DRAFT ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

FOR

THE PROPOSED OCP FERTILIZER BLENDING PLANT PROJECT AT KALAMBAINA

WAMAKKO LOCAL GOVERNMENT AREA OF SOKOTO STATE

BY

OCP NIGERIA LIMITED

SUBMITTED TO THE FEDERAL MINISTRY OF ENVIRONMENT

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LIST OF ACRONYMS AND ABBREVIATIONS

ALARP	as Low as Reasonably Practicable
ASAP	As Soon as Possible
BCS	Broad Community Support
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CSO	Civil Society Organization
CFC	Chloro-floro-carbons
CHSSP	Community Health, Safety and Security Plan
CLO	Community Liaison Officer
CHSSP	Community Health, Safety and Security Plan
CLO	Community Liaison Officer
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ERP	Emergency Response Plan
ERP	Emergency Response Plan
FGN	Federal Government of Nigeria
FRN	Federal Republic of Nigeria
H&S	Health and Safety HSE Health Safety and Environment
HIV	Human Immuno-Deficiency Virus
AIDS	Acquired Immuno-Deficiency Syndrome

HSE	Health Safety and Environment
IEE	Initial Environmental Examination
KTSG	Sokoto State Government
LFN	Laws of the Federation of Nigeria
LGA	Local Government Area
MDAs	Ministries, Departments & Agencies
NGO	Non-governmental Organization
OSH	Occupational Safety and Health
OSHMS	Occupational Safety and Health Management System
OCPANL	OCP Africa Nigeria Limited
OSH	Occupational Safety and Health
PAP	Project Affected Persons
PPE	Personal Protective Equipment
S&H	Safety and Health
SWP	Safe Work Procedures
SMART	Specific, Measurable, Achievable, Relevant and Time-Bound
SME	State Ministry of Environment
SOSG	Sokoto State Government
STIs	Sexually Transmitted Infections
SWP	Safe Work Procedures
ToR	Terms of Reference

ST OF ORGANIZATIONS

ANL	Allot Nigeria Limited
FEPA	Federal Environmental Protection Agency
FMEnv	Federal Ministry of Environment
FMEnv	Federal Ministry of Environment
GASL	OCP Nigeria Limited
KSTMEnv	Sokoto State Ministry of Environment
OSHA	Occupation Safety and Health Administration
RUWASSA	Rural Water Supply and Sanitation Agency
UNEP	United Nations Environmental Programme
USEPA	United States Environmental Protection Agency
WHO	World Health Organization

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S/No.	Name	Address	Area of specialization	Role played in the EIA
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EXECUTIVE SUMMARY

BACKGROUND

Nigeria is struggling for self-sufficiency in its agricultural sector. In spite of the fact that agriculture is the highest employer of labour in Nigeria, the sector has remained largely underdeveloped, inefficient and characterized by dearth of sufficient supply of agricultural inputs such as fertilizers, pesticides and improved seedlings. In recognition of the fact that no meaningful economic growth and development can take place without food self-sufficiency, Government of Federal Republic of Nigeria is currently intensifying efforts in boosting local production of various inputs, especially fertilizers. In this regard, OCP Africa Nigeria Limited (OCPANL), wishes to establish a fertilizer blending plant in Kalambaina, Wamakko Local Government Area (LGA) of Sokoto State.

The proposed initiative will to a very large extent facilitate agricultural production as well as increase socio-economic activities in this part of Sokoto State well known for its vast and fertile agricultural lands as the agricultural hub of the State.

However, development projects of this nature and scale, when not handled in an environmentally sustainable manner, tend to degrade the environment and pose environmental challenges. To ensure environmental protection and sustainability in Nigeria, the Environmental Impact Assessment (EIA) Act CAP E12, LFN 2004, was enacted. The Act makes carrying out Environmental Impact Assessment mandatory for major development projects and stipulates the various categories of EIAs and their statutory requirements. EIAs are carried out in order to identify potential impacts in the planning process and to make provisions, through an Environmental Management Plan (EMP), to adequately handle negative impacts by out rightly avoiding, mitigating or compensating for them while enhancing positive ones.

In compliance with EIA Act 2004 therefore, an EIA has to be carried out before the implementation of the proposed project. In this regard Integrated Advanced Quest Engineering Limited (IAQEL), for the proposed project was commissioned, as an Environmental Consultant, to carry out an EIA for the proposed fertilizer blending plant, which is the subject of this report.

The EIA Study

The Environmental and Social Impacts Assessment (EIA) for the proposed project was therefore undertaken by IAQEL so as to identify environmental and socio-economic impacts associated with the project and offer preventive and mitigation measures through an Environmental Management Plan (EMP) which has been designed for the various phases of the project. The EMP also contains enhancement measures for the realization of the positive impacts of the project. The EIA was carried out in compliance with the Nigerian EIA Act of 2004, other environmental provisions/regulations and relevant Nigerian laws as well as other international regulations/guidelines.

The objectives of the EMP are to:

- ✓ Determine the beneficial and adverse impacts of the proposed project;
- ✓ Propose effective measures to mitigate the adverse (negative) impacts and enhance beneficial (positive) ones;
- ✓ Outline management clauses and enforcement mechanisms to be included in the contract for the implementation of the mitigation measures; and
- ✓ Prepare a monitoring and management plan indicating parameters to be monitored, responsibilities and outputs.

The Applicant

OCP Africa Nigeria Limited (OCPANL) is the proponent for the proposed project. The environmental consultant, IAQEL, has been appointed to apply for environmental approval of the project and is therefore the applicant for the EIA process.

EIA Terms of Reference (ToR)

The Terms of Reference (TOR) used in guiding the execution and implementing the EIA of the proposed project are as follows:

- ✓ Carry out a detailed one season Environmental baseline studies of the ambient environment;
- ✓ Define the procedures and protocols for identification and assessment of associated and potential impacts;
- ✓ Identify appropriate mitigation measures for such impacts and develop an effective Environmental Management Plan for the project;
- ✓ Define framework for interaction and integration of views of a multidisciplinary project team with regulators, host communities and other stakeholders; and
- ✓ Define relevant framework of legal and administrative requirements for the project.

