to climate change vulnerability; into Bank operations and thereby contribute to sustainable development in Africa. An ESIA study carried out under this OS helps to determine the scope and extent to which other OSs are addressed. It sets out the Borrower's (or Project's) responsibilities for assessing, managing, and monitoring E&S risks and impacts associated with each stage of an operation/project supported by AfDB. This OS, together with OS10 (Stakeholder Engagement and Information Disclosure) provide the overall process framework for the E&S assessment and management of AfBD financed operations at project level.
E&S OS 2 (Labour and Working Conditions	The objectives of OS2 are as follows: protect workers' rights; promote safety and health in the workplace; promote the fair treatment, non-discrimination, and equal opportunity of project workers; protect project workers, including vulnerable workers; prevent the use of all forms of forced labour and child labour; support the principles of freedom of association and collective bargaining of project workers, provide project workers with accessible means to raise workplace concerns; and enquire that the Bank, and national competent authorities as appropriate, be informed promptly of any material adverse impacts and events relating to labour protection and health and safety at the workplace. The applicability of this OS is established during the ESIA described in OS1.
E&S OS 3 (Resources Efficiency and Pollution Prevention and Management)	OS3 sets out the requirements to address resource efficiency and pollution 36 prevention and Management throughout the project life cycle in a manner consistent with Good International Industry Practice (GIIP). Throughout the different phases of the project's lifecycle—planning and design, construction, commissioning, operations, and decommissioning—the project is required to assess and evaluate resource-efficiency and pollution-prevention techniques and implement them, taking into consideration their technical and financial feasibility and cost-effectiveness. The applicability of this OS is established during the ESIA described in OS1.
E&S OS 4 (Community Health, Safety and Security)	This OS addresses potential risks and impacts on communities that may be affected by project activities. Occupational health and safety (OHS) requirements for project workers are set out in OS2, and measures to avoid or minimize impacts on human health and the environment due to existing or potential pollution are set out in OS3. The applicability of this OS is established during the ESIA described in OS1.
E&S OS 5 (Land Acquisition, Restrictions on Access to Land and	The objectives of OS5 are to: avoid involuntary resettlement where feasible, or minimize resettlement impacts where involuntary resettlement is deemed unavoidable after all alternative project designs have been explored; ensure

Land Use, and Involuntary Resettlement)	resettlement plans and activities are informed by social assessments (including gender issues); avoid forced evictions; mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use; improve living conditions of poor or vulnerable persons who are physically displaced by the project; establish a mechanism for monitoring the performance and effectiveness of involuntary resettlement activities which result from project activities; conceive and execute resettlement activities as sustainable development programs; and ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected. The applicability of OS5 is established during the ESIA described in OS1
E&S OS 6 (Habitat and Biodiversity Conservation & Sustainable Management of Living Natural Resources)	This OS outlines the requirements for the Project to (i) identify and implement opportunities to conserve and sustainably use biodiversity and natural habitats, and (ii) observe, implement, and respond to requirements for the conservation and sustainable management of priority ecosystem services. The applicability of OS6 is established during the ESIA as described in OS1.
E&S OS 7 (Vulnerable Groups)	OS7 contributes to poverty reduction and sustainable development by ensuring that projects supported by the Bank enhance opportunities for vulnerable groups to participate in, and benefit from, the development process in ways that do not threaten their unique cultural identities and well-being. The applicability of OS7 is established during the ESIA as described in OS1
E&S OS 8 (Cultural Heritage)	This OS sets out general provisions on risks and impacts to cultural heritage from project activities. OS7 sets out additional requirements for cultural heritage in the context of vulnerable groups and highly vulnerable rural minorities including Indigenous Peoples (IPs). The applicability of this OS is established during the ESIA described in OS1.
E&S OS 9 (Financial Intermediaries (FIs))	The objectives of this OS are to: set out how the FI will assess and manage environmental and social risks and impacts associated with the subprojects it finances; promote good environmental and social management practices in the subprojects the FI finances; o promote good environmental and sound human resources management within the FI; support the adoption of best practice standards in corporate governance, business management and corporate responsibility by enterprises supported by the Bank based upon the requirements of OSs 1 through 10, as appropriate; and encourage the consideration of environmental and social governance issues in capital market institutions such as development finance entities and stock exchanges.
E&S OS 10 (Stakeholder Engagement and Disclosure of Information)	This OS therefore recognizes the importance of open and transparent engagement between the project and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. OS10 applies to all Bank Group's funded operations. The project will engage with stakeholders as an integral part of the project's ESIA and project design and implementation, as outlined in OS1

1.10 Structure of EIA Report

The format of this report is essentially in line with the recommended format and guidelines by the Federal Ministry of Environment (FMEnv). Accordingly, the report is organised into the nine main chapters (1-9) as follows:

- **Preliminary Sections**:

  These include Table of Contents, List of Tables, Figures, Plates, and Executive Summary

- **Chapter One**: **Introduction**

  This chapter provides background information about the proposed project and highlights objectives, scope of work for the environmental assessment as well as the applicable legal and administrative framework for the project.

- **Chapter Two**: **Project Justification**

  This chapter outlines the project justification, including the need; value / benefits of the project and project development options.

- **Chapter Three**: **Project and Process Description**

  This chapter describes the proposed project location, project activities and processes involved including construction & installation, project operation and maintenance and schedule.

- **Chapter Four**: **Description of Existing Environment**

  This chapter describes the existing (baseline) environmental conditions of the project area including the socio-economic and health status of the inhabitants in the area. Also included are records of consultations held with the stakeholders notably the elders and youths in the host communities.

- **Chapter Five**: **Potential and Association Impacts**

  In this chapter, potential and associated environmental impacts of project activities are identified and evaluated.

- **Chapter Six**: **Impact Mitigations/Measures**

  This chapter proffers mitigation and ameliorative measures that would be adopted to eliminate or reduce to acceptable levels significant adverse impacts identified.

- **Chapter Seven**: **Environmental and Social Management Plan (ESMP)**

This chapter presents the Environmental and Social Management Plan (ESMP) that will be adopted throughout the project life cycle. It also includes the Environmental Management System (EMS) plan that will ensure the effectiveness of the mitigation measures and the remediation plan after decommissioning.

- **Chapter Eight**: **Decommissioning Plan**

  This chapter briefly presents the details of decommissioning plan at the end of the project life cycle.
- **Chapter Nine**: Stakeholder Engagement and Grievance Redress Mechanism
- **Chapter Ten**: Conclusions

  This chapter presents conclusions.
- **References**

  This section contains all the cited references and bibliographies referred to in the report.
- **Appendices**

  As much as possible, materials presented in the report are highlights, mostly the most important findings and results for clarity and to make the report easy reading and friendly. Other information sources, including some raw data are presented as appendices.

CHAPTER TWO

PROJECT JUSTIFICATION

2.1 Introduction

2.2 Need for the Project

Nigeria is the most populous country on the African continent with over 223,000,000 million people, and a population growth estimated at 2.41% per year (NPC Report, 2022). Like other middle-income countries, Nigeria faces significant and persistent poverty and inequality. Major factors contributing to rural poverty include low agricultural production and productivity, limited opportunities for value-addition, challenges of marketing capacity, poor yields in quality and quantity, and significant deficits in support systems such as infrastructure, access to productivity-enhancing inputs, financial backing, commercial orientation, and effective policies, as well as environmental degradation and the effects of climate change.

These challenges limit prospects for rural households. With competing needs on the national budget, this situation threatens national food security. Over 70% of Nigeria's population cannot afford a nutrient-adequate diet. The high sensitivity of the agricultural sector to increasing climate change and climate variability combined with high poverty rates are the main sources of Nigeria's vulnerability to food insecurity and malnutrition.

In 2011, the Federal Government of Nigeria (FGN) developed its Agricultural Transformation Agenda, which aims to achieve a hunger-free Nigeria through an agricultural sector that drives income growth, accelerates achievement of food and nutritional security, generates employment, and transforms Nigeria into a leading player in global food markets to grow wealth for millions of farmers. In the context of its agricultural transformation strategy, the FGN is tackling two main interrelated challenges: (i) Meet domestic food requirements by stepping up local sourcing to reduce its food import bill; as well as (ii) Modernize its farming model to reduce

poverty levels in rural areas. The FGN's strategy is to turn the country's huge food deficit into a market and employment opportunity for smallholders and small operators.

With the launch of the Special Agro-industrial Processing Zone (SAPZ) programme, Nigeria can, in less than a decade, banish food insecurity, while radically improving export earnings from agriculture, creating millions of lucrative agro-industrial jobs and opportunities for its citizens. The SAPZ is the flagship for Nigeria's agriculture, which entails the development and operation of agro-industrial processing clusters in areas of high food production across the country, to engender the competitiveness in agro-industrial production and processing that is critical to further unlock the potentials of Nigeria's agriculture, to improve food and nutrition security, to reduce post-harvest losses, create jobs for women and youth, as well as create wealth for the rural community.

The Federal Government of Nigeria has therefore requested the joint support of AfDB and IFAD in the materialization of its transformation agenda. The FGN seeks to leverage AfDB-IFAD complementary expertise, experience, and comparative advantage in the setting-up of SAPZs to: (i) sustainably meet the domestic food supply gap for key food products; (ii) create exportable surpluses; (iii) provide income and employment opportunities for rural poor households; and (iv) produce a replicable climate resilient and low emission model for further investments. Focus lies on high potential climate resilient pro-poor value chains that can be scaled-up and have relevance to the industry and off-takers operating in Agricultural Industrial Hubs (AIHs) and Agricultural Transformation Centres (ATCs), as well as on significantly improving livelihoods and generating decent employment, especially for women and youth. With regards to the demand and uptake of agricultural products, the FGN and AfDB will focus on attracting private sector agribusinesses to set up processing plants in zones of high food production, to process commodities into food products. In addition, the FGN and AfDB will create

an enabling environment for the private sector by putting in place appropriate fiscal policies and incentives, investment, and infrastructure policies for SAPZ.

2.3 Benefits of the Project

There are several significant benefits to gain from the construction of the project. The beneficiaries include the project proponent, the State and Federal Governments, the local community and importantly the local economy. The development is expected to benefit the location by creating an economic hub thereby creating local employment and raising the standards of living. The employment in turn is expected to train manpower towards skilled and un-skilled job requirements. Employment opportunities will be generated by the project. Based on these considerations, the following benefits have been considered:

- Meeting the development needs and policies of the Federal Government of Nigeria and Borno State.
- Revenue generation for Government through industrial, residential, commercial and social zones and other service charges and tax payment.
- Creating both direct and indirect employment opportunities for the local population and fostering sustainable inclusive economic growth;
- improving value-addition opportunities and creating surplus for export of products;
- Increased of incomes, reduce wastages, ensure value addition, generate employment opportunities as well as export earnings.
- Development of tremendous impact on the economy of the Borno State through job creation, security, socio-political stability effective economic growth and attainment of sustainable development.

2.4 Value of the Project

The African Development Bank (AfDB), with support from other development partners, has launched $520 million Special Agro-Industrial Processing Zones (SAPZs) in Nigeria with seven States as pioneer beneficiaries. The African

Development Bank is providing $210 million for the development of the SAPZs in Nigeria, in partnership with the Islamic Development Bank (IsDB) which is co-financing with $150 million, and with the International Fund for Agricultural Development (IFAD), which is co-financing with $160 million.

2.5 Envisaged Sustainability

The proposed project shall be sustained in broad and diverse ways. There shall be harmonization between the proposed project and social, environmental, economic and technical aspects of the project. The proponent intends to achieve the project sustainability in the following ways:

2.5.1 Technological Sustainability

Borno State Government has set up a highly technical multi-disciplinary project team which includes Architects, town planners, geologist, soil scientist, civil engineers, electrical engineers, structural and mechanical engineers, to prepare the engineering design of the development, which shall give rise to building construction, plumbing, electrical installations, roofing and painting, in an environmentally friendly manner. Equipment and machineries to be put in place for this project are those whose operation shall not have adverse effect on the environment in terms of release of noxious gases, noise and vibration. This project shall be undertaken using the best available technology in construction and building industry (from ground work to the finishing). It shall comply with environmental regulations and urban development laws of Nigeria and Borno State. All the structures and every associated infrastructural facility shall be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment and systems that save resources including energy, water conservation shall be given first priority without compromises on cost. The equipment and vehicles shall have highest levels of combustion efficiency through ensuring proactive maintenance culture.

Asphalt mixers, crushers and other construction equipment and machineries will be incorporated with pollution control devices like dust arrestors/precipitators,

emission control, noise abatement devices and desulfurization devices. The equipment and vehicles will have highest levels of combustion efficiency, capability to use cleaner fuels like bio-diesel and will have enhanced safety features.

2.5.2 Economic Sustainability

This project will be sustained economically by way of improving trade relations between Nigeria and the rest of the world; bringing in foreign investments into the country usage, and expanding local markets and trades in Borno State which in turn will increase foreign exchange inflow as well as generate revenue for the government. A move towards a solution-based business model will be undertaken, whereby a new perception of value is established, that will enhance material gain, eliminating the concept of waste as part of the production cycle.

It is planned that the proposed project will employ directly almost 6,500 workers. In different sectors, these skilled and unskilled workers will be part of all the socio-economic activities that will take place at SAPZ proposed project and assist the development of Nigeria. Besides, SAPZ proposed project will create a considerable amount of indirect employments in neighboring States of North Eastern Nigeria. Most importantly, residents will leave in more organized, civilized and well-disciplined commercial and residential District mostly established by foreign investors and their Nigerian counterparts. Direct payments for land spaces, goods and services will bring returns to the investors and governments.

2.5.3 Environmental Sustainability

The project will be environmentally sustained by incorporating into project design, practical mitigation measures or controls proffered for the identified environmental impacts of the proposed project (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 Federal Ministry of Environment and World Bank/ IFC regarding minimizing the environmental and

social impacts. The proposed project shall comply with environmental regulations and standards locally and internationally.

2.5.4 Social Sustainability

The project has secured its first social license – the host communities' acceptance of the proposed project their eagerness to see it succeed. The project will attract a lot of improvements in the social wellbeing of communities neighbouring the project area. Some category of jobs including some sub-contracting services shall be employed from the communities, resulting in financial upliftment and reduction in the number of unemployed indigenes and Nigerians. Borno State holds a comparative advantage in terms of availability of labour. The project is expected to result in a better standard of living of the project affect communities with better access to education and health facilities through provision of such facilities in the Hub and increased financial capacity, reduced crime rate and social vices through profitable engagement of the local population, continuous stakeholders' engagements and consultations, improvement in mental health caused by socio-economic related depressions, capacity building through training and empowerment programmes, establishment of a grievance mechanism, security surveillance of the hub particularly from acts of terrorism due to the security challenge of the proposed project state

2.6 Project Development Options

2.6.1 No project option

The "no-project option" implies that the construction of the proposed SAPZ project will not be achieved. This option is considered if there is economic, technical or human capacity deficiencies or that the proponents are unwilling to commence the project or that the regulatory authorities are unwilling to approve the project; thus leading to a "no project option". This option will translate to non-beneficiary by the people and government of Borno State in particular and the nation as a whole. This will also mean that the envisaged positive socio-economic impact on the people and

government of Borno State and the nation will not be achieved. This alternative was rejected because it is not viable. Also associated with this option are; loss of resources already committed to the project, depriving employment opportunities that can be accrued from the project. This is not good for socio-economy, population growth, poverty alleviation, health, expansion and development of the nation. This option was not considered, therefore, the need for the project.

2.6.2 Delayed project option

This option implies that the execution of this project will be delayed until a much later date. Such option is usually taken when conditions are unfavourable for project implementation, such as in a situation where there is war, or host community is deeply resentful of the project. Also, if the economics of the project are unacceptable or unattractive at the time, then a delay may be feasible. But none of these conditions are applicable. In fact, on the contrary, both the economics and the political environment are most favourably disposed towards the project. Therefore, the implication of delaying the project will include the fact that all contractors, workers and equipment that have been mobilized for this project, and procurement, will have to be demobilized. Also, because of the inflationary trends in Nigeria, such a delay may result in unanticipated increase in project costs, leading to a decrease in final profit accruable from the project. These, and other related problems make it impossible to adopt the delayed project option.

2.6.3 Project Implementation Option

The third option considered was the execution of the proposed project as planned. This option was accepted because the project will uplift the socio-economic activities of the host communities through its Corporate Social Responsibility (CSR). Further, it will generate employment opportunities for thousands of Nigerians and stimulate the springing up of ancillary industries that will also provide more job opportunities to the teeming unemployed youth in the country thereby increasing their standards of living. The SAPZ project is expected to achieve significant milestones, including reducing the country's current food import bill through

import substitution, boosting revenue from agricultural exports, creating wealth for rural farming communities, creating new sustainable jobs, especially for women and youths. These prospects will elude Nigerians if the project is not encouraged.

2.6.4 Project Location Alternatives

In accordance with the requirements of Nigeria's EIA procedures together with international best practice, a number of alternatives have been considered during the formulation of the proposed Project design. Location alternatives the present location of the SAPZ project was identified as the preferred location taking into consideration the following location alternative factors. The important factors that influence the site selection include:

- An existing private sector for PPP (NorthStar Agric Tech.)
- Availability of agro-processing machineries at the proposed AIH
- Availability of Solar farm for electricity supply (10kW for equipment/machines and 10kW for administrative building)
- Availability of sets of 500kva transformer for each of the factories (9pcs)
- 100,000 standing tomatoes Greenhouse farm
- Availability and reliability of essential utilities such as water supply to the project site; steady power supply and a solar farm as a backup.
- Sufficient land area (100ha) for current and future expansion
- Land acquisition belongs to Borno State Government
- Availability of agro-industrial plants such as:
    - Tomatoes factory processing plant
    - Onion hydration plant
    - Cassava processing plant
    - Mango juice processing plant
    - Bottle water plant
    - Solar panel plant
    - Plastic injection plant
    - Mat/Net/sack bag plant
    - Drip irrigation pipe plant

CHAPTER THREE

PROJECT DESCRIPTION

3.1 Background of the Project

Special Agro-Industrial Processing Industrial Processing Zones (SAPZ are agro-based spatial development initiatives designed to concentrate agro-processing activities within areas of processing activities of high agricultural potential to boost productivity and integrate production, high agricultural potential to boost productivity and integrate production, processing and marketing of selected commodities. These initiatives may or processing and marketing of selected commodities.

A SAPZ, as defined, consists of two major parts: i) a demarcated area of land (or a corridor), developed with desirable infrastructure and dedicated to attracting and supporting investments in agro-processing and related activities (otherwise called the Processing Hub) and, ii) its complementary the Rural Transformation Centres (RTCs) which are connected to the Processing Hub) usually 4 - 8 in number. RTCs, themselves are centrally located within farming clusters enveloping the Processing Hubs and they provide services to farmers including, technology, inputs, finance, production and, post-harvest support and uptake markets through the arrangement of efficient, quality feedstock supply for the Processing Hub including, aggregation, storage, pre-processing.

3.2 Description of Project Location (AIH)

The proposed AIH site is located at Njimtilo village along Kano-Maiduguri road, in Konduga LGA of Borno State with coordinates; longitude 11°51′03′′N, Latitude 12°59′46′′E, and elevation 1,102ft above the sea level. The proposed project site is a settlement bordering Maiduguri, the Borno State capital, and it is also Borno State Industrial Park established by former governor and the current Vice President of Nigeria His Excellency Kashim Shettima, where network of metal and food processing industries are located, including the housing estates, Borno State University and Auno settlement that was designed to eventually expand to link up with Maiduguri. The Borno Industrial

park where the AIH is been proposed sits on 200ha, and over 100ha is been allocated for the AIH project.

There facilities within the Industrial site: Brimarg Global Services on the west; Jitech/Energy Solution East; and other food processing Industries on the south, across the Maiduguri-Kano highway. While outside the Industrial site a farm called Inuwa farm is located on the East at 300m, on the south across the highway is Borno state University at 250m.

There are other settlements around the project community such as: Kalari on the east at 2km with estimated population between 250-350; Ngomari on North East at 4km with estimated population of 100-150; Malasari on North West at 2km, with estimated population of 50-100. While Maiduguri airport is less than 7km from the project site, with Airforce base, and joint military barrack at 3km from the project site, where military, police and security organization work jointly as unit.

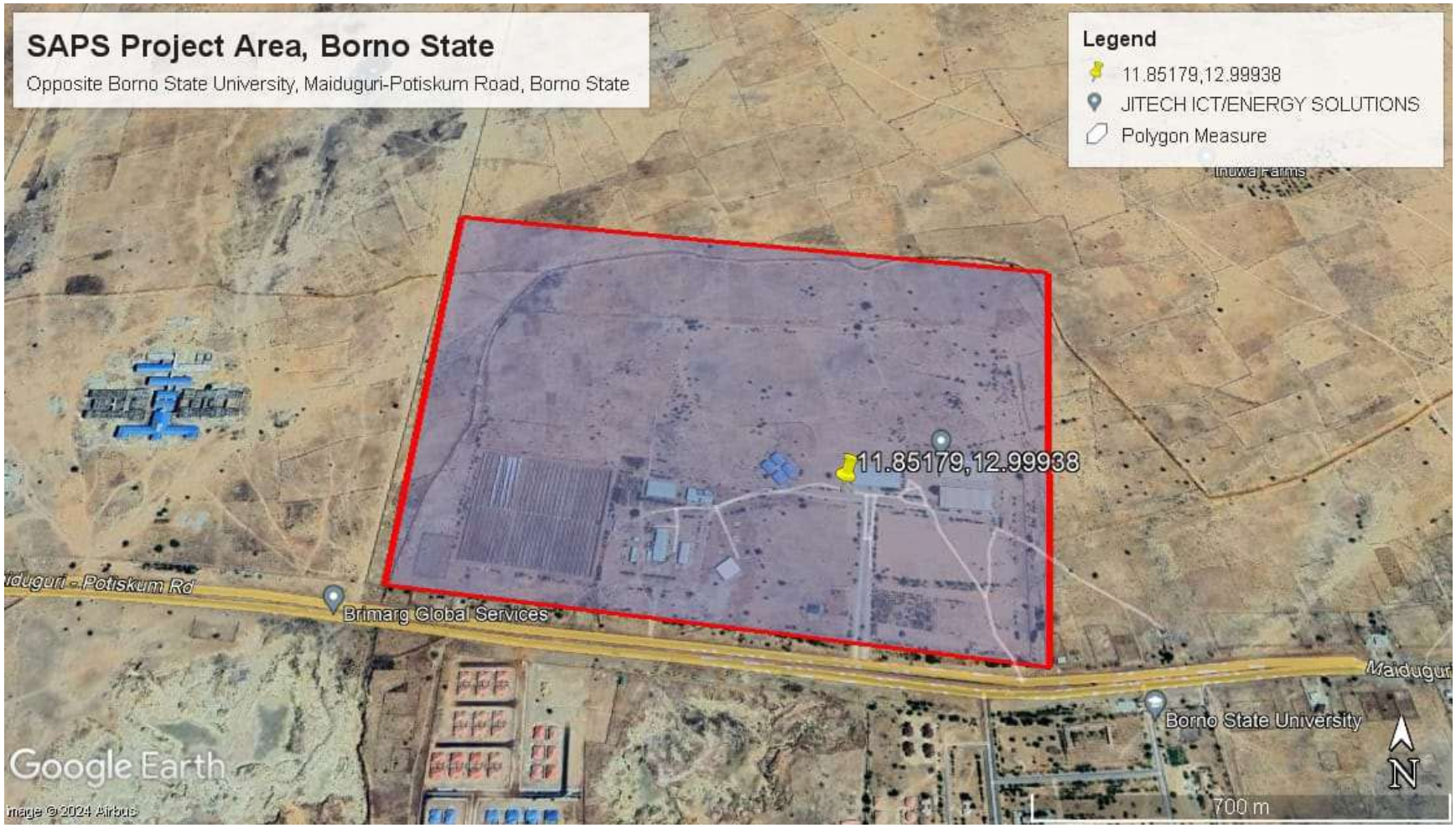


Figure 3.1: Satellite imagery of the proposed AIH locations

3.3.1 Existing Facilities

There are 10 existing facilities at the proposed Agro-Industrial Hub (AIH) including administrative offices which are tomatoes factory processing plant, onion hydration plant, cassava processing plant, Mango juice processing plant, bottle water factory, solar panel plant, Mat/Net/sack bag plant and drip irrigation pipe plant. There are two existing solar farms of 6 hectares and 450sqm for tomatoes cultivation and seedlings. 10kW solar farm to supply water and electricity to the facilities and another 10kW to the administrative buildings. There are 9 power transformers within the facilities and 3 water tanks of 75,000 and 50,000x2 capacities. The greenhouse farm is used in cultivating tomatoes, pepper and green vegetables. The following pictures depicts the proposed AIH project site.

Tomatoes factory/machineries

Solar panel factory

PVCs/Drip and Mat/Net/Sack bag factories

Solar panel factory

Pure water factory

Major juice processing factory

Containers containing equipment/machineries

Overhead water tank capacity (75,000)

Overhead water tank capacity (50,000)

500kva transformer

Solar farm (10kW)

Greenhouse Farm (100,000 capacity stand tomatoes)

Inside the Greenhouse Farm (100,000 capacity stand tomatoes)

Greenhouse Farm for nurseries

Solar panel

10kW each battery inverter (2pcs)

3.3 Description of ATCs Location

The proposed ATCs centers are distributed in four (4) Local Government Areas of Borno State. Table 3.1 below highlights the proposed ATCs locations with coordinates. The proposed ATC centers are identified and based on the availability connectivity in the identified locations.

Table 3.1: Proposed ATCs location

S/N	Community	LGA	Coordinates
1.	Baga community	Kukawa LGA	Longitude 13°06′22′′N Latitude 13°48′55′′E
2.	Ngaranam community	Mafa LGA	longitude 11°54′46′′N Latitude 13°35′05′′E
3.	Amarwa community	Konduga LGA	Longitude 11°39′10′′N Latitude 13°24′42′′E
4.	Briyel community	Bayo LGA	longitude 10°20′02′′N Latitude 11°35′23′′E

Source: Field work, 2024

3.3.1 Baga ATC Site Description

The project site is located at Baga off Kukawa – Kauwa border road, in Kukawa LGA of Borno state with coordinates; longitude 13°06′22′′N, Latitude 13°48′55′′E, and elevation 925ft above the sea level. The proposed project site is a green area that spread across an area of over 40ha, with no standing infrastructures within, as it is being used for farming and grazing of ram, goat and cows.

The surrounding of the site location not build-up residential or commercial area, however Baga town located south lees than 1km away from the project site, where many facilities like: Central primary school Baga 1km and Government Girls Secondary School, Baga 2km; Baga Market 1.5km; Hospital (Kenembu Hospital) 1km; First Bank 700m, Townhall 1.5k; and other business activities, additionally, the estimated population is between 400–600. Another active community around the project site is Doro community on the east at 4km, with active commercial activities such as Doro market, Doro central school, Mbaga health center and other

business activities. Surroundings of the project site on the north and west are farmlands, with no major infrastructures located within them.

The project site is 5km to Baga School of Fishery, less than 50km to Lake Chad and over 50km to Nigeria – Chad land border. Their major source of water within these communities around the project site are, hand-pump borehole and open well, while their major occupations are, farming and fishing from the Lake chad tributaries.

Kukawa Local Government Sites Description

Kukawa (previously Kuka) is a town and Local government area in the northeastern Nigeria Borno state, close to Lake Chad. The weather is dry, with with temperatures between 59°F and 107°F and infrequently falling below 53°F or rising over 112°F, Heat waves, extreme weather, and rising temperatures are caused by climate change, although its effects are not uniform worldwide. Towns in the Kukawa Local Government Area include Cross Kauwa and Baga. It is one of the sixteen LGAs that constitute the Borno Emirate.

Kukawa is known for large scale production of beans, millet, and maize and water melon. Farming in Kukawa is all year round. People farm on the shores of the Lake Chad regardless of whether it is raining season or not. The soil is also very fertile that fertilizer is not needed for planting. Kukawa LGA boarders Lake Chad, Lake Chad is an important wetland in the semi-arid Sahel corridor. It provides the basis of many thousands of livelihoods which depend on its seasonal fluctuations to renew fish stocks, farmland and rangeland. The Lake bed is flat and its waters shallow, so that seasonal changes in the volume of water result in large fluctuations in the surface area of the lake. The consequent exposure and submerging of the lake shore provides both fertile farmland and good feeding grounds for fish. The flooding regime represents an important natural asset which most households at Lake Chad exploit in one way or another. The fishing systems on the lake shore have therefore been developed to exploit seasonal flooding.

Fish is also a significant source of income and a principal trade commodity in Kukawa LGA, bringing together the re-mote fishing community of North-east Nigeria with the major urban centers of the Southern part of the country. The

origin of the fish trade from the waters of Lake Chad is a long standing one. The coming of modern transport system, the rise in population (especially in the urban centres) and the increase in earnings (mainly as a result of the expansion of the overseas export sector of the Nigerian economy) have greatly contributed to the expansion of the trade in fish. In other words, the fish trade developed with the coming of colonialism largely because of the expansion of the market, greater freedom of movement and increased cash needs33. Throughout the arid and semi-arid tropics, the interfaces between wetland and dry land provide the natural resources on which many livelihoods depend. Lake Chad is endowed with fish throughout the year, though there are particular periods for the peak and off peak periods for abundance of fish, fishermen from various parts of Nigeria and the neighboring countries take advantage of the lake in order to earn a living. There are fishermen who seasonally come for fishing on the lake chad.

Plate1.0. The Project site being used for grazing and with no Infrastructures inside

Fig.4.1.Administrative map of Borno state showing the proposed site LGAs and locations

Google Earth Imagery of the Project site

3.3.2 Ngaranam ATC Site Description

The project site is located at Ngaranam along Maiduguri-Dikwa road, in Mafa LGA of Borno state with coordinates; longitude 11°54′46′′N , Latitude 13°35′05′′E, and elevation 991ft above the sea level. The proposed project site is Ngarannam Livestock Ranching (RUGA) settlement, which sits on 200 hectares and out of the 200ha, 30ha is been allocated for the ATC project site. There are facilities within this 200ha livestock ranching settlement such as: 20 one-bedroom housing units, 12 numbers of 2-bedroom units and 5 numbers of 3 bedrooms for the leaders of the herders (Ardos). Three earth dams with each having capacity for 12 million litres, a 10-hectare irrigated pasture plot for growing fodder, a hammer mill for feed formulation and a silage bunker including a 20km access road within the ranch. There is also veterinary and human clinics, three blocks of two classrooms for school and a milk collection and processing centres are under construction and vast grazing land.

The surroundings which is Mafa community on the East less than 1.5km, a commercial and residential area with estimated population between 1000-2500, these are some facilities within Marafa community: Mafa Fire department, 1.32km; General hospital Marafa,1.7km; Marafa local government secretariat,2k; Marafa central school, 2.5km; Marafa police station, less than 3km; Mosque and shopping complex. Other community close to the project site is Moufi community on the North less than 2km from the project site, a densely residential area with population estimate between 800-1500.

The project site is around 45km to University of Maiduguri Teaching Hospital, located in Maiduguri the state capital, 40km to University of Maiduguri, and over 50km to Maiduguri airport.

Their major source of water within and around the project site are, borehole and few open well, while their major occupations are, farming and cattle grazing.

Konduga Local Government Sites Description.

Mafa is a local government area of Borno state, Nigeria. It has its headquarters in the town of Mafa. It has a total landscape area of 2,869 km^2, The weather throughout the

year fluctuates greatly, with the dry season being oppressively hot and humid and the wet season being hot and partially cloudy. It has a total population of 103,518 at the 2006 census. Districts & villages under Mafa LGA, Abbari, Anadua, Gawa, Koshebe, Laje, Limanti, Loskuri, Ma'afa, Mafa, Masu, Mujigine, Tamsu Ngamdua, Anadua, Kajari, Loslari, Mafa-Nguranna, Mafa Abbari, Mbuta, Mijigine, Siguabuya, Umarari, Zannari. It is one of the sixteen LGAs that constitute the Borno Emirate.




Plate1.0. Facilities within the Project site

Fig.4.1.Administrative map of Borno state showing the proposed site LGAs and locations

Google Earth Imagery of the Project site

3.3.3 Amarwa ATC Site Description

The project site is located at Armawa community along Yelwa-Konduga-Bama road, in Konduga LGA of Borno state with coordinates; longitude 11°39′10′′N , Latitude 13°24′42′′E, and elevation 1,096ft above the sea level. The proposed project site is much of a green area that spread across an area of over 10ha, with few facilities such as borehole and a collapsed telecommunication equipment, and most part of it being used for farming and grazing.

The surroundings are build-up areas with some facilities: Konduga General hospital at 400m east; Konduga Central School at 500m same east; Konduga local government secretariat at 1km south; Government Secondary School at 1.5km north; and Low cost housing at Mandarari at 2km west. The estimated population of the surrounding of the site is between 800–1500. There is river located at 2km south, across the major Baga highway, where farming activities are taking place, and it flows west to to Alau Dam at 13km from the project site.

The project site is 31km to University of Maiduguri teaching hospital, located in Maiduguri the state capital, 30km to University of Maiduguri Baga, and over 40km to Maiduguri airport.

Their major source of water within these communities around the project site are, hand-pump borehole and open well, while their major occupations are, farming and fishing from the Lake chad tributaries.

Konduga Local Government Area

Konduga Local Government Area is about 25 km to the southeast of Maiduguri, Borno state, situated on the north bank of the Ngadda river. A mild season, lasting from July 20 to September 22, with an average daily high temperature below 92°F, follows Konduga's hottest month, April, which has an average high of 105°F and low of 77°F. The population of the Konduga Local Government Area is about 13,400, It is one of the sixteen LGAs that constitute the Borno Emirate.

Konduga Local Government Area of Borno State has an area of about 6,000 square kilometers with a population of 375,000. Out of this 206,250 (55%) are women. Women aged 15-49 years (reproductive age) are 93,750 (25% of the total

population) or 45.5% of the women population. The ethnic groups in the local government are: Kanuri, Shuwa Arab, Marghi, Mulgwai, Wula, Gamargu, Fulani and Hausa. The main occupation of the people is subsistence farming combined with livestock rearing, fishing and trading. The road network in the Local Government may be over 300km mostly (over 90%) untarred bush roads and footpaths with a substantial part of the villages living behind a river, which keeps them away from the local government headquarters. The principal means of transport from the local government headquarters to the villages are: four wheel drive motor vehicles, pick up vans with high suspension, cattle and horse driven carts and manual push – push carts. Those living behind the rivers use canoes to cross to the local government headquarters. The terrain becomes difficult during the rainy season.

Plate1.0. The Project site being used for grazing and with collapsed Telecommunication mat Infrastructures inside

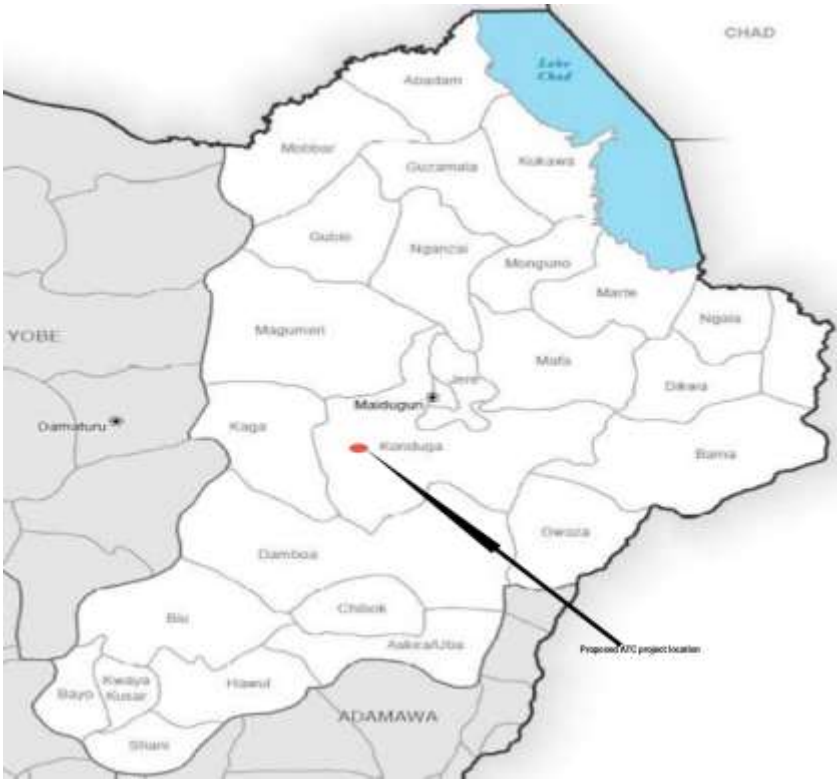


Fig.4.1.Administrative map of Borno state showing the proposed site LGAs and locations

Google Earth Imagery of the Project site

3.3.4 Briyel ATC Site Description

The project site is located at Ndoki-Gasi, Briyel along Gombe – Biu road, in Bayo LGA of Borno state with coordinates; longitude 10°20′02′′N , Latitude 11°35′23′′E, and elevation 875ft above the sea level. The proposed project site is a green area that spread across an area of 35ha. The total 35ha contains no infrastructures. (Plate: 1.0). There is a Lake-Reservoir 50m south, which originates from gongola river 4km from the project site.

The surrounding of the site location not build-up residential, however there are settlements close to the project site: on the north at 1.5km is Maina Baba settlement; west at 500m is Ndeki-Gasi settlement; south at 2km is Banglory; and east is Briyel settlement 3km, where the local government headquarters is located, additionally, the estimated population of these settlements is between 100 – 300. There are other facilities located around the project site such as: Primary school 1.5km on the east; Briyel general hospital at 700m, adjacent to the project site on north; Cotton Agricultural processors limited and Supermarket at 1.5km on the west; Mosque and other businesses located majorly at Briyel community.

The project site is 7km to Federal Collage of Horticulture, Dadiri, located at Gombe state, the boundary between both Gombe and Borno states. The source of water within these settlements around the project site are, hand-pump borehole and open well, while some uses the lake. Their major occupations are, farming and fishing, because of the water bodies around, while few of them works as government workers.

Bayo Local Government Area

Bayo Local Government Area of Borno State is domiciled in Biriyel town and consists of the wards and communities of Bayo, Balbaya, Fikayel, Gamadadi, Jara Dali, Jara Gol, Limanti, Teli, Wuyo and Zara. It has an area of 956 km^2 and a population of 78,978 at the 2006 census. It is one of the four LGAs that constitute the Biu Emirate, a traditional sate located in Borno State, Nigeria.

Bayo is one among the 27 Local Government Areas of Borno state, Nigeria located in the southwestern axis of the state. It shares common boundaries with Biu, Shani and

Hawul Local government areas. The administrative headquarters in the town of Biriyel and the council that oversees the area is in charge of public administration in the local government area.

Plate1.0. The Project site, with no Infrastructures inside

Fig.4.34.Administrative map of Borno state showing the proposed site LGAs and locations

Google Earth Imagery of the Project site

3.4 Project Components

The Agro-Industrial Hub is designed to encompass a diverse array of facilities and services. It is planned to include Industrial use (multi-products processing zone, clustered processing zone); Logistics and Warehousing (warehouse, cold storage, open yard, truck parking); Non-Industrial use (residential, commercial, social amenities, offices, support services). Additionally, it will feature a wastewater treatment facility, a solid waste facility area, two areas dedicated to administrative and social facilities, truck parking lots, and technical infrastructure areas. Also, provision of range of services including electricity, heat, utility water for irrigation, wastewater treatment, telecommunications, and solid waste management.

Associated Facilities

The project will also involve installing associated facilities that are crucial for the operational efficiency and sustainability of the agricultural zone. This includes the construction of administrative/technical/social facilities, energy transmission lines / transformer centers, connection/access roads, a wastewater treatment facility, a fuel station and truck parking lots. Additionally, as part of future plans to further enhance sustainability and self-sufficiency, the project intends to incorporate renewable energy sources like wind, solar, and biogas systems into the SAPZ project.

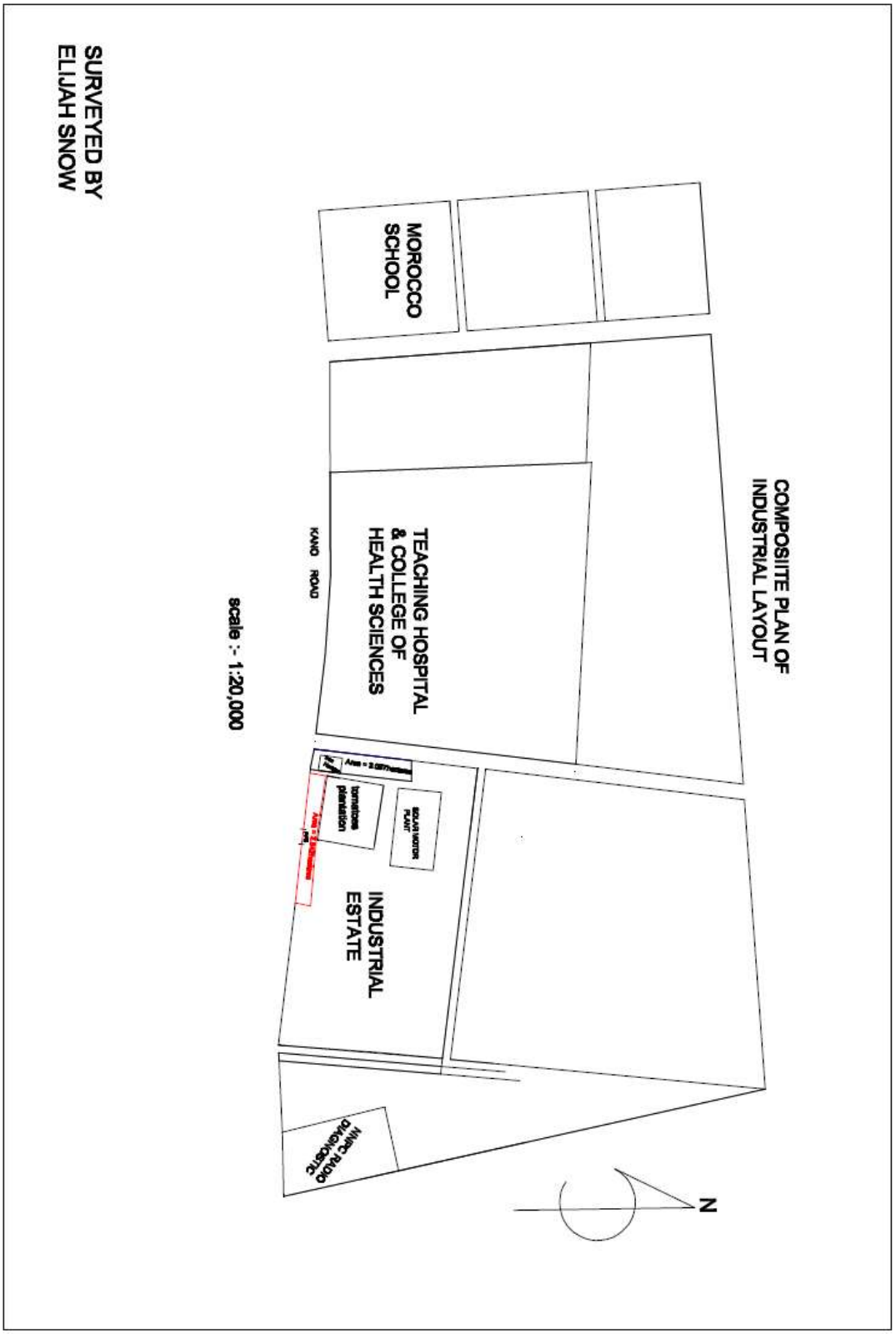


Figure 3.10a: proposed SAPZ Project layout

3.5 Project Development Phases

The Project activities for the proposed Borno-SAPZ sites according to the project phases includes but not limited to the following:

I. Pre-construction Phase

• Mobilisation of equipment and materials to site
• Use of labour
• Establishment of staging area
• Land clearing/Setting out
• Excavation of top soil

II. Construction Phase

• Use of materials and equipment
• Use of labor
• Establishment of burrow pit
• Building trenches
• Footings and blinding
• Reinforcement for culling and sand filling
• Block works
• Field solid
• Ground beams
• Ground beam casting
• DP Works
• Super structure, roofing, finishing (Plastering, painting, wiring, furniture)

III. Decommissioning from Site

• Demobilization of workers and equipment
• Exit of staging areas
• Burrow pit reclamation

IV. Operation and Maintenance Phase

• Maintenance of Agro-processing facilities
• Operation of the Agro-Processing facilities

• Movement of raw materials in and finished products out of the Hub.