Policy and Legal Frameworks

EIA studies are carried out within the frameworks of both local and international policies, laws as well as environmental guidelines and regulations. The following policies, laws, principles, guidelines and regulations were specifically considered:

- ✓ The 1999 Constitution of the Federal Republic of Nigeria;
- ✓ The National Policy on the Environment, NPE (1989, revised 1999);

- ✓ Economic Policy Framework;
- ✓ Environmental Decree No 86 of 1992 (known as Environmental Impact Assessment Act CAP E12) (hereinafter referred to as the EIA Act);
- ✓ The National Environmental Standards and Regulation Enforcement Agency Act (No. 25 of 2007) (NESREA);
- ✓ Harmful Waste Act No. 42 of 25 November 1988;
- ✓ Forestry Act, 1958;
- ✓ Land Use Act 1978;
- ✓ Environmental Impact Assessment Sectorial Guideline for Infrastructure development projects (1995) of the Federal Ministry of Environment;
- ✓ National Environmental Protection (Effluent Limitation) Regulations S.I.8 (1991)
- ✓ National Environmental Protection S. I .9 (Pollution and Abatement in Industries in Facilities Producing Waste) Regulations, 1991;
- ✓ National Environmental Protection (Management of Solid and Hazardous Wastes) Regulation S.I. 15; and
- ✓ Other national legislations such as Penal Code and Explosives Act.

International Standards, Treaties and Conventions

At the international level, Nigeria is party to a number of Conventions that are relevant to the proposed development project. The more relevant ones are as follows:

- ✓ Vienna Convention for the Protection of the Ozone Layer, including the Montreal Protocol and the London Amendment;
- ✓ The Framework Convention on Climate Change, Kyoto Protocol, 1995; and
- ✓ The Convention on Biological Diversity, 1992;

EIA Procedure in Nigeria

The procedure indicates the steps to be followed from project conception to commissioning in order to ensure that the project is implemented with maximum consideration for the environment.

The procedure for EIA involves the project proposal stage where the project proponent notifies FMEnv of the proposed project in writing.

This stage is followed by the screening phase, during which the Ministry will carry out, an Initial Environmental Examination (IEE) and assign the project into a category based on some of its characteristics such as magnitude, environmental risks and their significance, etc. The location of the project if in Environmentally Sensitive Areas (ESAs) is also an important criterion in project categorization. There are three categories (I, II, III) in FMEnv's EIA/EMP Procedural Guideline. Category 1 projects are subjected to full-scale EIA/EMP. Projects listed in Category II may not require a full-scale EIA/EMP except when such a project is located in an Environmentally Sensitive Area (ESA) and in this case the project will be automatically assigned to Category I. The requirement for Category II projects is a partial EIA/EMP. Category III projects are those expected to have essentially beneficial impacts on the environment.

The next stage is scoping stage, the main feature of which is that the proponent will be required to submit a Terms of Reference (TOR) for the proposed EIA study. This stage is followed by actual implementation of the EIA/EMP study, preparation of Draft Final and Final EIA/EMP Reports, review process and approval/certification.

EIA Methodology

This EIA has involved environmental screening which allowed the FMEnv to appropriately categorize the proposed project. A scoping process was undertaken in which a wet season sampling of relevant bio-physical components in the project areas and Stakeholder Engagement with various sectors of society as a well as stakeholder workshop were carried out. Analysis of collected samples and consultation allowed the environmental and social baselines of the project to be established and also the constraints, opportunities and potential impacts of the projects to be analyzed. The specialists engaged have completed their specific studies. The studies involved the assessment of the significance of the potential biophysical and social impacts and provision of recommended measures to reduce negative impacts and enhance positive ones. The results of these studies formed the basis of this Environmental Management Plan (EMP) which sets out how the social and biophysical environment would be protected and enhanced during the construction and operational phases of the proposed project.

Need for the Project

For Nigeria to become self-sufficient agriculturally, it needs to be self-reliant in the production of agricultural inputs which are indispensable in agricultural production. In this regard Nigerian Government recently banned importation of fertilizer which further necessitates gearing of efforts by local entrepreneurs towards local manufacturing of fertilizer.

It is therefore imperative to implement this project so as to boost agriculture and socio-economic activities in the project area. The proposed project will thus go a long way in meeting the critical fertilizer needs of farmers in this key agricultural hub of Sokoto State and Nigeria.

Project Objectives

The overall objectives of the project are to:

- ✓ Make fertilizer available to farmers at the right time and price;
- ✓ Produce 90 tons of fertilizer through the use of Urea, Di-ammonium Phosphate (DAP), Muriate of Potash (MOP) and Limestone Granules (LSG) as raw materials

- ✓ Stimulate and contribute to the agricultural development of Sokoto State and by extension Nigeria; and
- ✓ Create both direct and in-direct employment opportunity for substantial number of Nigerians.

Benefits of the project

The key benefits associated with the project are thus as follows:

- ✓ Increasing the national supply of fertilizer;
- ✓ Making fertilizer more affordable in the project area;
- ✓ Creation of job opportunities for people in the project area and the country at large
- ✓ Creation of wealth in the project area and the country at large; and
- ✓ boosting socio-economic activities in the project area and the country.

PROJECT DESCRIPTION

The proposed fertilizer blending plant is to be located in Kalambaina industrial area of Wamakko LGA in Sokoto State. The site is about 10-hectare of land and has adequate space for the proposed facilities and with land also available for expansion whenever required in future.

Preconstruction activities

Preconstruction activities for this project include feasibility/technical design and environmental planning. Others are recruitment of semi-skilled and non-skilled workforce as well as establishment of site offices.

Source of Construction Equipment

It is expected that the construction company to be awarded the contract would own all or most of the construction equipment to be utilized in executing the project. It therefore follows that construction equipment would be transported by road from the main yard of the construction company or from any existing project site run by the company.

Estimated Project Workforce

In the construction phase, the proposed project will directly employ about seventy skilled professionals as well as about eighty to a hundred unskilled employees; in the operational phase, the project will employ twenty-five (25) skilled professionals and about twenty-five to fifty (25-50) unskilled labourers depending on the number of shifts to be operated.