3.6 Project Workforce

The project aims to support investments that contribute to increasing employment in rural nonarable lands and boosting the national exports of agricultural products. The projected employment impact is substantial, with an estimated 6,500 individuals expected to be employed with about 35% will be women. Moreover, during the construction and drilling activities, it is anticipated that several hundred individuals will be employed.

In the project area, it has been decided not to construct any accommodation facilities for the employees. Instead, round-trip transportation will be arranged for them using shuttle services. This approach is designed to minimize the project's footprint and simplify logistics related to employee housing. However, there is a contingency plan in place should the need arise to establish a camp site for the Project. If a camp site becomes necessary, it will be developed in strict accordance with the standards for worker accommodation as outlined by the International Finance Corporation (IFC).

3.7 Implementation Schedule

The project activities will be carried out on a phase-by-phase basis as follows;

- Site Survey
- Site Leveling
- Leveling & Grading
- Marking for Mounting Structures
- Pier Foundations
- Structure Erection
- Structure & Model Alignment

The proposed schedule for the engineering, procurement and construction is provided in table 3.4 below.

Table 3.4: Proposed Project Timeline

S/N	Activities	Q1 2024	Q2 2024	Q3 2024	Q4 2024	Q1 2025	Q2 2025	Q3 2025	Q4 2025	Q1 2026	Q2 2026	Q3 2026	Q4 2026
1.	Initial Conception												
2.	Site survey & mapping												
3.	Grid & load flow survey												
4.	Feasibility studies												
5.	ESIA												
6.	Financial Closure												
7.	Engineering & Construction												
8.	Interconnection & commissioning												
9.	Start operation												

CHAPTER FOUR

40 DESCRIPTION OF EXISTING ENVIRONMENT

4.1 Introduction

This chapter presents the current ecological conditions around the environment of the proposed Agro Industrial Hub (AIH) project. The objective of baseline data acquisition is to identify environmental issues associated with the proposed project by predicting them as well as proffering measures to mitigate/minimize and avoid their adverse effects. The environmental components studied are physico-chemical environment (meteorology, geology, sediment/soil type and distribution, surface / groundwater characteristics), biological environment (location and distribution of benthos, plankton, fisheries, flora and fauna characteristics), as well as socio-economic and health conditions describing the demographic structure, culture, heritage sites, social and health status of the people and their environment, including outcomes of consultations held.

The baseline conditions are based on information sourced from literatures review, stakeholder consultation and data interpretation, as well as findings from laboratory analysis and field data sampling collected within the proposed project site boundary (1km radius). The data gathered shall be utilized to inform future decisions about environmental management and to track any changes that may occur to the environmental elements.

4.2 Study Approach

The baseline status of the project area was obtained through consultations with the relevant stakeholders as well as from field studies covering the following:

- Reconnaissance survey;
- Field studies including air, surface water, sediment, soil and vegetation sampling;
- Geophysical investigation and groundwater sampling;
- Field analysis and sample preservation;
- Laboratory analysis of samples;

- Socio-economic and health studies;
- Data processing, analysis and interpretation; and
- Reporting

4.2.1 Baseline Data Acquisition Methods

Basically, measurements, field data collecting, and sample collection of representative populations were utilized in the data acquisition process to determine the environmental parameters of the study area. This exercise involved a multi-disciplinary approach and was executed within the framework of a quality, health, safety and environment (QHSE) management system approach. Using the best available equipment, resources, and personnel, this method guarantees that the necessary data and samples were collected in accordance with established (scientific and regulatory) requirements. Elements of this approach include:

- review of existing reports that contain environmental information on the study area;
- designing and development of field sampling strategies to meet work scope and regulatory requirements;
- pre-mobilization activities (assembling of field team, sampling equipment / materials calibrations/checks, review of work plan and schedule with team, and job hazard analysis);
- mobilization to field; fieldwork implementation - sample collection (including positioning and field observations), handling, documentation and storage protocols and procedures; and
- demobilization from field; transfer of sample custody to the laboratory for analyses.

The methodology/procedures for collecting field data are described in the succeeding sub-sections. Also, baseline environmental conditions of the proposed AIH project's area as recorded during field study are described in succeeding sections below. The detailed documentation of the fieldwork execution including descriptions of the laboratory analytical methods and procedures, the detection

limits for the various parameters analyzed as well as an overview of the general QHSE plan adopted for field data gathering and laboratory analysis is presented.

4.2.3 Consultation with Regulators and Stakeholders

Prior to field sampling, meetings were held with the relevant stakeholders to intimate them of the project and seek their consent to carry out the field data gathering. Consultation is an important element of socio-economic assessment and an integral component of the entire EIA process. This is because appropriate and adequate consultations will ensure smooth project implementation and guarantee economic and commercial sustainability of the proposed project. It involves information dissemination and interaction/dialogues with the host communities and other stakeholders on the EIA of the proposed project. The key objectives of consultation on the ESIA for the proposed AIH project are to:

- Ensure that the communities and all stakeholders are given early and adequate information on the ESIA and the proposed AIH project activities;
- Provide a framework for improving the understanding of the potential impacts of the proposed project on the socio-economics and biophysical environment;
- Include stakeholders' views and concerns as part of the ESIA execution especially as it concerns the potential impacts;
- Identify contentious issues in the proposed project execution;
- Establish transparent procedures for carrying out the proposed projects; and
- Create accountability and a sense of local ownership during project implementation, thus minimizing communities' conflicts and project delays that may result thereof.

4.2.4 Reconnaissance Survey and Delineation

Site visits were carried out from 30th to 31st May 2024, to collect primary data relevant to the site assessment and for the generation of baseline information used in assessing potential impacts. The areas visited were the proposed Agro Industrial Hub at Njimtilo, Konduga LGA and the ATCs in Baga, Ngaranam, Amarwa and Briyel communities in Borno State. During the site visit, site assessment was carried out (strengthened by secondary data gotten from desk studies), samples for environmental assessment were collected, socio-economic data was collected through administration of questionnaires and conduction of semi-formal interviews, and stakeholder meetings were held. Plans for community consultations were also made which were eventually carried out. Information gotten from all these activities are presented in this chapter. Photo 4.1 show image of the site visitation team on site.

Plate 4.1: Site verification exercise with the Hon. Minister's rep. at the proposed project AIH site

4.2.4 Desktop Studies

Desktop studies involved the acquisition of relevant background information on the environment of the study area. Approved reports from earlier environmental studies conducted in the region, as well as books, articles, maps, and other materials about the proposed AIH project area and environs similar to it, were among the materials studied. The list of materials consulted is specified in relevant sections.

4.2.5 Field Sampling/Measurement

To accurately describe the ecology and meteorology of the study area and ascertain seasonal variations of particular environmentally relevant characteristics, field data gathering exercise was conducted for dry season sampling on 30th May, 2024. The specific objectives of the ecological field sampling were to determine:

- Ambient air quality and noise level of the study area;
- Physico-chemical and microbiological characteristics of the soil within the study area;
- Physico-chemical and biological characterization of water and sediment samples within the study area;
- Hydrobiology and fisheries resources of the study area;
- Wildlife abundance and diversity of the study area and environs;
- Vegetation characteristics of the area; and
- Establish the socio-economic and health status of the project affected communities.

Ecological samples and data (water, soil, sediment etc.) were collected as appropriate. The exercise involved in situ measurement of unstable parameters where possible or they were preserved for laboratory analysis.

a. Field Study and Sampling Design

Field data gathering is designed to typically cover the proposed AIH project area. Soil sample stations were established to ensure the major soil types that characterise the proposed AIH project site are adequately covered. Also, surface water and sediment sampling as well as hydro-biological studies were carried out at

the surface water station while air quality and noise level measurement stations were distributed to ensure the entire project site is representatively covered. On the whole, the following sample requirements were established:

- Soil samples obtained from fifteen (14 + 1 control) stations, with samples collected from 0-15cm for top soil and from 16-30cm for subsoil;
- Surface water/sediment samples from one station;
- Air quality measured at fifteen (14 + 1 controls) stations;
- Noise level measured at fifteen (14 + 1 controls) stations;
- Groundwater sampling at one (1) stations (well);
- Vegetation and wildlife

The sampling locations were selected as waypoints using the Geographic Positioning System (GPS). Locations for biophysical sampling considered ecological types around the project areas, vulnerable environmental attributes with regards to the potential and associated impacts of the environment and control or buffer zones. Socio-economic and health impact studies on the other hand, considered human habitations, infrastructures, cultural heritage sites and prevailing health conditions of people within the sphere of influence to the proposed AIH project area. Table 4.1 presents an inventory of the biophysical and socio-economics/health details collected during field studies.

Table 4.1: Inventory of Biophysical and Socio Samples

S/N	Environmental Component	Parameter	No of Samples as requested by FMEnv
1	Surface water and Sediments	Physico chemical microbial, Benthos and Plankton	1 sampling unit/water body
2	Groundwater	Physico chemical and microbial	1
3	Soil	Physico chemical and microbial	30 + 1 Control (for both 0-15cm and 16-30cm)
4	Ambient air quality	Criteria pollutants	15 + control
5	Noise	Sound level	15 + control
6	Geology/ Geophysics	Static water level, Stratigraphy, flow direction	-
7	Meteorology	Temperature, relative humidity,	-
8	Vegetation	Transects, key Informant Interviews, Use of Binoculars, Direct Observation and sample collection	-
9	Wildlife	Direct Observation, Key Informant	

		Interviews and indirect count method	
10	Socio-economics / health	Interviews, questionnaires, focus group discussions, publications	-

Source: Engineering Seven Integrated Konsult Ltd Fieldwork, 2024

b. *Analytical Methods*

Samples collected from the field were analysed in Federal Ministry of Environment accredited laboratory, Abuja Environmental Protection Board (AEPB) Laboratory, Plot 776 Cadastral AO off Z, Maimalari Street, Central Business District, Abuja. This study employed analysis techniques approved by the Federal Ministry of Environment. Some international analytical procedures were also adopted for this study. Those of APHA, EPA, and ASTM analytical procedures for soil, sediment, and water quality were among analytical procedures adopted and used in the course of this study. To ensure the reliability and integrity of some unstable physico-chemical parameters, in-situ measurement of pH, conductivity, Total Dissolved Solids (TDS), and temperature were carried out in the field. All field instruments were regularly cleaned and recalibrated after each use. The Quality Assurance and Quality Control (QA & QC) for laboratory analyses is in accordance with FMEnv recommended method, and include blank analyses to establish analyte level, duplicate analyses to establish analytical precision, spiked and blank sample analyses to determine analytical accuracy.

4.3 Climate and Meteorology Data of Borno State

The climate of Borno state is characterized as tropical wet and dry or alternatively known as savanna. The average percentage of the sky covered by clouds experiences significant seasonal variation over the course of the year. The clearer part of the year in Borno begins in October and lasts till March. The clearest month of the year is January, during which on average the sky is clear, mostly clear, or partly cloudy 57% of the time.

The cloudier part of the year begins in March lasts till October. The cloudiest month of the year is April, during which on average the sky is overcast or mostly cloudy 65% of the time.

Across the year, the weather exhibits a notable fluctuation in numerous parameters as presented below.

Temperature

In Borno state, hot season starts from March to May, with an average daily high temperature above 37^0C. The hottest months of the year are April and May, with an average high of 42^0C and low of 37^0C. The cool season starts from November to February, with an average daily high temperature below 25^0C. The coldest month of the year is January, with an average low of 18^0C and high of 33^0C.

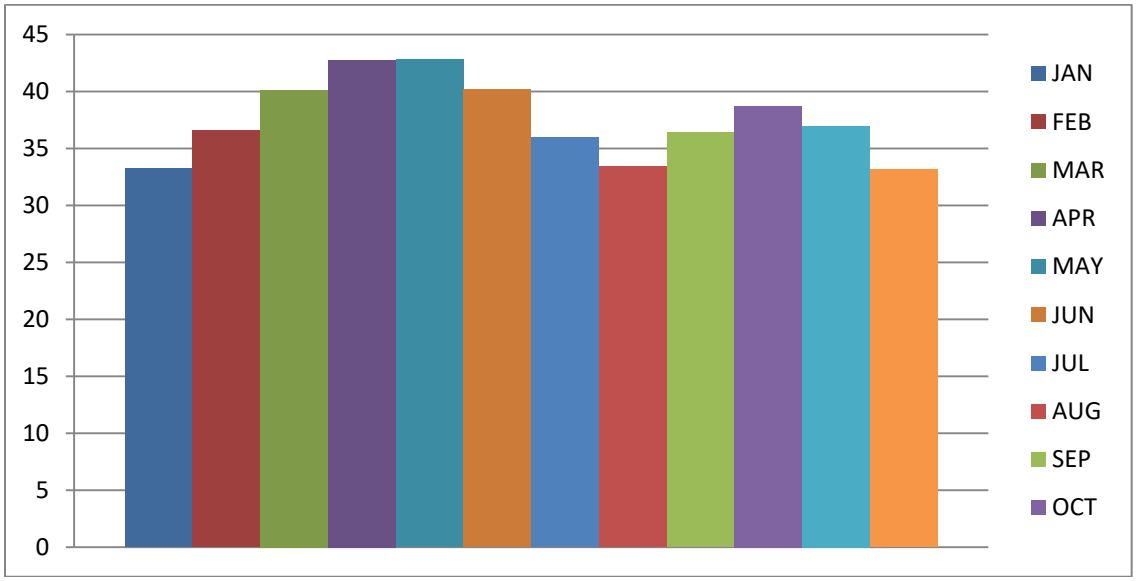


Figure 4.14a: Average Maximum Temperature of the study area (1985 to 2021)
Source: NiMet, 2023

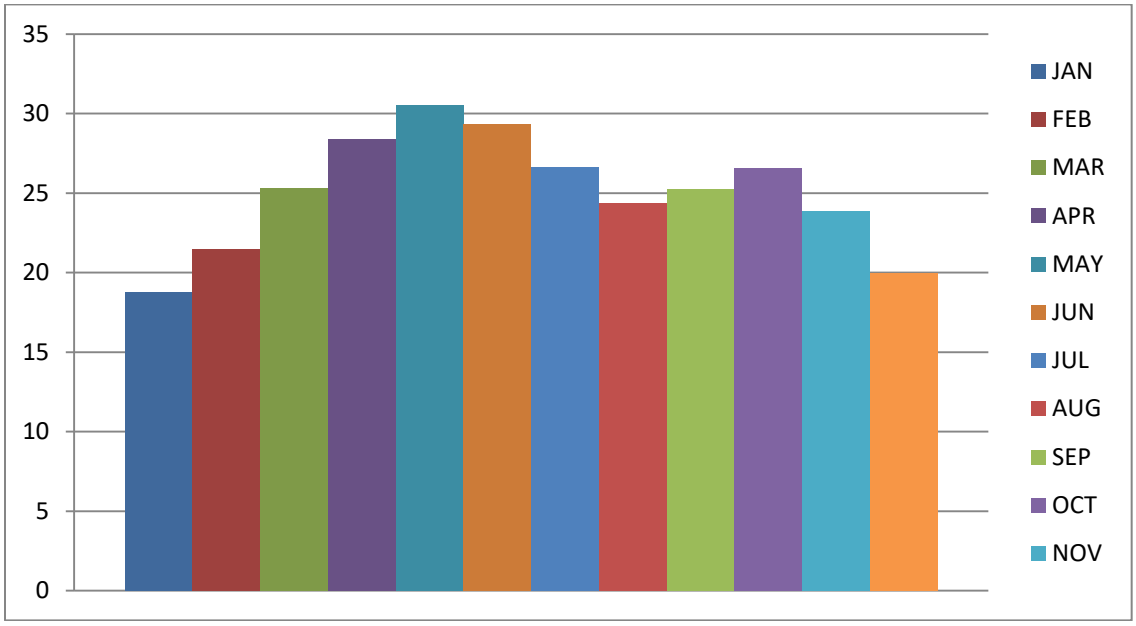


Figure 4.14b: Average Minimum Temperature of the study area (1985 to 2021)
Source: NiMet, 2023

Rainfall

Borno state experiences extreme seasonal variation in monthly rainfall. The rainy period of the year lasts is from July to September. The month with the most rain is August, with an average rainfall of 192mm. The driest period of the year is from October to April. The months with the least rain are December and January, with an average rainfall of 0.0mm.

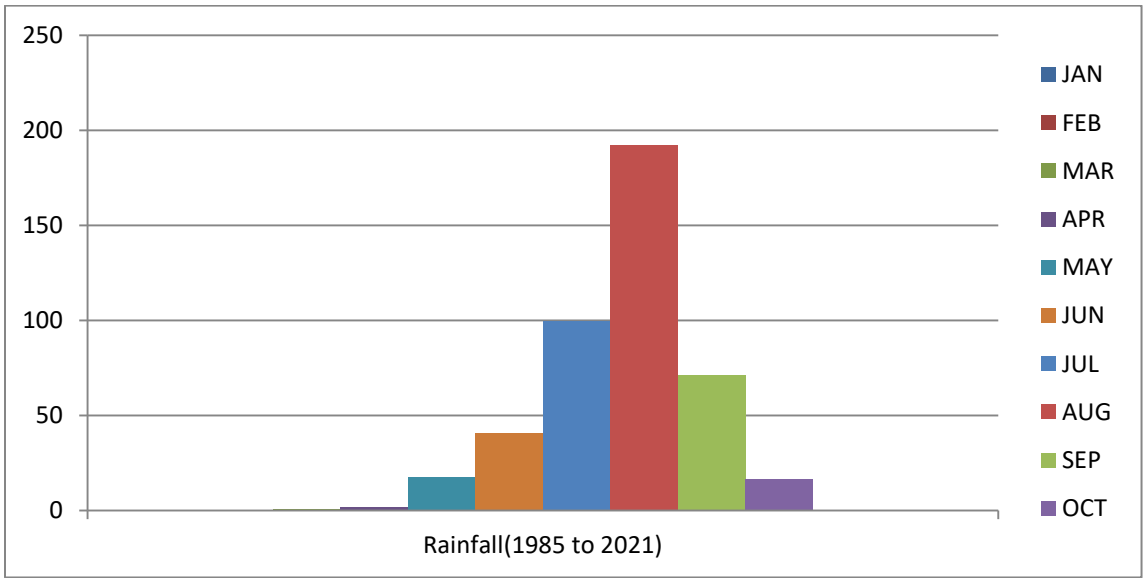


Figure 4.15 Average Rainfall (mm) of the Study Area
Source: NiMet, 2023

Relative Humidity:

Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night. Relative humidity is lowest in February to April with values of about 15%. It is highest in the month of August with values of about 66%.

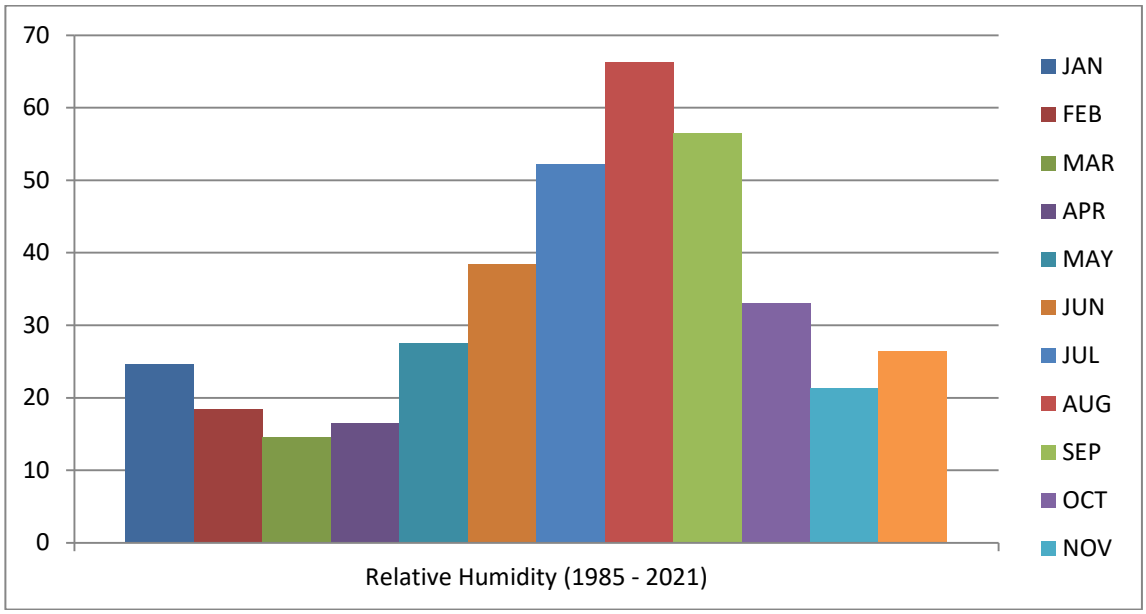


Figure 4.16: Average % Relative Humidity of the study area
Source: NiMet, 2023

Wind Speed and Direction:

The wind experienced at any given location is highly dependent on local topography and other factors. The average hourly wind speed in Borno experiences significant seasonal variation over the course of the year. High wind speed for the year is February with an average wind speed of 4.6m/s. Low wind speed of year is recorded August and September, with an average hourly wind speed of 2.6m/s.

The wind is most often from the east in April and from October to November, The wind is most often from the south from May to July and from August to October. The wind is most often from the north from November to April.

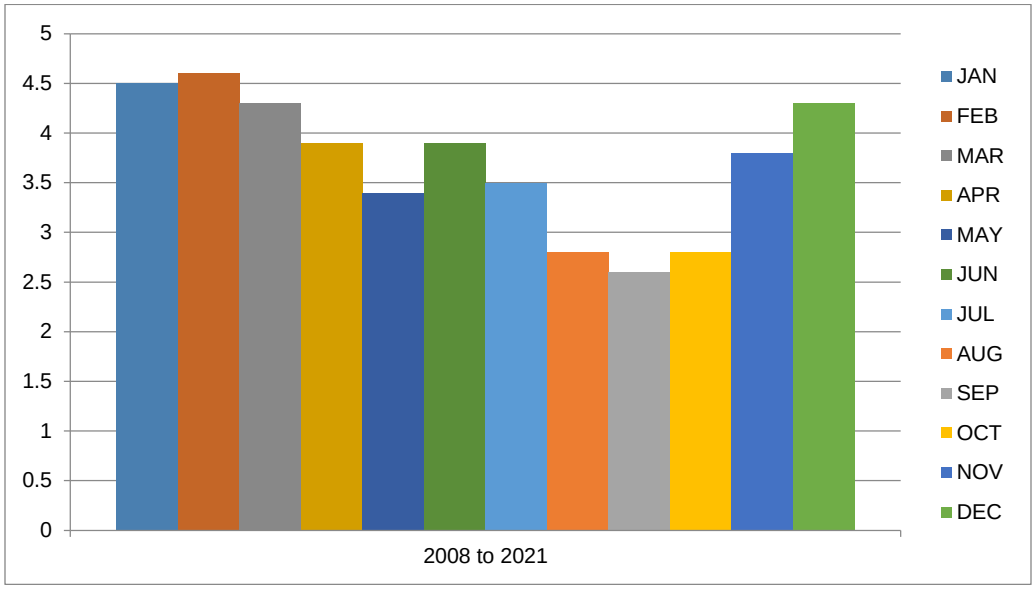


Figure 4.17: Average Wind Speed in the Project Area
Source: NiMet, 2023

Sunshine

According to NiMet record, an average of about 11 hours of bright sky per day are recorded in Borno state. A further assessment reveals that the dullest months are around November to December when about 8 to 10 hours daily are recorded. The brightest months are between May and July with an average of 12 hours per day.

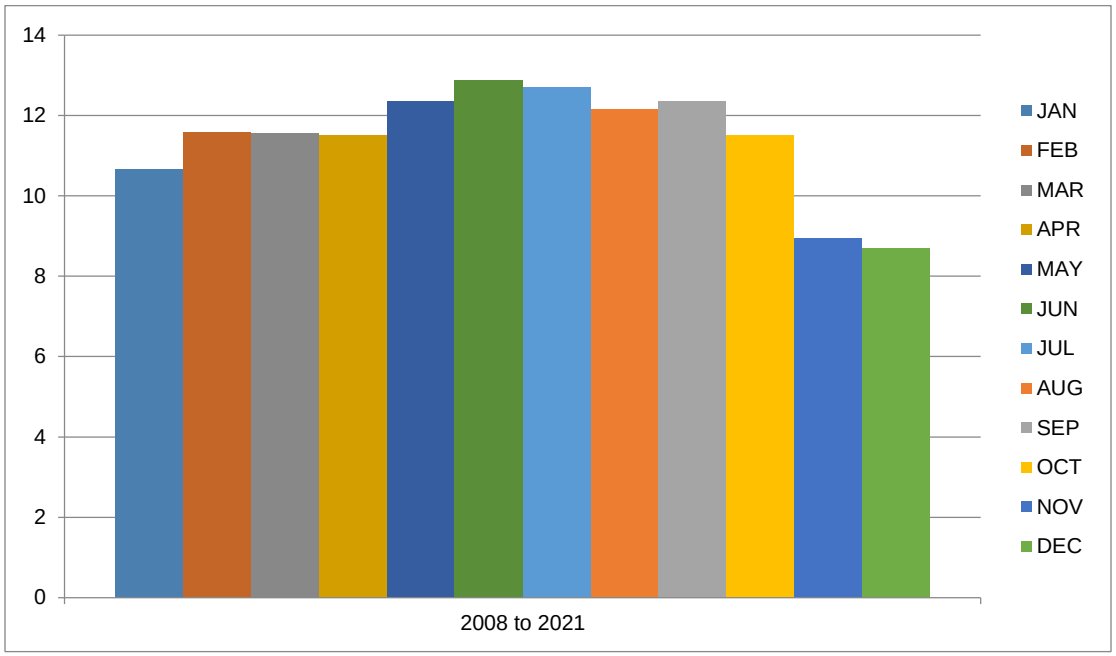


Figure 4.18: Annual Sunshine hours
Source: NiMet, 2023

4.4 Air quality and Noise Level for Borno State Study Area

The results of ambient air quality and noise level measurements conducted within and around the site in Borno State are presented in Table 4.5. The results do not show any remarkable deviation from the Federal Ministry of Environment's permissible limit for Nigeria air quality.

Discussion of Air Quality Results in Borno State Study Area

Oxides of Nitrogen (NOx): oxides of nitrogen are highly reactive gases. NOx primarily enters the air through the combustion of fuel, and as such can be used as a general indicator of air pollution from motor vehicles. It is one of the most prominent air pollutants. NOx were not detected in the sampled locations.

Carbon monoxide (CO): This is a colourless, odourless, non-irritating but very poisonous gas. It is a product of incomplete combustion of fuel such as natural gas, coal or wood. Vehicular exhaust is a major source of carbon monoxide. The highest concentration of CO detected in Borno State sampled locations is 3ppm.

Carbon dioxide: Carbon dioxide is a greenhouse gas emitted from combustion but is also a gas vital to living organisms. It is a natural gas in the atmosphere. According to preliminary data released in December 2022 by Mauna Loa Observatory (NOAA ESRL), atmospheric CO_2 on the Planet is 422ppm. The concentration observed in the sampled locations is within the range of 414– 427ppm. OSHA established a permissible out door Exposure Limit for C02 in air as 5000ppm averaged over an 8-hour work day.

(*https://www.osha.gov/dts/chemicalsampling/data/CH_225400.html*). The obtained values from the study locations are below this exposure limits.

Volatile organic compounds (VOC):

VOC level were below detection limit as 0.01ppm was recorded in all the sampled locations. VOCs are organic chemicals that have a high vapour pressure at ordinary temperature and are pollutant compounds that contaminate the air. Some VOCs are dangerous to human health as well as the environment. Short-term exposure to

various VOCs may cause irritation of the eyes and respiratory tract, headaches, dizziness, visual disorders and memory problems. While long-term exposure could result to nausea, fatigue, loss of coordination, damage to the liver, kidneys, and central nervous system as well as cancer.

Suspended particulate matter

Suspended particulate matter across the project area is relatively low. $PM_{2.5}$ across the studied locations ranged from 35 to 44.0µg/m^3. PM_{10} ranged from 52.0 to 65.0µg/m^3. The values obtained for PM_{10} and $PM_{2.5}$ are below NESREA limit of 40µg/m^3 for $PM_{2.5}$ and 150µg/m^3 for PM_{10}. The size of particles is directly linked to their potential for causing health problems. Small particles less than 10 micrometers in diameter pose the greatest problems, because they can get deep into the lungs, and some may even get into the bloodstream. Factors contributing to SPM include Climatic factors at the time of monitoring, farming activities and vehicular movements along the approach roads to the project sites and at the time of this study. Increased levels of fine particles in the air are linked to health hazards such as malfunctioning of the lung and lung cancer, non-fatal heart attacks, irregular heartbeat, aggravated asthma, increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.

Oxides of Sulfur especially sulfur dioxide, is a chemical compound with the formula SO_2. It is produced by various industrial processes. Since petroleum often contains sulfur compounds, their incomplete combustion generates sulfur dioxide. Further oxidation of SO_2, usually in the presence of a catalyst such as NO_2, forms H_2SO_4, and thus acid rain. This is one of the causes for concern over the environmental impact of the use of these fuels as power sources. In this study area, SO_2 concentration was not detected at all sampled points. Sulfur dioxide in combination with water and air, forms sulfuric acid, which is the main component of acid rain. It has the tendency of causing deforestation, acidify waterways to the detriment of aquatic life and corrode building materials and paints.

Methane: is a main constituent of natural gas. Methane has an impact on the earth's temperature and climate because it is a greenhouse gas (GHG). Various anthropogenic (influenced by humans) and natural sources both produce and release methane. Landfills, natural gas and oil pipelines, industrial processes, mining for coal, stationary and mobile combustion, wastewater treatment, and some agricultural practices are examples of anthropogenic emission sources. In this study area, CH_4 concentration was below the equipment detection limit of 0.01ppm at all the sampling points. With around 20% of all greenhouse gas emissions coming from humans, methane is the second most prevalent anthropogenic GHG after carbon dioxide (CO_2). As a heat-trapping gas, methane is more than 25 times more effective than carbon dioxide. The atmosphere's methane concentrations have more than doubled during the past two centuries, mostly as a result of human-related activities.

Hydrogen Sulphide (H_2S): also known as sewer gas, swamp gas, stink damp, or sour damp is a colorless gas known for its pungent "rotten egg" odor at low concentrations. It is extremely flammable and highly toxic. Hydrogen sulfide is used or produced in a number of industries, such as oil and gas refining, mining, tanning, rayon manufacturing, pulp and paper processing.

Hydrogen sulfide also occurs naturally in sewers, manure pits, well water, oil and gas wells, and volcanoes. Because it is heavier than air, hydrogen sulfide can collect in low-lying and enclosed spaces, such as manholes, sewers, and underground telephone vaults. Its presence makes work in confined spaces potentially very dangerous.

The health effects of hydrogen sulfide range from mild, headaches or eye irritation, to very serious, unconsciousness and death. This gas was not detected in all the sampled locations.

Noise Level

The result of air quality and daytime noise level measurement in the project locations is shown in table below. Noise level in project sites ranged from 40 to 52.8dB (A) which is within worldbank daytime noise limit for residential land use. The low level of noise may be attributed to low activities within these locations as at the time of this study.

Plate 4.8: On-field Measurement of Air Quality Parameters and Noise Levels

Table 4.5: Average Result of Ambient Air quality and Noise Level for sites

Sample Code	Coordinates	Air Quality										Noise dB(A)	Wind Speed (m/s)	Wind Direction
		$PM_{2.5}$ ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	CO (ppm)	CO_2 (ppm)	NO (ppm)	NO_2 (ppm)	CH_4 (%)	VOC (ppm)	H_2S (ppm)	SO_2 (ppm)			
A/N 001	11.856166 12.992718	40	60	2	422	BDL	BDL	BDL	BDL	BDL	BDL	44.6	2.6	NE
A/N 002	11.856310 12.995662	35	54	BDL	414	BDL	BDL	BDL	BDL	BDL	BDL	42.7	2.8	NE
A/N 003	11.855903 12.999414	38	58	BDL	422	BDL	BDL	BDL	BDL	BDL	BDL	47.3	3.2	NE
A/N 004	11.855457 13.002779	37	52	3	420	BDL	BDL	BDL	BDL	BDL	BDL	43.8	3.7	NE
A/N 005	11.853802 12.992436	35	58	BDL	420	BDL	BDL	BDL	BDL	BDL	BDL	42.9	3.0	NE
A/N 006	11.853238 12.994671	35	56	BDL	419	BDL	BDL	BDL	BDL	BDL	BDL	40.0	2.8	NW
A/N 007	11.853233 12.997807	38	62	BDL	417	BDL	BDL	BDL	BDL	BDL	BDL	52.6	2.8	NW
A/N 008	11.853671 12.999976	35	55	1	415	BDL	BDL	BDL	BDL	BDL	BDL	49.2	2.7	NE
A/N 009	11.852756 13.002703	40	65	BDL	427	BDL	BDL	BDL	BDL	BDL	BDL	46.9	3.4	NE
A/N 010	11.851299 12.992273	37	61	BDL	418	BDL	BDL	BDL	BDL	BDL	BDL	48.0	3.5	NE
A/N 011	11.850187 12.993242	37	56	2	427	BDL	BDL	BDL	BDL	BDL	BDL	49.5	3.2	NW
A/N 012	11.849690 12.997466	35	54	BDL	420	BDL	BDL	BDL	BDL	BDL	BDL	47.2	3.1	NW
A/N 013	11.851401 12.999161	37	62	3	419	BDL	BDL	BDL	BDL	BDL	BDL	52.8	3.2	NE
A/N 014	11.849727 13.001906	36	58	BDL	414	BDL	BDL	BDL	BDL	BDL	BDL	49.2	3.3	NE

A/N 015	11.851489 13.002174	44	65	BDL	422	BDL	BDL	BDL	BDL	BDL	BDL	43.9	2.9	NE
A/N Control	11.854911 13.008353	38	63	BDL	420	BDL	BDL	BDL	BDL	BDL	BDL	40.5	2.0	NE
	Minimum Value	35	52	BDL	414	-	BDL	BDL	-	-	-	40	2.0	-
	Maximum Value	44	65	3	427	-	BDL	BDL	-	-	-	52.8	3.7	-
	Equipment detection limit	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		30	0.01	-
	FMEnv Limit	250	250	10	-	-	0.04-0.06	-	-	-	-	90	-	-
	NESREA Limit	40	150	10			0.12	-	-	-	-	55-70	-	-

** WHO/ NESREA noise level Limit
Residential Land use - Day time = 55/45dB(A) and Night time = 35dB(A)
Commercial/industrial - Land use - Day time = 70dB(A) and Night time =60 dB(A)
Duration: for 8hourly

ICNIRP Limit:: GSM 900 MHz 4.5w/m² GSM 1800 MHz 9.0w/m² WCDMA 2100 MHz 10.0w/m²

KEY: BDL= below detection limit
Source: Fieldwork, 2024

4.5 Geology of Borno State

Borno state sits on the Bornu Basin which is the Nigerian section of the Chad Basin, a sedimentary formation believed to have been formed during the Cretaceous era while the Chad Basin is believed to have been formed during the late Aptian (between 125 – 113 million years ago) and Albian (113 – 100 million years) period.

The Bornu Basin is made up of:

a) The Bima sandstone which was formed from the weathering of basement rocks and contains stratified feldspathic sandstone
b) The Gongila formation formed on the Bima sandstone and contains moderately-thick shales with calcium carbonate content. It also contains silty sandstones which are found in shallow marine environment;
c) The Fika (Shale) formation, an overlay of Nigeria Mineral Resources the Gongila Formation, and contains blue-black shales with gypsum content, found in shallow to deep marine environment
d) The Gombe sandstone made up of siltstones, ironstones and shales deposited in estuaries and deltas.
e) The Kerri-Kerri formation found in the southern part of the state and contains sandstones with iron oxide and gritty clay of different colors; and
f) The Chad formation which is the topmost layer of rock formation, is found in the bottom of the lake and contains clays, sand and diatomite.

Borno state it is characterized by rugged terrain provided by the Mandara (Pulka-Gwoza-Chibok) mountains and the Biu plateau. The geology of southern Borno is typified by vast occurrence of Precambrian Basement Complex rocks in its eastern region, whereas the western flank of the area is underlain by the Tertiary-Quaternary basaltic rock of the Biu Plateau. Sedimentary rock of Albian-Tertiary age underlies the extreme western region and locally associated with volcanic intrusions.

4.6 Soil Quality

There are two different types of soil namely the clay and sandy soil found in northern and southern part of the local government. There is also lateritic soil and alluvial soil which is mainly found along the coast of Yadzaram River and streams. The clay is suitable for cultivation of crops like guinea corn, beans, groundnuts and even cotton while the sandy loam soil, on the other hand is more suitable for the cultivation of tree crops such as orange, mango, guava and various types of vegetables. The predominant soils textures are sandy loam to silty clay and are observed in some areas along the corridor. The land use is arable farming (under the bush fallow/rotation system) and crops grown include maize, guinea corn, millet, groundnut and beans.

A total of thirty (30 Nos) soil samples were collected within the proposed project site and one (1No) control soil sample. At each sampled point, soil samples were collected at two depths (0-15cm for top soil and 16-30cm for sub soil). This operation was carried out with the aid of stainless steel Dutch auger (Plate 4.9).

Each sample was collected in aluminium foil, labeled appropriately, and stored in a cooler. The samples were then transported to Abuja Environmental Protection Board Laboratory (accredited by FMEnv.) in Asokoro District of Abuja.

The physico-chemical characteristics of soil samples obtained from thirty (30) points and one (1) control point within the study area after in-situ/laboratory measurement and analyses.