However, during employee recruitment, priority will be given to qualified persons from the host community, followed by those from nearby communities. This will be in accordance with a Local Content Plan to be designed by the contractor and vetted by OCP Africa Nigeria Limited, FMEnv and Sokoto State Ministry of Environment.

Construction phase activities

The Construction Phase of this project will begin with surveying and clearing of the proposed land. It will also involve provision of additional fill material for improvement of the low-lying sections of the land through provision of naturally occurring lateritic material as fill. Building of perimeter fence will follow and then building of factory blocks (to house the processing and blending equipment), office blocks, storage facilities and security gate post. All buildings will be made of concrete blocks.

Processing and blending equipment will then be procured and installed according to manufacturers' specifications. Afterwards, installed equipment will then be test-run to ensure they have been successfully installed.

Operational Activities

Operational phase of the project will succeed the construction phase and would be characterized by raw materials processing and fertilizer blending and production activities which would be followed by packaging and branding and then shipping out to customers or storage. The installed equipment would also require routine maintenance in the operational phase.

Decommissioning Activities

The design life of the proposed factory will be 20 years, which is dependent on proper maintenance. Establishment of the fertilizer factory is part of the medium- and long-term plans to meet the country's fertilizer needs for agricultural production and economic growth; therefore, it is unlikely that the plant would be decommissioned in the near future. It would more likely be upgraded or rehabilitated if this is found to be necessary. However, should decommissioning be required in the long run, the general good practice guidelines for decommissioning of infrastructure as well as the existing environmental legislation of the time would then guide appropriate decommissioning of the fertilizer blending plant.

However, at the end of the construction phase the construction site and yard will be rehabilitated according to recommended plans before abandonment.

ENVIRONMENTAL BASELINE DESCRIPTION

Baseline Data Acquisition Method

Environmental baseline data for this project were acquired through desktop research, field observations, sampling and measurements as well as laboratory analysis of collected samples. Prior to field investigations, background and design information on the project were obtained from the project developer. Wet season field work was then used to verify and complement information gathered from desktop research. The fieldwork, which took place from 15th to 19th October 2019, covered all relevant elements of the ecological and socio-economic environment.

Public consultations were held with different stakeholders on issues relating to the potential ecological and socio-economic impacts of the proposed project.

Spatial boundaries for ecological and socio-economic studies

Spatial boundary considered for the ecological studies in this EIA consisted of areas not more than five hundred (500) metres from the proposed site of the project, while that for socio-economic studies was limited to areas not farther than two kilometres (2km) from the proposed project site.

In situ Measurements

As recommended by FEPA (1991), in situ measurements were carried out on some physical parameters of the project environment. These parameters included: Air quality (Suspended particulate matter, SPM, COx, SOx, NOx, NH_3, H_2S, HC) Noise; and water quality (pH, temperature, dissolved oxygen concentration, total dissolved solids, conductivity, turbidity and salinity).

Sampling Criteria

Wet season sampling of flora, fauna, soil and ground water was carried out during the field work. Based on the objectives, eitht (8) soil samples including two controls and three surface water samples and two (2) groundwater samples were taken from the project area.

Soils Sampling

Surface soil was investigated through visual observation and sampling. Eight (8) soil samples were collected including two (2) control samples. Composite soil samples were obtained from designated sampling points on the site of the proposed project. Samples for microbiological analysis were collected in sterile McCarthey bottles and kept under 4^0C in a refrigerated box. Physico-chemical analysis of soil samples was carried out using the analytical methods recommended by FEPA (1991).

Water Quality and Hydro-biological Studies

In-situ measurements for pH, temperature, conductivity and dissolved oxygen were conducted with Pye Unicam meter on two groundwater samples and one control sample. For physiochemical and microbial analysis, duplicate water samples were collected in two 1-litre plastic containers, labeled and stored in an insulated refrigerated container.

All samples for laboratory analysis were taken to Zabson Laboratories Limited, located in Masaka, Nasarawa State. This was because, according to available information, there was no any accredited environmental laboratory in Sokoto State. However, the consultant made sure that all samples for microbial analysis were appropriately preserved at 4^0C.

Socio-Economic Studies

The primary data for the study was obtained from structured questionnaires; Focus Group Discussions (FGDs), stakeholder's workshop and personal interviews. The questionnaire was designed to generate information on demographic structure and socio-cultural characteristics of the inhabitants; local economy and available infrastructure among others.

A simplified spatial boundary considered for the socio-economic studies in this EIA comprised of communities living or carrying out business activities in locations within a two-kilometer (2km) radius from the proposed factory site. Thus the socio-economic studies were restricted to the three districts of Wamakko, Arkilla and Kalambaina.

The Project Area

Wamakko (LGA) is one of the 23 LGAs of Sokoto State. It has an area of 697 km^2 and a population of 179,619 people, (NPC, 2006). The Local Government Area was created out of Sokoto state in 1991. It has ten (10) districts: Dundaye, Gumburawa, Gumbi, Gwuiwa, Wajake, Gedawa, Kalambaina, Arkilla, Gidan Bubu, and Wamkko. Its headquarters is located in Wamakko town, about 10km from Sokoto city, the state capital. The Local Government Area is located to the extreme North West part of the state on lat of 130 7.5528' N - and long 5o 12.5400' E. It is bordered on the North by Tangaza Local Government Area, to the South by Bodinga (LGA) and Yabo (LGA), to the West by Silame (LGA) and to the East by Sokoto north and Kware (LGA).

Climate

The climate of the study area is characterized by a long dry season (October/November-April/May) with a short rainy season (May-September/October), (Singh, 1995). The study area experiences harmattan wind (N-E Trade winds), which are dry, cold, and dusty blowing between the months of November to February.

Vegetation

The vegetation of the area falls within the Sudan Savannah vegetation zone characterized by soils that are mostly sandy to loamy in texture with some patches of clayey subsoil. An assortment of various species of grasses and legumes, patches of bushes and sparsely distributed indigenous tree species majority of which are thorny tree species, such trees include Acacia nilotica, Faidherbia albida, Zizipus spp, Tamarindus indica, Balanites aegyptiaca, etc, (Ango, et al., 2014).

Relief

The LGA is general composed of undulating plains which generally rise up to about 300 m above sea level.

Geology and Soils

The Kalambaina Formation consists of marine white, clayey limestones and shales. The thickness of the formation is quite variable, because of the subsurface dissolution of the limestone. The maximum thickness in the boreholes is over 20 m, but usually only about 12 m of section is exposed in the quarry.

Soil in the project area is sandy to loamy in texture with some patches of clayey subsoil. It is relatively easy to cultivate with little leaching hence, it is generally good for cultivation of groundnuts, grains and cotton.

Soil Physico-chemical Characteristics

The baseline concentrations of key potential pollutants from the production process shows that the potential pollutant concentrations in the baseline is below the regulatory limits stipulated by FMEnv. This is the case with Phosphate, Nitrate, Nitrite, Calcium.

Physico-Chemical Properties of Water in the Project Area

Relevant physico-chemical parameters of water from the project area were analyzed and the results show that among other salts present which include phosphate, sulphates, nitrites, nitrates, magnesium, etc., only calcium has higher baseline concentrations than the regulatory limits set by FMEnv.

Air Quality Studies

Air quality characteristics were monitored in eight (8) locations on the proposed factory site. Overall, results from air quality monitoring in the project area showed that the concentrations of gaseous pollutants were lower than the limits set by the regulatory authority (FMEnv).

Noise Level Studies

The noise level measurements were carried out directly at selected points on the project site by using a very sensitive noise level meter. Noise levels recorded were all within the regulatory limits stipulated by FMEnv.

Public Consultation

Consultations were carried out with the communities to be affected by environmental and social impacts of the proposed project and with other relevant institutional stakeholders.

Objectives of Consultation

The main objectives of these consultations were to:

- ✓ To inform stakeholders about the proposed project and its potential benefits as well as discuss environmental and social issues associated with the project and solicit for their views and concerns;
- ✓ Collect relevant information for the project design;
- ✓ To identify and mitigate impacts before the project gets underway;
- ✓ To avoid conflicts by addressing issues of concern early and continuously in the life of the project; and
- ✓ To ensure that any fears or apprehension about the nature, scale and impacts of the project have been fully addressed.

The primary stakeholders consulted include FMEnv; communities in Wamakko, Arkilla and Kalambaina districts and their traditional councils headed by the District Heads; youth groups; Wamakko LGA Council; and SEPA/SOSME.

The stakeholders were consulted directly and indirectly through visitations and by Focused Group Discussions.

Highlights from the consultation process in the project communities include the following:

- ✓ Attendance at all the consultation meetings was appreciable and cut across the different strata of the communities;
- ✓ The communities want the proponent consider some of their youths for employment in both the constructional and operational phases of the project;
- ✓ The communities also want complimentary infrastructure such as roads and drainage system; and
- ✓ Community leaders assured the meetings that they would give their moral support in the implementation of the project.

Traditional Administration

The emirate system of traditional governance is practiced in Sokoto State, with the Sultan as Head of all emirs and the leader of all Muslims in Nigeria. The District Heads of Wamakko, Arkilla and Kalambaina districts are the highest-ranking traditional rulers in the project area. They report to the Sultan of Sokoto who appointed them. They run local traditional councils that assist them in running the daily affairs of their respective districts.

Ethnic Groups

The predominant ethnic groups in the project area are the Hausas and the Fulanis. Other ethnic groups, such as the Igbo and Yoruba and other minority tribes also reside in the area in small populations.

Population

The current population of the three districts in the project area (projected from the 2006 Census figure) is 76469 people.

Age Profile

The age distribution of respondent household heads at various locations in the study area showed a predominance of the working-age population (21 to 60 years), which is cumulatively much higher than 50% of the entire respondents in all the three districts.

Marital Status

The percentage of married respondent household heads in Wamakko, Arkilla and Kalambaina are respectively 82.5%, 65.4% and 96%.

Educational Background

27.5% of respondents in Wamakko have secondary school education, while those with primary education and Islamic/Quranic education constitute 20% each. Respondents with tertiary education and those with postgraduate level of education constitute 15% and 17.5% respectively.

Social Infrastructure

Wamakko LGA is supplied with water by boreholes provided by both the three tiers of Government as well as by International Donor Agencies and similar organizations. Other sources of water in the project area include pipe-borne water, wells and surface water in seasonal ponds and rivers in remote parts of the project area.

Electricity in the settlement is provided by Kaduna Electricity Distribution Company (KEDCO). However, as in other parts of the country, a number of reasons have combined to impede a constant supply of electricity in the project area which led many people to be using private electricity generating sets.

Private telecommunication companies that provide telecommunication services in form of mobile phone (GSM) and digital data services (Internet) in the project area include MTN, 9Mobile, Airtel and Glo.

Means of transportation in the study area include automobiles and bicycles, as well as animals and animal-driven carts in the rural areas.

Wamakko LGA enjoys a fairly good tarred road network. However, the network is more prominent at the city centres.

The project area is relatively secure and free from activities of criminals such as kidnappers and armed robbers.

Social vices like drug abuse and prostitution take place in the project area in a very limited extent. People in the area normally frown at such vices which mainly take place in hidden or isolated areas at night.

Most people in the study area dispose of their domestic waste by open dumping. Sometimes they openly burn such refuse after gathering it over a long period of time.

Housing and Settlement Pattern

Settlements in the project area are a mixture of urban and rural with low and high residential densities. Types of houses in the study area are both modern and traditional. In major streets, houses made of cement and concrete blocks predominate, while in other smaller settlements in the outskirts and neighbouring villages, houses are mostly made of mud.

Land use

Major land use observed in the project area is agricultural, followed by residential, institutional and commercial and to a much lesser extent recreational. Agricultural land use in the project area is in form of farming and rearing of animals, while institutional land use is mostly in form of schools and administrative and office accommodation.

Economic Activities

People in the project area are predominantly peasant farmers. Other occupations in the project area include traditional crafts, petty trading, transportation services, hawking, masonry, civil service, etc. However, some respondents have multiple streams of income.