Plate 4.9: Soil sample collection using soil auger

Proposed Special Agro-Industrial Processing Zone Borno Physical/Chemical Parameters of Soils Samples

S/N	PARAMETERS (Units in mg/kg) accepted stated	BOR- SS 1 0-15cm	BOR- SS 1 16-30cm	BOR- SS 2 0-15cm	BOR- SS 2 16-30cm	BOR- SS 3 0-15cm	BOR-SS3 16-30cm
A	**PHYSICAL TEST**						
1	TEMERATURE (^{O}C)	36.4	36.1	36.7	36.3	36.2	35.7
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 13.70/47.07/39.23	SAND/SILT/CLAY 19.76/46.54/33.70	SAND/SILT/CLAY 15.08/55.63/29.29	SAND/SILT/CLAY 11.15/52.14/36.71	SAND/SILT/CLAY 12.79/56.90/30.31	SAND/SILT/CLAY 10.23/57.17/32.6
3	$_{P}$H	7.21	7.04	7.19	6.90	7.23	6.89
4	MOISTURE CONTENT (%)	1.037	1.302	0.980	0.960	0.992	1.022
5	SOIL POROSITY (%)	30.00	33.33	24.00	26.66	30.00	33.33
6	BULK DENSITY (g/cm^3)	1.050	1.190	1.053	1.110	0.950	1.130
7	WET DENSITY (g/cm^3)	1.420	1.270	0.980	1.000	1.080	1.000
8	DRY DENSITY (g/cm^3)	1.005	1.120	0.180	1.240	1.160	1.260
B	**ORGANICS**						
9	TOTAL ORGANIC CARBON	2.40	4.30	2.00	1.80	3.10	1.70
C	**EXCHANGEABLE IONS**						
10	PHOSPHATE (mg/kg)	1.184	0.896	1.320	1.052	3.805	6.220
11	SULPHATE (mg/kg)	42.00	34.10	47.20	33.00	29.75	25.80
12	NITRATE (mg/kg)	6.00	4.26	7.34	5.96	5.00	5.87
13	CALCIUM (mg/kg)	29.70	25.80	30.10	23.70	32.60	29.70
14	MAGNESSIUM (mg/kg)	15.40	13.10	15.00	12.05	16.70	15.30
15	CHLORIDE (mg/kg)	2.70	2.50	3.27	2.97	3.00	2.20
D	**HEAVY METALS**						
16	MANGANESE (mg/kg)	0.872	0.576	1.820	1.135	0.550	0.446
17	COPPER (mg/kg)	1.285	1.020	2.140	1.503	0.975	1.021
18	IRON (mg/kg)	4.020	3.680	3.990	2.894	3.130	2.885
19	ZINC (mg/kg)	3.140	3.010	4.403	2.775	2.850	3.006
20	CADMIUM (mg/kg)	0.029	0.016	0.018	0.012	0.016	0.021
21	LEAD (mg/kg)	0.011	0.007	0.010	0.006	0.013	0.010
22	NICKEL (mg/kg)	0.004	0.002	0.004	0.002	0.003	0.005
E	**BACTERIAL ISOLATE**						
23	*Total Heterotrophic Bacteria (cfu/100 ml)*	4.4 X 10^2	4.5 X 10^2	4.3 X 10^2	4.0 X 10^2	4.7 X 10^2	4.8 X 10^2
24	*Total Heterotrophic fungi (THF) (cfu/100 ml)*	3.8 X 10^2	3.6 X 10^2	3.7 X 10^2	3.3 X 10^2	3.6 X 10^2	3.4 X 10^2
25	*Total fungi count (TFC) (cfu/100 ml)*	3.7 X 10^2	3.4 X 10^2	3.1 X 10^2	3.1 X 10^2	3.1 X 10^2	2.8 X 10^2
26	*Feacal Coliform Count (FCC) (cfu/ 100 ml)*	3.2 X 10^2	3.0 X 10^2	2.8 X 10^2	2.6 X 10^2	2.6 X 10^2	2.7 X 10^2

Proposed Special Agro-Industrial Processing Zone Borno Physical/Chemical Parameters of Soils Samples

S/N	PARAMETERS (Units in mg/kg) accepted stated	BOR- SS 4 0-15cm	BOR- SS 4 16-30cm	BOR- SS 5 0-15cm	BOR- SS 5 16-30cm	BOR- SS 6 0-15cm	BOR-SS6 16-30cm
A	**PHYSICAL TEST**						
1	TEMERATURE (^{O}C)	36.4	35.8	36.0	35.4	35.4	35.0
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 41.03/48.37/10.6	SAND/SILT/CLAY 12.12/55.46/32.42	SAND/SILT/CLAY 12.80/56.51/30.13	SAND/SILT/CLAY 13.28/52.85/30.04	SAND/SILT/CLAY 20.03/55.26/24.71	SAND/SILT/CLAY 23.49/52.71/23.8
3	$_{P}$H	7.21	6.98	7.16	7.07	7.34	6.97
4	MOISTURE CONTENT (%)	1.024	1.007	0.940	0.930	1.204	1.170
5	SOIL POROSITY (%)	30.00	30.00	20.00	23.33	25.00	26.66
6	BULK DENSITY (g/cm^3)	1.210	1.110	1.090	1.120	1.090	1.110
7	WET DENSITY (g/cm^3)	1.150	1.017	1.110	1.040	1.006	0.930
8	DRY DENSITY (g/cm^3)	1.075	1.190	1.075	1.194	1.191	1.280
B	**ORGANICS**						
9	TOTAL ORGANIC CARBON	1.80	1.40	2.40	1.20	1.60	2.80
C	**EXCHANGEABLE IONS**						
10	PHOSPHATE (mg/kg)	1.670	1.416	0.809	0.731	1.404	1.234
11	SULPHATE (mg/kg)	49.30	40.66	44.10	35.70	31.00	20.15
12	NITRATE (mg/kg)	6.07	10.73	6.45	16.50	8.13	9.29
13	CALCIUM (mg/kg)	32.40	28.60	26.80	28.10	33.20	30.40
14	MAGNESSIUM (mg/kg)	12.80	19.80	13.70	14.80	16.50	15.60
15	CHLORIDE (mg/kg)	2.30	2.00	3.61	1.12	4.84	4.03
D	**HEAVY METALS**						
16	MANGANESE (mg/kg)	0.662	0.355	1.157	0.945	1.674	1.220
17	COPPER (mg/kg)	1.914	1.364	0.909	0.787	1.555	1.310
18	IRON (mg/kg)	4.160	3.420	3.160	2.872	4.280	3.460
19	ZINC (mg/kg)	2.713	2.810	2.743	1.993	3.640	4.005
20	CADMIUM (mg/kg)	0.024	0.017	0.014	0.013	0.018	0.023
21	LEAD (mg/kg)	0.009	0.008	0.006	0.007	0.011	0.007
22	NICKEL (mg/kg)	0.004	0.002	0.002	0.003	0.003	0.004
E	**BACTERIAL ISOLATE**						
23	*Total Heterotrophic Bacteria (cfu/100 ml)*	5.3 X 10^2	4.8 X 10^2	4.7 X 10^2	4.1 X 10^2	3.3 X 10^2	3.0 X 10^2
24	*Total Heterotrophic fungi (THF) (cfu/100 ml)*	4.7 X 10^2	4.6 X 10^2	4.6 X 10^2	4.3 X 10^2	2.9 X 10^2	2.8 X 10^2
25	*Total fungi count (TFC) (cfu/100 ml)*	4.1 X 10^2	3.7 X 10^2	3.8 X 10^2	3.9 X 10^2	2.3 X 10^2	2.1 X 10^2
26	*Feacal Coliform Count (FCC) (cfu/ 100 ml)*	3.8 X 10^2	3.1 X 10^2	2.9 X 10^2	3.1 X 10^2	1.9 X 10^2	1.6 X 10^2

Proposed Special Agro-Industrial Processing Zone Borno Physical/Chemical Parameters of Soils Samples

S/N	**PARAMETERS (Units in mg/kg) accepted stated**	BOR- SS 7 0-15cm	BOR- SS 7 16-30cm	BOR- Control 0-15cm	BOR- control 16-30cm
A	**PHYSICAL TEST**				
1	TEMERATURE (^{O}C)	35.9	35.0	35.8	35.1
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 47.34/39.1/13.56	SAND/SILT/CLAY 26.25/45.84/27.91	SAND/SILT/CLAY 18.20/52.65/29.15	SAND/SILT/CLAY 11.37/43.19/45.44
3	$_{p}$H	7.28	7.23	7.27	7.24
4	MOISTURE CONTENT (%)	1.127	1.270	0.870	0.823
5	SOIL POROSITY (%)	28.33	26.00	25.00	26.00
6	BULK DENSITY (g/cm^3)	1.175	1.120	1.070	1.130
7	WET DENSITY (g/cm^3)	1.220	1.114	0.950	1.000
8	DRY DENSITY (g/cm^3)	1.110	1.050	1.190	1.250
B	**ORGANICS**				
9	TOTAL ORGANIC CARBON	3.60	3.10	1.00	1.80
C	**EXCHANGEABLE IONS**				
10	PHOSPHATE (mg/kg)	1.014	0.904	0.706	0.706
11	SULPHATE (mg/kg)	42.33	37.90	31.60	30.20
12	NITRATE (mg/kg)	11.04	10.60	2.074	3.870
13	CALCIUM (mg/kg)	32.60	29.40	25.70	22.90
14	MAGNESSIUM (mg/kg)	16.70	15.40	12.60	11.80
15	CHLORIDE (mg/kg)	2.138	2.840	2.000	2.000
D	**HEAVY METALS**				
16	MANGANESE (mg/kg)	1.107	1.053	0.608	1.832
17	COPPER (mg/kg)	1.004	0.893	2.185	1.110
18	IRON (mg/kg)	4.024	3.613	3.652	2.615
19	ZINC (mg/kg)	3.243	1.817	2.483	2.854
20	CADMIUM (mg/kg)	0.032	0.020	0.017	0.014
21	LEAD (mg/kg)	0.012	0.007	0.009	0.008
22	NICKEL (mg/kg)	0.009	0.005	0.004	0.002
E	**BACTERIAL ISOLATE**				
23	*Total Heterotrophic Bacteria (cfu/100 ml)*	3.2 X 10^2	3.0 X 10^2	4.7 X 10^2	4.1 X 10^2
24	*Total Heterotrophic fungi (THF) (cfu/100 ml)*	2.8 X 10^2	2.5 X 10^2	3.6 X 10^2	3.4 X 10^2
25	*Total fungi count (TFC) (cfu/100 ml)*	2.2 X 10^2	2.0 X 10^2	3.1 X 10^2	3.2 X 10^2
26	*Feacal Coliform Count (FCC) (cfu/ 100 ml)*	1.8 X 10^2	1.4 X 10^2	1.8 X 10^2	1.7 X 10^2

Discussion

Soil samples were collected from a top layer of 0-15cm and a sub layer of 15-30 cm.

Nutrients: Nitrogen, Phosphorous and Potassium are the three main soil nutrients. PO_4^{3-}, SO_4^{2-} and NO_3 were analysed. In general, nutrients decreased with depth across most of the samples except in few cases where the values was lower in the upper layer and increased in the sub layer. In the topsoil, the nutrient levels ranged as follows: 5.00 mg/kg to 11.04 mg/kg for nitrate, 0.8 mg/kg to 38.5 mg/kg for phosphate and 29.75 mg/kg to 49.30 mg/kg for sulphate. In subsoil samples (15-30cm), the nutrient levels were 4.26 mg/kg – 16.50 mg/kg for nitrate, 0.73 mg/kg – 6.22 mg/kg for phosphate and 20.15 mg/kg to 40.66 mg/kg for sulphate. Other important soil nutrients are calcium, magnesium and sulphur.

Exchangeable Cations: Generally, the measured exchangeable cations (Mg^{2+} and Ca^{2+}) decreased with depth except for few samples. Overall, the soil show rich in nutrient values. Cation exchange capacity (CEC) is a measure of the total negative charges within the soil that adsorb plant nutrient cations such as calcium (Ca^{2+}), magnesium (Mg^{2+}) and potassium (K^+). As such, the CEC is a property of a soil that describes its capacity to supply nutrient cations to the soil solution for plant uptake. The nutrient cation plants use in the largest amounts are potassium (K^+), calcium (Ca^{2+}) and magnesium (Mg^{2+}). Micronutrient cations such as copper and manganese are typically present at very low concentrations in the soil.

Heavy Metals: Different metals in soil have different effects on it. Low concentration of heavy metals indicates high microbial activity and growth and thus high microbial biomass. Heavy metals analysed from the sample include: Mn, Cu, Fe, Zn, Cd, Pb, and Ni. These values were found to have low concentrations except Fe and Zn which are higher. Fe and Zn are both essential micronutrients for plant growth

pH: The soil pH ranged from slightly acidic to alkaline. The pH range was 7.16 – 7.34 in the top layer and 6.89 – 7.23 in the sub soil. Decomposition of different kinds of organic matter in soil produces different types of organic acid. These organic acids produce H^+ which can create soil acidity. Some plants grow well in slightly acidic soil from 5.5 to 7 such as beans, onions, and some fruits.

4.7 Ground Water Quality

Both natural and man-made factors controls the chemistry of groundwater. Chemical composition of geologic formations affects the hydrochemical characteristics of groundwater during their circulation in the subsurface (Elango et al. 2003). This underground passage through the pore spaces and weathered zones may alter the natural composition of the groundwater by the action of various hydrochemical processes (Rajmohan and Elango 2004). In other words, the many processes occurring in groundwater can be revealed by the composition of the water. Numerous human activities have the potential to alter the chemistry of groundwater. These include industrial pollutants and point sources such waste disposal facilities. The reason for the vulnerability categorization is the ease with which pollutants can pass through the fracture and weathered formation as a result of rainfall and runoff carrying over from the surface to groundwater. This assessment is based on the generic consideration of soil and rock types and does not indicate that the risks to individual sources are high.

Sampling Methodology

Ground water sample were typically collected from a borehole in Njimtilo closest to the proposed AIH project site. These samples were collected using 750ml plastic bottles, labeled appropriately, preserved in ice pack and transported to AEPB Laboratory in Abuja for laboratory analysis.

Plate 4.11: Ground water sample collection from Njimtilo community

Proposed Special Agro-Industrial Processing Zone Borno Physical/Chemical Parameters of Ground Water Sample

S/N	PARAMETERS	BOR GW 1 Project Site	BOR GW 2 Njimitilo community 1	BOR GW 3 Njimitilo community 2	FMEnv LIMIT
A	**PHYSICAL TEST**				
1	Odour	Odorless	Odorless	Odorless	**Odorless**
2	TEMPERATURE (^{0}C)	31.0	30.8	30.9	**<40**
3	pH	7.5	7.4	7.6	**6-9**
4	ELECTRICAL CONDUCTIVITY (µS/cm)	584.0	544.0	636.0	**1000**
5	DISSOLVED OXYGEN (mg/l)	3.1	3.3	3.5	**7.5**
6	TOTAL DISSOLVED SOLIDS (mg/l)	292.0	272.0	318.0	**500**
7	SALINITY (%)	0.02	0.02	0.03	**0.0**
8	ALKALINITY (m/l)	28.0	31.0	34.0	**100**
9	TOTAL SUSPENDED SOLID mg/l)	0.022	0.026	0.029	**<10**
B	**CHEMICAL TEST**				
10	TOTAL HARDNESS (mg/l)	171.2	154.08	205.44	**200**
11	MAGNESIUM HARDNESS (mg/l)	34.24	34.24	51.36	**50**
12	CALCIUM HARDNESS (mg/l)	136.96	119.84	154.08	**150**
13	PHOSPHATE (mg/l)	1.204	2.116	2.337	**5**
14	NITRATE as NITROGEN (mg/l)	6.50	6.00	7.30	**10**
15	TOTAL CHLORIDE (mg/l)	3.70	4.00	3.80	**250**
16	BOD (mg/l)	-	-	-	**7.5**
17	COD (mg/l)	-	-	-	**30**
18	SULPHATE (mg/l)	56.2	54.3	61.4	**250**
C	**HEAVY METAL**				
19	MANGANESE (mg/l)	0.127	0.121	0.138	**0.2**
20	IRON TOTAL (mg/l)	0.301	0.374	0.924	**1.5**
21	COPPER (mg/l)	0.005	0.005	0.005	**0.1**
22	CADMIUM (mg/l)	0.010	0.011	0.017	**0.05**
23	ZINC (mg/l)	0.412	0.640	0.890	**0.1**
24	LEAD (mg/l)	0.006	0.005	0.008	**0.05**
25	NICKEL (mg/l)	0.002	0.002	0.003	**0.05**
D	**BATERIOLOGICAL**				
26	*Total Coliform count (CFU/100ml)*	3.2	2.9	4.6	**1.8**
27	*Escherichia Coli (cfu/ml)*	1.4 X 10^1	1.2 X 10^1	2.3 X 10^1	**Absent**
28	*Salmonella (cfu/ml)*	0.0	0.0	1.0 X 10^1	**Absent**
29	*Shigella (cfu/ml)*	0.0	0.0	0.0	**Absent**
30	*staphylococcus (cfu/100ml)*	2.0 X 10^1	1.8 X 10^1	2.2 X 10^1	**Absent**

Discussion

Ground water quality assessment within the proposed project location in Borno is an integral component of this EIA. This baseline study helps to determine the present quality of the ground water as well as the potential impacts this project will have on the water resources. This informs decision with respect to mitigation strategies and whether/how the project should proceed.

Temperature: The groundwater temperature ranged from 30.8^{0}C to 31.0^{0}C with a mean value of 30.9^{0}C

pH: pH value expresses the acidity or alkalinity of water and measured on a scale of 0 to 14. The values obtained for Project site (GW1), Njimitilo1 (GW2), and Njimitilo2 (GW3) communities are 7.5, 7.4 and 7.6 respectively. These values fall on alkalinity side of the pH measuring scale and within FMEnv safe limit of 6-9.

Electrical Conductivity: As salinity and temperature increase in water, conductivity also increases. The higher the conductivity above regulatory limit, the higher amount of impurities (such as dissolved substances, chemicals, and minerals) is present in the water. The EC values of the samples are moderate ranging from 544 to 636µS/cm.

Dissolved Oxygen (DO): DO is one of the most important indicators of water quality in drinking water. High DO levels in the drinking water makes a better taste than one with lower DO levels. However, water with higher DO levels can damage industrial components such as increased corrosion in water pipes, therefore costing water suppliers more money with maintenance and repairs. DO values in the sample ranged from 3.1 to 3.5mg/l. The main causes of low dissolved oxygen in water are increases in temperature, decaying organic matter from aquatic plants and algae, and weather changes.

Total Dissolved Solids (TDS) in drinking water could originate from natural sources, sewage, amongst others. TDS values in the water samples are fair having 292mg/l for Project site, 272 mg/l for Njimitilo community 1, and 318 mg/l for Njimitilo community 2.

Nitrate (NO_3^-): Nitrate values ranged from 6.0 to 7.30mg/l which are below the FMEnv limit. Nitrate is a colourless, odourless and tasteless compound that may get in contact with water sources through chemical fertilizers, leaching from natural vegetation, domestic wastewater amongst others.

Sulphate (SO_4^{2-}): The concentration of sulphate in the samples ranged between 54.3 – 61.4 mg/l below the FMEnv permissible limit.

Exchangeable Cations: Mg, Ca, P, and N concentrations present in the sample include: Mg: 34.24 to 51.36 mg/l , Ca: 119.84 to 154.08 mg/l, P: 1.2 to 2.3 mg/l and N: 6.0 to 7.3 mg/l respectively. In combination with magnesium, calcium is responsible for water hardness. Calcium is an important element in nutrition as it is essential for building of human bones and teeth. The samples were found to have calcium concentrations above FMEnv limit in sample collected from Njimiti community 2. Total hardness in this community also recorded 205.44 mg/l above FMEnv limit of 200mg/l.

Heavy Metals: Mn, Pb, Fe, Cu, Cd, Zn, Pb, and Ni, were investigated in the samples. Heavy metal concentrations across the sampled locations are low with the exception of Zn having high concentrations of 0.412mg/l, 0.640mg/l and 0.890mg/l higher than the FMEnv limit of 0.1 mg/l.

Among the microbial community, shigella was absent in the samples. Other parameters measured are indicated in the table.

4.8 Vegetation of Borno Study Area

The vegetation in Borno state is mainly of the Sudan savanna type, which includes the acacia (a source of gum arabic), baobab, locust bean, shea butter, dum palm, and kapok trees; however, there is a region of Sahel savanna, mostly thorn scrub and with sandy soils, in the north.

Table 4.24: Plant Species identified with the IUCN Status in Borno State

SN	Family	Genus	Species	Common Names	Abundance	Uses	IUCN Conservation Status
1.	Malvaceae	*Ceiba*	*Pentandra*	Kapok tree	++	Commercial	Least Concern
2	Arecaceae	*Cocos*	*Nucifera*	Coconut	++	Food	Not Assessed
3.	Fabaceae	*Daniella*	*Oliverii*	Gum copal	++	Commercial	Threatened
4.	Fabaceae	*Delonix*	*Regia*	Flamboyant tree	++	Medicinal	Least Concern
5.	Arecaceae	*Hyphaene*	*Thebaica*	Doum palm	++	Commercial	Least Concern
6.	Arecaceae	*Elaeis*	*guineensis*	Oil-palm	++	Food	Not Assessed
7.	Malvaceae	*Adansonia*	*Digitata*	Baobab tree	++	Food	Not Assessed
8.	Euphorbiaceae	*Jatropha*	*Curcas*	Bubble bush	++	Medicinal	Not Threatened
9.	Anacardiaceae	*Mangifera*	*Indica*	Mango	++	Food	Not Assessed
10.	Sapotaceae	*Vitellaria*	*Paradoxa*	Shea butter	++	Food	Vulnerable
11.	Moringaceae	*Moringa*	*Olifera*	Drumstick	++	Medicinal	Not Threatened
12.	Poaceae	*Panicum*	*maximum*	Guinea grass	++	Medicinal	Not Threatened
13.	Fabaceae	*Parkia*	*biglobosa*	Locust bean	++	Food	Not Assessed
14.	Myrtaceae	*Psidium*	*Guajava*	Guava	++	Medicinal	Not Assessed
15.	Malvaceae	*Sida*	*Acuta*	Wireweed	++	Medicinal	Not Threatened
16.	Cannabaceae	*Trema*	*orientalis*	Charcoal tree	++	Medicinal	Not Assessed
17.	Asteraceae	*Tridax*	*procumbens*	Coatbuttons	++	Medicinal	Not Threatened
18.	Poaceae	*Zea*	*Mays*	Maize	++	Food	Not Assessed
19	Anacardiaceae	*Anacardium*	*occidentale*	Cashew	++	Food	Not Assessed
20	Asteraceae	*Ageratum*	*conyzoides*	Goat weed	++	Medicinal	Not Assessed

Key: LC = Least Concern, EN = Endangered

7.9 Fauna of Borno State Study Area

Footprints and sounds were used to identified Fauna species; also locals, hunters, meat traders were interviewed to determine the type of Fauna species in the study area. Table 4.30 presents the list of fauna species recorded in the project area.

Table 4.30: List of Wildlife Species cited or reported in and around Borno State

Group	Scientific name	Common name
BIRDS	*Corvus corax*	Crow
	Streptopelia senegalensis	Laughing Dove
	Ploceus cucullatus	Weaver bird
	Tropicranus albocristatus	White-Crested hornbill
	Centopus senegalensis	Senegal Councal
	Anthreptes collaris	Nectar Bird
SNAKES	*Bitis gabonica*	Gabon Viper
	Bitis nasicornis	Night adder
	Causus rhombeatus	Puff adder
	Dendroaspis viridis	Green tree Mamba
	Naja nigricollis.	Cobra
	Veranus niloticus	Monitor lizard
MAMMALS	*Cephalopus Maxwell*	Maxwell's Duiker
	Cricetomys gambianus	Giant Bush Rat
	Dendrohyrax dorsalisqtree	Tree hyrax
	Erythrocebus patas	Patas Monkey
	Hystrix cristata	Porcupine
	Phacochoerus aethiopicus	Warthog
	Protoxerus stranger	Oil palm squirrel
	Manis longicaudata	Long-tailed Pangolin
	Tragelaphusscriptus	Buschbock / deer
	Thryonomys swinderianus	Cane rat / Grass Cutter
	Viver racivetta	Civet
	Xeruserythropus	Ground squirrel

Key: C.E = Critically Endangered; LC = Least Concern,EN = Endangered.

Source: Field work, 2024

4.9 Socio-Economic Assessment

4.9.1 Introduction

The socio-economic baseline describes the existing social conditions essential to identifying and assessing the potential impacts of a proposed project. The baseline data was collected through various methods, including a review of secondary data, primary data collection from key informant interviews, village-level surveys, Focus Group Discussions (FGD), and household surveys. The data was used to assess potential impacts and generate mitigation measures for the ESIA study. The primary objective of this study was to survey the baseline social and economic features of the host communities where the proposed SAPZ project is located. The aim of the study was to ascertain the potential effects of the proposed SAPZ project on the social and economic lives of the people of the communities including potentially positive effects. Specifically, this study was undertaken to achieve the following objectives:

- Establish baseline Socio-economic and health status of the host communities.
- Identification or definition of ameliorative/mitigation/enhancement measures such as to protect and promote socio-economic and public safety.
- Advise on management or implementation plan so as to control levels of impacts.
- Define a monitoring mechanism that would ensure performance.
- Incorporate socio-economic and health factors in decision making.

4.9.2 Socio-economic Study Methodology

This socio-economic study was undertaken based on recommended guidelines by the appropriate regulatory agencies such as the Federal Ministry of Environment (FMEnv) as contained in the EIA Act CAP E12 LFN 2004. The methods adopted in the collection and analysis of information are discussed below.

Research Design

A descriptive research design has been selected to provide in-depth explanation and analysis using quantitative and qualitative approaches. The overall study design

entailed determining the target populations i.e. the population of the host/impact community of the project. It also involved making decisions to:

- Whether to obtain information at one point several points in time
- The methods of data collection; and
- Whether questionnaires, if used should be self - administered face-to-face, using trained interviewers.

It was decided that:

- Questionnaires were used and administered face to face to house hold respondents at one point in time by trained assistants;
- Discussions were held with focus groups;
- Key informants (Knowledgeable persons within the community) were interviewed;
- Observation and measurements of key community features were undertaken by trained assistants; and that photography was liberally employed to clarify the community and project features
- In terms of research design, the study belongs to the class described as 'passive Observation' (Cook and Campbell, 1979), in the sense that subjects were studied in-situ, without any form of experimental manipulation.

Instrumentation and Data collection

This Study employed both primary and secondary data sources. The latter comprised government records and internet, while the former included pre-coded questionnaires, interviews (of Key Informants), Focus Group Discussion (FGDs), direct observation, direct measurement, standardize formats for recording observations, photography, and participatory research.

Primary Data Collection

The various data collection tools are described below:

a) Questionnaires

A detailed and structured questionnaire was used alongside other methods to acquire relevant information. Questionnaires had questions on basic demography, livelihood of inhabitants, availability of social infrastructure etc. This was distributed and completed for the project area. A total of 274 questionnaires were administered among the residents of the project areas and the same number of copies were retrieved for analysis of the socio-economic baseline for the project area. Table 4.9 presents the distribution of administered questionnaires per community. The questionnaires were administered based on the size of the community. Considering the homogeneity of the population, this sample size is considered adequate. In administering the questionnaire, a purposive sampling procedure was utilized to select individuals/groups that were sampled for the survey.

Table 4.9: Questionnaire administered and retrieved per community

S/N	Community	No of questionnaire administered	No of questionnaire retrieved
1.	Baga community	39	39
2.	Ngaranam community	35	35
3.	Amarwa community	46	46
4	Briyel community	65	65
5	Njimtilo	89	89
	TOTAL	**274**	**274**

Source: Field study, 2024

b) The Stakeholder Engagement Process (SEP)

Stakeholder engagement is an all-inclusive, interactive, systematic and continuous process, spanning the entire life cycle of a project, in which stakeholders are engaged as active partners in establishing the priorities and focus of a project or programme, and not treated merely as the passive recipients of the project when completed. Stakeholders' engagement is all about redressing the problem of nonparticipation of stakeholders by providing strategies, processes and infrastructure to enable the proponent to:

i. Discover what really matters to key stakeholders involve them in providing feedback on corporate strategies and performance and in identifying what and how things can be changed.
ii. Monitor and manage stakeholder's contributions and satisfaction levels.

Information disclosure and consultation will be carried out throughout the preparation period, construction period and operation period of the project, by laying primary focus on the requirements (inclusiveness) of directly affected and vulnerable groups, such as the elderly, women, physical challenged, etc.
Table 4.10 is a list of categories of stakeholders consulted.

Table 4.10: List of categories of stakeholders consulted

S/N	Categories of Stakeholders	Institutions consulted
1.	Government Ministries, Departments	1. Federal Ministry of Environment 2. Borno State Ministry of Environment 3. Federal Controller, Borno State Ministry of Environment. 4. Ministry of Agriculture, Borno State 5. Ministry of Agriculture Extension Services 6. Borno State Agricultural Development Programme 7. Kukawa LGA 8. Mafa LGA 9. Bayo LGA 10. Konduga LGA
2.	Traditional Institution	Emir of Argungu, Mai Angwa, Sariki, Imam, Hakimi
3.	Youths, Women Leaders and Community Based Organisations	Youths, Women Leader, Community Based Organisations, Mai Angwa in the communities

Source: Field Work, 2024

Other sources of primary data utilized for this socio-economic study include: interviews, Focus Group Discussion (FGDs) and participant observation. While interviews and participant observation were used to source information on socio-economic indices, public consultation provided the basis for understanding the attitude, perception and approach of the people to the issues surrounding the project area. Questionnaires with both open and closed-ended questions providing data on socio-economic and health indices were utilized.

Stakeholder Engagement and Consultation

The first visit was to the Hon. Commissioner, Borno State Ministry of Agriculture in his office in order to collect official information and establish link to respective leader of the communities ahead of the community engagement, communications was sent to all community leaders, Elders, Youth leaders and women leaders. Various meetings were held with these groups on the proposed project and need for the socio-economic studies. They were then mobilized to co-operate and participate in the survey. The consultations continued with workshop for members of the communities, that involved question and answer, interviews and discussions.

Visit to the Hon. Commissioner, Ministry of Agriculture and Natural Resources

4.9.3 Socio-economic Baseline Information

Baseline information on socio-economic was obtained through the following activities:

- Reconnaissance survey, selection and training of survey assistant:
- Pre-stating of questionnaires;
- Household listing;
- Field Identification and Interview of Key Informants;
- Questionnaire administration and interview of Key assistance.

- Focus Group Discussion (FGD) and
- Photography and geo-location of key features.

The socio-economic baseline information obtained for this study include:

- Demographic Profile of the study area;
- Administrative and socio-cultural institutions;
- Livelihood Assets and Activities;
- Infrastructure and Services;
- Housing Structures/settlement patterns;
- Land Acquisition;
- Project Affected Persons (PAPs);
- Waste management;
- Health Profile;
- Gender Assessment; and
- Community Concerns and Perceptions.

4.9.4 Affected Communities and People

The Proposed Njimtilo-AIH Project is situated in Konduga Local Government Area of Borno State. The people of the communities under study (Njimitilo, Baga, Briyel, Mafa and Konduga) are homogenous in their origin, culture and religion.

Borno is one of the six states that form the North-East geopolitical zone of Nigeria. It shares international borders to the North with Niger and Chad as well as with Cameroon to the East. Its Southern and Western borders are shared with Adamawa, Gombe and Yobe States. Maiduguri is the state capital. Borno State has an area of 57,798.2 square kilometres. It lies roughly at latitude 11°30' North and longitude 13°00' East. Its population is 4,171,104 (2006 census) being 2,163,358 males and 2,007,746 females. Its 2022 population projection is put at 6,111,500 at an annual growth rate of 2.4%. The state accounts for 2.9% of Nigeria's total population.

Cultural Heritage

There are no archaeological and sacred sites, such as traditional burial grounds and shrines in the communities. Furthermore, there are no taboos, although it is forbidden to

entice married women into illicit relationship and stealing of any form is forbidden and attracts punishment. In conclusion, there are no taboos that will negatively impact contractor activity on the project. The major festival celebrated within the study area are Muslim festivals such as "Salah" celebrations of ldeI fitri and ldeI Kabir.

Religion

The majority of the local population are Muslim with only a small number identified as Christian.

4.9.5 Traditional Administrative Structure

Running along with the state administrative structure are the traditional authorities. Although there is no traditional head of state, each state has a traditional leader and in the case of Borno state there is an Emir called Shehu. The Shehu of Borno has authority over the whole state and is supported by an Emirate Council. The Emirate Council acts as an advisory board to the Shehu (Emir); council members are not elected, but selected based on their knowledge, skills and influence.

At LGA level there is no traditional authority equivalent, however, at the district level the Lawan/Bulama (Hakimi) is the traditional leader. Each Hakimi is supported by a number of Sarki's, who are the traditional leaders at the settlement level. Sarki's are often supported by a Yerima, who is a trusted individual and often a family member, who shares responsibilities for managing the settlement. The final level in the traditional authority structure is a Mai Anguwa, who is the leader of a sub-settlement and answers directly to the Sarki.

All traditional leaders are selected by the Emirate Council and the positions are hereditary with candidates chosen from members of a royal family. Once selected, the Hakimi, Sarki and Mai Anguwa all need to be approved by the Emir before taking up the leadership position. The traditional authority continues to be an important administrative structure in the day to day lives of the local population. Cultural ties continue be strong and although traditional leaders must subscribe to national laws, they have executive and judicial powers, and are key to conflict resolution.

Finally, within northern Nigeria, Imams also pay a significant role in the lives of local people. Not all settlements have a mosque, but local people travel every Friday to their nearest mosque to pray. Imams continue to influence the behaviour and opinions of local people.

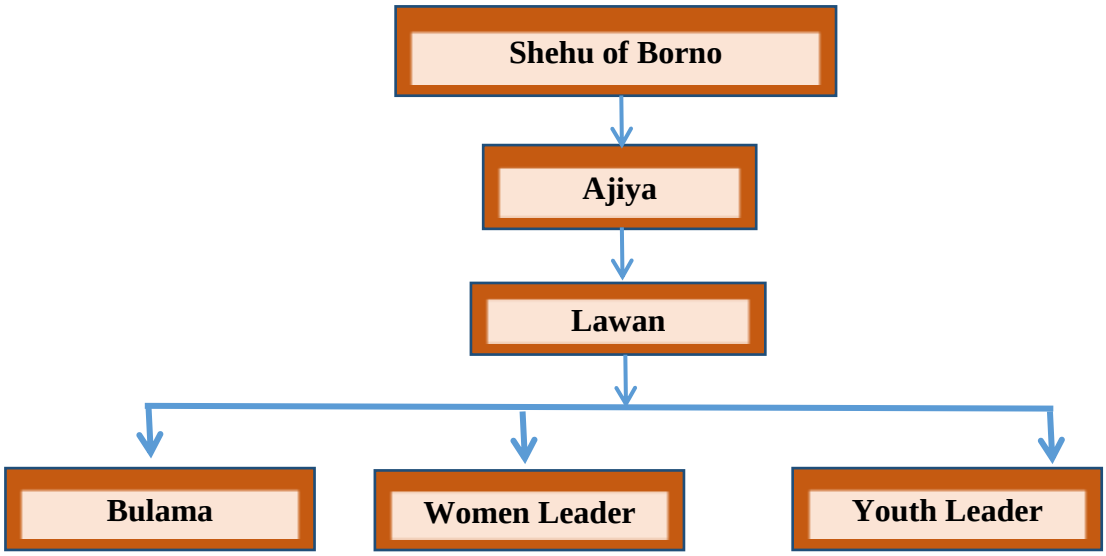


Figure 4.11: Showing Traditional Administrative Structure of Host Community

4.9.6 Demographic Profile of the Study Area

(a) Population Size

According to the 2006 population census, the population of Konduga LGA is 157,322. This population has increased steadily over the years, 2022 projection placed the number at 230,500, with population density of 43.32/km^2. Therefore, the annual population change between 2006 and 2022 is 2.4% with an area of 5,320 km^2. Furthermore, the structure of the population (2006 census) showed the children aged 0-9 had the highest proportion of the population, followed by ages 10 – 19 years and ages 20 – 29 years respectively, and the least were people 60 years and above. Males and females were equal 50% in the area. The family size is large with an average of about 10-15 persons per house. The population of the affected communities were not documented. However, by estimation, the three communities of Njimitilo, Baga, Briyel, Mafa and Konduga have an

estimated population of approximately 45,000 residents (Njimitilo – 15,000, Baga – 10,000, Briyel – 8,000, Mafa - 7000 and Konduga – 5,000)

Table 4.13: Gender and Age Distribution of Konduga LGA

Age Distribution	Population %
0-9 years	45
10-19 years	15
20-29 years	15
30-39 years	5
40-49 years	5
50-59 years	4
60-69 years	5
70-79 years	5
80+ years	1
Gender	
Males	51
Females	49

Source: 2006 Census

(b) Ethnic Composition of Respondents

Generally, the project communities are a mix of four ethnic groups; Shuwa Arabic, Kanuri, Mafa and Wandala.

(c) Gender Distribution of Respondents

A total of 274 questionnaires were administered across the five communities around the project area which include: Njimitilo, Baga, Briyel, Mafa and Konduga communities. The field survey revealed that the respondents is made up of 76% male and 24% female. The gender distribution of respondents across the communities is presented by table 4.14 and figure 4.14. The high proportion of males encountered in the project area can be attributed to the fact that many of the men are farmers, while their wives engage in trading activities nearby, additionally, cultural and religion belief does not permit married women to interact freely with male counterpart especially visitors.

Table 4.14: Sex composition of the respondents

Community	Female	Male	Total
Njimitilo	18	84	**89**
Baga	12	39	**39**
Briyel	8	28	**35**
Mafa	13	26	**46**
Konduga	15	31	**65**
Total	**66**	**208**	**274**

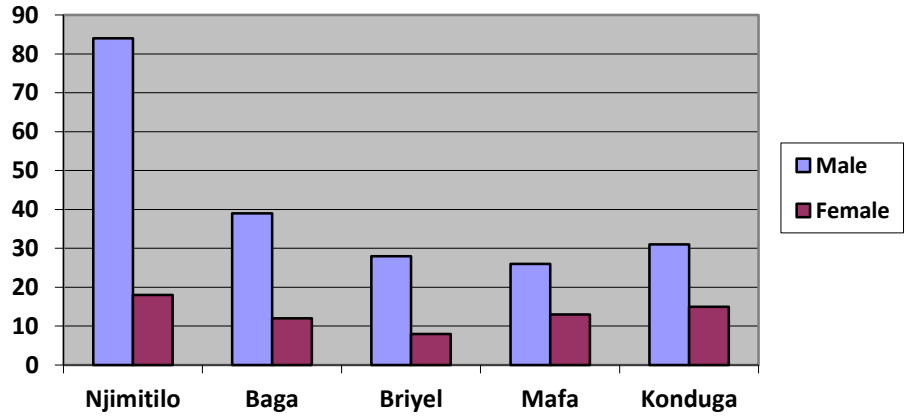


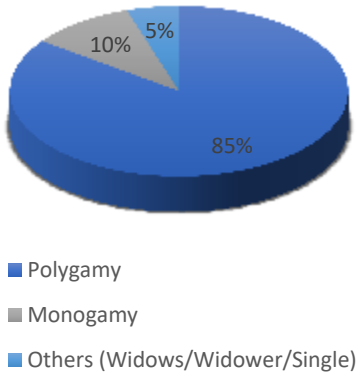
Figure 4.14: Sex composition of respondents

(d) Marital status of Respondents

All the respondents across the five communities were married across the age-groups. However, 58% of the males practiced polygamy, while about 18% married only one wife and most of them with one wife are young people that just got married, but still have ambition of marrying another wife in near future. About 24% of the respondents are widows and widowers. This third category were largely elderly women who by reason of age have lost their partners. Polygamy is more dominant in Northern Nigeria, due to cultural and religion belief. However, members of the communities marry at an early age of about 17 years old. The older men claimed that the several wives and children enabled them to maintain their farms and to support their farming and fishing occupations to feed and maintain the family.

Table 4.15: Nature of Marriage of Respondents

Description	Number	Percentage
Monogamy	49	18
Polygamy	159	58
Others (widows, etc)	66	24
Total	274	100



(e) Household Size of Respondents

Information on household size of the communities in the project area is presented in figure below. As could be seen, the dominant household sizes in the project area are those made up of 11-15 persons, accounting for 43% of the households, closely followed by those made up of 6-10 persons (29%), 16 above 25% and 1-5 made up only 3%. The predominance of large family size is as result of polygamy widely practiced in the region of the project site and peculiarity of rural dwellers maintaining large family sizes to secure additional hands during agricultural activities, which are their main occupations.

Table 4.16: Household Size of Respondents

Community	1-5 people in Household	6-10 people Household	11-15 people Household	16 people and above	Total
Njimtilo	7	28	36	16	**89**
Baga	4	16	24	12	**39**
Briyel	3	12	19	8	**35**
Mafa	3	10	18	10	**46**
Konduga	2	13	21	12	**65**
Total	**19**	**79**	**118**	**58**	**274**

Source: EISA Field work 2024

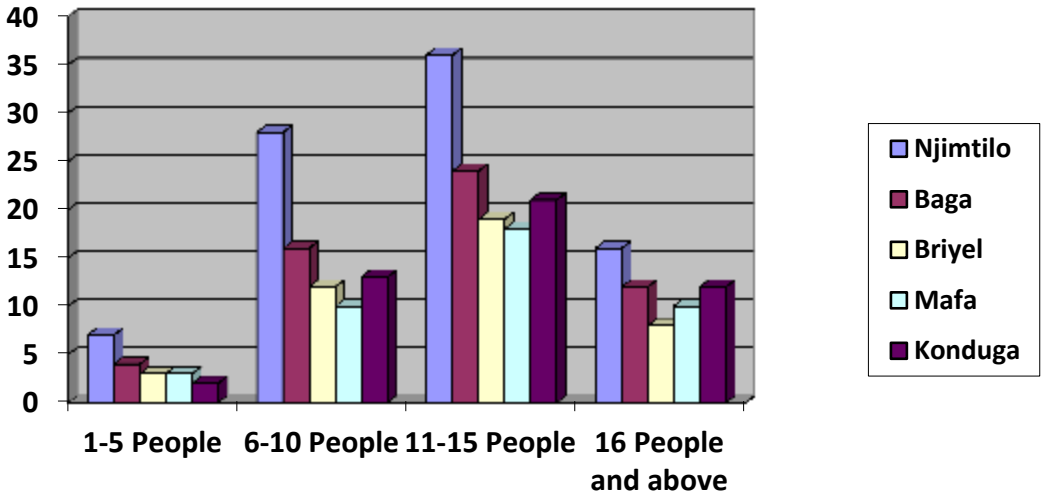


Figure 4.16: Household Size of Respondents

Literacy Level

Adulut Litracy: This is defined as the ability to read and write in English or any other language. The total adult literacy rate for the study area was 32%. Males' literacy rate (24.5%) was higher than females' literacy rate (8%).

Youth Litracy: Youth literacy rates are defined for person's age 15 to 24. The youth literacy rates in any language in the Study area was 63%. More males youth literacy rate (42.3%) was recorded compared with female youth literacy rate (25.7%).

Primary Education: More than six in every ten (63.4%) household children had access to primary school in the Study area. The primary Net enrolment for the Study area was 63.6%. Net enrolment for males (48%) was slightly lower than for females (25.7%). The primary school completion rate for the Study area was 63%.

Secondary Education: Almost four out of ten children (36.0%) had access to secondary school in the Study area. The secondary Net enrolment for the Study area was 36%. Males net enrolment (28%) was higher than females (14.2%). More than half of secondary school children (52%) completed their secondary school in the Study area.

4.9.7 Economic Activities within the Project Area

(a) Land Use

The rural nature of the project area, land is primarily used for crop farming and livestock rearing. However, a university campus is also close to the site. Cropping is mostly mixed, and typically cultivated crops include maize, rice, millet, and guinea corn. Slash and burn is used for site clearing, with areas of regeneration used to feed livestock.

There is usually some coordination between livestock farmers and crop farmers to maximize the effectiveness of land use. Farmers often have limited access to fertilizers and so at the end of each season the livestock farmers are encouraged to graze their animals on their land. This provides food for the livestock and manure for the farmers, also to avoid conflict of interest.

(b) Occupation

Being an agrarian community, farming is the predominant occupation within the proposed project area. Few civil servants who are staff of the university also exist. Farming activities cut across all age group and gender; majority of the inhabitants who are in government employment are also involved in farming during farming seasons as a means of supplementing their earnings from their various paid employment. Some of the crops grown include; guinea corn, maize, and tomatoes, sweet pepper, cucumber among others. However, the project would not negatively impact any of the farms or crops in this area much, as the project site is an area already mapped out for ranching, even though the surrounding community do farm inside it. Domestic animals reared include;

sheep, goats, and cows. Petty trading activities were observed to be practiced by both male and female genders who were selling household items such as soft drinks, masa, kunu, snacks, cigarette, charcoal, food items, artisan worker and others.

As shown in Figure 4.17, farming is the predominant occupation of people in the study communities (82% of the respondents). Other livelihood activities include trading/business (14.4%), civil service (3.1%) and industry worker (0.4%).

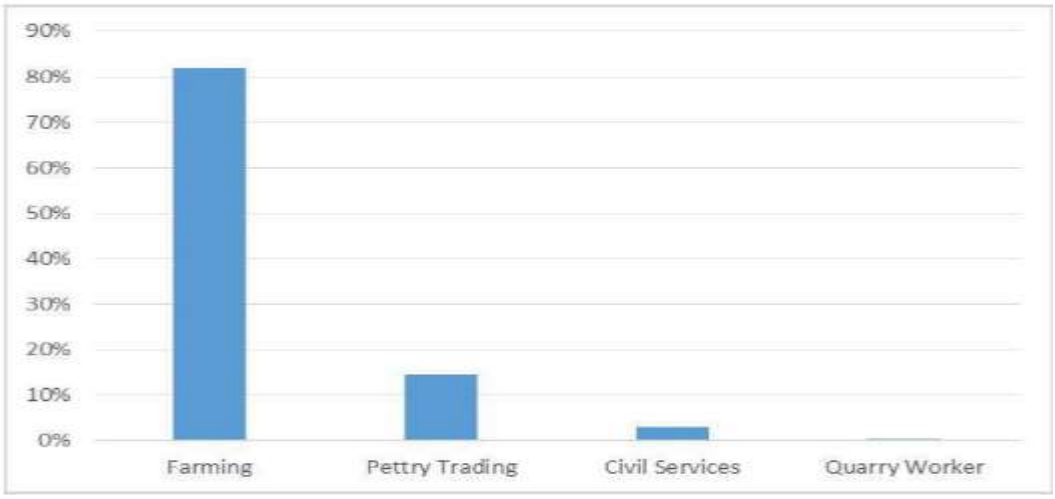


Figure 4.17: Occupation of Respondents

The farmers reported growing various types of crops as indicated in Table 4.17. The most popular crop was said to be maize which is grown by 62.4% of farmers. Other crops include beans (24.8%); millet (23.2%), ground nut 19.2%; rice 18.8%; guinea corn (8%), sorghum/cowpea (4.8%) and soya beans 0.8%.