People in the project area make use of government hospitals, private clinics, off-the-shelf self-medication and also resort to consulting herbal and traditional alternative health practitioners.

Primary Health Centres are owned and operated by Wamakko Local Government Area in its major wards. There are also numerous private clinics in the study area, although they charge relatively higher prices for their services. According to the survey, most people prefer to use government health services in the project area.

Biological Features

Vegetation in the project area mainly composes of bushes and farm lands and is characterized by the coexistence of trees, shrubs and grasses. The vegetation zone in the area can be described as Sahel Savanna type which combines the characteristics and species of Sahel Savanna. Extensive farming is practiced in this zone and agricultural produce in the zone include vegetable, fruits and cereals. In particular, guinea corn, rice, cowpea, groundnut, onion, water melon, soy beans, etc. are grown in the region.

Invertebrate fauna was the most common and ubiquitous of all identified species and include black ants, earth worms, wood lice dragon and damsel flies, bugs, crickets, butterflies and moths, beetles, mantis, stick insects, bees, wasps, etc.

BENEFICIAL AND ADVERSE IMPACTS

Either positive or negative, impacts can vary considerably in magnitude, extent and in significance. The following impacts were identified from the analysis carried out using appropriate time-tested methodologies.

Positive Impacts in the construction phase

Significant positive impacts identified in the construction phase include provision of skill acquisition training and local employment and procurement opportunities to the host communities as well as boost in local trading activities.

Positive Impacts in the operational phase

The most significant positive impacts of the proposed project in this phase is increased availability of fertilizer as well as lowering of its cost and boost in agricultural production and socio-economic activities in the project area and the country at large.

Negative Impacts in the construction phase

Negative impacts in the Construction Phase, include the risks of soil and water pollution, occupational accidents and spread of HIV/AIDS and other communicable diseases that may come from interaction with a non-local workforce.

Negative impacts in the Operational phase

Negative impacts in the Operations Phase may include soil and water pollution and hazards on human health from emissions and operation accidents/injuries.

There may be also be risks of attack by terrorist who may attack the factory to steal urea for the purpose of making Improvised Explosive Devices (IEDs).

MITIGATION AND ENHANCEMENT MEASURES

Mitigation measures have been designed for identified negative impacts. Some of these measures against the negative impacts in the construction phase include regular maintenance of construction equipment to reduce emission and soil and water pollution as well as appropriate planning of noisy operations and provision and enforcement of use appropriate HSE kits. As mitigation measures against HIV/AIDs and operational accidents in the construction phase, employees and communities should be sensitized on HIV/AIDs protection and prevention measures and occupational accident prevention measures.

Enhancement measures for positive impacts in construction phase of the project will include giving project host communities procurement opportunities whenever possible as well as employing them as construction employees and developing their capacity through on-the-job training.

Mitigation measures in the Operations Phase include ensuring strict use of PPEs, good house-keeping and appropriate waste management as well as robust emergency preparedness, including having effective fire-fighting equipment as well as standby emergency medical ambulance and First Aid Kits. As mitigation against terrorist attack, a fortified perimeter fence and gate post with a round-the-clock armed security guards will be provided.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (EMP)

This Environmental Management Plan has been designed provides details of management measures including actions to be taken, stakeholder roles and responsibilities, time frames and monitoring schedule for ensuring that all potential impacts are effectively managed.

The Environmental Management Plan aims at ensuring the following:

- ✓ That environmental, social and health & safety factors are carefully managed throughout the project cycle.
- ✓ That the project complies with regulatory stipulations and guidelines;
- ✓ That environmental performance is verified through information on impacts as they occur;
- ✓ That project implementation responds to unforeseen events and to changes not considered in this EIA;
- ✓ That there is provision of feedback for continuous improvement in environmental performance;
- ✓ That institutional arrangements required to implement the environmental impact mitigation and enhancement measures are specified and include a monitoring program, for appropriate environmental parameters, to assess the success of the mitigating/enhancement measures, as well as their timely execution; and
- ✓ That an implementation schedule for the mitigation measures is provided.

The project contractor shall be responsible for the implementation of the EMP falling under the scope of his contract. The environmental consultant shall undertake the monitoring of the EMP for all the phases of the project. This shall be done in close collaboration with FMEnv and SEPA/SOSME.

To ensure the success of environmental management of the project, the entire project team and other relevant stakeholders would be properly mobilized and oriented on the necessity and methods for sound and environmentally responsible project operations and delivery. Sokoto State Ministry of Environment and the project host communities are also expected to be part of the monitoring programme to be carried out under the EMP. Good relations and interactions between the contractor and the other stakeholders and exchange of timely information and project scheduling, duration of construction works, and minimizing potential interference with public services and business and social activities will go a long way in avoiding social conflicts. Communication channels between the contractor, host communities and other stakeholders should always be open to ensure proper and timely responses to any complaints that may arise during project execution.

CONCLUSIONS

The Environmental Impact Assessment for the proposed OCP Fertilizer Blending Plant project was carried out in compliance with existing national and international guidelines and regulations. Relevant stakeholders were also duly consulted during the study so as to ensure the success of the implementation of the environmental and socio-economic management framework for the project. The study has identified the potential environmental impacts of the project and proffered appropriate mitigation measures to be carried out under this Environmental Management Plan.

Although the project is expected to produce some negative impacts, most of which are expected to occur in the constructional phase, these impacts can be effectively mitigated by implementing the stipulated actions in the EMP.

In conclusion, the proposed OCP Fertilizer Blending Plant project, by OCP Nigeria Limited, is environmentally and socially justified and acceptable to the entire project stakeholders, as long as the Environmental and Social Management Plan is strictly implemented. The project is therefore recommended for an integrated implementation with the Environmental Management Plan.

ACKNOWLEDGEMENTS

OCP Africa Nigeria Limited (OCPANL) wishes to use this opportunity to express its profound gratitude to Federal Ministry of Environment (FMEnv), Sokoto State Ministry of Environment as well as Wamakko Local Government Area Council; for their guidance and worthwhile contributions towards discharging this onerous responsibility. Contributions of other stakeholders, especially community leaders, engaged during the conduct of this Environmental Impact Assessment are also hereby acknowledged. These enormous contributions have proved invaluable in the successful conduct of this assignment.

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

A critical component in agricultural production is sufficient supply of agricultural inputs such as fertilizers, pesticides and improved seedlings. In recognition of the above facts and the fact that no meaningful economic growth and development can take place without food self-sufficiency, Government of Federal Republic of Nigeria is currently intensifying efforts in boosting local production of various types of fertilizers to meet local needs. In this regard, OCP Nigeria Limited (OCPNL), a subsidiary of OCP Group which is a leading global provider of phosphate and its derivatives with almost 100 years of experience, wishes to establish a fertilizer blending plant in Kalambaina, Wamakko Local Government Area of Sokoto State.

The proposed initiative will to a very large extent facilitate agricultural production as well as increase socio-economic activities in this part of Sokoto State well known for its vast and fertile agricultural lands.

However, development projects of this nature and scale, when not handled in an environmentally sustainable manner, tend to degrade the environment and pose further environmental challenges. To ensure environmental protection and sustainability in Nigeria, the Environmental Impact Assessment (EIA) Act CAP E12, LFN 2004 was enacted. The Act makes carrying out Environmental Impact Assessment mandatory for major development projects and stipulates the various categories of EIAs and their statutory requirements. EIAs are carried out in order to identify potential impacts in the planning process and to make provisions, through an Environmental Management Plan (EMP), to adequately handle negative impacts by out rightly avoiding, mitigating or compensating for them while enhancing positive ones.

Therefore, in compliance with EIA Act CAP E12, LFN 2004, an EIA has to be carried out before the implementation of the proposed project. In this regard Integrated Advanced Quest Engineering Limited, IAQEL, the environmental consultant for the proposed project was commissioned to carry out an EIA and design an EMP for the proposed fertilizer blending plant, which is the subject of this report.

1.2 PROJECT OBJECTIVES

The overall objectives of the project are to:

- ✓ Make fertilizer available to farmers at the right time and price;
- ✓ Help to boost local fertilizer production;
- ✓ Facilitate export opportunities and balance the trade between Nigeria and Morocco;
- ✓ Produce different NPK grades with the flexibility to add micronutrients;
- ✓ Produce 120 ton/hour of fertilizer through the use of Urea, Di-ammonium Phosphate (DAP), Muriate of Potash (MOP) and Limestone Granules (LSG) as macronutrients. Alternatively, other raw materials like Ammonium Sulphate, Kieserite and NPS can also be used
- ✓ Stimulate and contribute to the agricultural development of Sokoto State and by extension Nigeria; and
- ✓ Create both direct and in-direct employment opportunities for a substantial number of Nigerians.

1.3 THE APPLICANT

OCP Africa Fertilizers Nigeria Limited is a subsidiary of OCP Group. It's a leading global provider of phosphate and its derivatives created in 2016 to contribute to the sustainable development of African agriculture through providing fertilizer solutions customized to local conditions and crop needs. The company work with partners in many different African governments, non-profit and private enterprises to connect farmers to agricultural services, knowledge, and resources they need in order to prosper.

OCP AFRICA is a multicultural African company based in Morocco, having a presence in eighteen countries with twelve subsidiaries and employees representing 17 nationalities, that works hand-in-hand with farmers and partners across the African continent. CP Group holds 75 percent of the world's phosphate reserves, is one of the leading exporters and producers of raw phosphate, phosphate-based fertilizers, and phosphoric acid in the world. The group already supplies more than 90% of Nigerian fertilizer demand and also wants to leverage on the abundance of ammonia in Nigeria to establish an ammonia production plant which when operational is expected to export ammonia to OCP Morocco plant in Jorf Lasfar.

The Head office of OCP Africa Fertilizers Nigeria Limited is located at No. 29 Wikki Spring St, Maitama 900271, Abuja.

1.4 PROJECT LOCATION

The proposed site for the blending plant is located in Kalambaina town of Wamakko LGA of Sokoto State. The size of the land is 10.209 hectares. Although the shape of the land is irregular, the site is bounded by the following four geographic coordinates: 13^{0}03'05.93" N, 5^{0}11'10.95" E; 13^{0}03'01.1693" N, 5^{0}11'14.25" E; 13^{0}02'52.74" N, 5^{0}11'04.36" E; and 13^{0}03'01.83" N, 5^{0}10'59.80" E. The proposed site is bounded to the northwest by Kalambaina Amusement Park; to the northeast by Kalambaina Road and to the southeast by the new site for Sokoto State Zakkat Commission.

The proposed project area in Kalambaina is a semi-urban area. The climate is a local steppe climate, classified as BSh according to Köppen and Geiger. There is little rainfall throughout the year. The average annual temperature is 28.4 °C.

Relative humidity is generally low especially in the dry season and high in the wet season. The topography of the area is generally flat with few undulations over large areas.

The map of Figure 1.1 shows the proposed project location, while Figure 1.2. is a Google Earth image of the location of the proposed site.