(c) Monthly Income of Respondents

Income distribution is highly dependent on the occupation and how much money an individual earns. The income distribution of the study area reveals that majority of the people are poor; where earnings from various economic activities were below one (1) Dollar per day. The table below shows that people in Konduga community, which is the most active commercially make more monthly income compared to the other two communities with less social activities.

Table 4.18: Monthly Income of Respondents

Village name	> ₦5,000	₦5,000 - ₦20,000	₦20,000 - ₦50,000	₦50,000 - ₦100,000	₦100,000 and Above	Total
Njimtilo	7	8	20	45	9	**89**
Baga	3	3	6	24	3	**39**
Briyel	2	3	5	21	4	**35**
Mafa	3	4	13	20	6	**46**
Konduga	6	9	15	29	6	**65**
Total	**21**	**27**	**59**	**139**	**28**	**274**

(d) Housing and Living Conditions

In the host communities of study most of the houses (90%) were personally owed by the residents. There are traditional mud houses with thatcher roofing material or zinc, while some are built with block cements and aluminium zinc as roof in the communities.

Traditional houses provide good ventilation for the residents, but it also exposes them to mosquito bite, which will make them susceptible to malaria disease. Malaria as well known is an endemic tropical disease which is currently being prevented with insecticide treated net. The building arrangement as witnessed in the three communities are constructed in clusters pattern.

4.12.3.5 Public Infrastructure and Social Facilities

(a) Educational facility

Responsibility for the Nigerian education system is shared between the federal, state and local governments. At a federal level, the Ministry of Education regulates education through policy formation, ensures quality control and manages tertiary level institutions. It is the state's responsibility to manage secondary education, with primary education managed at the LGA level.

The education system in Nigeria is provided by both public and private institutions, and is divided into three levels: basic education (nine years), post- basic/senior secondary (three years), and tertiary (four to seven years, depending on the course).

The Universal Basic Education Program (UBE) is free and compulsory between the ages of 6 and 15 and covers 6 years of primary school (6 years old to 12 years old), followed by 3 years of Junior Secondary School (12 years old to 15 years old).

Educational facilities within the Project site is poor except for the university campus close to the site.

(a) Water Supply

There are three main ways to access water for domestic use in the communities around the project site: borehole, hand dug wells and River/stream.

(b) Electricity Supply

The main source of electricity across the five communities is the National grid, as the infrastructures to support electricity are there, electric poles were observed up to 5meters away from the road. Some members of the communities also have generator and solar power system as back-up energy supply.

(c) Transportation facility

The site is connected to major highway that linked Borno to Yobe and Kano state. The road is a single lane highway.

Transport and road infrastructure within the study communities is generally poor and most settlements do not have asphalt roads. Car ownership is very low and motorcycle remain widely used for transportation, followed by bicycles.

(d) Security facility

The nearest security presence around the project site is the University security station. The communities rely largely on local community policing (vigilante groups) or solely rely on tradition medium in tackling crime. The practice of good neighborliness as held in rural areas is generally relied upon for security of lives and properties (everyone watching over the others things).

(e) Drainage

Drainage system within the communities is not adequate.

4.12.3.6 Security and Social Issues

There are no reported cases of Fulani/herdsmen clashes in the study areas despite being a Kanuri/fulani dominated habitat. There are no records of communal/tribe clashes/conflict in the communities; residents of the various communities have lived together in peace and harmony for several decades and engages in inter-tribal marriages; hence they treat one another with respect and see themselves as families/in-laws.

Vulnerable or Marginalised Groups

Vulnerability is the diminished capacity of an individual or group to anticipate, cope with, resist and recover from the impact of a natural or man-made hazard (IFC, 2012). In the context of this report, vulnerable groups are groups who by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status may be more adversely affected by a Project than others. They may include people who are limited in their ability to take advantage of a Project's development benefits.

Vulnerable groups within the villages were observed to be men and women, children and youths. This classification is by virtue of their economic vulnerability and susceptibility based on dependency. The women depend on their husbands, who are farmers and not economically buoyant, while the men are often farmers who rely on their farm produce to survive. Other vulnerable groups are the farmers, who are not the owners of their farmland and could lose their livelihood if their right to use the land for farming is revoked.

Women and the female-headed households: The majority of the households in all the villages are male-dominated. Also, women's participation in community-level decision-making is low. None of the villages has women in their leadership council. Men are generally seen as the head of the household even if they do not reside in the house.

***Youths*:** All the villages have youthful populations. Some youths are involved in the livelihood activities of their parents, such as farming. When implementing Corporate Social Responsibility (CSR), the Project will need to consider and provide special attention to the needs of the youths as they were observed to be involved primarily in farming.

***Children*:** These vulnerable groups depend on their parents for nurture and sustenance, and many cannot make decisions. Without adequate representation by an adult, the children may be vulnerable to exploitation. However, the Project needs to consider how the children will be represented and help determine how they will be affected.

4.9.7 Waste Management

The predominant method of waste disposal includes burning and indiscriminate disposal. Majority of their domestic waste comprises of biodegradable food waste, consist of non-biodegradable waste such as polyethene bags (nylon), plastic bottles of water and other drinks and other agricultural waste from farms.

The survey results show that 41.6% of the respondents dispose their waste in open dumpsites, 33.6% burn or bury their domestic waste, 26.4% use temporal public dumpsites, 15.2% dump their waste into drainage channels and stream while an insignificant 1.6% recycle their waste. The results show the need to prohibit open dumping of waste in the area in order to reduce environmental nuisance and poor sanitation.

4.9.8 Health Assessment

Health care facility

The Inhabitants of the study areas do not enjoy access to standard health care service delivery except for the University college of health located few kilometers from the communities.

Health Indicators in the Project Affected Area

The Borno State faces many challenges in improving the health status of residents and data shows that the state has very low health indicators, especially for child mortality, maternal health, HIV/AIDS, malaria and other diseases that were targeted for reduction under the Millennium Development Goals (MDG). According to a World Health Organisation (WHO) data published in 2013, life expectancy in Nigeria is: Male 54, Female 55 and total life expectancy is 55. For Borno state, there is no precise data on life expectancy but the estimated data is very similar to the national data (male 53, female 56) (Nigeria Bureau of Statistics NBS, 2014). The population structure of Borno state also

indicates low life expectancy, high birth rate, and high death rate. Despite the challenges facing local people in accessing primary health care services, over half of survey respondents stated that a midwife attended their child's birth and in three settlements over 80% of all births were attended by a midwife.

Survey respondents reported that the most common illnesses found in the Project area are malaria, cough, yellow fever, dysentery/diarrhoea, and skin diseases/rashes. Malaria is the most serious illness in the Project area, and Borno state in general, affecting children the most. According to the Borno State Strategic Health Development Plan (BASSHDP) 2010 - 2015, the target was to reduce the incidence of malaria in Borno state from 11,534/100,000 to 7500/100,000 by 2020. No precise data is available on the incidence of malaria in each community, but the general consensus amongst stakeholders, is that malaria is the most serious illness in the Project area. The main reasons for the high incidence of malaria and other diseases are lack of awareness on health matters, inadequate health facilities and inadequate social infrastructure, such as electricity and sanitation facilities.

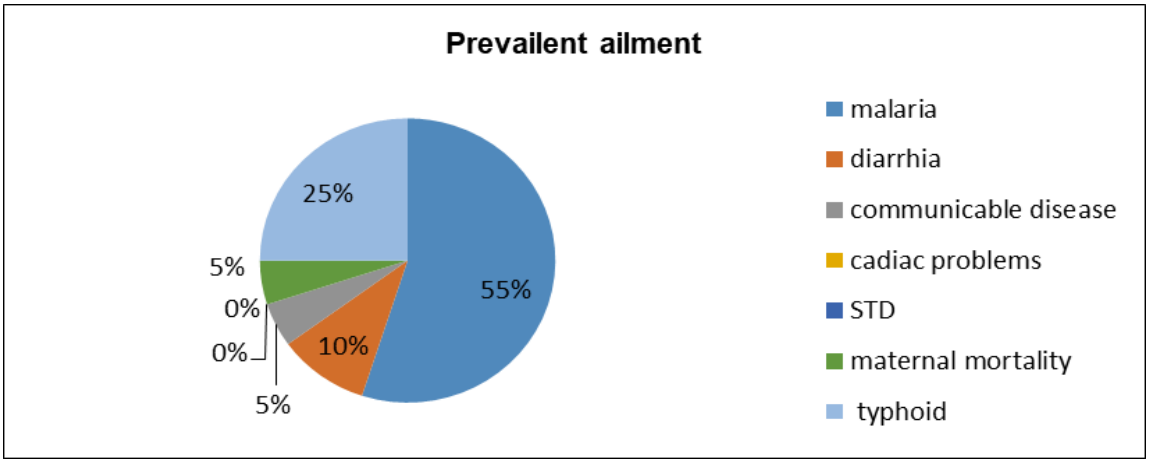


Figure 4.20: Prevalent ailments in the Communities
Source: Field survey 2024

4.8 Defining Stakeholder Engagement

Stakeholder engagement is an ongoing process of sharing project information, understanding stakeholder concerns, and building relationships based on collaboration. Stakeholder consultation is a key element of engagement and essential for effective project delivery. Disclosure of information is equally as vital. If there are risks or adverse impacts from a project, consultation must be inclusive and culturally appropriate and provide stakeholders with opportunities to express their views. In line with current guidance from the International Finance Corporation (IFC), consultation should ensure *"free, prior and informed consultation of the affected communities."* In other words, effective consultation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities. The Project's consultation program was intended to ensure that stakeholder concerns are considered, addressed and incorporated in the development process, especially during the ESIA.

4.8.1 Objectives

The stakeholder engagement process was designed to conform to the Nigerian EIA Act and International standards. For this project, the key objectives for stakeholder engagement are:

i. inform and educate stakeholders about the proposed Project;
ii. gather local knowledge to improve the understanding of the environmental and social context;
iii. better understand the locally-important issues;
iv. provide a means for stakeholders to have input into the project planning process;
v. take into account the views of stakeholders in the development of effective mitigation measures and management plans; and
vi. lay the foundation for future stakeholder engagement

4.8.2 Stakeholder Engagement Activities

This section describes the stakeholder engagement activities that have been carried out so far. The activities that are planned for later stages are also described.

Scoping Activities

At the scoping stage, project stakeholders were identified to understand the individuals, groups, and organizations that may be affected by or may influence project development positively or negatively. Initially, a broad list of potentially affected and interested parties (AIPs) was considered, such as:

- National, regional and local government;
- Local businesses/cooperatives and associations;
- Local communities and individuals; and

The consultations served to provide stakeholders with information about the Project and to gather information important to the ESIA. The objective was to identify any key concerns or high-level issues that the stakeholders had at this early stage. Additional consultation shall be undertaken as the study progresses. Plates 4.21 to 4.31 show the sample photographs of the stakeholder Scoping Workshop conducted on the 30th of May 2024.

The Hon. Minister's Rep. addressing the participants

The representative of State Ministry of Environment addressing the participants

Team of consultants addressing the participants during the scoping workshop

Women participation during the scoping workshop

Group photograph

CHAPTER FIVE

POTENTIAL AND ASSOCIATED IMPACT ASSESSMENT

5.1 Introduction

The objectives of Environmental and Social Impact Assessment (ESIA) are to identify and describe the potential environmental and social impacts associated with the proposed project activities, predict the likelihood and magnitudes of such impacts, evaluate the significance of changes likely to result from them, and thereafter proffer measures that will be taken to mitigate the predicted impacts. This chapter therefore, presents the associated and potential Health, Safety and Environmental (HSE) impacts of the proposed implementation of the Special Agro-Industrial Processing Zone (SAPZ), Borno, Nigeria.

5.2 Impact Assessment Methodology

The use of appropriate impact identification and prediction methods is crucial for good ESIA. A number of methods have been developed over the years for impacts assessment, while new approaches continue to emerge. Every method has merits and demerits; however, all good methods have certain elements in common, which are widely accepted as essential for good ESIA. The Scientific Committee on the Problems of the Environment (SCOPE, 1979) suggested that the following qualities should be considered while choosing Impact assessment methods:

Comprehensiveness: This implies that the method should be able to detect the full range of important elements and combinations of elements, directing attention to novel or unsuspected effects or impacts, as well as to the expected ones.

Selectivity: This has to do with the ability of the method to focus attention on major factors. It is often desirable to eliminate as early as possible (i.e., during identification) impacts that would dissipate effort if included in the final analysis.

Mutually exclusive: This quality ensures that double counting of impacts or effects are avoided. However, experience has shown that this is difficult because of the many interrelationships existing in the environment.

Yield to Confidence limits: Subjective approaches to uncertainty are common in many existing methods and can sometimes lead to quite useful predictions. However, explicit procedures are generally more acceptable, as their internal assumptions are open to critical examination, analysis, and, if desirable, alteration.

Objectivity: The objectivity of impact assessments has been well emphasized by many regulators including the FMEnv. Objectivity minimizes the possibility that the predictions automatically support the preconceived notions of the promoter and/or assessor. Such pre-judgments are usually caused by a lack of knowledge of local conditions or insensitivity to public opinion. A second merit of objectivity is to ensure comparability of EIA predictions amongst similar types of actions. An ideal prediction method contains no bias.

Prediction of Interactions: Environmental, social, and economic processes often contain feedback mechanisms. A change in the magnitude of an environmental effect or impact indicator could produce unsuspected amplifications or dampening in other parts of the system.

Generally, impact assessment methods fall under seven types of approaches:

1. The Leopold matrix approach
2. The Battelle environmental evaluation system
3. Checklists
4. Matrices
5. Flowcharts and Networks
6. Mathematical/Statistical and computer models
7. Overlays using maps and GIS

In selecting an overall impact assessment methodology for this project, a number of widely used methods were reviewed and qualities considered appropriate, were incorporated in the assessment. The major steps in the impact assessment methodology for this project are as presented in Figure 5.1.

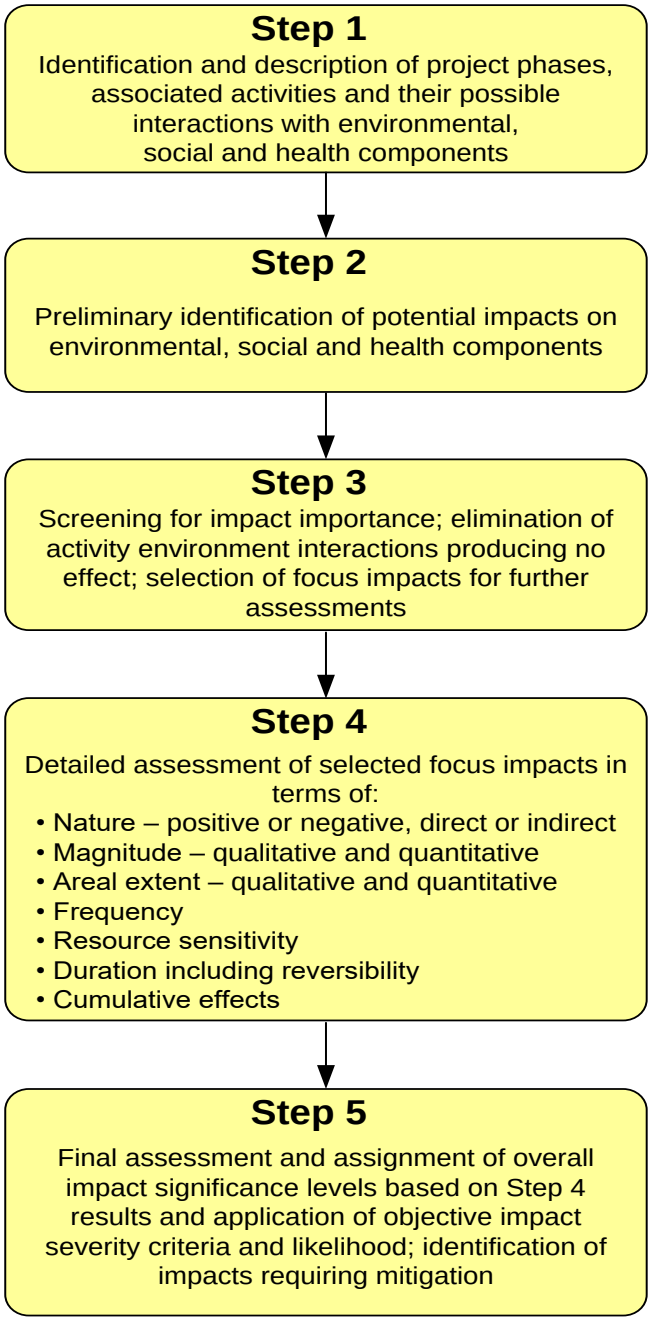


Figure 5.1: Schematic of the Impact Assessment Methodology

5.3 Identification and Description of Project Phases and their Possible Interaction with the Environment

The analysis of impacts covers the following project phases and associated activities interaction with the environment.

1. **Pre-construction:** This will include mobilization of materials and personnel, recruitment of workers and community engagement, permit to work, site preparation activities, creation of access road and camping etc.
2. **Construction/Installation:** Soil excavation, foundations and building constructions, and other associated earthen works, metal works, waste management etc.
3. **Operation and maintenance:** Operations such as processing of agricultural products for exportation, transportation of raw materials from ATCs to the HUB and subsequent maintenance activities
4. **Decommissioning:** Disusing/abandoning of project.

Table 5.1 shows the environmental components as they interact with the various project phases

Table 5.1: Environmental Components and their Impact Indicators

Aspect	Environmental Component	Project Phase	Impact Indicators
Biophysical	Climate	All project phases	Humidity, Temperature, Rainfall, Wind Speed and Direction
	Air quality	All project phases	Gaseous emissions (like: NO_x, SO_x PM, CO, VOC) that contaminates ambient air.
	Noise levels	All project phases	Day and night disturbance, hearing loss communication impairment.
	Water Quality (Surface water and Ground water)	Construction, Operation and Maintenance phases	Changes in the baseline physico-chemical and biological properties of surface water; Changes in the Physico-chemical properties of sediment; Changes in community composition and abundance of aquatic biota including; microbes, plankton, macrobenthos, fishes, mammals, reptiles, amphibians, bird species, etc.
	Geology	Pre-construction phase	Changes in geology structure
	Soil	Pre-construction, operation and maintenance phases	Changes in physico-chemical and biological properties of soil

	Topography	Pre-construction phase	Changes in land terrain and topography
	Vegetation	Pre-construction phase	Changes to vegetation population, health, species abundance and diversity and impact on endangered and economic species
	Wildlife	Pre-construction phase	Changes in wildlife distribution and abundance
Human, Socioeconomic and Cultural	Land-use pattern	Pre-Construction and Construction phases	Changes in land-use patterns such as agriculture, fishing, logging, hunting, etc,
	Local Population level	All project phases	Immigration and in-migration of workers and other people
	Socio-economic system	All project phases	Changes in employment opportunities, income differentials, inflation, difference in per capita income, inequality of benefits to local population, etc.
	Socio-cultural system	Operation and Maintenance	Changes in social structure, organisation and cultural heritage, practices and beliefs, natural resources, rights of access, changes in value system influenced by foreigners, etc.
	Basic Amenities and Infrastructure	All project phases	Access to goods and services such as housing, education, healthcare, water, fuel, electricity, sewage and waste disposal, consumer goods brought into the region, etc.
	Transportation System	All project phases	Changes in transport systems and associated effects such as noise, accidents risk, changes in existing facilities, etc.
	Aesthetics	Construction phase	Presence of unsightly structures.

5.4 Preliminary Identification of Potential Impacts on the Environment

The existing baseline description of the environment and the various project phases/ activities were used to develop a checklist of potential and associated impact of the proposed Special Agro-industrial Processing Zones (SAPZ) on the biophysical and socio-economic environment. The World Bank Environmental Assessment Source book on Industrial set-up and FMEnv EIA Sectoral Guidelines for Infrastructures were used as reference in developing the checklist (Table 5.2).

Table 5.2: Checklist of Associated and Potential Impacts

Project Phase/Activity	Associated and Potential Impacts
Pre-Construction • Permitting • Land Acquisition • Mobilisation of materials and personnel • Recruitment • Site Preparation	Economic loss arising from the clearing of farmlands
	Uncertainty and misunderstanding due to a lack of information and communication.
	Acquisition/Displacement of people
	Employment opportunities arising from the recruitment of skilled and unskilled workers
	Business opportunities for local contractors through sub-contracting activities
	Local support services from roadside supply markets and shops etc.
	Skill acquisition and enhancements to local indigenes and workforce.
	Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure
	Increase of communicable diseases due to influx of people
	Increase in social vices (like theft, prostitution etc.) resulting from the increased number of people
	Community agitation over unidentified stakeholders, leadership tussles etc.
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset
	Conflicts/community agitations over employment issues (quota and methods)
	Nuisance (noise and vibrations) due to movement from heavy-duty equipment and vehicles affecting site workers and wildlife
	Increase of dust particles and vehicular emissions
	Disturbance of the vegetative cover due to site clearing and preparation
	Waste Disposal • Paper, domestic waste • Waste from laydown area and campsite (material and wood) • Scrap metal, wood, sand, concrete, iron rods, paper • Used oil and replace/obsolete equipment parts that may contaminate soil/groundwater
	Contamination of surface water as a result of siltation caused by increased erosion during site preparation
Construction Phase Civil work, Mechanical and Electrical work which include: • Drainage • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc.	Visual intrusion and aesthetic quality resulting from the construction of the road
	Workplace accidents/ incidents (falling from height, injury from falling objects, etc.)
	Littering of site with packaging materials and unused construction material.
	Respiratory disorder from inhalation of cement dust.
	Respiratory / health hazards to onsite personnel due to the release of fumes from construction equipment (bulldozers, excavators)
	Injuries to on-site workers from falls or dislodgement of earth, rock or other materials.

• Commissioning /Testing • Waste management	Localised increase (above baseline values) in ambient concentrations of air pollutants (NOx, SOx, COx, CxHy, H2S, & SPM) from fuel combustion engines (e.g. cement mixing machine) used for construction and cement dust
	The influx of predominantly male population, job seekers into host community and neigbouring communities leading to increased extramarital sexual activity, and the introduction of commercial sex workers.
	Increase in the ambient noise level of the area above baseline values due to noise generated from construction activities
	Increased pressure on social amenities (housing, water supply, roads) due to the influx of workers and job seekers into the community
	Decrease in groundwater aquifer as a result of groundwater abstraction for construction activities e.g. concrete mixing, equipment washing, etc.
	Increased erosion potential as a result of construction activities such as excavation and reduction in structural stability and percolative ability of soil resulting from compaction during civil works and installation activities.
	Damage to ecological resources and environmental degradation by minor spillages during fuelling of construction trucks and equipment
	Risk of electrocution and burns (to onsite workers) during electrical installation processes
	Job creation/ Business opportunity/Economic enhancement
	Accidents due to the collapse of the structure under construction
	Kidnapping of personnel
Demobilisation • Demobilization after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, and objects at height lead to injury or fatalities.
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)
	Traffic congestion during transportation of demobilized equipment and personnel
	Generation of dust and automobile/heavy duty equipment emissions
	Waste disposal (scrap metal, wood, sand, concrete, paper)
	Reclamation and restriction of access roads to prevent unauthorized uses
	Loss of employment and business opportunities due to completion of construction phase
	Illegal access to building site leading to accident, sabotage, asset damage and loss
	Surface runoff and erosion resulting in sedimentation problems
Operations and maintenance • Building inspection and checks • Power generation/ servicing • Transportation of raw materials and finished product • Agro-products processing for export	Risk of injury from fall from height/trip or being hit by object
	Air pollution by gaseous emission (CO, SO_2, NO_2) and particulates from power generator and other processing plants
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator and plant servicing (diesel, spent oil etc.)
	Generation of dust and gaseous pollutants from automobile emissions
	Increase in noise level nuisance from vehicles plying the access roads
	Traffic congestion along as a result of transportation of raw materials and processed agro-products
	Metallic materials generation from plant parts, retrofitting/upgrade of parts

• Plant maintenance • industrial waste discharges • Emergence of small-scale enterprises • Green buffer development around each industrial plot. • Recruitment of workers	during plant servicing
	Potential for land contamination from industrial waste disposal
	Pollution of surface water bodies by wastewater generated from industrial waste discharges
	Change in Land Use of nearby areas
	Recreational facility
	Acquisition of skills by individuals to be employed
	Increase in income for workers.
Decommissioning/ Abandonment • Removal of electrical cables and wires • Demolition of buildings for facilities retrieval • Waste generation • Transportation of Plant components for sale/ another site	Risk of accident and injury to workers during demolition of structures
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles
	Increased sedimentation process close to river banks and floodplains along the building sites
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages
	Traffic obstruction from transportation of decommissioned structures and equipment
	Availability of land for alternative uses such as community hall
	Improved Ecology, Air Quality and Aesthetics

5.5 Screening of Impact Importance

This involves the elimination of project activity-environmental interaction producing no effect and selection of focus impact for further assessment. The basis for the screening was derived from the following:

- Knowledge of the Project activities as summarized in Table 5.1.
- Detailed information on the environmental and socio-economic setting of the Project's area of influence as documented in Chapter 4. The potential environmental and social receptors/resources that could be affected by the proposed Project are summarized in Table 5.1.
- Consultation with relevant stakeholders including potentially affected community
- Review of other ESIA reports on similar projects/environments.
- Series of experts group discussions, meetings and experience on similar projects.

A modified Leopold matrix (Leopold, 1971) was used for the screening. The matrix arrays project activities against environmental (biophysical and socio-economic)

components, and supports a methodical comprehensive and objective identification of impacts each activity could have on the environmental components. The matrix consists of a horizontal list of biophysical and socio-economic environmental components that could be affected by the proposed activities versus a vertical list of project activities, which represent environmental aspects, or sources of impacts associated with each project phase.

Entries in the matrix cells represent the nature and preliminary ranking of the impacts. Ranking of the severity is based on the colour code shown in Table 5.3 below.

Table 5.3: Impact Ranking Matrix

+	Positive Impact
0	Negligible/No Impact
1	Minor Impact
2	Moderate Impact
3	Major Impact

The impact ranking categories are defined as follows:

Positive Impact - this is impact that adds a measurable benefit to the environment. It is considered sufficient for the purpose of the impact assessment to indicate that the Project is expected to result in a positive impact, thus no magnitude designation is assigned.

Ranking of negative impacts are discussed below:

Negligible Impact: this impact may occur but based on experience, available scientific information and expert knowledge will have very insignificant, immeasurable, undetectable effect on the environment or within the range of normal natural variation.

Minor Impact: this impact could either affect a large (as defined below) or moderate (less than 40%) amount of an affected resource and has mid to long-term effect, but is most likely reversible.

Moderate Impact: This affects a portion of an area, system, aspect (physical), population or species (biological) and at sufficient magnitude to cause a measurable

numerical increase in measured concentrations when compared with national or international limits and standards specific to the receptors) and may bring about a change in species abundance, but does not threaten the integrity of that population or any population dependent on it.

Major Impact: this impact would affect a large (higher than 40%) amount of a resource and/or has a relatively long-term effect.

In this preliminary screening, all potential impacts, whether likely or unlikely, are considered. The likelihood of an impact is further assessed in the detailed impact evaluation. The result of the preliminary impact identification and screening is presents in Table 5.4.

Table 5.4: Activity-Receptor Interaction for Impact Screening

Summary of ProjectActivities at various Phases	Receptors														
	Physical					Biological		Socio-economic					Others (Health and Safety)		
	Air Quality	Ambient Noise	Soil	Groundwater and Aquifers	Landscape / Topograph	Terrestrial Flora	Terrestrial Fauna	Land Use	Population	Utilities	Infrastructure	Employment /Income	Construction workers	Workplace health and safety	General Public
Pre-construction Phase															
Site selection	0	0	0	0	0	0	0	2	1	1	0	1	0	0	1
Site clearing and preparation	2	1	1	0	0	3	3	3	1	1	1	+	2	2	1
Mobilization of construction equipment and materials to site	2	2	1	0	0	1	1	2	2	2	1	+	2	2	1
Construction of access road, drainages and erosion control	2	2	3	2	2	2	2	2	1	1	1	+	2	3	2
Construction Phase															
Civil work activities including excavation, trenching, cable laying, foundation, construction of buildings	3	2	2	2	3	1	1	3	2	2	2	+	3	3	2
Installation of agro-processing plant and other facilities	1	2	0	1	0	0	0	0	1	1	1	+	2	3	1
Waste generation and disposal	2	0	3	0	2	0	0	2	0	0	0	+	0	2	2
Commissioning															
Testing of agro-processing plant and associated infrastructure.	2	2	0	0	0	0	0	0	0	0	0	0	2	2	0
Commissioning of the Agro-Industrial Hub (AIH).	0	2	0	0	0	0	0	0	2	2	1	0	0	0	2
Operation and Maintenance															
Power generation	3	3	0	0	0	0	0	0	0	0	2	+	2	3	2
Plant operation and maintenance	3	3	2	2	0	1	1	0	2	2	2	+	3	3	2
Movement of Agro-products from ATCs to AIH for storage and exportation	2	1	1	0	0	1	1	0	0	0	2	+	2	3	2
Routine maintenance; waste generation and disposal	2	1	2	0	2	1	1	2	0	0	0	0	2	2	2
Decommissioning	2	2	2	0	2	+	+	+	2	1	1	2	2	2	2

5.6 Detailed Assessment of Selected Focus Impact

The preliminary identification and screening of environmental and social impacts resulted in a group of focus impacts (impacts ranked 1, 2 and 3), which were further assessed in terms of severity and significance. Impact severity and significance criteria used at this next stage (as shown in table 5.5 and table 5.6) relied on a number of resources and tools including the following:

- ISO 14001guidelines
- Federal Ministry of Environment (FMEnv) EIA Guidelines.
- Overlaying project components on maps of existing conditions to identify potential impact areas and issues.
- Environmental Baseline Studies conducted specifically for this project.
- Consultation with Nigerian experts and residents.
- Experience from similar projects in Nigeria and worldwide.
- Discussion with design contractors and project engineers.
- Published and unpublished documents (such as The World Bank Environmental Assessment Sourcebook, relevant IFC Performance Standards, and other authoritative texts on performing environmental and social impact assessments) providing guidance on performing impact analysis for industrial development activities.
- UNEP EIA Training Resources Manual (1996) and
- European Commission Guidance on EIA/EIS Review (European Commission, 2001).

Table 5.5: 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: • 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 5.6: Characterization of potential and associated impacts of the proposed project

Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
Pre-Construction -Permitting -Mobilization -Recruitment -Site Preparation	Economic loss arising from loss of farm lands.	√		√		√			√	
	Employment opportunities arising from recruitment of skilled and unskilled personnel.	√			√	√				√
	Business opportunities for local contractors through subcontracting activities.	√			√	√				√
	Local support services from road side supply markets and shops etc		√		√					√
	Skill acquisition and enhancements to local indigenes and workforce.	√			√		√		√	
	The influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure		√	√		√				√
	Increase of communicable diseases due to influx of people		√	√		√				√
	Increase in social vices (like theft, prostitution etc.) resulting from increased number of people		√	√		√				√
	Community agitation over unidentified stakeholder, leadership tussles etc.		√	√		√				√
	Conflicts/community agitations over employment issues (quota and methods)	√		√		√				√
	Noise and vibrations due to movement from heavy duty equipment and vehicles affecting site workers, residents and wildlife	√		√		√				√
	Increase of dust particles and vehicular emissions such as SO_X, NO_X, CO_X, etc	√		√		√				√
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset		√	√			√			√
	Disturbance of the vegetative cover due to site clearing and preparation	√		√			√		√	

Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
	Littering of the environment due to waste from wood, sand paper; domestic waste from laydown area and camp site (material and wood)	√		√		√			√	
	Contamination of surface water as a result of siltation caused by increased erosion during site preparation	√		√		√				√
Construction / Installation Civil work, Mechanical and Electrical work which include; • Drainage • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc. • Commissioning /Testing • Waste management	Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.	√		√			√			√
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities	√			√		√			√
	Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	√			√		√			√
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers		√		√		√		√	
	Generation of dust and automobile / heavy duty equipment emissions from construction earthworks.	√		√		√		√		√
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and building sites.	√		√			√	√	√	
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	√		√			√		√	
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)		√	√		√		√		√
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites		√	√			√	√		√
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	√		√			√			√
	Traffic congestion during haulage of plant components to site for installation		√	√		√				√

Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
	Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	√		√			√			√
	Reduction in wildlife population as a result of poaching due to easier access created by access roads		√	√			√	√	√	
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	√		√			√			√
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	√		√		√				√
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	√		√		√				√
	Waste Disposal • Scrap metal, wood, sand, concrete, paper • Spent-oil and replaced /obsolete equipment parts that may contaminate soil/ground water • Waste from laydown area and building sites causing unsightliness	√		√		√		√		√
Demobilization -Demobilization after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.	√		√			√			√
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)		√	√			√			√
	Traffic congestion during transportation of demobilized equipment and personnel		√	√		√				√
	Generation of dust and automobile/heavy duty equipment emissions		√	√		√		√		√
	Waste disposal (scrap metal, wood, sand, concrete, paper)	√		√		√				√
	Reclamation and restriction of access roads to prevent unauthorized uses		√		√			√	√	

Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
	Loss of employment and business opportunities due to completion of construction phase	√		√		√			√	
	Illegal access to building site leading to accident, asset damage and loss		√	√		√				√
Operation and Maintenance • Building inspection and checks • Power generation /servicing • Transportation of raw materials and finished product • Agro-products processing for export. • Plant maintenance • Industrial waste discharges • Emergence of small-scale enterprises • Green Buffer development around each industrial plot. • Recruitment of workers	Risk of injury from fall from height/trip or being hit by an object	√		√			√			√
	Security threat such as kidnapping and banditry attack		√	√			√		√	
	Air pollution by gaseous emission (CO, SO_2, NO_2) and particulates from power generator		√	√			√	√	√	
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator servicing (diesel, spent oil etc.)		√	√			√			√
	Generation of dust and gaseous pollutants from heavy duty equipment, agro processing machineries, automobile emissions	√		√			√		√	
	Increase in noise level nuisance from operation machines and from vehicles plying the access roads		√	√			√	√	√	
	Traffic congestion along agro-products transportation route		√	√		√		√	√	
	Reduction of water tables and source of water for production processes	√		√		√			√	
	Metallic materials generation from plant parts, retrofitting/upgrade of parts during plant servicing	√		√			√			√
	Potential for land contamination from industrial waste disposal	√		√		√			√	
	Pollution of surface water bodies by wastewater generated from industrial waste discharges	√		√			√		√	
	Change in Land Use of nearby areas	√		√		√		√	√	
	Recreational facility from lawns/parks/green areas		√		√		√	√	√	
	Acquisition of skills by individuals to be employed as operators	√			√		√	√	√	
Decommissioning/ abandonment	Risk of accident and injury to workers during demolition of structures	√		√			√			√

Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
• Removal of electrical cables and wires, water and sewage treatment plant pipelines. • Demolition of buildings for facilities retrieval • Waste generation • Transportation of Plant components for sale/another site • Re-vegetation of site	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	√		√			√			√
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages		√	√		√		√		√
	Traffic obstruction from transportation of decommissioned structures and equipment		√	√		√		√		√
	Abandoned structures possibly taken-over by miscreants/criminals		√	√		√				√
	Availability of land for alternative uses such as community hall, farmland, etc	√			√		√		√	
	Improved Ecology, Air Quality and Aesthetics	√			√	√			√	

5.7 Final Assessment and Assignment of Overall Impact Significance Levels

At this stage, the potential and associated impacts identified and characterized in the previous stages of the assessment process were evaluated. The evaluation which was based on clearly defined criteria was used to determine the significance or otherwise of the impacts. The criteria and weighing scale adopted for the evaluation are described below.

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 one of this report. The weighting scale used was as follows:

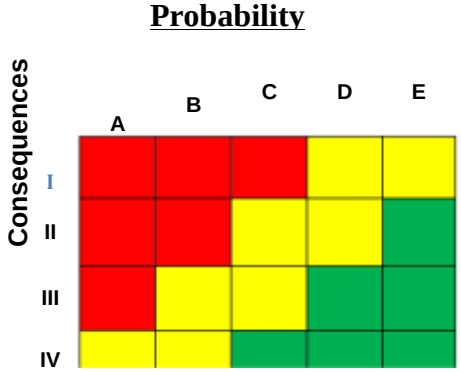
Table 5.7: Legal/Regulatory Requirements Criterion

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 Table 5.8.

Table 5.8: Risk Assessment Matrix (RAM)



Probability Category	Definition
A	Possibility of Repeated Incidents
B	Possibility of Isolated Incidents
C	Possibility of Occurring Sometime
D	Not Likely to Occur
E	Practically Impossible

Consequence Category	Considerations			
	Safety / Health	**Public Disruption**	**Environmental Aspects**	**Financial Aspects**
I	Fatalities / Serious Impact on Public	Large Community	Major/Extended Duration/Full Scale Response	**High =5**
II	Serious Injury to Personnel / Limited Impact on Public	Small Community	Serious / Significant Resource Commitment	**Medium =3**
III	Medical Treatment for Personnel / No Impact on Public	Minor	Moderate / Limited Response of Short Duration	**Low =1**

IV	Minor Impact on Personnel	Minimal to None	Minor / Little or No Response Needed	**None**

The risks (measure of the likelihood and magnitude of an adverse effect) associated with such project operations were evaluated in terms of:

- Risk to human health;
- Risk to asset (commercial and economic risk);
- Risk to the biophysical environment; and
- Risk to the SAPZ's reputation.

Based on the matrix above, the weighting used was as follows:

Table 5.9: Risk Criterion

Risk	**Attribute – Environmental, Human Health, Safety and Reputation**
1= Low	• This means that no further mitigation may be required
3= Medium	• This means that the impact can be mitigated with additional controls and modifications
5=High	• This means that the impact require 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 summarized below.

Table 5.10: Frequency Criterion

Frequency	**Attribute – Environmental, Human Health and Safety**
High = 5	• 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 (< 4months) • Geographic extent of impact (e.g. encompassing areas beyond study area)
Medium =3	• 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	• Minor 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 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)

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.

Table 5.11: Importance Criterion

Importance	Attribute – Environmental, Human Health and Safety
High = 5	• 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	• Negative outcome • Measurable reduction or disruption in value, function or service of impacted resource • Potential for non-compliance with international best practices
Low =1	• 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 stakeholders. The public perception/interest criterion is summarized below:

Table 5.12: Public perception /interest criterion

Public Perception	Attribute – Environmental and Human Health
High (5)	• 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)	• 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)	• No known risk to human health, acute and/or chronic • No known risk of life endangered for community inhabitants and site personnel • Minor reduction in social, cultural, economic value • Unlikely adverse perception among population

Result of Impact Assessment

For each of the three main project phases (pre-construction/construction, operation, maintenance, demobilization and decommissioning), the levels of significance for potential impacts of the proposed project were assigned (table 5.13) as those impacts to which the following conditions apply.

High = (L+R+F+I+P) ≥ 15 or (F+I) ≥ 6 or P = 5

Medium = (L+R+F+I+P) ≥ 9 but < 15

Low = (L+R+F+I+P) <9

Table 5.13: Potential and Associated Impact Assessment of the Proposed Project

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
Pre-Construction -Permitting -Mobilization -Recruitment -Site Preparation	Economic loss arising from loss of farm lands.	3	5	1	5	5	**21**	**6**	High
	Employment opportunities arising from recruitment of skilled and unskilled personnel	-	-	-	-	-	**-**	**-**	Beneficial
	Business opportunities for local contractors through subcontracting activities	-	-	-	-	-	**-**	**-**	Beneficial
	Local support services from road side supply markets and shops etc	-	-	-	-	-	**-**	**-**	Beneficial
	Skill acquisition and enhancements to local indigenes and workforce.	-	-	-	-	-	**-**	**-**	Beneficial
	Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure	1	3	3	5	5	**17**	**6**	High
	Increase of communicable diseases due to influx of people	1	5	1	3	3	**13**	**4**	Medium
	Increase in social vices (like theft, prostitution etc.) resulting from increased number of people a	1	5	1	3	3	**13**	**4**	Medium
	Community agitation over unidentified stakeholder, leadership tussles etc.	1	5	1	5	5	**17**	**6**	High
	Conflicts/community agitations over employment issues (quota and methods)	1	5	1	3	5	**15**	**4**	High
	Noise and vibrations due to movement from heavy duty equipment and vehicles affecting site workers, residents and wildlife	3	3	1	3	1	**11**	**4**	Medium
	Increase of dust particles and vehicular emissions such as SO_X, NO_X, CO_X, etc	3	3	1	3	1	**11**	**4**	Medium
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset	1	3	1	5	3	**13**	**6**	High
	Disturbance of the vegetative cover due to site clearing and preparation	3	3	1	3	3	**13**	**4**	Medium

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
	Littering of the environment due to waste from wood, sand, paper; domestic waste from laydown area and camp site (material and wood)	3	3	3	3	1	**13**	**6**	High
	Contamination of surface water as a result of siltation caused by increased erosion during site preparation	3	3	1	3	1	**11**	**4**	Medium
Construction / Installation Civil work, Mechanical and Electrical work which include; • Drainage • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc. • Commissioning /Testing • Waste management	Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.	3	3	1	3	3	**13**	**4**	Medium
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities	-	-	-	-	-	**-**	**-**	Beneficial
	Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	-	-	-	-	-	**-**	**-**	Beneficial
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers	-	-	-	-	-	**-**	**-**	Beneficial
	Generation of dust and automobile/heavy duty equipment emissions from construction earthworks.	3	3	3	3	1	**13**	**6**	High
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and building sites.	3	3	1	3	1	**11**	**4**	Medium
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	3	3	1	3	1	**11**	**4**	Medium
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	3	3	1	3	1	**11**	**4**	Medium

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites	3	3	1	5	3	**15**	**6**	High
	Traffic congestion during haulage of plant components to site for installation	3	3	1	3	3	**13**	**4**	Medium
	Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	1	3	1	3	3	**11**	**4**	Medium
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	1	3	1	3	3	**11**	**4**	Medium
	Reduction in wildlife population as a result of poaching due to easier access created by access roads	5	1	3	3	1	**13**	**6**	High
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	1	3	3	3	1	**11**	**6**	High
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	3	3	3	3	1	**13**	**6**	High
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	1	3	1	3	3	**11**	**4**	Medium
	Waste Disposal • Scrap metal, wood, sand, concrete, paper • Spent-oil and replaced /obsolete equipment parts that may contaminate soil/ground water • Waste from laydown area and building sites causing unsightliness	3	3	3	3	3	**15**	**6**	High
Demobilization -Demobilization after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.	1	3	1	3	1	**9**	**4**	Medium
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	3	3	1	3	3	**13**	**4**	Medium

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
	Traffic congestion during transportation of demobilized equipment and personnel	3	3	3	5	3	**17**	**8**	High
	Generation of dust and automobile/heavy duty equipment emissions	3	3	1	3	1	**11**	**4**	Medium
	Waste disposal (scrap metal, wood, sand, concrete, paper)	3	3	1	3	3	**13**	**4**	Medium
	Reclamation and restriction of access roads to prevent unauthorized uses	-	-	-	-	-	**-**	**-**	Beneficial
	Loss of employment and business opportunities due to completion of construction phase	3	3	1	3	3	**13**	**4**	Medium
	Illegal access to building site leading to accident, asset damage and loss	1	3	1	3	3	**11**	**4**	Medium
Operation and Maintenance • Building inspection and checks • Power generation /servicing • Transportation of raw materials and finished product • Agro-products processing for export. • Plant maintenance • Industrial waste discharges • Emergence of small-scale enterprises • Green Buffer development around each industrial plot • Recruitment of workers	Risk of injury from fall from height/trip or being hit by an object	3	3	1	3	1	**11**	**4**	Medium
	Security threat such as kidnapping and banditry attack	3	5	1	5	3	**17**	**6**	High
	Air pollution by gaseous emission (CO, SO_2, NO_2) and particulates from power generator	3	3	3	3	1	**13**	**6**	High
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator servicing (diesel, spent oil etc.)	3	3	1	3	1	**11**	**4**	Medium
	Generation of dust and gaseous pollutants from automobile emissions	3	3	3	3	1	**13**	**6**	High
	Odour disturbances from the processing of Rice, Tomato, Edible oil etc	1	3	5	1	3	**11**	**6**	High
	Increase in noise level nuisance from operation machines and from vehicles plying the access roads	3	1	3	3	1	**11**	**6**	High
	Traffic congestion along agro-products transportation route	3	3	1	3	3	**13**	**4**	Medium
	Threat to community culture, safety and security due to presence of workers and business opportunists	1	3	1	3	3	**11**	**4**	
	Reduction of water tables and source of water for production processes	3	1	3	3	3	**13**	**6**	High

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
	Metallic materials generation from plant parts, retrofitting/upgrade of parts during plant servicing	1	3	1	3	1	**9**	**4**	Medium
	Potential for land contamination from industrial waste disposal	3	3	1	3	3	**13**	**4**	Medium
	Pollution of surface water bodies by wastewater generated from industrial waste discharges	3	3	3	3	3	**15**	**6**	High
	Change in Land Use of nearby areas	1	3	1	3	3	**11**	**4**	Medium
	Recreational facility from lawns/parks/green areas	-	-	-	-	-	**-**	**-**	Beneficial
	Acquisition of skills by individuals to be employed as operators	-	-	-	-	-	**-**	**-**	Beneficial
Decommissioning /Abandonment • Removal of electrical cables and wires, water and sewage treatment plant pipelines. • Demolition of buildings for facilities retrieval • Waste generation • Transportation of Plant components for sale/another site • Re-vegetation of site	Risk of accident and injury to workers during demolition of structures	3	3	1	3	1	**11**	**4**	Medium
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	3	3	1	3	3	**13**	**4**	Medium
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages	3	3	1	3	1	**11**	**4**	Medium
	Traffic obstruction from transportation of decommissioned structures and equipment	3	3	1	3	3	**13**	**4**	Medium
	Abandoned structures possibly taken-over by miscreants/criminals	1	3	3	3	3	**13**	**6**	High
	Availability of land for alternative uses such as community hall, farmland e.t.c	-	-	-	-	-	**-**	**-**	Beneficial
	Improved Ecology, Air Quality and Aesthetics	-	**-**	**-**	-	**-**	**-**	**-**	Beneficial

5.8 Analysis of Impacts for the Proposed ATC Projects

An in-depth analysis of the identified impacts indicate that some impacts may generate from the local social and economic setting, which may in many ways have significant costs on the social, economic and environmental settings related to the proposed ATC projects. Other impacts are phase specific, but each has different levels of significance indicating that those most sever demand attention for the sustainability of the project. The significance of these impacts is summarized in Table 5.14.