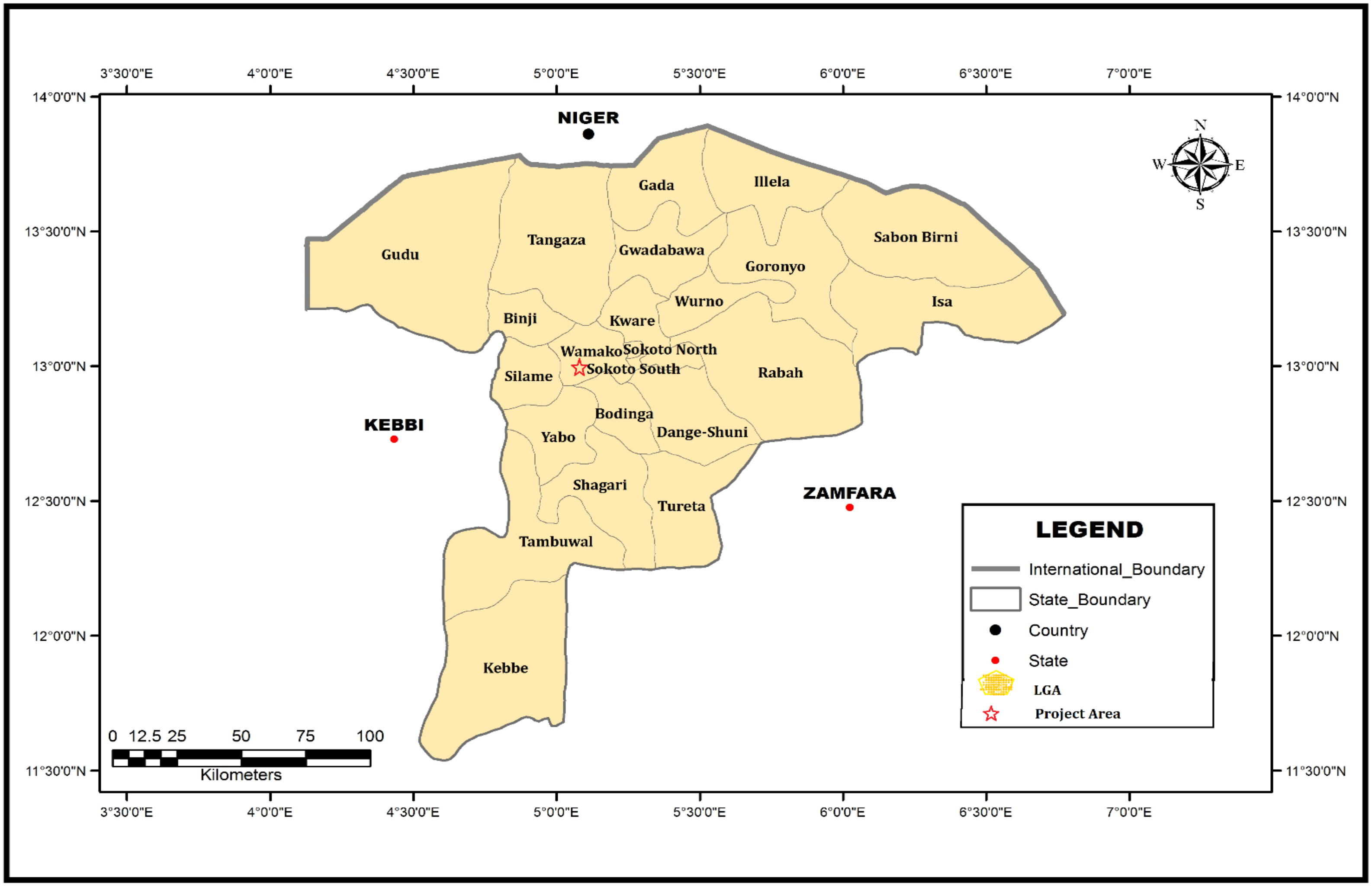

Figure 1. 1: Location of Kalambaina LGA in Sokoto State

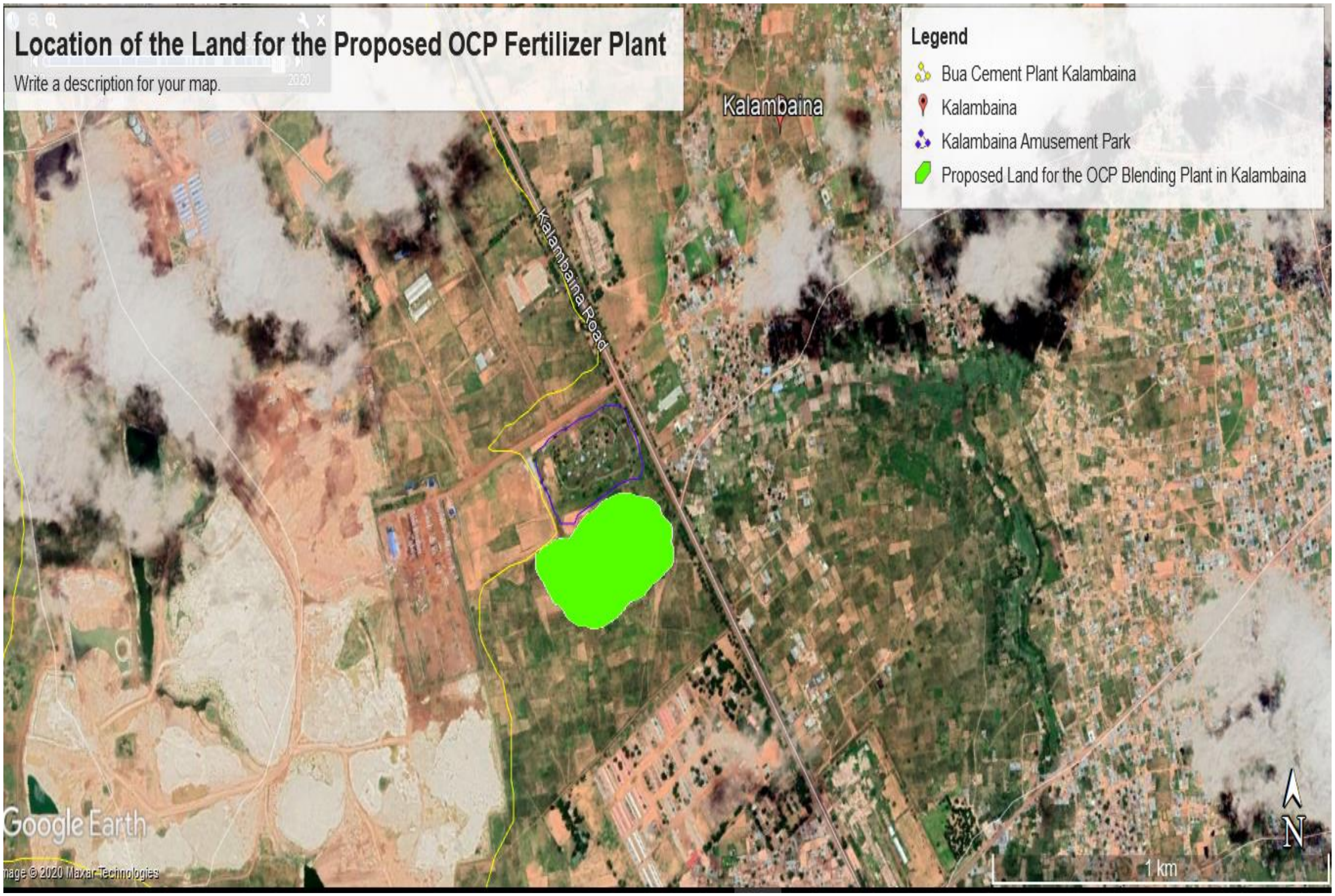

Figure 1. 2: Google earth image of the project lacation in Kalambaina town

1.5 OBJECTIVES OF THE EIA

Environmental Impact Assessment (EIA) is one of the environmental management tools used worldwide to ensure sustainable development and compliance with local, regional and international regulations relating to environmental protection and conservation. The objectives of this EIA are therefore to:

- ✓ Improve the environmental aspects of the proposed project design in order to arrive at an environmentally sound and sustainable design;
- ✓ Ensure compliance with environmental standards, regulations and legislations;
- ✓ Avoid irreversible and serious damage to the project environment;
- ✓ Safeguard valued environmental, socio-economic and cultural resources in the project area;
- ✓ Protect human health, safety and welfare in the immediate and extended project environment;
- ✓ Mitigate the negative impacts and enhance positive impacts associated with the project;
- ✓ Provide an environmental monitoring plan indicating environmental parameters to be monitored, responsibilities and outputs throughout the project life cycle; and
- ✓ Facilitate informed decision making, including formulating the environmental terms, conditions, monitoring and management plans for implementing the project proposal.

1.6 METHODOLOGY

Generally, the study involved desktop studies, field research, consultation, impact assessment and proffering of mitigation measures and the development of an Environmental Management Plan (EMP). The approach used involved the use of a blend of multidisciplinary standard methods used in obtaining basic data for impact prediction/identification which was followed up with designing of appropriate mitigation measures.

The EMP Methodology adopted for this study is shown in Figure 1.2.

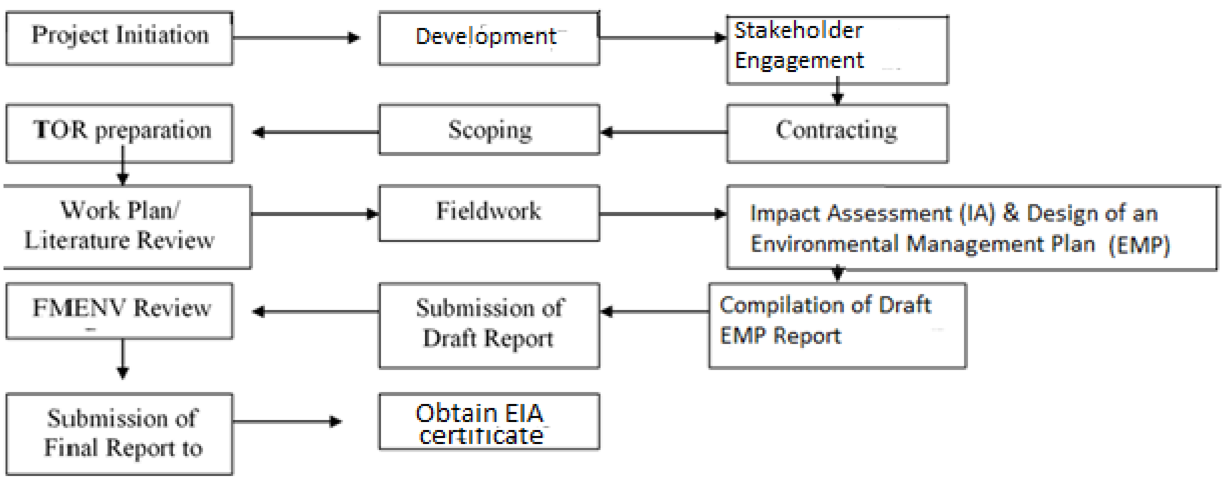

Figure 1. 3: EMP design methodology

1.6.1 Desktop Studies