Table 5.14: Impact assessment

Impact	Description	Impact assessment
Potential employment opportunities	- It is envisaged that employment opportunities will increase for local communities during both construction and operational phases. This will be mostly in manual, skilled and unskilled work (excavation, security guards, cleaners). - Technical works (plant/machine operators) will require training, capacity building.	Significant impact, particularly on individual and local economies
Enhanced farming and livestock keeping skills	- The proposed strategy for extending extension services to local producers will enhance their skills and eventually their competitiveness in terms of supplying quality products in the long run.	Significant
Enhanced women's empowerment	- Women's trades such as in food vending and food processing will have a larger market/clientele during both project construction and operational phases. This opportunity will increase their incomes and ability to enhance their livelihood status.	Significant
Advanced trade linkages	- There is the potential of increased involvement of local traders in the value chain associated with ATCs	Significant
Enhanced District economy and incomes	- Once project management structures are clearly shared, District/Municipal authorities will receive revenues from the ATC operations	Significant
Limitations in access to employment	- Possibility of favouritism or discrimination in recruitment which may affect local people's opportunity for employment within the ATCs' catchment. This may be because of recruitment policies, or, targeting of individuals with special skills.	Significant impact, could affect social acceptability of project, threaten security
Conflict/competition in basic resources	- Project development may threaten availability or water access/supply for project and surrounding communities	Significant, during both construction and operational phases
Decline in business by some traders	- Possibility of more attractive terms of trade offered by the ATC facility can minimize the ability of locally established private entrepreneurs to get adequate supply of products for their business	Not significant, will depend on the conduciveness of business run by the ATC
Loss of competitive edge by local producers	- The degree of quality demanded by the ATC may shelve out certain products and hence the incomes of local producers who cannot maintain certain standards.	Medium impact, can be mitigated by concerted extension services to producers

Dust pollution during construction phase	- Frequent movement of construction vehicles and pilling of construction materials, sand, gravel will definitely cause dust emission beyond normal levels.	Significant, but short term
Bio-diversity loss (degradation of vegetation and disturbance of insects	- Vegetation clearance during construction phase is inevitable given the proposed designs of the facilities. This will definitely disturb the natural environment and fauna dependent on it.	Significant, low scale depending on area to be covered by the facility.
Increased road traffic	- Increased volume of vehicles going in and out of the facility to bring products or transport products to the ATC is expected particularly on the access road to the project area. Depending on volume of traffic this may impact on the safety of traders and residents.	Low significance
Increase in waste generation (solid, liquid)	- A large volume of solid and liquid waste is likely to be generated during the operational phase, and is likely to increase as the volume of products also increases over time. This includes waste water for processing.	Significant
Potential of aflatoxins in crops	- Poor quality of storage facilities at initial collection points (household and ATCs) may expose harvested produce to aflatoxin contamination	Significant, small-scale
Contamination of water sources	- Accidental spillage of liquid waste, solid matter or facility debris into water sources	Likely to occur during both construction and operational phases
Spread of infectious diseases – HIV, STIs	- Population increase, increase in money transactions due to increase in trade and other opportunities may encourage multiplication of transactional relationships and sex. - Possibility of lowly-resourced females to succumb to unsafe sex is likely.	May occur during both construction and operational phases
Gender-based violence (GBV)	- The abuse of women and young girls is likely to happen in the manner of sexual abuse or sexual exploitation.	Medium intensity because it may be mitigated by sensitization and punitive action
Child abuse	- There is a high likelihood of individuals taking advantage of children seeking employment in an environment of lucrative business interaction such as that expected of the ATCs. This is because they are easier to exploit.	Medium intensity because it may be mitigated by sensitization and punitive action
Occupational and Workers health	- Project (facility) workers may be exposed to a number of health and safety hazards during both the construction and operation phase due to work-related hazards, including pollution, or accidents. - There is also the possibility that other individuals may be affected by pollution owing to the increase in number of products transacted within the facility's catchment.	Significant, depending on the quality of safety measures put in place.

5.8 Discussion of Impacts

5.8.1 Positive Environmental and Social Impacts of the Proposed Project

Employment Opportunities

Several employment opportunities (skilled and unskilled) shall be created throughout the project phases.

Provision of Market for Supply of Construction Materials

The proposed project shall require supply of large quantity of materials, most of which will be sourced locally and in surrounding areas. This provides market for material suppliers such as quarry companies, sand, wood, cement, paints and roofing material dealer as well as other dealers of building materials and local food vendors. The impact is rated significant and positive.

Improved Drainage

The project area is seriously affected by gully erosion due to lack of a well-planned drainage pattern; therefore, upon completion of the project, the drainage system of the area will be enhanced to meet the designed standard of the project. This will be a positive impact.

Gains in the Local and National Economy

There will be gains in the local and national economy as a result of the construction of this project, through consumption of locally available materials including: timber, metals and cement. The consumption of these materials in addition to fuel oil for the machines to be used at the site and others will attract taxes including Value Added Tax (VAT) and Income Tax which will be payable to the government. The cost of the materials will be payable directly to the suppliers.

Informal Sectors Benefits

During construction phase of this project, the informal sectors are temporarily likely to benefit more from this phase. This will involve kiosk operators who will be selling food to the workers on site thereby promoting entrepreneurs in the host communities for the period that the construction will be taking place.

Skills Transfer and Training

Through labour recruitment locally, the workers will have an opportunity to learn an array of skills that relate to building construction and ancillary works. Improved transport will improve interaction with other communities that will also provide an opportunity for further learning and cultural exchange.

Gender and youth Aspects

The SAPZ Project will systematically ensure that the project contributes to active gender equality and will not lead to unintended negative gender impacts, such as exclusion. Gender perspectives have been integrated into project formulation in line with the National Gender Strategy and policies while taking due cognizance of the Bank's Gender Policy. The PIU will also ensure development of a Gender Action Plan (GAP) that will drive the real engagement of either of the gender and also the youth to fully engage during the implementation of the project. In terms of project implementation, Component 1, 2 and 3 will aim to ensure that at least 35% of all beneficiaries are female, and/or female headed households to ensure the project addresses the challenges of the most vulnerable households. In terms of Component 4, which focuses on training, a target of 50% has been set to ensure balance in the institutional capacity building efforts.

Climate Change and Green Growth

This project was screened using the Climate Safeguards System (CSS) of the African Development Bank and found to be a Category 2 Project. In terms of climate change and green growth, the project will contribute to climate change resilience through improved agricultural production, better land use programme and good water and land management practices through catchment management. The project will also enhance climate change resilience through improved storage and warehousing facilities and improved marketing systems. However, efforts should and will be made to seek additional resources that may be used to enhance the effectiveness of this project by implementing climate change adaptation measures such as catchment management programmes and rainwater harvesting initiatives. Such activities will include: (i) sustainable land use practices; (ii)

terracing to minimise topsoil losses through erosion; (iii) agroforestry initiatives that will improve soil fertility while providing animal feeds; (iv) development of water harvesting micro-dams; (v) provision of drought tolerant crop seeds; and, (vi) capacity building.

Climate mitigation and adaptation

The project is unlikely to directly cause material greenhouse gas (GHG) emissions. Emissions will arise from transport and construction of infrastructure and facilities such as micro-dams, irrigation systems, agro-processing facilities, dam access roads, agricultural produce storage facilities, or similar activities. In such regard, there will be limited scope for project-based mitigation. However, by improving land, water management and agricultural production systems, the project will directly increase the overall GHG emission efficiency of the agricultural sector and hence reduce the net GHG emission intensity of food production in the country. The project will, therefore, directly assist Borno State to adapt to changing climates by improving the efficiency agricultural production while minimizing wastages through improved storage and marketing systems and market facilitation.

5.8.2 Anticipated Negative Impacts of the Proposed Project

Dust Emissions Impact

During construction work, substantial quantity of dust shall be generated through excavation, construction, leveling works, and to a small extent, transport vehicles delivering materials. Emission of large quantities of dust may lead to significant impacts on construction workers and the local residents. This impact is rated high. However it is expected that after mitigation measures are applied, the residual impact will be low.

Noise and Vibration Impact

The construction works, delivery of materials by heavy trucks and the use of machinery/equipment including bulldozers, generators, graders and compactors shall contribute high levels of noise and vibration within the construction site and the surrounding area. Elevated noise levels within the site shall affect project

workers, the residents, passers-by, domestic animals, wildlife and other persons within the vicinity of the project area.

Increased Soil Erosion Impact

The project area will be exposed to erosion and structures need to be developed to reduce soil erosion during construction activities. Soil erosion leads to sediments loading and silting water sources, reduction in stream flows upon abstraction or siltation, expose aquatic life to risks, depleted oxygen levels and destruction of river basin.

Impact on Vegetation clearance

Vegetation clearance/removal of tree shall be required which will lead to disruption/displacement of animal's ecosystems and death of animals, among others.

Extraction and Use of Materials Impacts

Construction materials such as hard core, rough stone, sharp sand gravel, laterite and water shall be required for the construction activities and will be obtained from quarries, bore holes and land. Sharp sand shall be extracted from rivers. Since substantial quantities of these materials will be required for construction of the proposed development project, the availability and sustainability of such resources at the extraction sites will be negatively affected, as they are not renewable in the short term. In addition, the sites from which the materials will be extracted shall be significantly affected in several ways including landscape changes, displacement of wildlife, intrusion into animal's breeding ground, and destruction of vegetation, poor visual quality and opening of depressions on the surface leading to pond creation thereby serving as a breeding ground for vector organisms, as well as other human and animal health impacts.

Exhaust Emissions Impact

Trucks and other vehicles that will be used to transport various materials from their sources to the project area will contribute to the increase in emissions of oxides of carbon, oxides of nitrogen, oxides of sulphur amongst other harmful gases and fine particulates along the way as a result of fossil fuel combustion. Such emissions can

lead to several environmental and health impacts including global warming. The impacts of such emissions shall be greater in areas where the materials are sourced and at the construction site as a result of frequent combustion by vehicle engines, frequent vehicle turning and slow vehicle movement in the loading and offloading areas.

Risks of Accidents and Injuries to Workers

As a result of intensive engineering and construction activities, including grinding and cutting, masonry work, traffic, among others, construction workers will be exposed to risks of accidents and injuries. Such injuries will result from accidental falls from high elevations, injuries from hand tools and construction equipment, cuts from sharp edges of metal sheets, failure and collapse of machines. Injuries and/or fatal death can also occur due to attacks by wildlife. Open ditches, unfinished works and improper storage of materials can lead to accidents to both the public and workers.

Impacts on Soil

The impacts on the soil of the study area will be: disturbance of the natural soil structure, mixing of layers and compaction thus reducing the ecological function of soil in the respective areas. Generally, the valuable top soil containing organic material, nutrients as well as seeds and the soil fauna will be excavated separately for landscaping.

Waste Generation Impact

Large quantities of solid waste will be generated at the site during construction of the proposed development project. Such waste will consist of excavated materials, vegetation, metal drums, rejected materials, surplus materials, surplus spoils, paper bags, empty cartons, waste oil, and waste bitumen, amongst others. Such solid waste materials can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on human and animal health. This may be emphasized by the fact that some of the waste materials contain hazardous substances such as waste oil, solvents, while some of the waste materials

including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment.

Energy Consumption Impact

During the construction of the proposed project, fossil fuels will be used to run transport vehicles, generators and construction machinery. This fuel is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability.

Contamination of Environment

Contamination of soil, water and air will take place during the construction process. Soil contamination will occur through aerial deposition and spills of related pollutants; asphalt residual, erosion by storm water. Air quality will be reduced due to generation of dust, hydrocarbon emissions, oxides of nitrogen, oxides of sulphur, oxides of carbon amongst other gases and particulate matter from machineries. Noise generation from machinery, equipment and increased traffic will also lead to disturbance of residential members, scare domestic and wild animals. Water shall be contaminated due to siltation of water pans, stream; deposit of construction residual materials (asphalt, cement, oil, hydrocarbons, spoils etc). The hydrological patterns will also be affected with increased flows from collection drains and surface run off from the site. The water quality shall change in terms of turbidity, hydrocarbon levels, silt, suspended solids, organic matter etc. Hydrocarbons levels at water sources will increase due to spillage and deposit of oil residue, transfer of hazardous material into aquatic and human systems leading to health risk.

Impact on Sanitary Facilities

Construction workers will require sanitary facilities while working in the field and other areas leading to pollution of the environment.

Water supply impact

The proposed project will create or require large quantities of water. Excessive water use may negatively impact on the water source and its sustainability.

Impact on Storm Water Flow and Demand for Sanitation

The roof and pavements will increase volume and velocity of storm water or run-off flowing across the project area.

Impact on Interference of Traffic Flow

If access road and its maintenance activities are not well planned or organized, it will interfere with traffic flow leading to delay, accidents and other negative impacts related to traffic flow.

Social Infrastructural Impact

From the existing baseline data collected, the project area has a very good and organized social infrastructures such as housing, portable water, schools, health centers, market etc. This means that there will be increased pressure on these infrastructures as population will increase with the development of this project.

Impact on Health / Aesthetics

The impact of the proposed project on the health of the community may arise as a result of sharp increase in the population, induced by employment. This will increase the health demand on the existing health facilities in the community. This may lead to secondary effects like pollution, increase in solid waste generation in the environment of the project. On the positive side, the presence of clinics will go a long way in stabilizing the health situation in the area.

CHAPTER SIX

6.0 MITIGATION MEASURES

6.1 Introduction

This chapter presents the mitigation (preventive, reduction and control) measures considered to ensure that the associated and potential impacts of the project on the ecological and socio-economic environment are eliminated or reduced to as low as reasonably practicable (ALARP), thus preserving the ecological integrity of the existing environment. Also, stated here are details of the control technology and compliance with health and safety hazards requirements including a table showing potential impacts of proposed project with their proffered mitigation measures (Table 6.1).

6.2 Impact Mitigation Methodology

The framework for determining the form of mitigation measures to be applied for the significant impacts identified for the project is shown in Figure 6.1 below. The frequency, severity, sensitivity, scale, magnitude and nature of the impacts were taken into consideration in the assessment.

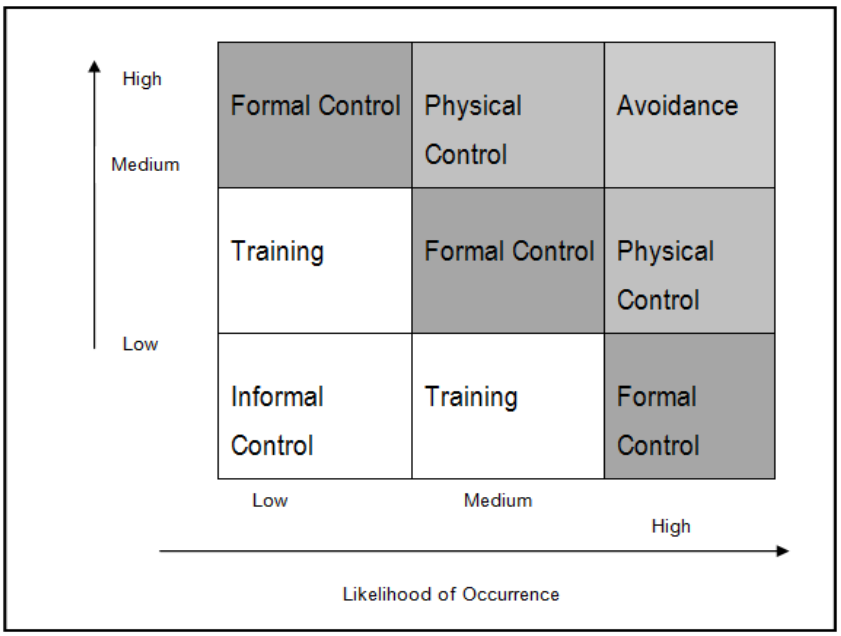


Figure 6.1: Matrix for Determination of Mitigation measures

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 definitions of the various approaches to impact mitigation 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.

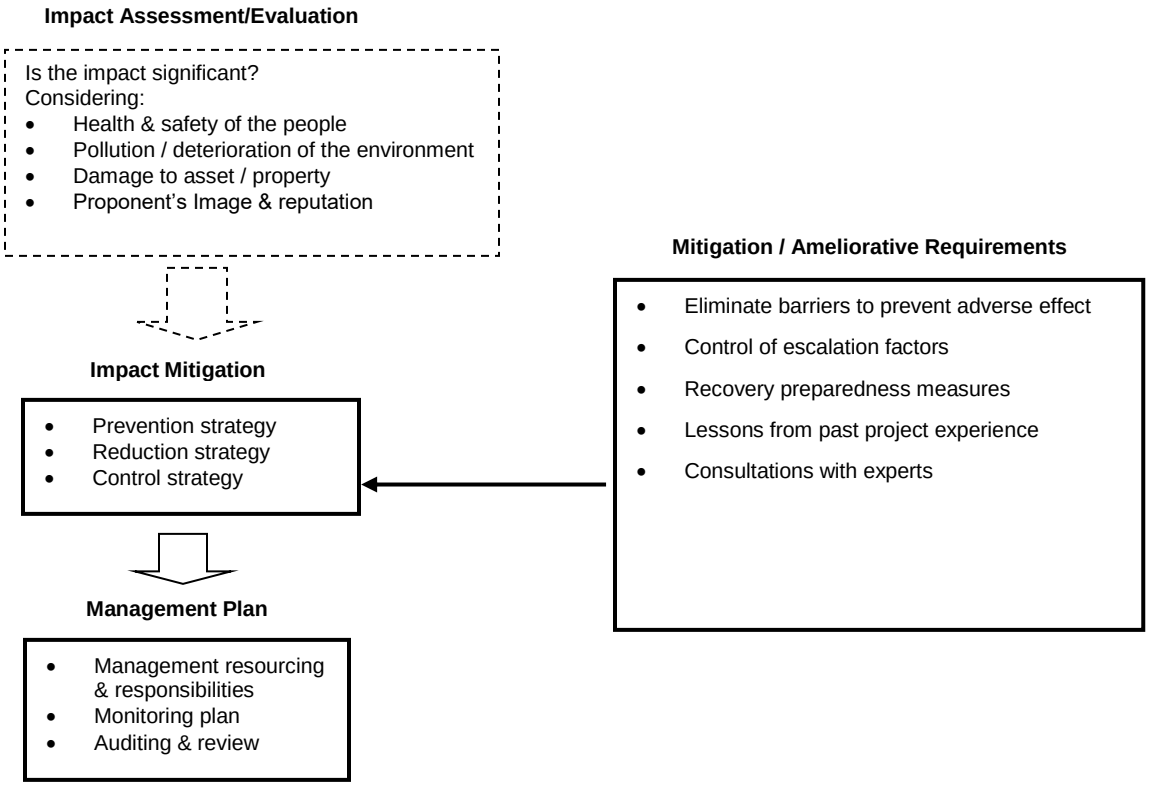


Figure 6.2: Management Procedure for Mitigation Measures

6.4 Proffered Mitigation Measures

Accordingly, this section presents the mitigation measures proffered for the significant (medium and high) adverse impacts of the project. These cost effective measures have been proffered with reference to best industry practice and HSE considerations.

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. A residual impact is the impact that is predicted to remain after mitigation measures have been designed into the intended activity. Impact prediction takes into account any mitigation, control and operational management measures that are part of the project design and project plan. The residual impacts are described in terms of their significance in accordance with the categories identified in chapter 5.

Table 6.1: Impacts and Mitigation Measures of the Proposed Project

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
Pre-Construction -Permitting -Mobilization -Recruitment -Site Preparation	Economic loss arising from loss of farm lands	High	BOSG shall ensure: • That due diligence is carried out prior to land acquisition. • To carry out census of affected farmers for compensation. • That all relevant stakeholders and issues are identified, discussed, and resolved properly prior to mobilization. • To implement regular consultations with the local community and other stakeholders (government, community, NGOs, CBOs, etc.) for effective communication and social license; support traditional conflict resolution structures in the project communities. • The activation of Grievance Redress Mechanism. • To compensate and resettle displaced farmers prior to mobilization.	Medium
	Employment opportunities arising from recruitment of skilled and unskilled personnel	Beneficial	BOSG shall ensure: • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term employees for future call-ups when required • Adopt 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. • Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour.	Positive
	Business opportunities for local contractors through subcontracting activities	Beneficial		
	Local support services from road side supply markets and shops etc	Beneficial		
	Skill acquisition and enhancements to local indigenes and workforce.	Beneficial		
	Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure	Medium	BOSG shall ensure: • To embark on community development programmes in line with the desires and needs of the people. • The provision of accommodation for workers. • Employment of indigenes.	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
	Increase of communicable diseases due to influx of people	Medium	• To coordinate with medical posts and emergency services to prepare for water supply, waste management and incidents. • To install proper and independent facilities at construction site for water supply, sanitation, solid and liquid waste, so that pressure on community infrastructure is limited. • Areal fumigation and use of Insecticide Treated Net should be promoted in the Workers camp • Sex education in protected sex, risk of casual sex and counselling services should be provided. • Provision should be made for workers to live off-site with their families.	
	Increase in social vices (like theft, prostitution etc.) resulting from increased number of people a	Medium	BOSG shall: • Make security plan and emergency response and contacts with security forces. • Engage professional security outfit in protecting lives and properties within the project area and the community. This must be registered with the Nigerian Police/NSCDC etc. • Prepare a Local Content Plan to facilitate involvement of locals in the security network. • Develop a code of behaviours for workers. All workers to receive training on community relations and code of behaviour. • Ensure that the workers are properly cautioned to respect the culture and place of worship of the people.	Low
	Community agitation over unidentified stakeholder, leadership tussles etc.	High	BOSG shall: • Inform communities about details of construction activities (e.g., employment opportunities, schedule, timing of noise activities, traffic including movements of oversized loads) by billboards, posters and community meeting • Set-up and effectively monitor project grievance redress mechanism • Engage communities in the monitoring activities to enhance transparency and involvement. • Enhance ongoing consultations with local communities (with good representation) to create continuous dialogue, trust and	Low
	Conflicts/community agitations over employment issues (quota and methods)	High		

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			planning of community development activities. • Proper consultation with the host communities and youth organizations on the recruitment of labour and work at height. • To liaise with local community head and relevant local organizations to work out formula for recruitment from the host communities • To be transparent in working out the formula for recruitment	
	Noise and vibrations due to movement from heavy duty equipment and vehicles affecting site workers, residents and wildlife	Medium	BOSG shall ensure: • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration.	Low
	Increase of dust particles and vehicular emissions such as SO_X, NO_X, CO_X, etc	Medium	BOSG shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.	
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset	High	BOSG shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management	Medium
	Disturbance of the vegetative cover due to site clearing and preparation	Medium	BOSG shall ensure: • That vegetation clearing will be limited to the surveyed area • That plants of economic value are transplanted • To limit vegetation clearing to approved widths and, as practicable, to minimum required ; and • for disturbed areas that are no longer required for project operations, monitor regrowth and, if necessary, initiate actions to enhance regrowth or re-vegetation with appropriate species consistent with operation requirement	Low
	Littering of the environment due to waste from wood, sand paper; domestic waste from laydown area and camp site (material and wood)	High	BOSG shall ensure: • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws.	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
	Contamination of surface water as a result of siltation caused by increased erosion during site preparation	Medium	BOSG shall ensure: • Implement effective site drainage on the construction yard to allow for the directed flow of surface water off site. This shall include cut-off drains to divert surface runoff from exposed soils or construction areas. • Install oil/water separators and silt traps before effluent, leaves the site. • Minimise bare ground and stockpiles to avoid silt runoff. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • That processed wastewater is treated before discharging to nearby water bodies. • That treated waste water is reused to minimize its discharge volume. • An inventory of waste is developed and maintained • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Regular checking and maintenance of all plant and equipment to minimize the risk of fuel or lubricant leakages. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Backfill foundation pits by the excavated soils which will resemble the order of the original soil layers. • Protect excavated soil materials from erosion. • That the land is physically restored (include revegetation where possible) during the rainy season subsequent to the construction activities. • Use of existing track for transport of man and material to the extent possible. • Construction of foundations to be undertaken in the dry season.	Low
Construction/ Installation Civil work, Mechanical and Electrical work which	Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.	Medium	BOSG shall ensure: • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties.	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
include; • Drainage • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc. • Commissioning /Testing • Waste management			• Unregistered labourers and touts shall not be employed. • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence • workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire- fighting shall be included in the induction programme for workers.	
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities	Beneficial	BOSG shall ensure: • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term employees for future call-ups when required • Adopt 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. • Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour.	Positive
	Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	Beneficial		
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers	Beneficial		
	Generation of dust and automobile/heavy duty equipment emissions from construction earthworks.	High	BOSG shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.	Medium

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and building sites.	Medium	BOSG shall ensure: • Ensure that vegetation clearing will be limited to the surveyed area • Ensure that plants of economic value are transplanted • for disturbed areas that are no longer required for project operations, monitor regrowth and, if necessary, initiate actions to enhance regrowth or revegetation with appropriate species consistent with operation requirement	Low
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	Medium	BOSG shall ensure: • Workers are warned not to kill fauna species but allow them to move back to the forest • 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
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	Medium	BOSG shall ensure: • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • An inventory of waste is developed and maintained • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Waste bins shall be provided at designated locations on site for temporary storage of different waste streams. • General waste that cannot be reused or recycled shall be disposed of at an approved dumpsite. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite.	
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites	High	BOSG shall: • use standard warning notice (e.g. signal lights and horn) to other road users; • ensure a practicable journey management programme is developed and adhered to; • maintain speed limits for road vehicles • ensure that mobilization is carried out after due consultation with relevant road authorities and other stakeholders to minimize interference along the road ways	Low
	Traffic congestion during haulage of plant components to site for installation	Medium	BOSG shall ensure: • the creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • compliance with journey management policy • to minimize movement at the peak hours of the day • that all traffic rules are obeyed by the drivers	Low
	Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	Medium	BOSG shall ensure: • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties. • Unregistered labourers and touts shall not be employed. • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence • workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire- fighting shall be included	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			in the induction programme for workers. • Test structures for integrity prior to undertaking work. • Implement a fall protection program that includes training in climbing techniques and the use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others. • Provide an adequate work-positioning device system for workers.	
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	Medium	BOSG shall ensure: • Appropriate PPE shall be provided for workers. • Workers shall imbibe the workplace safety rules via proper sensitization procedures. • Strict compliance to the SOPs shall be ensured. • A conduit type of wiring shall be adopted instead of a surface to prevent shock. • Only allowing trained and certified workers to install, maintain, or repair electrical equipment; • Deactivating and properly grounding live power distribution lines before work is performed on, or close to, the lines; • ensuring that live-wire work is conducted by trained workers with strict adherence to specific safety and insulation standards. • Prior to excavation works, all existing underground cable installations should be identified and marked. Drawings and plans should indicate such installations.	Low
	Reduction in wildlife population as a result of poaching due to easier access created by access roads	High	BOSG shall ensure: • Workers are warned not to kill fauna species but allow them to move back to the forest. • Poachers are not allowed access to the site • 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	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			in inclement weather e.g., periods of low visibility, are avoided	
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	High	BOSG shall: • Cover properly loose materials and keep top layers moist • Use binder material for erosion and dust control for long term exposed surfaces. • Regular cleaning of equipment, drains and roads to avoid excessive buildup of dirt. Spray surfaces prior to excavation • Use covered trucks for the transportation of materials that release dust emissions. • Speed limits on-site of 15 k/h should be recommended and enforced	Medium
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	High	BOSG shall ensure that: • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration.	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	Medium	BOSG shall: • Maintain construction site in orderly condition and do not distribute material over many sites before usage.	Low
	Waste Disposal • Scrap metal, wood, sand, concrete, paper • Spent-oil and replaced /obsolete equipment parts that may contaminate soil/ground water • Waste from laydown area and building sites causing unsightliness	High	BOSG shall ensure: • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws.	Low
DEMOBILISATION **-**Demobilization after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.	Medium	BOSG shall ensure: • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties. • Unregistered labourers and touts shall not be employed. • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence • workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire- fighting shall be included in the induction programme for workers. • Test structures for integrity prior to undertaking work. • Implement a fall protection program that includes training in climbing techniques and the use of fall protection measures;	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others. • Provide an adequate work-positioning device system for workers.	
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	Medium	BOSG shall ensure: • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite.	Low
	Traffic congestion during transportation of demobilized equipment and personnel	High	BOSG shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management	Low
	Generation of dust and automobile/heavy duty equipment emissions	Medium	BOSG shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.	
	Waste disposal (scrap metal, wood, sand, concrete, paper)	Medium	BOSG shall ensure: • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws.	Low
	Loss of employment and business opportunities due to completion of construction phase	Medium	BOSG shall: • Counsel worker and occupant who losses job. • Give enough notice • Pay Workers all entitlement due to them prior to job loss	Low
	Illegal access to building site leading to accident, asset damage and loss	Medium	BOSG shall: • Make security plan and emergency response and contacts with security forces. • Professional security outfit be engaged in preventing illegal access to the building sites • Prepare a Local Content Plan to facilitate involvement of locals in the security network.	Low
OPERATION AND MAINTENANCE • Building inspection and checks • Power generation/ servicing • Transportation of raw materials	Risk of injury from fall from height/trip or being hit by an object	Medium	BOSG shall ensure that: • A comprehensive HSE Policy must be displace openly, and enforced through monitoring within the site; • All staff must be trained and retrained on regular basis for HSE compliance; • Develop a training program including a code of conduct for all workers; • Well-equipped Clinic should be put up for emergence attention, while referral system should be arranged with a Secondary Hospital	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
and finished product • Agro-products processing for export. • Plant maintenance • Industrial waste discharges • Emergence of small-scale enterprises • Green Buffer development around each industrial plot. • Recruitment of workers	Security threat such as kidnapping and banditry attack	High	BOSG shall: • Engage trained security personnel • Avoid lone working • Avoid working at nights • Avoid night journeys	Medium
	Air pollution by gaseous emission (CO, SO_2, NO_2) and particulates from power generator	High	BOSG shall ensure: • Generator to comply with international standards for exhaust gases; • Maintenance of generator and exhaust gas check; • Use of the cleanest fuel economically available shall be adopted	Low
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator servicing (diesel, spent oil etc.)	Medium	BOSG shall ensure: • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite. • Conduct bioremediation of polluted soil immediately to inhibit further spread	Low
	Generation of dust and gaseous pollutants from automobile emissions	High	BOSG shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			and machineries throughout the project phases. • Preference for usage of clean fuel like LPG, low sulphur diesel should be explored; • Energy conservation should be adopted by opting the alternate energy options like solar power; • Power Generators and equipment should be provided with stacks of adequate height (higher than nearest building) to allow enough dispersion of emission; • Enclosure of dust producing equipment, • Use of local exhaust ventilation; • Use of dust extraction and recycling systems to remove dust from work areas; • Regular checking and maintenance of all plant and equipment to minimize the risk gas leakage	
	Odour disturbances from the processing of Rice, Tomato, Edible oil etc	High	BOSG shall • Ensure all processing equipment are installed in an enclosed plant and processing activities are taking place within an enclosed system. • Ensure provision of appropriate PPE (respiratory protection) for workers and enforce usage. • Ensure that project staff are not exposed to more than nine hours at a go on any equipment generating noise level of more than 90 dBA	Medium
	Increase in noise level nuisance from operation machines and from vehicles plying the access roads	High	BOSG shall ensure that: • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			• Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration. • Machineries to be used should comply with the noise standards prescribed by FMEnv. • Workers shall be given PPE (ear plugs) and enforce compliance;	
	Traffic congestion along agro-products transportation route	Medium	BOSG shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management	Low
	Threat to community culture, safety and security due to presence of workers and business opportunists	Medium	BOSG shall: • Develop an induction program including a code of conduct for all workers. Code of conduct to address the following: o Respect for local residents; o unauthorized taking of products; o Zero tolerance of illegal activities such as child sexual exploitation and underage sex, prostitution, harassment of women, Gender Based Violence (GBV,) purchase or use of illegal drugs, o Disciplinary measures and sanctions (e.g. dismissal) for infringement of the code of conduct and/or company rules; o Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of GBV.	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			• Limit the number of migrant workers by engaging local workers.	
	Reduction of water tables and source of water for production processes	High	BOSG shall ensure: • Water conservation measures should be practiced • Waste water should be recycled for reuse. • Rain water harvesting. • Adoption of continuous horizontal washers and vertical spray washers or vertical, double-laced washers. • Adoption of counter current washing (e.g. reuse the least contaminated water from the final wash for the next-to last wash). • Use of water flow–control devices to ensure that water only flows to a process when needed.	Low
	Metallic materials generation from plant parts, retrofitting/upgrade of parts during plant servicing	Medium	BOSG shall ensure: • Recyclable materials should be sorted and sold to scrap metal converters • Regular checking and maintenance of all plant and equipment to minimize the risk of fuel or lubricant leakages.	Low
	Potential for land contamination from industrial waste disposal	Medium	BOSG shall ensure: • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws.	Low
	Pollution of surface water bodies by wastewater generated from industrial waste discharges	High		
	Creation of job and acquisition of skills by individuals to be employed as operators	Beneficial	BOSG shall ensure: • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term	Positive

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			employees for future call-ups when required • Adopt 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. • Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour.	
Decommissioning/ Abandonment • Removal of electrical cables and wires, water and sewage treatment plant pipelines. • Demolition of buildings for facilities retrieval • Waste generation • Transportation of Plant components for sale/another site • Re-vegetation of site	Risk of accident and injury to workers during demolition of structures	Medium	BOSG shall ensure that: • A comprehensive HSE Policy must be displace openly, and enforced through monitoring within the site; • All staff must be trained and retrained on regular basis for HSE compliance; • Develop a training program including a code of conduct for all workers; • Well-equipped Clinic should be put up for emergence attention, while referral system should be arranged with a Secondary Hospital	Low
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	Medium	BOSG shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.	Low
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages	Medium	BOSG shall ensure: • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques.	Low

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			• Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite.	
	Traffic obstruction from transportation of decommissioned structures and equipment	Medium	BOSG shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management	Low
	Abandoned structures possibly taken-over by miscreants/criminals	High	BOSG shall: • Make security plan and emergency response and contacts with security forces. • Re-vegetate the site with local plant species	Medium
	Availability of land for alternative uses such as community hall, farmland e.t.c	Beneficial	BOSG shall ensure: Use local plant species to re-vegetate the abandoned site	Positive
	Improved Ecology, Air Quality and Aesthetics	Beneficial		

6.5 Impact Mitigating Measures for Pre-Construction and Construction Phase

6.5.1 Vegetation Clearance and Disturbance

Clearance of vegetation at the project site to pave way for construction shall take place within the perimeter of the acquired land. This will be aimed at ensuring that any disturbance to flora and fauna is restricted to the actual project area and avoid spillover effects on the neighbouring areas. In the same vein, there will be strict control of construction vehicles to ensure that they operate only within the area allocated with access routes and other works; deviation works shall be confined close to the road to avoid spread of vegetation destruction; avoid encroachment into drainage. Since sustainable development equally recognizes that vegetation must inevitably give way to developmental projects, adequate care will be taken in order that some native plants within the project radius (2km) will be conserved. Specifically, only trees at the project right of way shall be cut. In addition, the proponent shall re-vegetate some of the disturbed areas through implementation of a well-designed landscaping programme. It is recommended that part of the topsoil excavated from the construction site be re-spread in areas to be landscaped to enhance plant health.

6.5.2 Run-off and Soil Erosion

The contractors shall put in place measures aimed at minimizing run-off and spillover effects on neighbouring land as well as sources of water during rainy season or when wet activities are being conducted on the site. These measures will include clearing the project site of excavated materials or protect excavated sections from storm water, back filling and creating proper channels for waste water and solid waste disposal, develop emergency measures and procedures for protection of soils and streams downstream from effect of siltation, design adequate culverts to accommodate peak flows; stabilize cut-surfaces with gabions, concrete walls, vegetation etc.; direct all surface runoff into existing natural drains and stabilize the drains downstream.

6.5.3 Dust Generation and Emission

Dust emission during construction shall be minimized through strict enforcement of speed controls in the host community as well as limiting unnecessary traffic within the project site from vehicle delivering materials. Some dust generating activities shall be carried out under wet condition within the project site by damping with water regularly to reduce amount of dust generated by the construction trucks and other heavy equipment. The workers will also be provided with nose masks to protect them against dust effects.

6.5.4 Noise and Vibration

Noise and vibration shall be minimized in the project site and surrounding areas through sensitization of construction truck drivers to switch off vehicle engines, avoid gunning of vehicle engines or hooting during movement and while offloading materials. Construction machinery including generators and heavy duty equipment shall be insulated or placed in enclosures to minimize ambient noise levels, construction activities to be conducted during the day in order to avoid noise nuisance to the resident around the areas, excavation to be undertaken with ordinary earth movers, ensure good maintenance of vehicles and equipment. Engine mufflers shall be incorporated into all project equipment to reduce noise pollution.

6.5.5 Mitigation Measures for Energy Consumption Impact

There shall be proper planning of material transportation; this will ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts. Complementary to these measures, the contractor will monitor energy use during construction and set targets for reduction of energy use. Renewable energy sources at the project site office as a sustainable alternative are recommended.

6.5.6 Exhaust Emissions

This shall be achieved through proper planning of transportation of materials to ensure that vehicle fills are increased within axle weight limits in order to reduce the number of trips or the number of vehicles on the road. Truck drivers shall be

sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas, and to switch off or keep vehicle engines off at these points. Machineries for construction and other combustion sources shall be provided with equipment to enhance high-efficiency burners that will minimize the emission of noxious gases.

6.5.7 Construction Waste Impact

Construction wastes shall be reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the contractor shall be committed to ensuring that construction materials left over at the end of construction is used in the same or other projects rather than being disposed of. In addition, damaged or waste construction materials including gravel, cement, off-cut of rods, wood and roofing sheets, damaged blocks and waste oil among others shall be recovered for use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents (secondary users). An integrated solid waste management system shall be employed by the contractors. Solid wastes arising from construction works shall be contained and disposed in approved disposal site by the service of Borno State Environmental Protection Agency's registered waste contractors. Priority shall be given to reducing waste at source. Other measures to be employed in minimizing solid waste during construction of the project shall include:-

- Use of durable, long-lasting materials and equipment's that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time.
- Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements of weather.
- Use of construction materials that have minimal packaging to avoid the generation of excessive packaging waste.

- Use of construction materials containing recycled content when possible and in accordance with accepted standards.

6.5.8 Water Use and pollution of water sources

The contractor shall ensure that water shall be used efficiently at the site by sensitizing construction staff to avoid irresponsible water usage. No solid waste, fuels/oil shall be discharged into drains. Washing of construction equipment and trucks shall be carried out in a designated area. Waste water from project site and from the site office shall be channeled into the appropriate channel to avoid contamination of water bodies (both surface and ground) and soils.

6.5.9 Mitigation Measures for Landscape related impacts

The proposed project and Associated Services will affect the surrounding landscape, which encompasses natural relief, vegetation, water courses and other object of aesthetic value. As a result, the project activities will follow the natural relief as far as practicable and cutting of native trees will be minimized.

6.5.10 Mitigation Measures for Human Health and Safety Impact

Since the proposed project will be instrumental in the contamination of water body, air and noise pollution, road accidents, poor signage and traffic control systems worsen the situation if not properly managed. The ESIA report recommends that the project team through the PRO in conjunction with the host and neighbouring Community Leaders and FRSC to carry out comprehensive awareness to prevent outbreaks of communicable diseases including STIs, Screen and treat the affected persons, control dust by spraying water and assign high priority to accident preventive measures, enforce mandatory use of seatbelts, compulsory driver training and testing, prohibition and punishment of driving while those impaired with drugs or alcohol, traffic safety education, testing and inspection of all vehicles to comply with national safety standards, Improve road safety features for non-motorized vehicles, provide proper safety feature for vulnerable road users like pedestrians and cyclists, and reducing congestion.

6.6 Mitigation for Operation and Maintenance Phase Impacts

6.6.1 Efficient Solid Waste Management

Borno State Environmental Protection Agency's accredited waste contractor shall be responsible for efficient management of solid waste that shall be generated by the project during its operation and maintenance phase. In this regard, waste handling facilities such as waste receptacles for temporarily holding of domestic waste generated shall be provided. In addition, they will ensure that the waste is disposed off regularly and appropriately.

6.6.2 Social Impact

Immigration of workers will be controlled through employment of locals. Locals' capacity building will be conducted to prepare them for challenging assignment. The contractor will discourage labour yard by allowing workers to live at their homes; this is to reduce vices that will be induced by immigrating labourers as this normally increases incidence of illicit behavior.

6.6.3 Energy Consumption

The contractor shall use energy-efficient lighting systems to light the entire area. This will contribute immensely to energy saving during the operational phase of the project. This will ensure adequate management of the power supply

6.6.4 Mitigation Measures for Environmental Pollution and Contamination impact

All measures will be put in place to avoid environmental pollution and contamination. Oil spillage management measures will be put in place (through storage, and disposal) including use of bio-diesel; materials will be covered to avoid pollution caused by elements of weather such as wind, rain etc; enclose plants and usage and materials transfer facilities, smoking equipment's during site clearing and trucks will be installed with pollution control devices including; control leakages during maintenance and cleaning of vehicles and construction equipment; noisy equipment's shall be installed with sound proof; proper drainage and erosion structures shall be developed to reduce effects of erosions; contaminated soils shall

be stabilized before disposal, avoid disposal of oil residuals, asphalt, and engine parts; hold top soils from material sites for rehabilitation and stabilize cut sections. Professional handling of pollution point sources during the project development and decommission of the potential point sources of pollution will be necessary. Quality control of the streams shall be conducted downstream; culverts shall be kept clear at all times and channeled into natural drains, control soil loss from the neighbouring land through storm water flows, introduce appropriate vegetation in the project area and compel occupant to take responsibility of their own pollutants by depositing them in the appropriate bins for evacuation.

6.6.5 Occupational Health and Safety Impact

Contractors of the project shall ensure adherence to the occupational health and safety rules and regulations. They shall be committed to provision of security, insurance of both personnel and equipment, train and develop capacity especially for inexperienced labourers/workers, compensate for losses and injuries, provide appropriate personal protective equipment, as well as ensuring a safe and healthy environment for construction workers as outlined in the ESMP. Other critical practices that shall be ensured to enhance safety are: evaluation of risks, inform host community on schedule and activities, workers shall be trained on health and safety procedures, reflective signage shall be installed for safety of workers/users, keep public away from material site. In addition, the construction workers shall be exposed to 'Daily Safety Briefing' on health, safety and environment (HSE) to reduce or completely eliminate this impact. Use of PPE shall be enforced. Project workers that shall be engaged with electrical works shall be provided with electrical protective devices such as line hose, gloves, covers and sleeves made of rubber.

6.7 Mitigation for Decommissioning Phase Impacts

6.7.1 Mitigation Measures for Dust Emission Impact

Dust emission during decommissioning shall be minimized through strict enforcement of onsite speed controls as well as limiting unnecessary traffic within the area. Some dust generating activities shall be carried out in wet condition; and unpaved traffic routes within and around the area shall be damped with water regularly to reduce amount of dust generated by trucks. The workers will also be provided with nose masks to protect them against dust effects.

6.7.2 Mitigation Measures for Exhaust Emissions Impact

This shall be achieved through proper planning of transportation of materials outside the area and the dismantling activities to ensure that vehicle fills are increased within axle weight limits in order to reduce the number of trips or the number of vehicles on the road. Truck drivers shall be sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas, and to switch off or keep vehicle engines off at these points. Machineries for dismantling and other combustion sources will have high-efficiency burners that will minimize the emission of noxious gases.

6.7.3 Efficient Solid Waste Management Impact

Decommissioning waste shall be recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the contractor shall be committed to ensuring that materials left over shall be used in the same or other project rather than being disposed of. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, refilling of gullies. An integrated solid waste management system shall be employed. Solid wastes arising from decommissioning shall be contained and disposed off in approved disposal site.

6.7.4 Mitigation Measures for Noise and Vibration Impact

Noise and vibration shall be minimized in the project site and surrounding areas through sensitization of truck drivers to switch off vehicle engines, avoid gunning of vehicle engines or hooting during movement and while offloading materials. Machinery including generators and heavy duty equipment shall be placed in enclosures to minimize ambient noise levels, decommissioning activities to be conducted during the day, excavation to be undertaken with ordinary earth movers, ensure good maintenance of vehicles and equipment. The contractor will provide hearing protective devices, specifically ear muff, for all project workers. The use of the ear-muffs at all times on the site shall be strictly enforced.

CHAPTER SEVEN

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN(ESMP)

7.1 Introduction

This chapter presents the Environmental and Social Management Plan (EMP) developed for the proposed construction of Special Agro-industrial Processing Zone (SAPZ), Borno, Nigeria. An environmental and social management plan (ESMP) is essentially a management tool and standalone component of an ESIA 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.

Borno State Government has designed the ESMP 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 ESMP 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.

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. Figure 7.1 illustrates this principle graphically.

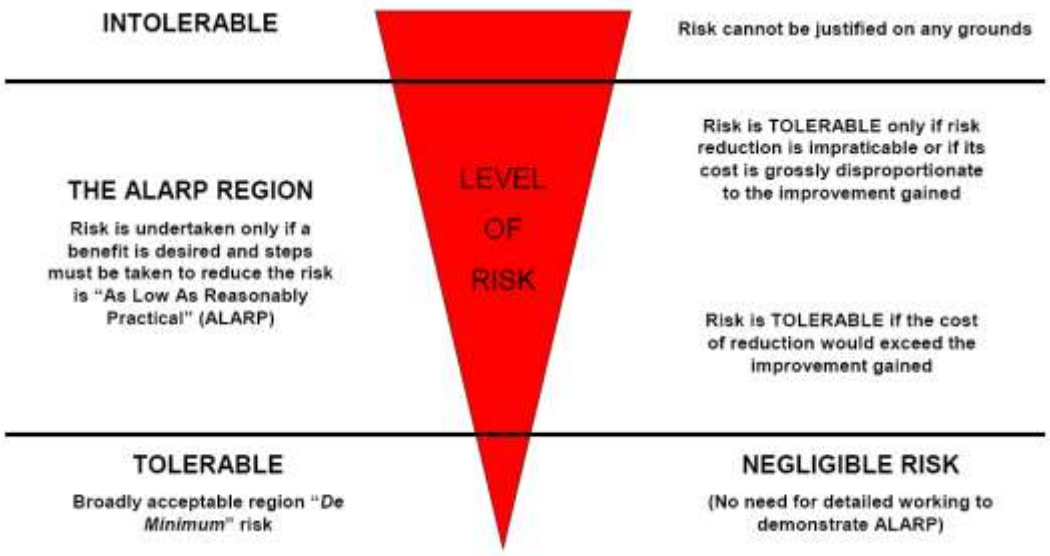


Figure 7.1: Level of Risk and ALARP

7.2 ESMP Objectives

The ESMP is essential for successfully implementing the Project's 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 performance and helps ensure that environmental risks and liabilities are identified, minimised and managed. The ESMP will be a living document and will continue to develop during the design and construction phase to enable continuous improvement of the Project's environmental performance.

Specifically, the ESMP is designed to:

- ensure that all mitigation measures prescribed in the ESIA 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 Borno State Ministry of Agriculture 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, landlords, etc), youth leaders, Community Based Organizations (CBOs), and other stakeholders throughout the project lifecycle.

7.3 Core Elements of the EMP

In line with the objectives summarized in section 7.2 above, the main elements of this ESMP are:

- Overall project organizational chart (including HSE) organogram;
- Preliminary ESMP 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 Structure and Responsibility

The roles and responsibilities (HSE) for the proposed project include:

Resident Engineer

- HSE management on the project
- Provide visible leadership, systems and resources for environmental management
- Initiate action to maintain compliance with requirements
- Specify and participate in project audits/reviews as required

Assistant Project Manager(s)

- Review procedures for environmental aspects
- Follow up actions from project risk assessments and environmental reviews
- Be focal point for environmental matters with subcontractors as required
- Participate in project audits/review as required

HSE Advisor

- Be pro-active in promoting HSE
- Follow-up /monitor requirements with responsible parties
- Provide specialist HSE advice
- Facilitate project risk assessment as required
- Lead/participate in audits, as required
- Maintain HSE Activities matrix and monitor close out of Project Environmental Review
- Development of Project HSE documentation

Environmental Lead

- Provide specialist environmental advice
- Jointly monitor project Environmental aspects with Project Team
- Review relevant project documentation on circulation by Project Team
- Facilitate project environmental review
- Lead / participate in audits and inspections as required
- Review project environmental documentation

7.4.1 Institutional Responsibility

The responsibilities of all incorporated institutions in the implementation of this ESMP are presented in table 7.1 below:

Table 7.1: Roles and Responsibilities of Relevant Institution

S/N	Category	Roles & Responsibilities
1.	Federal Ministry of Environment	• Provision of advice on screening, scoping, review of draft ESIA report (in liaison with State Ministry of Environment), receiving comments from stakeholders, public hearing of the project proposals, and convening a technical decision-making panel, environmental and social liability investigations, monitoring and evaluation process and criteria.
2	Borno State Government	• Overseer all environmental compliance at the State level • Review of draft ESIA report (in liaison with Federal Ministry of Environment) • Site assessment and monitoring of ESMP implementation.
3.	State Government MDAs (Ministry of Physical Planning, Urban Development, Bureau of Lands etc.	• Compliance overseer at State Level, on matters of land acquisition and compensation and other resettlement issues, • Other MDAs come in as and when relevant areas or resources under their jurisdiction or management are likely to be affected by or implicated projects. • They participate in the EA processes and in project decision-making that helps prevent or minimize impacts and to mitigate them. • Issuance of consent or approval for an aspect of a project; allow an area to be included in a project; or allow impact to a certain extent or impose restrictions or conditions, monitoring responsibility or supervisory oversight.
	BSEPA	• Inspection of project premises in order to ensure strict compliance with sanitation and waste management standards in the state. • Collaboration with other MDAs at the State and Federal level, NGOs and Donor Agencies in environmental protection and management especially in areas of waste recycling etc.
	Local Government	• Provision of oversight function across subproject in LGAs for ESMP compliance. • Monitoring of activities related to public health, sanitation, waste management amongst others.

	Affected Community	• Promote environmental awareness. • Review environmental and social performance report made available by BOSG • Provide comments, advice and/or complaints on issues of nonconformity. • Attend public meetings organized by BOSG to disseminate information and receive feedback.
	CDA	• Ensure community participation by mobilizing and sensitizing community members.
	NGOs/CSOs	• Assisting in their respective ways to ensure effective response actions, conducting scientific researches alongside government groups to devise sustainable environmental strategies and techniques.
	Others/General Public	• Identify issues that could disrupt the project and support project impacts and mitigation measures and awareness campaigns.

7.5 Framework for Implementing the EMP

The framework for the implementation of this ESMP 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 Borno State Ministry of Agriculture.
- 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: Though not highly applicable in offshore project far removed from Community, 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 Borno State Ministry of Agriculture meeting 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.

7.6 Borno State Government

Roles and Responsibilities

Borno State Government is committed to provide resources essential to the implementation and control of the ESMP in the construction phase of the proposed SAPZ project. The major roles and responsibilities of BOSG is provided in Table 7.2 below. Resources include the appropriate human resources and specialized skills. BOSG 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 and operation.

Table 7.2: Roles and Responsibilities

Project Manager	Oversee and coordinate all activities pertaining to the project and responsible for safety during the

	construction phase.
General Manager	Manage all technical operations pertaining to the project and responsible for safety during the operations phase.
HSE Manager	Ensure that SAPZ operates in accordance with its HSE plans and assists line management in performing their line duties.
Facilities/Site Engineer	Monitor, report and ensure the efficient working conditions of all facilities on site
Community/Regulatory Liaison Officer	Liaise with the host communities and regulators on BOSG 's behalf
Federal Ministry of Environment	Ensure that environmental recommendations in the ESIA to mitigate against construction impacts are implemented
Borno State Ministry of Environment	Ensure that environmental recommendations in the ESIA to mitigate against construction impacts are implemented

The management and regulatory responsibilities on a project of this magnitude mandate stakeholders' commitments to environmental and socio-economic issues attached to project sustainability. BOSG has a mandatory responsibility under the Nigerian law to perform its operations in the best environmentally and socio-economically sustainable way. So, also, the regulatory agencies (Borno State Ministry of Environment) are empowered by law to take responsibility for the monitoring of the operations of all organizations operating within the boundaries of the country/state to ensure environmental and socio-economic sustainability of the recipient communities. The host communities also have an important stake in the environmental and socio-economic sustainability of the project by giving the required support to both the operators and the regulators. An all encompassing organisational structure for the implementation of the HSE, ESMP and Community Affairs has been designed and approved for the SAPZ project (Figure 7-2). BOSG shall faithfully adopt and implement this organogram for a result oriented HSE systems.

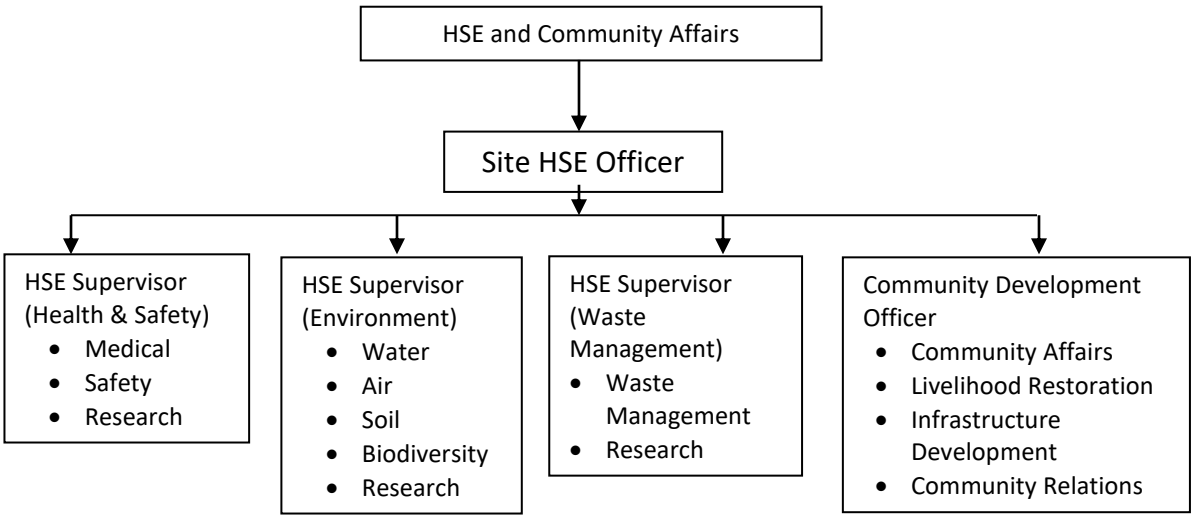


Figure 7-2: BOSG Proposed Organogram for Health, Safety and Environment (HSE)

7.7 ESMP Guidelines

Preliminary ESMP 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.

7.7.1 Environmental and Social Management Plan

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase of the proposed project are outlined in Table 7.3 below.

Table 7.3: Environmental and Social Management Plan

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
Pre-Construction -Permitting -Mobilization -Recruitment -Site Preparation	Economic loss arising from loss of farm lands	High	BOSG shall ensure: • That due diligence is carried out prior to land acquisition. • To carry out census of affected farmers for compensation. • That all relevant stakeholders and issues are identified, discussed, and resolved properly prior to mobilization. • To implement regular consultations with the local community and other stakeholders (government, community, NGOs, CBOs, etc.) for effective communication and social license; support traditional conflict resolution structures in the project communities. • The activation of Grievance Redress Mechanism. • To compensate and resettle displaced farmers and miners prior to mobilization.	Medium	Stakeholder engagement report	Quarterly	BOSG, Project Contractor	N/A
	Employment opportunities arising from recruitment of skilled and unskilled personnel	Beneficial	BOSG shall ensure: • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term employees for future call-ups when required • Adopt 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. • Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour.	Positive	Stakeholder engagement report, Evidences of workers payment	Monthly	BOSG, Project Contractor	N/A
	Business opportunities for local contractors through subcontracting activities	Beneficial						N/A
	Local support services from road side supply markets and shops etc	Beneficial						N/A
	Skill acquisition and enhancements to local indigenes and workforce.	Beneficial						N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
	Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure	Medium	BOSG shall ensure: • To embark on community development programmes in line with the desires and needs of the people. • The provision of accommodation for workers. • Employment of indigenes. • To coordinate with medical posts and emergency services to prepare for water supply, waste management and incidents. • To install proper and independent facilities at construction site for water supply, sanitation, solid and liquid waste, so that pressure on community infrastructure is limited. • Areal fumigation and use of Insecticide Treated Net should be promoted in the Workers camp • Sex education in protected sex, risk of casual sex and counselling services should be provided. • Provision should be made for workers to live off-site with their families.	Low	Employment Record, HSE Record	Once during mobilization	BOSG, Project Contractor	N/A
	Increase of communicable diseases due to influx of people	Medium						N/A
	Increase in social vices (like theft, prostitution etc.) resulting from increased number of people a	Medium	BOSG shall: • Make security plan and emergency response and contacts with security forces. • Engage professional security outfit in protecting lives and properties within the project area and the community. This must be registered with the Nigerian Police/NSCDC etc. • Prepare a Local Content Plan to facilitate involvement of locals in the security network. • Develop a code of behaviours for workers. All workers to receive training on community relations and code of behaviour. • Ensure that the workers are properly cautioned to respect the culture and place of worship of the people.	Low	Security Report	Monthly	BOSG HSE Supervisor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
	Community agitation over unidentified stakeholder, leadership tussles etc.	High	BOSG shall: • Inform communities about details of construction activities (e.g., employment opportunities, schedule, timing of noise activities, traffic including movements of oversized loads) by billboards, posters and community meeting • Set-up and effectively monitor project grievance redress mechanism • Engage communities in the monitoring activities to enhance transparency and involvement. • Enhance ongoing consultations with local communities (with good representation) to create continuous dialogue, trust and planning of community development activities. • Proper consultation with the host communities and youth organizations on the recruitment of labour and work at height. • To liaise with local community head and relevant local organizations to work out formula for recruitment from the host communities • To be transparent in working out the formula for recruitment	Low	Stakeholder Engagement Report	Monthly	BOSG, Project Contractor	Provided by GRM
	Conflicts/community agitations over employment issues (quota and methods)	High						Provided by GRM
	Noise and vibrations due to movement from heavy duty equipment and vehicles affecting site workers, residents and wildlife	Medium	BOSG shall ensure: • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g.	Low	Noise Level	Daily	BOSG, Project Contractor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration.					
	Increase of dust particles and vehicular emissions such as SO_X, NO_X, CO_X, etc	Medium	BOSG shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.	Low	SO_X, NO_X, CO_X, VOC, SPM	Weekly during mobilization	BOSG, Project Contractor, BSMEnv	N/A
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset	High	BOSG shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management	Medium	Traffic Record	Daily	BOSG, Project Contractor, FRSC	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
	Disturbance of the vegetative cover due to site clearing and preparation	Medium	BOSG shall ensure: • That vegetation clearing will be limited to the surveyed area • That plants of economic value are transplanted • To limit vegetation clearing to approved widths and, as practicable, to minimum required ; and • for disturbed areas that are no longer required for project operations, monitor regrowth and, if necessary, initiate actions to enhance regrowth or revegetation with appropriate species consistent with operation requirement	Low	Flora species record	Once before Mobilization	BOSG, Project contractor	N/A
	Littering of the environment due to waste from wood, sand, paper; domestic waste from laydown area and camp site (material and wood)	High	BOSG shall ensure: • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws.	Low	Waste Management Record	Weekly	BSEPA, Project Contractor	5,000,000.00
	Contamination of surface water as a result of siltation caused by increased erosion during site preparation	Medium	BOSG shall ensure: • Implement effective site drainage on the construction yard to allow for the directed flow of surface water off site. This shall include cut-off drains to divert surface runoff from exposed soils or construction areas. • Install oil/water separators and silt traps before effluent, leaves the site. • Minimise bare ground and stockpiles to avoid silt runoff. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • That processed wastewater is treated before discharging to nearby water bodies. • That treated waste water is reused to minimize its	Low	Water Quality	Monthly	BSMEnv, Project Contractor	15,000,000.00

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			discharge volume. • An inventory of waste is developed and maintained • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Regular checking and maintenance of all plant and equipment to minimize the risk of fuel or lubricant leakages. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Backfill foundation pits by the excavated soils which will resemble the order of the original soil layers. • Protect excavated soil materials from erosion. • That the land is physically restored (include revegetation where possible) during the rainy season subsequent to the construction activities. • Use of existing track for transport of man and material to the extent possible. • Construction of foundations to be undertaken in the dry season.					
Construction/ Installation Civil work, Mechanical and Electrical work which include; • Drainage • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and	Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.	Medium	BOSG shall ensure: • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties. • Unregistered labourers and touts shall not be employed. • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence • workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of	Low	Incident/accident rate record	Daily	Project Contractor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
coating • Transportation and logistics etc. • Commissioning / Testing • Waste management			work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire-fighting shall be included in the induction programme for workers.					
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities	Beneficial	BOSG shall ensure: • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term employees for future call-ups when required. • Adopt 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. • Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour.	Positive	Stakeholder Engagement Report, Evidences of workers payment	Monthly	Project Contractor	N/A
	Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	Beneficial						N/A
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers	Beneficial						N/A
	Generation of dust and automobile/heavy duty equipment emissions from construction earthworks.	High	BOSG shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.	Medium	SO_X, NO_X, CO_X SPM	Weekly	Project Contractor	N/A
	Flora/habitat loss and disturbance through vegetation clearing and	Medium	BOSG shall ensure: • Ensure that vegetation clearing will be limited to the surveyed area	Low	Biodiversity Record	Once	Project Contractor	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
	earthworks along access roads and building sites.		• Ensure that plants of economic value are transplanted • for disturbed areas that are no longer required for project operations, monitor regrowth and, if necessary, initiate actions to enhance regrowth or revegetation with appropriate species consistent with operation requirement					
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	Medium	BOSG shall ensure: • Workers are warned not to kill fauna species but allow them to move back to the forest • 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	Fauna Species Record	Once before Construction	Project Contractor	N/A
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	Medium	BOSG shall ensure: • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • An inventory of waste is developed and maintained • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Waste bins shall be provided at designated locations on site for temporary storage of different waste streams. • General waste that cannot be reused or recycled shall be disposed of at an approved dumpsite. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate	Low	Soil & Water Quality and Waste evacuation/disposal rate	Monthly	Project Contractor, BSMEnv, BSEPA	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite.					
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites	High	BOSG shall: • use standard warning notice (e.g. signal lights and horn) to other road users; • ensure a practicable journey management programme is developed and adhered to; • maintain speed limits for road vehicles • ensure that mobilization is carried out after due consultation with relevant road authorities and other stakeholders to minimize interference along the road ways	Low	Incident/accident rate record	Daily	Project Contractor	N/A
	Traffic congestion during haulage of plant components to site for installation	Medium	BOSG shall ensure: • the creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • compliance with journey management policy • to minimize movement at the peak hours of the day • that all traffic rules are obeyed by the drivers	Low	Traffic Record	Daily	BOSG, Project Contractor, FRSC	N/A
	Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	Medium	BOSG shall ensure: • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties. • Unregistered labourers and touts shall not be employed. • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence • workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of	Low	Result of geotechnical survey	At Foundation	Project Contractor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire-fighting shall be included in the induction programme for workers. • Test structures for integrity prior to undertaking work. • Implement a fall protection program that includes training in climbing techniques and the use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others. • Provide an adequate work-positioning device system for workers.					
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	Medium	BOSG shall ensure: • Appropriate PPE shall be provided for workers. • Workers shall imbibe the workplace safety rules via proper sensitization procedures. • Strict compliance to the SOPs shall be ensured. • A conduit type of wiring shall be adopted instead of a surface to prevent shock. • Only allowing trained and certified workers to install, maintain, or repair electrical equipment; • Deactivating and properly grounding live power distribution lines before work is performed on, or close to, the lines; • ensuring that live-wire work is conducted by trained workers with strict adherence to specific safety and insulation standards. • Prior to excavation works, all existing underground cable installations should be identified and marked. Drawings and plans should indicate such installations.	Low	HSE record	Throughout construction phase	Project Contractor	N/A
	Reduction in wildlife population as a result of poaching due to easier access created by access roads	High	BOSG shall ensure: • Workers are warned not to kill fauna species but allow them to move back to the forest. • Poachers are not allowed access to the site • Work force are provided with and use appropriate	Low	Biodiversity record	Once before construction	Project Contractor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			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					
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	High	BOSG shall: • Cover properly loose materials and keep top layers moist • Use binder material for erosion and dust control for long term exposed surfaces. • Regular cleaning of equipment, drains and roads to avoid excessive buildup of dirt. Spray surfaces prior to excavation • Use covered trucks for the transportation of materials that release dust emissions. • Speed limits on-site of 15 k/h should be recommended and enforced	Medium	Air Quality, HSE Record	Throughout Construction Phase	Project Contractor	N/A
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	High	BOSG shall ensure that: • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where	Low	Noise Level	Daily	Project Contractor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration.					
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	Medium	BOSG shall: • Maintain construction site in orderly condition and do not distribute material over many sites before usage.	Low	Visual Inspection, Incident/Accident record	Monthly	Project Contractor	
	Waste Disposal • Scrap metal, wood, sand, concrete, paper • Spent-oil and replaced /obsolete equipment parts that may contaminate soil/ground water • Waste from laydown area and building sites causing unsightliness	High	BOSG shall ensure: • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws.	Low	Waste Generation and Evacuation rate	Daily	Project Contractor, BSEPA	3,000,000.00
DEMOBILISATION -Demobilization after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.	Medium	BOSG shall ensure: • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties. • Unregistered labourers and touts shall not be employed. • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence	Low	Accident/Incident Record, HSE record	Daily	Project Contractor	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			• workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire-fighting shall be included in the induction programme for workers. • Test structures for integrity prior to undertaking work. • Implement a fall protection program that includes training in climbing techniques and the use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others. • Provide an adequate work-positioning device system for workers.					
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	Medium	BOSG shall ensure: • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite.	Low	Soil & Water Quality, Waste Management Record	Daily	Project Contractor, BSMEnv, BSEPA	
	Traffic congestion during transportation of demobilized equipment and	High	BOSG shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra	Low	Traffic Record	Daily	BOSG, Project Contractor, FRSC	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
	personnel		precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management					
	Generation of dust and automobile/heavy duty equipment emissions	Medium	BOSG shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.	Low	SO_x, NO_x, CO_x, VOC, SPM	Daily during demobilization	BOSG, Project Contractor, BSMEnv	
	Waste disposal (scrap metal, wood, sand, concrete, paper)	Medium	BOSG shall ensure: • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws.	Low	Waste Management Record	Daily	Project Contractor, BSEPA	
	Loss of employment and business opportunities due to completion of construction phase	Medium	BOSG shall: • Counsel worker and occupant who losses job. • Give enough notice • Pay Workers all entitlement due to them prior to job loss	Low	Staff welfare record	Once	Project Contractor	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
	Illegal access to building site leading to accident, asset damage and loss	Medium	BOSG shall: • Make security plan and emergency response and contacts with security forces. • Professional security outfit be engaged in preventing illegal access to the building sites • Prepare a Local Content Plan to facilitate involvement of locals in the security network.	Low	HSE Record	Daily	Project Contractor	
Operation and Maintenance • Building inspection and checks • Power generation/ servicing • Transportation of raw materials and finished product • Agro-products processing for export. • Plant maintenance • Industrial waste discharges • Emergence of small-scale enterprises • Green Buffer development around each industrial plot. • Recruitment of workers	Risk of injury from fall from height/trip or being hit by an object	Medium	BOSG shall ensure that: • A comprehensive HSE Policy must be displace openly, and enforced through monitoring within the site; • All staff must be trained and retrained on regular basis for HSE compliance; • Develop a training program including a code of conduct for all workers; • Well-equipped Clinic should be put up for emergence attention, while referral system should be arranged with a Secondary Hospital	Low	Incident/Accident Record	Daily	BOSG	
	Security threat such as kidnapping and banditry attack	High	BOSG shall: • Engage trained security personnel • Avoid lone working • Avoid working at nights • Avoid night journeys	Medium	HSE Record	Weekly	BOSG	
	Air pollution by gaseous emission (CO, SO_2, NO_2) and particulates from power generator	High	BOSG shall ensure: • Generator to comply with international standards for exhaust gases; • Maintenance of generator and exhaust gas check; • Use of the cleanest fuel economically available shall be adopted	Low	SO_X, NO_X, CO_X, VOC, SPM	Monthly	BOSG, BSMEnv	
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator servicing (diesel, spent oil etc.)	Medium	BOSG shall ensure: • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and	Low	Soil Quality, Waste Management Record	Daily	BOSG, BSMEnv, BSEPA	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			handling practices, and rapid spill response and clean-up techniques. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite. • Conduct bioremediation of polluted soil immediately to inhibit further spread					
	Generation of dust and gaseous pollutants from automobile emissions	High	BOSG shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Preference for usage of clean fuel like LPG, low sulphur diesel should be explored; • Energy conservation should be adopted by opting the alternate energy options like solar power; • Power Generators and equipment should be provided with stacks of adequate height (higher than nearest building) to allow enough dispersion of emission; • Enclosure of dust producing equipment, • Use of local exhaust ventilation; • Use of dust extraction and recycling systems to remove dust from work areas; • Regular checking and maintenance of all plant and equipment to minimize the risk gas leakage	Low	SO_x, NO_x, CO_x, VOC, SPM	Weekly	BOSG, BSMEnv	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
	Odour disturbances from the processing of Rice, edible oil etc	High	BOSG shall • Ensure all processing equipment are installed in an enclosed plant and processing activities are taking place within an enclosed system. • Ensure provision of appropriate PPE (respiratory protection) for workers and enforce usage. • Ensure that project staff are not exposed to more than nine hours at a go on any equipment generating noise level of more than 90 dBA	Medium	SO_X, NO_X, CO_X, VOC, SPM	Daily	BOSG, BSMEnv	
	Increase in noise level nuisance from operation machines and from vehicles plying the access roads	High	BOSG shall ensure that: • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration. • Machineries to be used should comply with the	Low	Noise level	Daily	BOSG, BSMEnv	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			noise standards prescribed by FMEnv. • Workers shall be given PPE (ear plugs) and enforce compliance;					
	Traffic congestion along agro-products transportation route	Medium	BOSG shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management	Low	Traffic Record	Weekly	BOSG, FRSC	
	Threat to community culture, safety and security due to presence of workers and business opportunists	Medium	BOSG shall: • Develop an induction program including a code of conduct for all workers. Code of conduct to address the following: o Respect for local residents; o unauthorized taking of products; o Zero tolerance of illegal activities such as child sexual exploitation and underage sex, prostitution, harassment of women, Gender Based Violence (GBV,) purchase or use of illegal drugs, o Disciplinary measures and sanctions (e.g. dismissal) for infringement of the code of conduct and/or company rules; o Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of GBV. • Limit the number of migrant workers by engaging local workers.	Low	HSE training report	Monthly	BOSG	N/A
	Reduction of water tables and source of water for production processes	High	BOSG shall ensure: • Water conservation measures should be practiced • Waste water should be recycled for reuse. • Rain water harvesting.	Low	Water Quality	Monthly	BOSG, BSMEnv	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			• Adoption of continuous horizontal washers and vertical spray washers or vertical, double-laced washers. • Adoption of counter current washing (e.g. reuse the least contaminated water from the final wash for the next-to last wash). • Use of water flow–control devices to ensure that water only flows to a process when needed.					
	Metallic materials generation from plant parts, retrofitting / upgrade of parts during plant servicing	Medium	BOSG shall ensure: • Recyclable materials should be sorted and sold to scrap metal converters • Regular checking and maintenance of all plant and equipment to minimize the risk of fuel or lubricant leakages.	Low	Waste Management Record	Daily	BOSG, BSEPA	
	Potential for land contamination from industrial waste disposal	Medium	BOSG shall ensure: • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws.	Low	Soil & Water Quality, Waste Management Record	Daily	BOSG, BSMEnv, BSEPA	
	Pollution of surface water bodies by wastewater generated from industrial waste discharges	High						
	Creation of job and acquisition of skills by individuals to be employed as operators	Beneficial	BOSG shall ensure: • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term employees for future call-ups when required • Adopt 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.	Positive	Stakeholder Engagement Record	Monthly	BOSG	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			• Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour.					
Decommissioning /Abandonment • Removal of electrical cables and wires, water and sewage treatment plant pipelines. • Demolition of buildings for facilities retrieval • Waste generation • Transportation of Plant components for sale/another site • Re-vegetation of site	Risk of accident and injury to workers during demolition of structures	Medium	BOSG shall ensure that: • A comprehensive HSE Policy must be displace openly, and enforced through monitoring within the site; • All staff must be trained and retrained on regular basis for HSE compliance; • Develop a training program including a code of conduct for all workers; • Well-equipped Clinic should be put up for emergence attention, while referral system should be arranged with a Secondary Hospital	Low	Incident/Accident Record	Daily	Project Contractor	
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	Medium	BOSG shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.	Low	SO_x, NO_x, CO_x, VOC, SPM	Daily	BOSG, Project Contractor, BSMEnv	N/A
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages	Medium	BOSG shall ensure: • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques.	Low	Soil & Water Quality, Waste Management Record	Daily	Project Contractor, BSMEnv, BSEPA	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			• Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite.					
	Traffic obstruction from transportation of decommissioned structures and equipment	Medium	BOSG shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management	Low	Traffic Record	Daily	BOSG, Project Contractor, FRSC	N/A
	Abandoned structures possibly taken-over by miscreants/criminals	High	BOSG shall: • Make security plan and emergency response and contacts with security forces. • Re-vegetate the site with local plant species	Medium	Stakeholder Engagement Record	Once at decommissioning	Project Contractor	
	Availability of land for alternative uses such as community hall, farmland e.t.c	Beneficial	BOSG shall ensure: Use local plant species to re-vegetate the abandoned site	Positive	Stakeholder Engagement Record, Biodiversity Record	Once at decommissioning	Project Contractor	
	Improved Ecology, Air Quality and Aesthetics	Beneficial						
TOTAL ESTIMATED COST								**₦73,000,000.00**

Environmental and Social Management Plan for the proposed ATC Project

Anticipated impact	Proposed Mitigation measures	Monitoring indicators	Responsibility/ Institution	Cost estimate (₦)
CONSTRUCTION PHASE				
Limited access to employment:	▪ Design recruitment strategy with respective District and Ward/ Village council to ensure local people are given priority ▪ Technical positions to be recruited on professional merit, with special consideration of local experts ▪ Recruitment strategy to stipulate 50% of all non-professional occupations to be given to females.	Transparent recruitment strategy in place which stipulated gender considerations, locality and skills	Project Supervisor/ Local Village/ Borno governments	N/A
Competition in basic resources threatening sustainable water access/supply for project and surrounding communities	▪ Establish secure and separate water supply connection with Municipal Water supply source. ▪ Project should have its own water source	Water supply sources for community and facilities identified. Community-facility platforms for GRM in place and meeting.	Borno State Water Board	15m
Dust pollution during construction phase	▪ Minimize dust generation by using sprinklers ▪ Put speed limits to control construction vehicle speed ▪ Workers should use respirators	Workers and truck drivers be sensitized on speed.	Site environmental officer/ BSEPA	Nil
Bio-diversity loss (degradation of vegetation and disturbance of fauna)	▪ Enhance natural environment by planting indigenous trees, shrubs, and grass around project site. ▪ Ensure re-vegetation around project site, by planting indigenous trees and shrubs to stimulate natural regeneration	Facility environmental management policy	Site Environmental Officer/Borno State Forestry Division	10m
Increase in waste generation (solid, liquid)	▪ Ensure that effective solid waste collection and disposal systems are in place during operations ▪ Ensure that all waste water is treated before disposal ▪ Ensure debris generated during construction is disposed-off appropriately to minimize pollution	Facility Waste management policy Sensitization of workers on environmentally sound waste disposal	Facility supervisor/ Borno State Waste Management	1m
Spread of infectious diseases – HIV, STIs	▪ Sensitize workers and community members on protective sex	Frequency of sensitization campaigns on infectious diseases and material distributed	Site Health worker/ Health Officers	Nil
Gender-based violence (GBV)	▪ Introduce anti-GBV protocols in workers' employment contracts ▪ Promote GBV support services with local	Frequency of Sensitization seminars to workers and Community	Project supervisor with relevant authorities	Nil

	Community Development (CD) and Social Welfare (SW) authorities ▪ Support community sensitization on GBV and Violence against Women and Children			
Child abuse	▪ Introduce child abuse protocols in workers' employment contracts ▪ Promote GBV support services with local Community Development and Social Welfare authorities ▪ Support community sensitization on GBV and Violence against Women and Children	Child protection policy	Project supervisor with relevant authorities	Nil
Occupational and Workers health	▪ Establish workplace health and safety procedures and train workers and management to avoid, minimize exposure to infections and accidents. ▪ Provide quality respiratory protection to capture dust and micro-organisms ▪ Ensure proper storage of chemicals within production or processing sites ▪ Ensure that first aid facilities are in place in designated locations and easily accessible. ▪ Design training and sensitization sessions to the general public on the possible health hazards generated by project operations and how they can mitigate or avoid them.	Frequency of training sessions on workplace health and safety standards Workplace occupational health and safety policy in place First Aid Kit in accessible locations within facility	Project supervisor/ OSHA officer	Nil
OPERATIONAL PHASE				
Limited access to employment	▪ Design recruitment strategy with respective District and Ward/ Village council to ensure local people are given priority ▪ Technical positions to be recruited on professional merit, with special consideration of local experts ▪ Recruitment strategy to stipulate 50% of all non-professional occupations to be given to females	Transparent recruitment strategy in place which stipulated gender considerations, locality and skills	Project Supervisor Local Village/ Borno State government	N/A
Conflict/competition in basic resources threatening sustainable water access/supply for project and surrounding communities	▪ Establish secure and separate water supply connection with Municipal Water supply source. ▪ Project should have its own water source.	Water supply sources for community and facilities identified	Borno State Water Board	Nil
Decline in business by some traders	▪ Establish trading and marketing linkages along the value chain of each product	Equal rights policy in trade and procurement Mobilization for	District Heads/ Trader Unions/	Nil

	▪ Deliberate promotion of local private investors to collaborate in the marketing linkages of targeted products to ATCs	networking and farmers' organizations	Associations	
Competitive edge by local producers	▪ Establish local centers for developing skills such as value addition for crops local producers, and women. ▪ Link collection with farm-based extension to improve quality of produce.	Capacity building and training to local producers	District Heads/ Borno State Ministry of Agriculture	N/A
Dust pollution during construction phase	▪ Minimize dust generation by using sprinklers ▪ Put speed limits to control construction vehicle speed ▪ Workers should use respirators ▪ Ensure debris generated during construction is disposed off appropriately to minimize pollution.	Workers and truck divers sensitized on speed	Site environmental officer/ BSEPA	Nil
Bio-diversity loss (degradation of vegetation and disturbance of fauna)	▪ Enhance natural environment by planting indigenous trees, shrubs, and grass around project site. ▪ Ensure re-vegetation around project site, by planting indigenous trees and shrubs to stimulate natural regeneration	Facility environmental management policy	Site Environmental Officer/ Forestry Department	2m
Increase in waste generation (solid, liquid)	▪ Ensure that effective solid waste collection and disposal systems are in place during operations ▪ Ensure that all waste water is treated before disposal ▪ Ensure debris generated during construction is disposed off appropriately to minimize pollution	Facility Waste management policy Sensitization of workers on environmentally sound waste disposal	Facility supervisor	Nil
Potential of aflatoxins in crops	▪ Educate farmers and monitor the process and quality of all harvesting, handling and drying equipment and storage bins prior to harvest, and during post-harvest to control contamination of aflatoxins.	Household level training on proper crop storage	Borno State Ministry of Agriculture Officer/ BSEPA	Nil
Spread of infectious diseases – HIV, STIs	▪ Sensitize workers and community members on protective sex.	Frequency of sensitization campaigns on infectious diseases and material distributed	Local Health facilities/ Community Development Officer (CDO)	Nil
Gender-based violence (GBV)	▪ Introduce anti-GBV protocols in workers' employment contracts ▪ Promote GBV support services with local Community Development (CD) and Social Welfare	Frequency of Sensitization seminars to workers and Community on GBV	Project authorities	Nil

	(SW) authorities ▪ Support community sensitization on GBV and Violence against Women and Children	Facility anti-GBV policy		
Child abuse	▪ Introduce child abuse protocols in workers' employment contracts ▪ Promote GBV support services with local Community Development and Social Welfare authorities ▪ Support community sensitization on GBV and Violence against Women and Children	Facility child protection policy	Project authorities	Nil
Occupational and Workers health	▪ Establish workplace health and safety procedures and train workers and management to avoid, minimize exposure to infections and accidents. ▪ Provide quality respiratory protection to capture dust and micro-organisms ▪ Ensure proper storage of chemicals within production or processing sites ▪ Ensure that first aid facilities are in place in designated locations and easily accessible. ▪ Design training and sensitization sessions to the general public on the possible health hazards generated by project operations and how they can mitigate or avoid them.	Frequency of training sessions on workplace health and safety standards Workplace occupational health and safety policy in place First Aid Kit in accessible locations within facility	Project Supervisor / OSHA officer	Nil
DECOMMISSIONING PHASE				
Loss of employment due to cessation of contracts	▪ Ensure facility workers are prepared for decommissioning	Trainings on alternative income generation to workers	Facility supervisor	Nil
Inadequate waste management (debris from facilities)	▪ Ensure that effective solid waste collection and disposal systems are in place during operations ▪ Ensure that all waste water is treated before disposal	Facility waste management protocol to include decommissioning phase	Facility supervisor	Nil
Total Costs (projected)				**46m**

7.7.2 Training and Awareness – Site Induction

Training is essential for ensuring that the ESMP provisions are implemented efficiently and effectively. The contractors shall be required to undertake general HSE awareness for their project workforce and specific training for those whose work may significantly have impact on the environment. This is to ensure that they are fully aware of the relevant aspects of the ESMP and are able to fulfil their roles and functions. The contractors shall ensure among others to provide the following training to their personnel as shown in table 7.4.

Table 7.4: Proposed Training Program for the Implementation of ESMP

Capacity Building Activity	Proposed Topics	Objectives	Target Audience	Duration
Module 1: Training on Environmental and Social Management Plan Implementation	• Overview of Environmental and Social Impact Assessment • Overview of Potential Impacts of Project • Environmental Pollution & Control • Environmental and Social Management Plan • Basic Environmental and Social Management • Environmental Performance Monitoring – Monitoring Mitigation Measures in ESMP • Environmental Reporting	To enhance competence in environmental sustainability and regulatory practice	BOSG Rep., relevant staff of FMEnv (EA Dept), BSMEnv, BSEPA, other relevant MDAs, LGA departments, Project Contractors, NGOs.	5 days
Module 2: Training on Construction HSE	• Introduction to Construction HSE • Overview of Health and Safety Hazards in Construction • Incidents: Causation, Investigation & Reporting • Excavation Safety • Construction Site Inspection • Personal Protective Equipment	To promote safe & healthy working conditions as well as the health of workers and regulators who may be involved in monitoring during project implementation	BOSG Rep., relevant staff of FMEnv (EA Dept), BSMEnv, BSEPA and other relevant MDAs, LGA departments, Project Contractors, NGOs.	4 days

Module 3: Training on Social and Community Engagement	• Listening to & understanding the opinions and perspectives of a diversity of stakeholders; • Negotiation and partnership contracting; • Interpersonal communication; • Relationship-building; • Facilitation; • Principles of cross-cultural awareness and cross-cultural communication; • Equity and diversity principles; and • Public sector values and codes of conduct.	To ensure effective engagement with communities around the project area, public officials and public relation team. To facilitate relationships with communities for continuous stakeholder engagement and peaceful co-existence with the project host communities.	BOSG Rep., BSMEnv, BSEPA and other relevant MDAs, Project Contractors	
Estimated cost				**19,000,000.00**

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. These talks will take place on-site and will include environmental issues particular to the proposed project, namely:

- Oil/Diesel spill prevention offshore including safe refueling practice.
- Emergency response procedures used to deal with an oil/diesel spill.
- Minimizing disturbance to wildlife such as cetaceans.

7.7.3 Communications

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 on-site 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.

Environmental Reporting: The contractor will report the status of project environmental activities to Borno State Ministry of Agriculture 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 Borno State Ministry of Agriculture. Contractors shall notify the onsite Borno State Ministry of Agriculture representative if any communications are received from external stakeholders.

7.7.4 Environmental Audit and Review

Borno State Ministry of Agriculture shall conduct periodic HSE audits (monthly/quarterly/annually, etc) of the project activities in the project area in order to ascertain extent of compliance with policy and regulatory requirements. The audits shall be carried out by certified auditors and in accordance with ISO 14001 guidelines. The scope of the audits must include the following, as a minimum:

- compliance with all necessary 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 ESIA 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 Borno State Ministry

of Agriculture for review.

7.7.5 Environmental Monitoring Programme

The Federal Ministry of Environment (FMEnv) guidelines require an environmental monitoring plan as part of an EIA. The aim of the monitoring programme is to ensure that the negative environmental and social impacts already identified in this ESIA are effectively mitigated in the design, construction, operation and decommissioning stages of the project. It also instils confidence in the host Community, the proponent of the project (Borno State Ministry of Agriculture and Natural Resources) and regulatory bodies that the identified impacts are adequately mitigated.

Environmental monitoring of this project is therefore advocated in order to ensure that the mitigation processes put in place have adequately taken care of the predicted impacts. This shall necessitate stable programmes to address the following:

- Alteration to the biological, chemical and physical characteristics of the recipient environment;
- Social and health issues;
- Alterations in the interactions between project activities and environmental sensitivities and interactions between the sensitivities;
- Determination of long term and residual effects; and
- Identification of project specific cumulative environmental effects.

Borno State Ministry of Agriculture and Regulators shall monitor the project from mobilisation through operation stages to keep track of the entire project development life cycle. The monitoring plans for the project including the environmental components, parameters and frequency of monitoring as well as responsibilities are presented in Table 7.5.

Table 7.5: Monitoring Plan for the Project

Environmental Components	Indicator Parameters	Frequency	Location	Responsibility

Air Quality	• NO_x, SO_x, CO_2, CH_4, SPM • Noise level	Monthly during construction and operation	Project site	FMEnv, SMEnv, LGA
Hydrobiological Components (plankton, benthos)	• Diversity and abundance • Stress	At the end of construction and then on a one (1) year interval	Water bodies around the site	FMEnv, SMEnv, LGA
Biodiversity (vegetation/forest resources and wildlife)	• Diversity and abundance • Pressure on species	6 months interval from beginning to end of project	Project site	FMEnv, SMEnv, LGA
Socio-economic	• Population • Health status • Infrastructure	At the project peak and before commissioning	Identified host community of the Project	BOSG

7.7.6 Guideline for Waste Management

General

The provision of adequate waste management guideline and disposal facility is vital to the implementation of the proposed project. Table 7.6 presents overview of waste stream in all phases of the project and specifies proactive management approach to prevent environmental pollution and degradation. Waste shall be managed in accordance with Borno State Ministry of Agriculture Waste Management Plan. The principle of waste reduction, recycling, recovery and reusing shall be practiced.

Some of the waste management options and waste disposal systems that shall be considered for this project are highlighted below:

(a) Solid Waste / Used Containers (Garbage and Inert Materials)

Borno State Ministry of Agriculture 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 government designated dump sites.
- Refilling and reusing of containers.

All construction waste shall be collected segregated and transported to a third party contractor management and disposal. No dumping of waste in water bodies shall be permitted.

(b) Sanitary Waste

Appropriate septic tanks shall be provided. Sewage shall be treated to residual chlorine level of 0.8 – 2.0mg/l before disposal.

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. 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 Guidelines

The four principles of waste minimization 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.

A large proportion of the excavated material shall be used for landscaping or other remedial works on site. All wastes associated with hydrocarbons, oils, hydraulic fluids, oily sump water, etc. shall be treated and channelled to the waste treatment facility.

Waste Segregation Guidelines

All wastes to be generated from the proposed project 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. Adequate treatment measures shall be undertaken, where applicable, in line with applicable guidelines, for all waste before final disposal. All wastes in transit shall be tracked by waste consignment note. The waste consignment note records shall be kept and should include as a minimum the following information: Date of dispatch, Description of waste, Waste quantity/container type, designated disposal site and method, Consignee /driver name and means of transportation, and Confirmation of actual disposal (time and date).

Table 7.6: Waste Streams and Management

S/NO	SOURCE	WASTE TYPE	WASTE STREAMS	MANAGEMENT
PRE-CONSTRUCTION				
1	Movement of vehicles on earth road and engine exhaust	Gaseous Emission and Particulates	CO_x, SO_x, NO_x, CO, Particulate Matter	• Use water suppression to prevent dust emission • Maintain vehicles and machineries to reduce emission • Maintain low speed to reduce dust and gaseous emission.
2	Installation of temporary workers camp, offices and workshops	Non-Hazardous solid waste	• Vegetal Waste /Overburden waste • Industrial Waste: Metal scraps, packaging waste	• Vegetal waste shall be supplied to farmers for use as compost. • Woody vegetal shall be supplied to host communities for domestic uses including as fuel wood for cooking. • Overburden waste shall be stockpiled for backfilling of pit and levelling of landscape. • Segregated and stored on site to be collected at least once a month for reuse or recycle through licensed third-party facilities.
3	Spills of oil and fuels from vehicles and equipment	Hazardous liquid waste	Spent oil and used grease from repairs of mechanical device	Stored and reuse/ sold to vendors were available in much quantity
4	Workers' camp	Domestic and Sanitary	• Food remnant, kitchen wastes. Food packaging etc. • Domestic Sewage	• To be transferred to locals for use as compost and animal feeds. • Plastic and other packaging to be recycled through licensed recycling third parties. • Use of Mobile toilets and transferred to licensed carrier for disposal
CONSTRUCTION				
1	Movement of vehicles on earth road and engine exhaust	Emission	CO_x, SO_x, NO_x, CO, Dust	• Use water suppression to prevent dust emission • Maintain vehicles and machineries to reduce emission • Maintain low speed to reduce dust and gaseous emission.

2	Construction of access roads, civil works on site, installation of equipment. Workers' camp/offices	Non-Hazardous /Industrial	Waste Packaging such as Scrap, wood, scrap metal, steel, glass, plastic, paper and cardboard, empty metal containers**,** excess concrete, broken equipment, or components Domestic-type waste: waste paper and food scraps, metal cans	• Segregated and kept securely in closed containers on site. To be transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by approved BSEPA waste contractor for onward disposal at approved sites. • To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be recycled through licensed recycling third parties.
3	Civil works on site, construction of different complexes/building section	Hazardous Waste	**Solid Wastes:** Domestic-type waste: wastepaper and food scraps, metal cans, Material waste (pipes, planks, empty metal containers**,** excess concrete, broken equipment etc.) **Liquid Waste:** spent lubricating oils, hydraulic fluids, brake fluids, battery electrolyte, and dielectric fluids, chemical cleaning agents, paints, primers, thinners, and corrosion control coatings; sealants and adhesives etc.	• Segregated and kept securely in closed containers on site. To be transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by approved BSEPA waste contractor for onward disposal at approved sites. • To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be recycled through licensed recycling third parties. Stored on site in closed containers with secondary containment and evacuated by an accredited waste management contractor with off-site permitted hazardous waste treatment, storage, or disposal facilities
	Civil works	Waste Water	Waste water from equipment washing and concrete production	Discharged to the ground as only very small quantity is envisaged at this stage.
4	Workers' camp	Domestic and Sanitary	• Food remnant, kitchen wastes. Food packaging etc. • Domestic Sewage	• To be transferred to locals for use as compost and animal feeds. • Plastic and other packaging to be recycled through licensed recycling third parties. • Use of Mobile toilets and transferred to licensed carrier for disposal

OPERATION AND MAINTENANCE				
1	Movement of vehicles on unpaved surface and engine exhaust	Emission	CO_x, SO_x, NO_x, CO, Dust	• Use water suppression to prevent dust emission • Maintain vehicles and machineries to reduce emission • Maintain low speed to reduce dust and gaseous emission.
2	Maintenance of facilities Workers' camp/offices	Non-Hazardous /Industrial	• Packaging waste, scrap metals, plastic, paper and cardboard, empty metal containers**,** broken equipment, or components • Domestic-type waste: wastepaper and food scraps, metal cans	• Segregated and kept securely in closed containers on site. To be transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by approved BSEPA waste contractor for onward disposal at approved sites. • To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be recycled through licensed recycling third parties.
3	Maintenance of facilities	Hazardous	**Solid Wastes:** Domestic-type waste: wastepaper and food scraps, metal cans, Material waste (pipes, planks, empty metal containers**,** excess concrete, broken equipment etc.) **Liquid Waste:** spent lubricating oils, hydraulic fluids, brake fluids, battery electrolyte, and dielectric fluids, chemical cleaning agents, paints, primers, thinners, and corrosion control coatings; sealants and adhesives etc.	• Segregated and kept securely in closed containers on site. To be transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by approved BSEPA waste contractor for onward disposal at approved sites. • To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be recycled through licensed recycling third parties. Stored on site in closed containers with secondary containment and evacuated by an accredited waste management contractor with off-site permitted hazardous waste treatment, storage, or disposal facilities
	Emissions from high temperature ovens	Hazardous	Volatile organic components	Using appropriate control technologies (e.g. diversion of stack emissions through boilers; installation of scrubbers with activated carbon slurries; or incineration of extracted vapors in a combustion system).

DECOMMISSIONING				
1	Movement of vehicles on unpaved surface and engine exhaust	Hazardous	CO_x, SO_x, NO_x, CO, Dust	• Use water suppression to prevent dust emission • Maintain vehicles and machineries to reduce emission • Maintain low speed to reduce dust and gaseous emission
2	Demolition of structures	Nonhazardous	Concrete, scrap metals, woods, plastic,	• Segregated and kept securely. • To be transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by approved BSEPA waste contractor for onward disposal at approved sites.
3	Removal of Industrial plant and other equipment	Hazardous	Spent lubricating oils, hydraulic fluids, brake fluids, battery electrolyte, and dielectric fluids, sealants and adhesives etc.	• Reuse materials in other construction site. • Recycle materials through licensed third parties • Waste materials shall be stored on site in closed containers with secondary containment and transferred to a registered waste contractor with off-site permitted hazardous waste treatment, storage, or disposal facilities.

7.7.7 Emergency Response Plan

This Emergency response plan is to address unexpected occurrence within or adjacent to the project site which could give rise to any or several of the following consequences. It may be impossible to anticipate every eventuality or combination of circumstances, but the following are foreseeable emergency situations that may arise:

- An Emergency Preparedness and Response Plan (EPRP) will be prepared to assist project staff in effectively responding to emergencies associated with project hazards. The EPRP will comply with the IFC Occupational Safety guidelines and performance standards. The EPRP will include:
- Roles and responsibilities of emergency personnel;
- Emergency contacts and communications systems/protocols, including procedures for interaction with local and regional emergency authorities;
- Specific emergency response procedures;
- Design and implementation of an emergency alarm system audible across the entire site at the sub-stations;
- An evacuation plan will be read and practice by all employees and contractors. The evacuation plan will include emergency escape routes, procedures for accounting for employees after an evacuation, and roles and responsibilities of personnel during an evacuation;
- Identification of supplies and resources to be utilized during an emergency event, including emergency equipment, facilities, and designated areas; and
- A training plan, which includes specific training and drill schedules for personnel
- Who are responsible for rescue operations, medical duties, spill response, and fire response?

If an emergency develops, all persons on site will be notified immediately and efforts will be coordinated with others in the vicinity surrounding the project area in order to reduce impacts, if applicable. The military personnel and police officials, and all

necessary authorities will be immediately notified. If an emergency is imminent, but has not yet begun, steps will be initiated to immediately advise person in the vicinity of the emergency to evacuate and notifications will be made to military personnel and police officials and all other authorities which have responsibility regarding the emergency.

If there is a slowly developing emergency or unusual situation where an emergency is not imminent, but could occur if no action is taken, project personnel will notify the military personnel and police officials, and all other authorities of the potential problem and keep them advised of the situation. These agencies will be requested to indicate if there are any immediate actions that should be taken to reduce the risk or severity of the emergency and if necessary, what preventative actions will be implemented. In an emergency situation, equipment and supplies will be needed on short notice. Therefore, the Borno SAPZ will maintain an accurate inventory of emergency response equipment and supplies.

The EPRP will include an evacuation plan which will be read and practiced by all employees and contractors. The evacuation plan will include emergency escape routes, procedures, for accounting for employees after an evacuation, and roles and responsibilities of personnel during an evacuation. In general, the following evacuation procedures should be followed:

- Alert the Emergency Response Team to assist in the evacuation.
- Use communications tools that are appropriate for the type of incident and the time of occurrence, such as alarms or loud speakers.
- When communicating an evacuation, speak clearly and succinctly: “we have a [state the type of emergency]. Evacuate to [state the assembly point]”.
- Turn equipment off, if possible.
- Take emergency supplies and staff roasters, if possible.
- Account for personnel.
- Wait at the assembly point for further instructions.

The EPRP will have specific information on the fire safety and explosion response, which will provide additional details specific to these emergencies.

7.7.8 Project Traffic Management Plan

This Traffic Management Plan describes procedures and protocols for site access, traffic routing and management, and contractor company guidelines with respect to vehicle and employee transportation in delivering their obligations on this intervention project. Public, employee and contractor safety is the primary goal of this plan. It is vital that the Contractor recognizes that the traffic within the project area will be dynamic throughout the course of execution of this works and the safety of other road users is absolutely essential during this time.

General Site Access

In the interest of site security and public safety, access to operational areas related to the execution of this contract will be restricted to authorized site personnel through the usage of signs and gates where appropriate. Facilities that potentially present danger to persons or wildlife such as the electrical, equipment staging area and workers camp will be fenced or barricaded as appropriate to prevent general access.

Traffic Management

All traffic on routes to and from the site will be radio controlled. Where this is not possible, signage will be installed at appropriate locations in order to warn the public along these routes. In the event that temporary closure occurs, access to the sites will be further restricted through the use of fences and gates as appropriate. Access to work areas such as temporary excavated places, or confined spaces where work is on going will be securely blocked by means of a temporary but robust barrier or barricade. Buildings and ancillary facilities will be locked and secured. A number of additional general measures related to site access, road management and public safety and construction events notification are presented here:

- Private employee off-road vehicles or private transport buses will be prohibited from entry into the site.

- Signage will be posted near all construction sites.
- Notifications will be provided for activities that would be carried out over the weekend or public holiday periods. These would be disseminated through existing social institutions such as the village or district heads of communities, Local Government Councilors and NGO's or CBO's
- Speed limit maintained at 10 km/hr speed limit within or near the communities;
- Install reverse alarm fitted on all trucks, heavy duty equipment and off road vehicles
- Employ or engage the use of a minimum of two flagmen around excavated areas, one for traffic approach and one to direct traffic away from the sites
- In accordance with the Occupational Health and Safety Regulations for public roads, use of flashing devices/trafficators on all vehicles/machinery and equipment that will cross, travel on or may otherwise pose a risk to users of public roads.

Employee Transportation

To the extent possible employees will use buses provided by the contractor as transportation to and from the site, thereby reducing overall vehicle traffic. Project vehicles or will be utilized by staff, only when necessary.

Speed Limits

Speed limits will be enforced to and from the site and signage(s) shall be posted along the access and site roads (maximum 40 km/hr, reduced to 20 km/hr at blind corners and bridge crossings. Traffic along other access roads will be radio controlled for safety and speed control. Furthermore, employees and contractors will be educated on safety including traffic protocols and speed limits during mandatory orientation. Routine traffic inspections and/or speed indicator signs will be used to encourage safe and responsible driving.

Communications and Notification Protocols

It is anticipated that the intervention project will require only single-lane temporary closures. Signage warnings of construction activities on the roads will be placed at appropriate distances from the construction site, in consultation with SPIU, Ministry of Transports, department of Highways & Public Works. For significant work activity (those requiring more than one day to complete), written notification will be distributed to residents and the SPIU, Ministry of Transport, department of Highways & Public Works will be notified. A public notice would be posted at multiple locations in the metropolis to communicate to residents any new activities that may be occurring or scheduled. Contact information for the Contractors senior management will be included in this notice and any concerns regarding the intervention work/project or traffic management can be forwarded through this notification system.

Traffic Routing and Volumes

Alternative traffic routing shall be mapped out and provided in the event that there will be complete closure of the road due to this intervention work activity. Traffic officers and appropriate road diversion signage(s) shall be deployed to ensure diversions routes are properly identified and traffic is directed along the mapped route. The flagmen shall be properly kitted in their Personal Protective Equipment (PPE), such as reflector vests and safety boots, to ensure that safety on the job is given due priority.

Reporting

Records on traffic management and implementation of this plan should be kept and updated by the contractor as evidence of on going mitigation compliance, which will be submitted to SPIU as part of routine reports on progress of work.

7.7.9 Environmental Health and Safety Plan

A Health and Safety Plan will be prepared for the construction, operation and decommissioning phases of the project to ensure compliance with the Ministry of

Health Guidelines for Occupational Health and Safety and IFC guidelines. To ensure its employees' health and safety plan will address the following topics:

- Safety device to protect employees from injuries or hazardous conditions;
- Safe drinking water;
- Immunizations, as applicable;
- Clean eating area;
- First aid facilities;
- Sanitary conditions;
- Waste management, including bathrooms, and proper disposal procedures;
- Appropriate signage;
- Fire prevention facilities, training, and awareness; and
- Personal Protective Equipment (PPE).

A safety specialist assigned by Borno-SAPZ will be responsible for the preparation, implementation and maintenance of a comprehensive safety program, which will be periodically evaluated. The safety specialist will be provided with written safety instructions including instructions on correct storage handling and disposal of hazardous waste, and written contingency Plans / guidelines of action for accidents, spills, and fire. The responsibility of the safety specialist includes performing safety training and conducting safety inspections, sessions and practice. The safety specialist will also be responsible for the investigation of accidents. A safety committee should be formed by Borno-SAPZ and regular safety meetings should be organized.

7.7.10 Spill Contingency Management Plan

The Borno-SAPZ will prepare and implement a spill contingency management plan that identifies this procedure to prevent, contain, cleanup, and report spill and release of fuel oil and their hazardous materials. Mitigation measure to prevent contamination from hazardous materials are primarily aimed at preventing their release into the environment in the first place and will include:

- Keeping equipment maintained.
- Inspecting equipment and containers for spill and leaks, corrosion, or other signs of deterioration
- Maintaining spill response equipment near material storage areas and on heavy equipment.
- Training employees on material storage, transfer, and transportation procedures, spill response procedures, and reporting requirements.

If a fuel spill occurs at the project sites, prompt action will be taken to contain the leakage or spillage in the event of a spill of leak, all combustible, flammable, and ignition sources (such as running engines) likely to result in a fire will be removed from the vicinity of the spill and anyone in the area will be advised to stay upwind. Spill kits will be kept at the project sites and the transport vehicles to readily clean up small spills. Large spills will be contained by constructing a berm around the spell area to control runoff to surface water. All soil contaminated by previous spills will be excavated and disposed of in accordance with the Borno-SAPZ hazardous waste management procedures.

7.7.11 Contractor Management

Borno-SAPZ will expect its contractors to follow IFC Guidelines for Occupational Health and Safety and Environmental Management. Borno-SAPZ will issue a set of Environmental, Social, Health and Safety safeguards to the construction contractor to follow, which include standards that are expected to be followed and programs that the contractors are expected to have in place (e.g. Environmental Health and Safety Management System)

7.7.12 Air Quality: Generation of Air Emissions from Disturbance

Control techniques for minimizing temporary particulate matter (PM) emission during construction will involve watering of surfaces, chemical stabilization, or surface wind speed with windbreak or source enclosures. Furthermore, surface

improvements offer long-term control techniques. These includes covering the road surface with a new material of lower site content, such as covering a dirt road with gravel or slag. Also, regular maintenance practices, such as grading of gravel roads, help to retain larger aggregate size on the traveled portion of the road and thus help reduce emissions. The amount of emissions reduction is tied directly to the reduction in surface site content.

Other mitigation measures include, maintaining good housekeeping prates throughout the construction phase. These low-cost measures include:

- Proper site enclosure through appropriate hoarding and screening
- On-site mixing and unloading operations.
- Proper handling of cement material.
- Maintain minimal traffic speed on-site and on access roads to the construction sites.
- Covering all vehicles hauling materials likely to give off excessive dust emissions.
- Ensure adequate maintenance and repair of construction machinery and vehicle
- Avoid burring of material resulting from site clearance
- Cover any excavated dusty materials or stockpile of dusty materials entirely by impervious sheeting.
- Proper water spraying when necessary.

7.7.13 Generation of Air Emission from Vehicles and Equipment Engines

In addition to PM generation, emissions will consist of combustion emission from diesel engine-driven electrical generators and vehicles and diesel-driven mobile construction equipment (such as, concrete trucks, dump trucks, excavators, and backhoes). The engines emit primarily CO2, Co, NO2, Sox, and HC. Measures to reduce combustion emissions include proper truck and engine maintenance, adoption of a traffic management plan while avoiding congested routes, proper maintenance of construction equipment, and the quality of diesel fuel used. In addition, equipment

will be turned off when not in use, while would reduce power needs as well as emissions of pollutants. The supervising consultant will have the responsibility of ensuring the implementation of these measures by the contractor.

7.7.14 Degradation of Water Quality due to Storm Water Runoff

The removal of vegetation and disturbance of soil in the construction work areas may result in erosion and sedimentation causing increased turbidity in water within the project area.

Additionally, degradation of water quality may occur from pollutants in storm water runoff from material and equipment storage areas and spills and leaks from construction equipment. Special care must be taken to decrease impacts where work is or near the marshland/wetland areas so as to keep disturbance of the ecosystems to a minimum.

Prior to commencement of construction activities, Borno-SAPZ will require its contractors to prepare and implement an Erosion and sediment Control Plan. Its purpose will be to assist Borno-SAPZ, its contractor, and subcontractors in the implementation of control measure for storm waste runoff from the project site, and material storage areas to prevent degradation of water quality. The plan will achieve this purpose by specifying the best management practices, required to assess the effectiveness of construction storm water management practices, especially during the rainy season. Borno-SAPZ will demonstrate, to the satisfaction line route will not occur during any stage of construction. Briefly, the erosion and sediment control measures to be implemented during the construction phase of the project include:

- Minimizing land cleaning activities to the project location work areas, access points, and material storage area
- Minimizing the time of exposure of erodible land exposed to storm water runoff during the rainy season
- Maintaining a riparian Management Zone (RMZ) between the construction work areas and surface water bodies to fitter sediments in storm water runoff
- Covering open stockpiles of construction materials with tarpaulin or similar fabric during rainstorm events to prevent erosion and resultant sedimentation of receiving waters.

- Compacting soil as soon as the foundations are formed to prevent erosion, especially during the wet season
- Restoring the construction working areas as soon as possible once construction is complete at the location.

7.7.15 Degradation of Water Quality due to accidental spills and leaks

Borno-SAPZ will develop and implement a spill contingency plan to prevent and mitigate spills of oils or hazardous material to surface water bodies and groundwater. Storage of fuel and hazardous material should not occur within 30m of a surface water body. If any pumps are needed for removal of water during site construction within 30m of marshland/wetland water body. They will utilize proper secondary containment. Oil leakage or spillage will be contained and cleaned up immediately. Spent oil and lubricants will be collected and stored for recycling of proper disposal. In addition, all fuel tanks and chemical storage areas will be provided with locks and located within secondary containment structure. Oil/water separators will be installed at storm water channels to remove oils from contaminated waters such as from workshops.

7.7.16 Soil Contamination and Erosion due to erosion

Prior to commencement of construction activities, Borno-SAPZ will implement an erosion and sediment control Plan, Borno-SAPZ will demonstrate, to the satisfaction of the FMEnv that any substantial risk of increased sediment discharges from the project sites will not occur during any stage of the project Cleaning of vegetation will be limited to where it is strictly needed so as decrease the risk of soil erosion, and Riparian Management Zone (RMZ) between the construction areas and surface water bodies. Unpaved roads will be graded so that to decrease the risk of erosion during rainstorms.

- Soils excavated for foundations will be used for re-filling and will not be left exposed to wind or water for long periods

- The contractor will avoid steep terrain during the transportation material by using alternative route or use light vehicles where appropriate
- Heavy machinery will be used as needed in the clearance of construction work areas in order to minimize soil compaction, which makes the soil susceptible for erosion.
- Riverine and surface water body associated vegetation will be minimally disturbed during the construction phase to reduce soil erosion and safeguard bank protection
- Disturbed areas will be replanted with local species common in the area complement natural vegetation regeneration to improve cover
- In are prone to soil erosion, suitable sediment binding grasses will be planted in degraded substrates.

7.7.17 Noise Management

Typical mitigation measures that will be enforced during construction to minimize noise levels are:

- Effectively utilizing material stockpiles and other structures, where feasible; to reduce noise from on-site construction activities
- Choosing inherently quiet equipment
- Operating only well-maintained mechanical equipment on-site
- Keeping equipment speed as low as possible
- Shutting down or throttling down to minimum equipment that may be intermittent in use, between work periods
- Utilizing and properly maintaining silencer or mufflers that reduce vibration on construction equipment during construction works
- Restricting access to the site for truck traffic outside of normal working hours
- Utilizing proper site logistics and planning
- Limiting site working hours the morning hour
- Scheduling noisy activities strictly during the morning hours

- Consulting with local communities and informing the locals when noisy activities are planned
- Enforcing noise monitoring
- Enforce the use of hearing protection actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140dB(C), or the average maximum sound level reaches 110db(A)
- Installing warning signs in area high noise levels
- Consider the use of acoustic insulating materials, isolation of the noise source, and other engineering controls to minimize noise impact.

The noise control measure will be included within the construction contracts and be considered as requirements from contractors. The supervising consultant will have the responsibility of ensuring the implementation of these measure.

7.7.18 Hazardous Materials Management

Borno-SAPZ will require its contractor to prepare and implement a spill contingency Plan that identifies the procedures to prevent, contain, cleanup, and report spills and releases of oil and hazardous material Mitigation measures to prevent contamination from hazardous materials are primarily aimed at preventing their release into the environment in the first place and will include:

- Storing oil and hazardous materials within secondary containment structures in designated area.
- Using portable oil collection pans during refueling operations.
- Storing pesticides and herbicides in designated areas according to FAO Guideline standards any pesticides to be used will be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards such as the minimum standards of FAO's Guidelines for packaging and storage of pesticides, Guidelines on Good labeling practice for pesticides.
- Ensuring that no storage of oil and hazardous materials occurs within 30m of a surface waste body
- Keeping equipment maintained

- Inspecting equipment and containers for spill and leaks, corrosion, or other signs of deterioration
- Maintaining spill response equipment near material storage areas and on heavy equipment
- Ensuring all working dealing with such substances are adequately informed about the risks
- Training employees on material storage, transfer, and transportation procedures, spill response procedures, and reporting requirements.

Borno-SAPZ will keep an accurate inventory of all oil, hazardous material, and waste stored on site and material safety Data sheets will be available for these material.

If a fuel/oil spill occurs at the project site, on any of the access roads to the site, or into a water body or wetland, prompt action will be taken to contain the leakage of spillage. In the event of a spill or leak, all combustibles, flammables, and ignition sources (such as running engines) likely to result in a fire will be removed from the vicinity of the spill and anyone in the area will be advised to stay upwind. Spill kits will be kept at the project site and on the transport vehicles to readily clean up small spills. Large spills will be contained by constructing a berm around the spill area to control runoff surface water, or deploying a spill boom if the spill is in a water body. All soil contaminated by the spills will be excavated and disposed of in accordance with the Borno-SAPZ hazardous waste management procedures.

7.7.19 Recurring Environmental and Social Issues

Environmental and Social issues and their management plan. They include public/ stakeholders' consultation, labour and gender-based violence.

- **Public / Stakeholders Awareness Consultations Management Plan**
  - Regular public sensitization and meetings during the project implementation to reduce incidences that may arise as a result of ignorance, incomplete knowledge and forgetfulness of the basic rules that guide the site.

- Have bi-Monthly Public/Stakeholders consultation and awareness meetings geared towards review, revalidate and documentation of the ESMP.
- Environmental Committee (EC) shall be formed and chaired by ESO.
- There must be representatives of the stakeholders, farmers and women among the committee.
- EC shall oversee the coordination of public stakeholder consultations and awareness on Environmental and Social Management issues.
- EC shall hold meetings twice every month, and more during emergency.
- The meetings shall read out and review its rules including health and safety rules among others.
- Flyers that contain basic rules shall be printed and shared to participants if need be.
- The minutes of meetings and consultations if adopted shall be inculcated in the rules.
- Each participant shall be able to know his obligation, roles and reasonability as a stakeholder.

- **Labour Management Plan**
  - Workers admitted as labourers must be of age 18 years and above.
  - Community members who possess the required skills and are ready to work shall be given preferential treatment during recruitment.
  - Payment of wages shall be made as and when due.
  - The Contractor shall be responsible for the safety and Health of its employees at the work place.
  - He shall provide PPE, train and inform all workers of any known hazards on the site.
  - Workers shall not be allowed to form labour unions in the site.
  - Labour Grievance Redress Desk shall be instituted.
  - If a labourer is dismissed, he shall be given reasons for dismissal and the right to lodge complaints to Grievance Redress Desk.

- No worker shall be stigmatized due to his or her social status in the communities.
- Physically impaired workers shall be given due considerations.
- Severance allowance should be paid to casual workers during decommissioning.

- **Gender Based Violence Management Plan**
  - Females with requisite skills should be given equal consideration as men during hiring
  - No male shall solicit for sex or any kind of favor in exchange for work
  - The management shall advocate against Gender Based violence, sexual exploitation and work place sexual harassment among his team, employees or community members.
  - The Contractor shall accord female employees the same treatment as their male counterpart, such as equal payment for equal work.
  - There shall be no form of physical or verbal abuse of women, especially those depicting them as less important.
  - Female counterpart shall be incorporated in decision making body in the site.
  - Women shall be given due recognition and award like male counterpart when they merited it.
  - No woman or man shall be stigmatized due to his or her social status in their communities.
  - Male workers involved in gender violence shall be penalized.

CHAPTER EIGHT

8.0 REMEDIATION PLANS AFTER DECOMMISSIONING/CLOSURE

8.1 Introduction

All project initiatives have a lifespan after which it is decommissioned. The project proponent does not expect to terminate the operation of the Special Agro-Industrial Processing Zone (SAPZ) for at least 50 years. However, a 'phased-out' of out-modeled or outdated machinery may make decommissioning inevitable. Decommissioning involves activities that result in the stabilization and restoration of unneeded site(s) to a more natural state. For this project, BOSG will 'return' the project site to its initial and unblemished natural state, through rehabilitation and enhancement in accordance with a plan and standard procedures that meet local regulatory requirements and international standards as prescribed by the environmental statutes and in recognition of multi-stakeholders' decision.

This chapter describes the activities that will be completed to restore the project location to an acceptable condition for its intended use. The incorporation of remediation plans into the overall project planning is essential because it allows proponents to understand the need for restoring the environment into its original, or near its original status when abandonment plans are being conceptualized.

Before decommissioning, BOSG will develop plans that include the following:

- Identification of components of the project that will be removed;
- The choice of environmentally sound methods for removal, re-use, recycling or disposal of special wastes that may arise from the decommissioning process.
- Expressly outline the time frame/schedule for the decommissioning and post-decommissioning process, and communicate the same to FMEnv and other relevant regulatory agencies as well as the affected or concerned persons and groups;
- Proper rehabilitation and decommissioning process;

- Appropriate site rehabilitation, remediation and enhancement techniques and technologies; and
- There shall be post-decommissioning assessments to compare ameliorated project-related impacts, relative to the baseline conditions.

8.2 Consultation

The project decommissioning and abandonment plan will include consultation with various stakeholders including employees from various departments. The decommissioning team will include competent personnel from the BOSG as well as the regulatory authorities.

8.3 Reporting

As required by regulations, a post-decommissioning report will be prepared and submitted to FMEnv. The report will include the following details:

- Overview of decommissioned facilities
- Details of methods used for decommissioning
- Nature of decommissioning (partial or whole)
- Record of consultation meetings
- Details of recyclable / reusable materials / facility components
- Decontaminated facilities
- State of the surrounding environment
- Waste Management Plan
- Plans for restoration and remediation where necessary.

8.4 Decommissioning Activities

At the end of the facilities utility, all equipment and structures will be decommissioned. All installed facilities on project site will be adequately dismantled and removed to allow for proper remediation of the project site. In general, the activities to be carried out during the decommissioning phase shall include the following:

- Dismantling of all surface equipment and structures

- Dismantling of buildings including excavation
- Removal of foundations
- Removal of decommissioning waste

BOSG will ensure safety of personnel and the public during decommissioning as well as minimize negative environmental and social impacts. Particular attention will be paid to the following:

- Protection from air pollutant emissions;
- Protection from noise; and
- Waste handling

All the components that can be used or recycled will be identified and quantified. Cleared locations will be re-vegetated using fast growing native plant species, which can either be purchased from a nursery plantations/farms or nursery of these seedlings will be developed by capable agronomists. Disturbed areas on the facility will be identified and restored using native species.

8.5 Decommissioning and Abandonment Plans

Decommissioning of the houses is not foreseen, however, decommissioning of other facilities especially project site offices and workshops are inevitable. BOSG will prepare a written abandonment plan within 30 days of determining decommissioning. The Plan will detail how the decommissioning will be carried out. The abandonment plan will be subject to approval by BSMEnv, FMEnv / NESREA. An Environment Project Report (EPR) will be prepared prior to implementation of this plan, to assess and minimize potential environmental and social impacts arising from the abandonment of operations. This abandonment EPR Study will be submitted to FMEnv / NESREA for consideration. Upon completion of the abandonment operations, an assessment of contaminated land will be prepared recording the final contamination status of the location of the project facilities. This assessment will be subjected to FMEnv/NESREA for approval.

8.6 Recommended Mitigation Measures for Decommissioning Phase

Some basic mitigation measures will be required to be undertaken once all operational activities of the project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames, prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in table 8.1

8.7 Decommissioning phase ESMP

In addition to the mitigation measures provided in chapter 6 of this report, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the proposed project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in the table 8.1.

Table 7.4: Decommissioning phase Environmental and Social Management Plan

Impact	Mitigation Measures	Responsible Persons	Frequency
Demolition waste	• Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Reuse • All buildings, machinery, equipment, that will not be used for other purposes Shall be removed and recycled/reused as far as possible • All foundations shall be removed and recycled, reused or disposed of at an approved disposal site • Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials shall be taken to an approved waste disposal site • Reusable demolition waste shall be donated to charitable organizations, individuals and institutions	BOSG	Throughout the demolition period
Noise and	• Sensitization of workforce including drivers of	BOSG	Throughout

Vibration	construction vehicles shall be undertaken • Installation of portable barriers to shield compressors and other small stationary equipment where necessary shall be in place • Proper maintenance of all equipment shall be carried out • Workers in the vicinity of high level noise shall wear safety and protective ear mug		demolition period
Dust	BOSG shall; • Spray demolished piles of earth with water • Avoid pouring dust materials from elevated areas to ground • Cover all trucks hauling soil, sand and other loose materials • Provide dust screen where necessary	BOSG	Throughout demolition period
Site degradation	BOSG shall • Implement an appropriate re-vegetation programme to restore the site to its original status as much as possible. • Consider use of indigenous plant species in re-vegetation	BOSG	Throughout the demolition period

Source: Field study, 2024

8.8 Remediation Plans after Decommissioning

The incorporation of remediation plans into the overall project planning is essential because it allows proponents to understand the need for restoring the environment into its original, or near its original status when abandonment plans are being conceptualized. Operating projects beyond the designed lifespan makes it economically unproductive as returns from such investment become unattractive. Therefore, investors make appropriate plans for either temporarily or permanent closures of facilities after the expiration of the project useful life. The useful life of any project is determined by a number of factors, among which are:

- Specifications of materials,
- Durability of equipment and machinery,
- Profitability of the proposed project and
- Importance of the end product.

The activities to be carried out during the decommissioning phase shall include the following:

- Dismantling of the facility and other ancillary equipment and
- Removal of all structures.

The potential impacts that might result from the decommissioning phase of the proposed project have been earlier identified and discussed in Chapter 5.

The strategy to be adopted for site remediation shall depend on the prevailing biophysical and social environmental attributes and the attendant impacts that may result from such an action.

CHAPTER NINE

STAKEHOLDER ENGAGEMENT AND GRIEVANCE REDRESS MECHANISM

9.1 Introduction

Consultations are an important tool in identifying the major environmental and social issues that form a vital aspect of the preparation of this ESIA. A Stakeholder Engagement Plan (SEP) which aims at facilitating the development and sustainable implementation of various stages of the Project's life cycle from (pre-construction to, construction, operations, and decommissioning) was done during preparation of this ESIA document.

It describes the process by which stakeholders were identified; the means by which they were consulted; and the outcomes of the consultations to date. It also describes the actions that the Project took to disclose pertinent information to stakeholders.

9.2 Stakeholder Engagement

A Stakeholder Engagement Plan (SEP) is the process of managing stakeholder expectations which influences project decisions throughout the life cycle of the project. This process provides a plan to interact effectively with stakeholders and support the project interest.it is very important to plan these activities well so that they appraise the contribution of stakeholders on projects, manage their expectations also achieve project objectives. Stakeholder engagement process focusing on free, prior and informed consultation (FPIC) shall be conducted with the community and other stakeholders, and take into account modalities of vulnerable and marginalized communities may be involved. The consultation shall include prior disclosure of information in a manner accessible and understandable to communities, key informant interviews, focus group discussion (male& female, youth) and public consultation. The consultation shall be documented with required facts, figures and evidence including participant list with contact details, photographs. Information shall be disclosed as per the requirement of National Regulations EIA Act No. 86 of

1992 (as amended by the EIA Cap E12 LFN 2004) and the African Development Bank's Integrated Safeguards System.

9.3 Objectives of Stakeholder Engagement

The objectives of public participation in an ESIA are to provide sufficient and accessible information to potentially interested and affected parties/stakeholders in an objective manner to assist them identify issues of concern, and provide suggestions for enhanced benefits and alternatives. The stakeholder engagement process was designed to conform to the Nigerian EIA Act and international standards. For this Project, the key objectives for stakeholder engagement are:

- Identify key stakeholders that can influence the Project and its activities;
- Inform and educate stakeholders about the proposed Project;
- Gather local knowledge to improve the understanding of the environmental and social context;
- Better understand the locally-important issues;
- Identify the most effective methods and structures through which to disseminate project information, and to ensure regular, accessible, transparent and appropriate consultation;
- Provide a means for stakeholders to have input into the Project planning Process;
- Take into account the views of stakeholders in the development of effective mitigation measures and management plans; and
- Lay the foundation for future stakeholder engagement.

9.4 Disclosure and Participation Plan

Information disclosure is an important activity not just as a form of engagement but for also enabling the other engagement activities to be undertaken in an informed and participatory manner. This section outlines the process to be followed for the disclosure and participation as part of the EEP implementation.

It is required under the AfDB operational Safeguards that the Proponent will maintain and disclose as part of the environmental and social assessment, a documented record of stakeholder engagement, including a description of the

stakeholders consulted, a summary of the feedback received and a brief explanation of how the feedback was taken into account, or the reasons why it was not.

9.4.1 Disclosure Mechanism

The process of information disclosure can be undertaken in two ways: either voluntary disclosure or disclosure as part of the regulatory requirements (EIA requirements, public hearing). While regulatory disclosure involves the provisioning of information as required by the authorities and agencies involved in the project, voluntary disclosure refers to the process of disclosing information to the various stakeholders in a voluntary manner.

This disclosure not only allows for trust to be built amongst the stakeholders through the sharing of information, but it also allows for more constructive participation in the other processes of consultation and resolution of grievances due to availability of accurate and timely information.

9.4.2 Process for Disclosure of Information

As a standard practice, this ESIA will be released for public review according to the AfDB disclosure procedures, and for a period of 21 days in accordance with Nigerian Regulatory Frameworks. Distribution of the disclosure material will be done by making them available at venues and locations convenient for the stakeholders and places to which the public have unhindered access. The language of the ESIA is in English. The report will be made accessible for the general public at the following locations:

- The EA Department of the Federal Ministry of Environment;
- Borno State Ministry of Environment
- Ministry of Agriculture and Natural Resource and
- Other designated public locations to ensure wide dissemination of the materials.

Electronic copies of the ESIA report will be placed on the website of the AfDB. This will allow stakeholders with access to Internet to view information about the planned development and to initiate their involvement in the public consultation process. The

mechanisms which will be used for facilitating input from stakeholders will include press releases and announcements in the media, notifications of the aforementioned disclosed materials to local, regional and national NGOs, relevant professional bodies as well as other interested parties.

9.4.3 Timetable for Disclosure

The disclosure process associated with the release of project E&S documentation will be implemented within the following timeframe:

• Placement of the ESIA report in public domain (FMEnv and AfDB website)

• 21-day disclosure period – dates to be confirmed by FMEnv.

• Addressing stakeholder feedback received on the entire disclosure package – Dates to be confirmed by FMEnv and AfDB.

The ESIA will remain in the public domain for the entire period of project development and will be updated on a regular basis as the project progresses through its various phases, in order to ensure timely identification of any new stakeholders and interested parties and their involvement in the process of collaboration with the project. The methods of engagement will also be revised periodically to maintain their effectiveness and relevance to the project's evolving environment. The table 9.1 summarizes the main stakeholders of the project, types of information to be shared with stakeholder groups, as well as specific means of communication and methods of notification.

Table 9.1: Stakeholder Engagement and Disclosure Methods

Stakeholder Group	Project information shared	Means of communication/ disclosure
Project beneficiary	- ESIA report - RAP/eRAP - Regular updates on project development.	- Public/Disclosure notices - Electronic publications and press releases on the Project web-site. - Dissemination of hard copies at designated public locations. - Press release in the local media - Consultation meetings.
AfDB	- ESIA Report - RAP/eRAP - Regular updates on project development.	- Electronic publications and press releases on the AfDB's web-site. - Submission of hard copies
Non-government	- ESIA Report	- Public notices

Organizations	- Regular updates on project development.	- Electronic publications and press releases on the project web-site. - Dissemination of hard copies at designated locations. - Press releases in the local media.

9.5 Grievance Redress Mechanism

The grievance mechanism is a company process that enables stakeholders to make a complaint or a suggestion regarding the way a project is being implemented. This includes ensuring that all grievances that are received are acknowledged, logged and tracked. It also enables complainants to know what to expect in terms of response and when. Generally, grievances may take the form of specific complaints for damages/injury, concerns about routine project activities, perceived incidents or impacts or requests for more information / clarity on project activities. In relation to resettlement, complaints may be related to compensation, land issues, resettlement assistance or housing, or other relevant issues.

The primary objectives of a grievance mechanism are to:

- enhance trust and positive relationships with stakeholders, particularly as resettlement is a sensitive and complex process;
- prevent the negative consequences of failure to adequately address grievances; and
- identify and manage stakeholder concerns and thus support effective risk management in relation to resettlement and the Project overall.

The grievance mechanism allows stakeholders to submit complaints and comments at no cost, without retribution and with the assurance of a timely response. The key principles and overview of an effective grievance mechanism are:

- *Culturally appropriate:* Tailored to the local language.
- *Accessible:* Accessible to all settlements and stakeholder groups within the project area.

- *Inclusive of vulnerable groups:* Available to those less likely to have the means to voice their concerns or opinions within the Nigerian context (e.g., women, elderly, Fulani).
- *Reliable:* The developer will respond to grievances within an agreed timeframe in order to manage expectations.
- *Publicized:* The developer will publicize the grievance mechanism through engagement activities and advertisements to ensure that stakeholders are aware and understand the process.
- *Logged:* Grievances will be logged and tracked, and
- *Confidential:* Grievances will remain confidential and anonymous

9.6 Grievance Management Standards

The RAP Grievance Mechanism has been designed in accordance with international best practice as summarised in Table 9.2 below.

Table 9.2 Grievance Management Standards

Standard	Summary
Nigerian Legislation	Section 30 of the Land Use Act 1990 6 v states: "Where there arises any dispute as to the amount of compensation calculated in accordance with the provisions of section 29, such dispute shall be referred to the appropriate Land Use and Allocation Committee."
AfDB Integrated Safeguard System (ISS)	The AfDB ISS includes provisions for establishing a culturally appropriate and accessible grievance and redress mechanism to resolve, in an impartial and timely manner, any disputes arising from the resettlement process and compensation procedures.
International Finance Corporation Performance Standard 5 (IFC PS5)	IFC PS 5 requires that the client establish a grievance mechanism as early as possible in the project development phase. This will allow the client to receive and address specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion, including a recourse mechanism designed to resolve disputes in an impartial manner.
European Investment Bank (EIB)	EIB Environmental and Social Standard 10 requires that the project promoter shall set up and maintain a grievance mechanism that is independent, free and that will allow prompt addressing of specific concerns about compensation and relocation The mechanism should be easily accessible, culturally appropriate, widely publicized, and well integrated in the promoter's project management system. It should enable the promoter to receive and resolve specific grievances related to compensation and relocation by affected persons or members of host communities, and use the grievance log to monitor cases and improve the resettlement process.

As described in the table, key principles of the mechanism include ensuring that the Grievance Mechanism is culturally appropriate, grievances are dealt with in a timely manner and impartially, it should be easily accessible and widely publicised to ensure that is can be accessed by all stakeholders, including vulnerable groups. This includes providing adequate assistance for those who may face barriers including language, literacy, awareness, finance, distance or fear of reprisal.

9.7 Roles and Responsibilities in Grievance Management

This outlines the key bodies that are involved in the Grievance Mechanism process. These include the following:

- **Project Staff:** The Project Community Liaison Officer (CLO) and Resettlement Coordinators (RC) will likely be the first point of contact for complainants and is responsible for receiving, recording and communicating the grievance to the Grievance Officer (GO), or equivalent. The GO is responsible for processing and resolving the grievance with relevant departments and stakeholders, including the complainant, Community Resettlement Committee (CRC) and Land Use and Allocation Committee (LUAC). All resettlement related grievances will be signed off by the Resettlement Manager (RM). Level 3 grievances will also require sign off by the Country Manager (CM).
- **Community Resettlement Committee (CRC):** If needed, the CRC particularly Community Leaders, will assist community members in accessing the grievance mechanism and ensure the Project is aware of the grievance. Additionally, depending on the type and priority level of the grievance, the CRC will play an active role in resolving the grievance. All the members of the CRC have been trained on their responsibilities, including grievance management responsibilities, which includes where required by PAPs and the Developer:
    - reporting grievances raised by PAPs if needed to the Project CLO;
    - keeping the aggrieved parties updated on the progress with respect to addressing their grievance; and

- supporting the development of solutions to the grievance if the grievance is not resolved.

• **Resettlement Steering Committee (RSC):** As with the CRC, if needed, the RSC or individual members will play an advisory role in grievance resolution at the highest level, and will intervene in the case that it is not resolved.

• **Land Use and Allocation Committee (LUAC):** The LUAC is a key stakeholder regarding the management of land. They will be required to assist with the resolution of grievances related to replacement land allocation.

All bodies will work closely together to ensure that grievances are dealt with fairly and transparently.

Under the PIU, there will be an established Safeguard Unit. This unit will work with the Grievance Redress committee that would be established for this specific purpose comprising administrative heads or an appointed representative of Borno local governments, community and/or village Heads/Mai Angwa's, Sarki, NGOs/CBOs and other relevant Government organs that will be set up to address complaints. For this reason, handling grievances will begin with the Local Government. A grievance log will be established by the project and copies of the records kept with all the relevant authorities.

The existence, location, purpose and composition of this committee will be publicized, so that complainants are knowledgeable about the availability of this committee for resolving any grievance.

9.8 Expectations when Grievances Arise

When people present their grievances, they expect to receive one or more of the following: acknowledgement of their problem, an honest response to questions/ issues brought forward, an apology, adequate compensation, modification of the conduct that caused the grievance and some other fair remedies. In voicing their concerns, they also expect to be heard and taken seriously. The company, contractors,

or government officials must therefore convince people that they can voice grievances and work to resolve them without retaliation.

9.9 Setting up a Grievance Redress Mechanism

During the time of implementing of the ESIA, the PIU shall establish a Grievance Redress Mechanism that incorporates the use of existing local grievance redress mechanism available in the community. It will be effective and result oriented to work with existing and functional local structures of dispute resolution than to design an entirely new one, which may be alien to the people.

9.9.1 Membership of the Grievance Redress Committee (GRC)

Membership of the GRC for the 3 levels of grievance uptakes shall comprise as follow:

GRC at the Site/community Level:

- The traditional Ruler/District head of Njimtilo community at the AIH or a person appointed by them from the council;
- The village heads of Baga, Ngaranam, Amarwa and Briyel communities in the ATC's project location site;
- The Woman leader in the communities or her secretary;
- A woman leader of an affinity association;
- 2 Representatives of PAPs including at least a woman;
- 2 members of the site committee including at least a woman.

GRC at the PIU Level:

It is recommended that the state project coordinator shall constitute a team within the PIU to receive, hear and address complaints arising from the project. The Social and Livelihood Officer/Safeguards Officer will head the team. Membership of the team shall be as follow:

- Social and Livelihood Officer;
- Communication officer/ Public relations officer;

- Environmental officer
- Monitoring and Evaluation officer, and
- The project engineer

GRC at the State Steering Committee Level:

The committee at this level shall be headed by the Permanent Secretary/Commissioner, Borno State Ministry of Agriculture, while the Project Coordinator shall serve as the secretary of the committee.

Membership of the GRC at this level shall constitute as follows:

- The Permanent Secretary Borno State Ministry of Agriculture;
- Director Ministry of Land & Survey
- Director Ministry of Agriculture;
- Director Ministry of Environment
- The State Project Coordinator

9.10 Grievance Redress Process Procedure

The GRM Process would comprise:

Registration

It may be less depending on the severity of the matter under consideration. The first step is the presentation of a grievance at the uptake point at any level. The social contact person or secretary of the committee will receive grievance from the complainant, register and acknowledge receipt of grievance to the grievant within 2 days. The registration will capture the following data: name of the complainant, date of the grievance, category of the grievance, persons involved, and impacts on complainant life, proofs and witnesses. A registration form will have all these bits of information.

Verification

The verification determines among other things whether the matter has relationship with the project activities, and whether the matter can be handled/resolved at the

level where it is presented. This will determine if the matter should be referred to the next level or not. Part of the investigations may also be to assess the cost of lost or risk involved in the grievance.

Processing

The processing step is when options for the approach to resolving the case are weighed and determined. Parties involved in the case are brought together for the first attempt at resolution with suggestions from the parties on practical steps to be taken which may also involve site visit for physical inspection and determination of the claim.

Feed back

All responses to the complainant in a grievance redress process that moves beyond a unit level must be communicated in writing and/or by verbal presentation to the complainant. This will include a follow up on the corresponding authority where cases are referred, to ascertain the status of reported cases. Feedback on outcome of each case should get to the complainant through the secretary of committee or social contact/safeguard person as the case may be. It is expected that reported complaints at each level will be resolved and determined within 21 days from date of receipt of the complaint.

Details are shown in the flow chart illustrated in Figure 9.1.

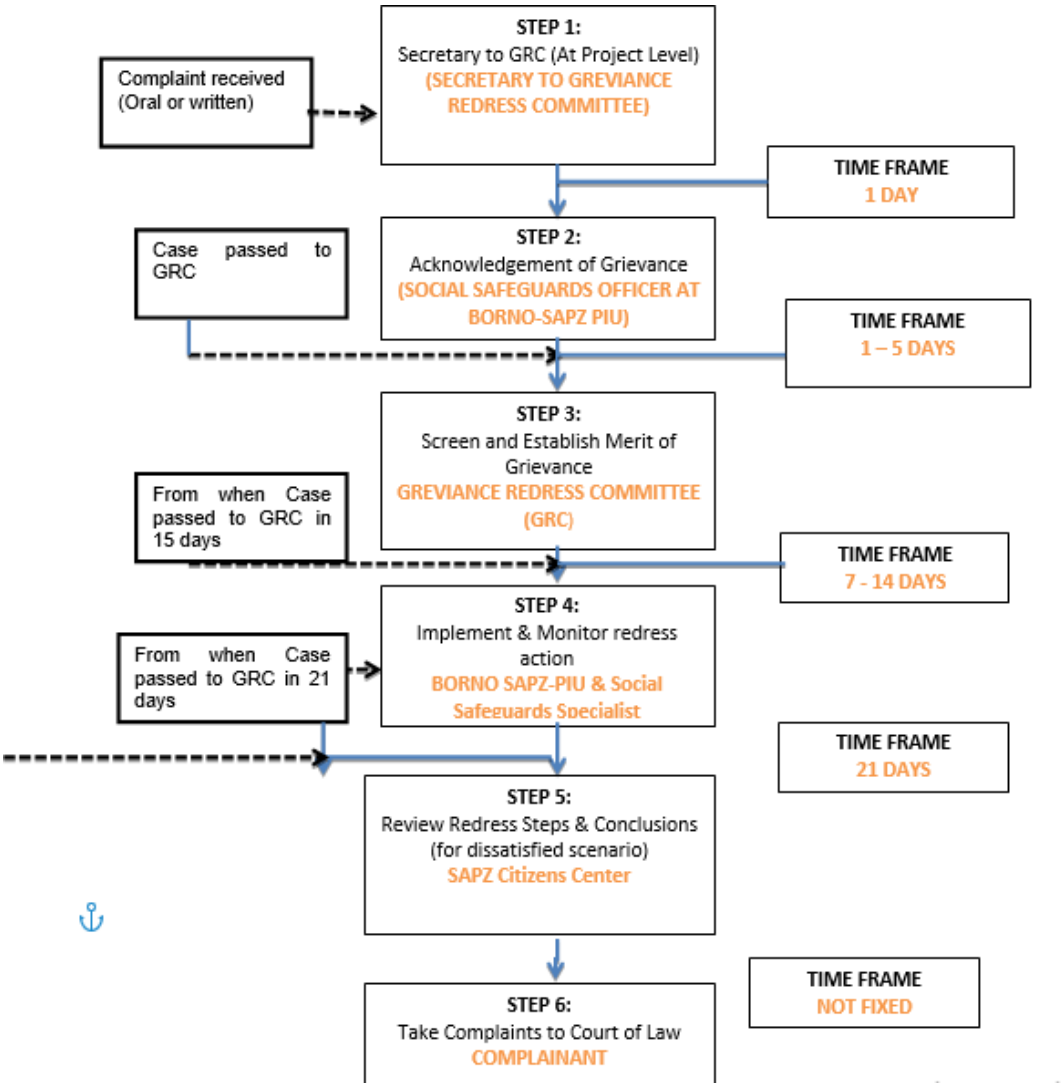


Figure 9.1: GRM flow chart

CHAPTER TEN

10.0 CONCLUSION

10.1 Introduction

The conduct of this ESIA for the proposed Special Agro-Industrial Processing Zone (SAPZ) project in Borno State was executed in strict compliance with acceptable National and International regulatory requirements. The ESIA process involved an extensive literature review, and wide-ranging consultation with all the identified communities and stakeholders, sampling and determination of the conditions of biophysical, social and health environmental components of the project area. The study sought the views and concerns of the host communities on essential aspects of the proposed project through special interaction and incorporated in the impact assessment process.

This ESIA has identified and assessed both positive and negative impacts of the proposed project and accordingly evaluated the associated and potential negative effects on the environment (biophysical), socio-economic and health characteristics of the project area in detail and mitigation measures have also been prescribed for significant negative impacts. For effective implementation of the recommended mitigation measures, an Environmental and Social Management Plan (ESMP) has been developed to ensure environmental sustainability during the construction and operation phases of the proposed Borno-SAPZ project.

The Environmental and Social Impact Assessment also revealed that the project will have significant transformative impacts on the socio-economic life of the host communities and Borno State in particular as well as the national economy in general.

The proposed SAPZ would pose limited environmental and social risks, taken into account the proposed mitigation measures. It is recommended that environmental performance should be regularly monitored to ensure compliance and that corrective

measures be taken if necessary. In addition, it is very necessary that this information should be made available to the host communities on a regular basis.

The Environmental and Social Management Plan (EMP) should be used as an on-site reference document during all phases (Planning, Construction and Operation) of the proposed SAPZ project.

Environmental auditing should be regularly undertaken, in order to determine compliance with the proposed EMP, and parties responsible for the implementation of the EMP should be held responsible for any inadequacy during the implementation process.

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APPENDICES

APPENDIX 1

LIST OF ATTENDANCE DURING SITE VERIFICATION EXERCISE

FEDERAL MINISTRY OF ENVIRONMENT

DEPARTMENT OF ENVIRONMENTAL ASSSESSMENT

SITE VERIFICATION EXERCISE

Attendance Sheet

PROJECT: Special Agro Industrial Processing Zone

PROPONENT : Borno State Ministry Of Agriculture

LOCATION: Jimtilo Maiduguri Borno State

Date : 30/05/2024 Time

S/N	Name	Organization	E-mail	Phone	Sign
1.	A.B. Maina	FMEnv-Abuja	[illegible]@gmail.com	08036129516	[illegible]
2.	S. A. YERO	E7 ENGINEERING 7KONSULT LTD	e7ik@gmail.com	07066661824	[illegible]
3.	Mathias Elijah	FMEnv	[illegible]	[illegible]	[illegible]
4.	Engr Usman M.D	M.O.E	[illegible]@gmail.com	08035713714	[illegible]
5.	Mohammed Umar [illegible]	M.O.E	[illegible]@gmail.com	[illegible]	[illegible]
6.	Adamu Aliyu		adamualiyu[illegible]@gmail	08067520800	[illegible]
7.	Maina M. Ayuba	MOA	[illegible]	0802[illegible]	[illegible]
8.	Shuaibu M. Shuaibu	Northstar Agric	shuaibu.mu.shuaibu[illegible]@gmail.com	0703144820[illegible]	[illegible]
9.	Abdulmajid Umar	Northstar Agric	Abdulmajidumar[illegible]@gmail.com	08036858094	[illegible]
10.					
12.					
13.					
14.					
15.					
16.					

LIST OF ATTENDANCE DURING SITE SCOPING WORKSHOP

FEDERAL MINISTRY OF ENVIRONMENT

ENVIRONMENTAL ASSESSMENT DEPARTMENT

PROJECT TITTLE: SCOPING WORKSHOP FOR THE PROPOSED SPECIAL AGRO-INDUSTRAIL ZONE BORNO STATE

DATE: 30th /05/ 2024.

S/N	NAMES	ORGANIZATION	PHNE NO	EMAIL	SIGN
1	Bulama Ruth Isk	Farmers	08030834054		
2	Auba Mallam	farmer	08062493220		
3	Bulama B. Kolo	Farmer			
4	Bullam Sanda	,,			
5	Mohammed Umar	,,	08020847970	Sirdalou@gmail.com	
6	Kaka mohammed	,,	07036918077		
7	Babagana Fannami	,,	08129312729		
8	Bukar modu	,,	09070152289		
9	Ibrahim mohammed	,,	08102840893		
10	Mohammed Abacha	,,	07034752328		
11	Modu Fantami	,,	08142994837	mohufantami450@gmail	
12	Bulama Zanna	,,	09078042740		
13	Abatcha M. Gajiram	,,	07066625369		
14	Mohd. Sani Abdulmunir	,,	09070152739		

FEDERAL MINISTRY OF ENVIRONMENT

ENVIRONMENTAL ASSESSMENT DEPARTMENT

PROJECT TITTLE: SCOPING WORKSHOP FOR THE PROPOSED SPECIAL AGRO-INDUSTRAIL ZONE BORNO STATE

DATE: 30th /05/ 2024.

S/N	NAMES	ORGANIZATION	PHNE NO	EMAIL	SIGN
1	Sadiq G. Mutti	Farmer	08082821885		
2	Modu Umara	"			
3	Hussaini M Alatta	"	08168796895		
4	Goni Kyari Farma	"	08158301607		
5	Malam Umara	"	09070153060		
	Usman Mustapha	"	09070152994		
	Ballama Ali Mustapha	"	08040666826		
	Adamu Aliyu	"	08067820800	adamualiyu90@gmail	
	Bala Kura Alkali	"	08030685533	balakuraalkali2020	
	Ahmed Hassan	"	09066307158	ahmedhassan564838	
	Abubakar Shettima	"	08020844419	abubakarshettima228	
	Audu Kachalla	"	08039560663	audukachalla1039	
	Mohammed Zanna	"	08068586470		
	A.B. Maina	FMEnv Abuja	08036129016		

APPENDIX 2

DEMOGRAPHIC INFORMATION

1. Educational qualification: No formal education_____

   Primary _____ Secondary_____ Tertiary_____
2. Marital status: Married …… Single …… Divorced……Separated……Widowed……
3. Marital Pattern: Polygamy……. Monogamy……
4. Number of children: Male:__ Female:_____
5. Total No. of people in household: Male:_____ Female:_____
6. Age _____ _____ Sex
7. Are you aware of this project? Yes __ No___

(B) ECONOMIC INFORMATION

8. What is your occupation?
9. What types of domestic and wild animals do you have around?
10. What is your estimated monthly income: less than N10,000 __ N10,000 to N50,000 ____ N51,000 to N100,000 ____ N101,000 to N150,000 More than N200,000__

(C) SOCIAL INFRASTRUCTURE

11. Do you have markets?_____ (names and the days of function)
12. What recreational facilities do you have in this community? _____
13. What communication network is in use here? _____
14. From which of the following sources is your water supply? Rain____ River_____ Stored run-off_____

    Pipe borne____ borehole_____ well__ Spring_____
15. How is water from each of these sources treated before use? _____
16. How is solid waste disposed-off: Burning_____ Burying Dumping____ Others_____
17. How is human waste disposed-off? Defecation in bushes ____ pail systems_____ pit toilet__ Water System (WC) _ Any other (specify)__

(D) CULTURE AND RELIGION

18. Is there any sacred object in the community? (stream, animal, deity, stones, trees etc)

    Mention them and location_____

19. Do you have any historic or archeological site/monuments in your community? If yes, mention their names and the location_____

20. Mention the kinds of festivals celebrated in your community and when

_____

_____

What are the Dos and Don'ts (taboos) in this community? _____

_____

21. (E) ENVIRONMENTAL PROBLEMS

22. List the main environmental problems in this community (e.g. deforestation; erosion; dust storm)

S/No.	Environmental problems	Causes

23. How seriously do these problems affect your occupations/jobs?

Little effect_ Serious _____ has forced us to stop some activities_
Further information on any serious effect_____

_____

29. Has the government or any other group embarked on any activity to help reduce environmental problems in your community? Yes:_____ No:_____

30. If yes what type of development programmes; which organization; and what has been the impact?

_____

31. How do you think this project will benefit this community?

_____

HEALTH IMPACT ASSESSMENT

1. What type of health care facility do you use?

S/No.	Type	Name	Address
1	General Hospital		
2	Primary Health Care		

3	Private Clinic		
4	Maternity		
5	Pharmacy		
6	Patent Medicine Store		
7	Traditional Healing Homes		
8	Faith Based		

2. How many children were born in your household in the past 1 year

3. Which sicknesses affected your household in the past 1 year?

4. Have you been to a healthcare facility for medical check or counseling in the past 2 years?

   Yes……/No……..

5. If No, why? 6. If yes, where?

COMMUNITY HEALTH NEEDS

7. What in your opinion is the most important health needs of your community (score in order of priority)

   - Safe Drinking Water
   - Health Services/Clinic
   - Electricity
   - Others

PROJECT RELATED

8. Do you have any concern about the effect the proposed project may have on the people of the community?

9. What benefits do you expect the project will have on the people in the area in order of importance?

   a. Economic Boom (increased commercial activity)

   b. Employment Benefit

   c. Infrastructural Development

   e. Housing

f. Others. Please specify
……

10. What are your fears about the proposed project in order of importance? a. Loss of land

b. Damage to farmland

c. Pollution of Air

d. Noise Pollution

e. Water Pollution

f. Health Problems

g. Socio-cultural Interference

h. High cost of living

i. Increased population

j. Disruption of business activities

k. Disruption of traffic

Others –
specify……
Explain your fears in detail

……
……

……
……

……
……

……
……

11. What causes death in this community most?

……

12. What are the important needs of the community in order of preference?

.....
.....
.....
.....

Name and position Telephone number

QUESTIONNAIRE: COMMUNITY PROFILE

IDENTIFICATION

Town/Village/Settlement……..……

Location…… GPS Reading…….……

LGA……..

BRIEF HISTORY OF ORIGIN OF COMMUNITY (Describe in a separate sheet)

Field worker……

S/N	Description	Remarks
1.	**Leader:** 1. What is the name of the leader in this community? 2. What is the predominant tribe and languages spoken? 3. What is the average number of household size? 4. Are you aware of this project? (probe for baseline knowledge)	
2.	**Ethnic Group** a. Major ethnic group b. Minority ethnic group	
3.	**Culture and Religion** 1. What religions are practiced here? 2. Are there any sacred plants, water, animal, artefact or forest? 3. What are the festivals celebrated and month of celebration? 4.What is regarded as a taboo in this community?	
4.	**Economic** 1. What are the means of livelihood? 2. What are the common crops farmed here? 3. What livestock do you keep around here? 4. What is the average monthly income?	
5.	**Social Infrastructure** 1. What types of transportation services are available? 2. Are there markets in this community? 3. Are there financial institutions around here? 4. How does the community manage her waste?	

	5. What toilet types are available here?	
6.	**Number of Houses: (Use census approach)** a. Huts b. Bungalows c. Storey Buildings	
7.	**Housing characteristics:**	
	Bricks, mold, zinc, thatch	
8.	**Political structure:** 1. Is the community leadership by election, appointment or is it hereditary? ……. Organogram (indicating leadership and hierarchy in community level decisions)	
9.	**Groups and Leaders:** a. Community Head (Title and Name) b. Chiefs-in-Council c. Men's Group d. Women's Group e. Youth Group	
10.	**Social Environment** 1. Are there any social groups in this community? 2. What common foods are eaten here?	
11.	**Demography:** a. Total population b. Number of houses c. Average household size d. Adults…… Youths Males……. Females Infants (0 - 5) Children……. Mortality	

12.	**Education:** a. Government nursery school b. Private nursery school c. Government primary school d. Private school e. Government secondary school f. Private secondary school g. Tertiary institutions h. Net enrolment rate i. Gender disparity	
13.	**Roads:** a. Tarred roads entering community b. Untarred roads entering community	
14.	**Source of domestic water** a. River b. Rain c. Well d. Borehole e. Pipe bone (Tap)	
15.	**Available social facilities:** a. Petrol station within 5km radius b. GSM	
	c. Electricity d. Public toilets e. Police stations f. Fire stations g. Markets h. Banks i. Pharmacy j. Chemist/patent medicine store k. Recreational facilities l. Archaeological sites	

16.	**Health Facilities:** **Government Facility:** a. Hospital b. Comprehensive health centres c. Maternity/PHC d. Dispensaries Private health facility: a. Hospital/clinics b. TBAs c. Traditional/spiritual homes d. Faith based e. NGOs	
17.	**Morbidity:** Communicable a. b. c. d. Non communicable a. b. c. d.	
18.	**Economic Activity:** Men a. b. c. Women a. b. c. Youth a. b. c.	
19.	**Waste/Refuse Disposal:** a. Bush b. Open space within homestead	
	c. Rivers/streams d. Incinerators e. others	

20.	**Major transport in the community:** a. Roads b. Water c. Rail	
21.	**Special features:** a. Sacred areas b. Shrines c. Forest reserves d. Common taboos	
22.	**Properties owned by members of the community:** 1. Farmland 2. Poultry 3. Plantation 4. Houses 5. Others	
23.	**Pattern of land ownership:** 1. Inheritance 2. Tenant/Lease 3. Family 4. Outright purchase 5. Communal	
24.	**Farming Methods** 1. Garden 2. Fallow 3. Shifting cultivation 4. Rotational bush fallow 5. Others	
25.	**Power Source:** 1. Electricity 2. Generator 3. Lantern 4. Candle	

APPENDIX 3

(RESULT OF LABORATORY ANALYSIS)

ABUJA ENVIRONMENTAL PROTECTION BOARD
PLOT 776 CADASTRAL AO OFF Z. MAIMALARI STREET
CENTRAL BUSSINESS DISTRICT–ABUJA
PMB 152 GARKI
LABORATORY UNIT
ACCREDITED BY FED. MIN. OF ENVIRONMENT
(REG NO: 0004265)

FAHAMU NIGERIA LIMITED
PROPOSED SPECIAL AGRO-INDUSTRIAL
PROCESSING ZONES (SAPZ) BORNO

CERTIFICATE OF ANALYSIS

Date sample collected: 03/06/2024
Date sample delivered to the Lab: 03/06/2024
Time sample received in the lab: 04:30pm

TABLE 1
PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE BORNO
PHYSICAL/CHEMICAL PARAMETERS OF GROUND WATER SAMPLE.

S/N	PARAMETERS	BOR GW 1 Project Site	BOR GW 2 Njimitilo community 1	BOR GW 3 Njimitilo community 2	FMEnv LIMIT
A	**PHYSICAL TEST**				
1	Odour	Odorless	Odorless	Odorless	**Odorless**
2	TEMPERATURE (^{0}C)	31.0	30.8	30.9	**<40**
3	$_P$H	7.5	7.4	7.6	**6-9**
4	ELECTRICAL CONDUCTIVITY (µS/cm)	584.0	544.0	636.0	**1000**
5	DISSOLVED OXYGEN (mg/l)	3.1	3.3	3.5	**7.5**
6	TOTAL DISSOLVED SOLIDS (mg/l)	292.0	272.0	318.0	**500**
7	SALINITY (%)	0.02	0.02	0.03	**0.0**
8	ALKALINITY (m/l)	28.0	31.0	34.0	**100**
9	TOTAL SUSPENDED SOLID mg/l)	0.022	0.026	0.029	**<10**
B	**CHEMICAL TEST**				
10	TOTAL HARDNESS (mg/l)	171.2	154.08	205.44	**200**
11	MAGNESIUM HARDNESS (mg/l)	34.24	34.24	51.36	**50**
12	CALCIUM HARDNESS (mg/l)	136.96	119.84	154.08	**150**
13	PHOSPHATE (mg/l)	1.204	2.116	2.337	**5**
14	NITRATE as NITROGEN (mg/l)	6.50	6.00	7.30	**10**
15	TOTAL CHLORIDE (mg/l)	3.70	4.00	3.80	**250**
16	BOD (mg/l)	-	-	-	**7.5**
17	COD (mg/l)	-	-	-	**30**
18	SULPHATE (mg/l)	56.2	54.3	61.4	**250**
C	**HEAVY METAL**				
19	MANGANESE (mg/l)	0.127	0.121	0.138	**0.2**
20	IRON TOTAL (mg/l)	0.301	0.374	0.924	**1.5**

21	COPPER (mg/l)	0.005	0.005	0.005	**0.1**
22	CADMIUM (mg/l)	0.010	0.011	0.017	**0.05**
23	ZINC (mg/l)	0.412	0.640	0.890	**0.1**
24	LEAD (mg/l)	0.006	0.005	0.008	**0.05**
25	NICKEL (mg/l)	0.002	0.002	0.003	**0.05**
D	**BATERIOLOGICAL**				
26	*Total Coliform count (CFU/100ml)*	3.2	2.9	4.6	**1.8**
27	*Escherichia Coli (cfu/ml)*	1.4×10^{1}	1.2×10^{1}	2.3×10^{1}	**Absent**
28	*Salmonella (cfu/ml)*	0.0	0.0	1.0×10^{1}	**Absent**
29	*Shigella (cfu/ml)*	0.0	0.0	0.0	**Absent**
30	*staphylococcus (cfu/100ml)*	2.0×10^{1}	1.8×10^{1}	2.2×10^{1}	**Absent**

ABUJA ENVIRONMENTAL PROTECTION BOARD
PLOT 776 CADASTRAL AO OFF Z. MAIMALARI STREET
CENTRAL BUSSINESS DISTRICT–ABUJA
PMB 152 GARKI
LABORATORY UNIT
ACCREDITED BY FED. MIN. OF ENVIRONMENT
(REG NO: 0004265)

FAHAMU NIGERIA LIMITED
PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES (SAPZ) BORNO

CERTIFICATE OF ANALYSIS

TABLE 3
PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE BORNO
PHYSICAL/CHEMICAL PARAMETERS OF SOILS SAMPLES

S/N	PARAMETERS (Units in mg/kg) accepted stated	BOR- SS 1 0-15cm	BOR- SS 1 16-30cm	BOR- SS 2 0-15cm	BOR- SS 2 16-30cm	BOR- SS 3 0-15cm	BOR-SS3 16-30cm
A	**PHYSICAL TEST**						
1	TEMERATURE (^{O}C)	36.4	36.1	36.7	36.3	36.2	35.7
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 13.70/47.07/39.23	SAND/SILT/CLAY 19.76/46.54/33.70	SAND/SILT/CLAY 15.08/55.63/29.29	SAND/SILT/CLAY 11.15/52.14/36.71	SAND/SILT/CLAY 12.79/56.90/30.31	SAND/SILT/CLAY 10.23/57.17/32.6
3	$_{p}H$	7.21	7.04	7.19	6.90	7.23	6.89
4	MOISTURE CONTENT (%)	1.037	1.302	0.980	0.960	0.992	1.022
5	SOIL POROSITY (%)	30.00	33.33	24.00	26.66	30.00	33.33
6	BULK DENSITY (g/cm^3)	1.050	1.190	1.053	1.110	0.950	1.130
7	WET DENSITY (g/cm^3)	1.420	1.270	0.980	1.000	1.080	1.000
8	DRY DENSITY (g/cm^3)	1.005	1.120	0.180	1.240	1.160	1.260
B	**ORGANICS**						
9	TOTAL ORGANIC CARBON	2.40	4.30	2.00	1.80	3.10	1.70
C	**EXCHANGEABLE IONS**						
10	PHOSPHATE (mg/kg)	1.184	0.896	1.320	1.052	3.805	6.220
11	SULPHATE (mg/kg)	42.00	34.10	47.20	33.00	29.75	25.80
12	NITRATE (mg/kg)	6.00	4.26	7.34	5.96	5.00	5.87
13	CALCIUM (mg/kg)	29.70	25.80	30.10	23.70	32.60	29.70
14	MAGNESSIUM (mg/kg)	15.40	13.10	15.00	12.05	16.70	15.30
15	CHLORIDE (mg/kg)	2.70	2.50	3.27	2.97	3.00	2.20
D	**HEAVY METALS**						
16	MANGANESE (mg/kg)	0.872	0.576	1.820	1.135	0.550	0.446
17	COPPER (mg/kg)	1.285	1.020	2.140	1.503	0.975	1.021
18	IRON (mg/kg)	4.020	3.680	3.990	2.894	3.130	2.885
19	ZINC (mg/kg)	3.140	3.010	4.403	2.775	2.850	3.006
20	CADMIUM (mg/kg)	0.029	0.016	0.018	0.012	0.016	0.021
21	LEAD (mg/kg)	0.011	0.007	0.010	0.006	0.013	0.010
22	NICKEL (mg/kg)	0.004	0.002	0.004	0.002	0.003	0.005
E	**BACTERIAL ISOLATE**						
23	*Total Heterotrophic Bacteria (cfu/100 ml)*	4.4×10^2	4.5×10^2	4.3×10^2	4.0×10^2	4.7×10^2	4.8×10^2
24	*Total Heterotrophic fungi (THF) (cfu/100 ml)*	3.8×10^2	3.6×10^2	3.7×10^2	3.3×10^2	3.6×10^2	3.4×10^2

25	*Total fungi count (TFC) (cfu/100 ml)*	3.7 X 10^2	3.4 X 10^2	3.1 X 10^2	3.1 X 10^2	3.1 X 10^2	2.8 X 10^2
26	*Feacal Coliform Count (FCC) (cfu/ 100 ml)*	3.2 X 10^2	3.0 X 10^2	2.8 X 10^2	2.6 X 10^2	2.6 X 10^2	2.7 X 10^2

TABLE 3
PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE BORNO
PHYSICAL/CHEMICAL PARAMETERS OF SOILS SAMPLES

S/N	**PARAMETERS (Units in mg/kg) accepted stated**	BOR- SS 4 0-15cm	BOR- SS 4 16-30cm	BOR- SS 5 0-15cm	BOR- SS 5 16-30cm	BOR- SS 6 0-15cm	BOR-SS6 16-30cm
A	**PHYSICAL TEST**						
1	TEMERATURE (^{O}C)	36.4	35.8	36.0	35.4	35.4	35.0
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 41.03/48.37/10.6	SAND/SILT/CLAY 12.12/55.46/32.42	SAND/SILT/CLAY 12.80/56.51/30.13	SAND/SILT/CLAY 13.28/52.85/30.04	SAND/SILT/CLAY 20.03/55.26/24.71	SAND/SILT/CLAY 23.49/52.71/23.8
3	$_P$H	7.21	6.98	7.16	7.07	7.34	6.97
4	MOISTURE CONTENT (%)	1.024	1.007	0.940	0.930	1.204	1.170
5	SOIL POROSITY (%)	30.00	30.00	20.00	23.33	25.00	26.66
6	BULK DENSITY (g/cm^3)	1.210	1.110	1.090	1.120	1.090	1.110
7	WET DENSITY (g/cm^3)	1.150	1.017	1.110	1.040	1.006	0.930
8	DRY DENSITY (g/cm^3)	1.075	1.190	1.075	1.194	1.191	1.280
B	**ORGANICS**						
9	TOTAL ORGANIC CARBON	1.80	1.40	2.40	1.20	1.60	2.80
C	**EXCHANGEABLE IONS**						
10	PHOSPHATE (mg/kg)	1.670	1.416	0.809	0.731	1.404	1.234
11	SULPHATE (mg/kg)	49.30	40.66	44.10	35.70	31.00	20.15
12	NITRATE (mg/kg)	6.07	10.73	6.45	16.50	8.13	9.29
13	CALCIUM (mg/kg)	32.40	28.60	26.80	28.10	33.20	30.40
14	MAGNESSIUM (mg/kg)	12.80	19.80	13.70	14.80	16.50	15.60
15	CHLORIDE (mg/kg)	2.30	2.00	3.61	1.12	4.84	4.03
D	**HEAVY METALS**						
16	MANGANESE (mg/kg)	0.662	0.355	1.157	0.945	1.674	1.220
17	COPPER (mg/kg)	1.914	1.364	0.909	0.787	1.555	1.310
18	IRON (mg/kg)	4.160	3.420	3.160	2.872	4.280	3.460
19	ZINC (mg/kg)	2.713	2.810	2.743	1.993	3.640	4.005
20	CADMIUM (mg/kg)	0.024	0.017	0.014	0.013	0.018	0.023
21	LEAD (mg/kg)	0.009	0.008	0.006	0.007	0.011	0.007
22	NICKEL (mg/kg)	0.004	0.002	0.002	0.003	0.003	0.004
E	**BACTERIAL ISOLATE**						
23	*Total Heterotrophic Bacteria (cfu/100 ml)*	5.3 X 10^2	4.8 X 10^2	4.7 X 10^2	4.1 X 10^2	3.3 X 10^2	3.0 X 10^2
24	*Total Heterotrophic fungi (THF) (cfu/100 ml)*	4.7 X 10^2	4.6 X 10^2	4.6 X 10^2	4.3 X 10^2	2.9 X 10^2	2.8 X 10^2
25	*Total fungi count (TFC) (cfu/100 ml)*	4.1 X 10^2	3.7 X 10^2	3.8 X 10^2	3.9 X 10^2	2.3 X 10^2	2.1 X 10^2
26	*Feacal Coliform Count (FCC) (cfu/ 100 ml)*	3.8 X 10^2	3.1 X 10^2	2.9 X 10^2	3.1 X 10^2	1.9 X 10^2	1.6 X 10^2

TABLE 4

PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE BORNO

PHYSICAL/CHEMICAL PARAMETERS OF SOILS SAMPLES

S/N	PARAMETERS (Units in mg/kg) accepted stated	BOR- SS 7 0-15cm	BOR- SS 7 16-30cm	BOR- Control 0-15cm	BOR- control 16-30cm
A	**PHYSICAL TEST**				
1	TEMERATURE (^{O}C)	35.9	35.0	35.8	35.1
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 47.34/39.1/13.56	SAND/SILT/CLAY 26.25/45.84/27.91	SAND/SILT/CLAY 18.20/52.65/29.15	SAND/SILT/CLAY 11.37/43.19/45.44
3	$_{P}$H	7.28	7.23	7.27	7.24
4	MOISTURE CONTENT (%)	1.127	1.270	0.870	0.823
5	SOIL POROSITY (%)	28.33	26.00	25.00	26.00
6	BULK DENSITY (g/cm^3)	1.175	1.120	1.070	1.130
7	WET DENSITY (g/cm^3)	1.220	1.114	0.950	1.000
8	DRY DENSITY (g/cm^3)	1.110	1.050	1.190	1.250
B	**ORGANICS**				
9	TOTAL ORGANIC CARBON	3.60	3.10	1.00	1.80
C	**EXCHANGEABLE IONS**				
10	PHOSPHATE (mg/kg)	1.014	0.904	0.706	0.706
11	SULPHATE (mg/kg)	42.33	37.90	31.60	30.20
12	NITRATE (mg/kg)	11.04	10.60	2.074	3.870
13	CALCIUM (mg/kg)	32.60	29.40	25.70	22.90
14	MAGNESSIUM (mg/kg)	16.70	15.40	12.60	11.80
15	CHLORIDE (mg/kg)	2.138	2.840	2.000	2.000
D	**HEAVY METALS**				
16	MANGANESE (mg/kg)	1.107	1.053	0.608	1.832
17	COPPER (mg/kg)	1.004	0.893	2.185	1.110
18	IRON (mg/kg)	4.024	3.613	3.652	2.615
19	ZINC (mg/kg)	3.243	1.817	2.483	2.854
20	CADMIUM (mg/kg)	0.032	0.020	0.017	0.014
21	LEAD (mg/kg)	0.012	0.007	0.009	0.008
22	NICKEL (mg/kg)	0.009	0.005	0.004	0.002
E	**BACTERIAL ISOLATE**				
23	*Total Heterotrophic Bacteria (cfu/100 ml)*	3.2 X 10^2	3.0 X 10^2	4.7 X 10^2	4.1 X 10^2
24	*Total Heterotrophic fungi (THF) (cfu/100 ml)*	2.8 X 10^2	2.5 X 10^2	3.6 X 10^2	3.4 X 10^2
25	*Total fungi count (TFC) (cfu/100 ml)*	2.2 X 10^2	2.0 X 10^2	3.1 X 10^2	3.2 X 10^2
26	*Feacal Coliform Count (FCC) (cfu/ 100 ml)*	1.8 X 10^2	1.4 X 10^2	1.8 X 10^2	1.7 X 10^2

TITILOYE 0. CHARLES AISLT
AD (LAB. SCIENCE)

APPENDIX 4

(FMENV LABORATORY CERTIFICATE)

Accreditation No: 0004265

FEDERAL MINISTRY OF ENVIRONMENT

ACCREDITATION TO OPERATE AS ENVIRONMENTAL CONSULTANT

The Permanent Secretary of the Federal Ministry of Environment (FMENV), hereby accredits the bearer whose particulars appear below to operate as Environmental Consultant pursuant to an Application for Registration/Renewal dated 12TH day of SEPTEMBER 20 11

1. Full Name of Consultant: ABUJA ENVIRONMENTAL PROTECTION BOARD
2. Location of Business Premises/Laboratory: BLOCK 10, PLANT NURSERY, ASOKORO, ABUJA, FCT
3. Year of Incorporation of Business:
4. Area(s) of Competence: ENVIRONMENTAL LABORATORY SERVICES

This Accreditation is granted subject to compliance with all regulations, Guidelines, Standards and Control criteria as may be issued by the Federal Ministry of Environment from time to time.

Date of Issue: 4TH JANUARY, 20 22 Expiry Date: 3RD JANUARY, 20 27

Seal of the Federal Ministry of Environment

FMENV shall not be liable to any claim(s) under this permit

Permanent Secretary

APPENDIX 5

LABORATORY ANALYSIS WITNESSING BY FMENV STAFF