Desktop study was undertaken to acquire information on climate, geology, soil, groundwater, socio-economics, and other environmental components of the proposed project area. The materials consulted included textbooks, articles, maps and previous EIA reports, such as the Proposed 3rd Line Cement Production Expansion and 48MW Gas Fired Power Plant in KM 10 Kalambaina Road Wamakko LGA, Sokoto State by Cement Company of Northern Nigeria.

1.6.2 Impact Identification and Evaluation

The potential adverse and beneficial impacts of the proposed project were identified by considering and studying the interactions of the environmental components with the existing environment at the mobilization/site preparation, civil works/construction, and maintenance phases. The EIA Sectoral Guidelines for Infrastructure Projects (FEPA 1995), the World Bank Environmental Assessment Source Book (1991), and the conceptual project description among other sources/references were used in the process. Evaluation of the identified impacts was carried out using such criteria as legal/regulatory requirements in respect of planned activities, magnitude of impact, risk posed by impacts, public perception and importance of affected environmental components.

1.6.3 Impact Mitigation

In proffering mitigation measures to prevent, reduce or control the adverse impacts of the proposed project, professional judgment (based on scientific deduction), project experience, knowledge of the ecosystem in which the proposed project shall be located and consensus of opinions among others were considered.

1.6.5 Terms of Reference

The Terms of Reference (TOR) used in guiding the execution and implementing the EMP of the proposed fertilizer blending plant is as detailed below:

- ✓ To define relevant framework of legal and administrative requirements for the project;
- ✓ To carry out a detailed one season environmental baseline studies of the project environment;

- ✓ To identify and assess the associated and potential impacts of the proposed project; and
- ✓ To identify appropriate mitigation measures for such impacts; and
- ✓ To develop an effective Environmental Management Plan for the project.

1.7.6 National EIA Procedure

The FMEnv developed a National EIA Procedure (FEPA 1985) in response to the promulgation of the EIA Act No. 86 of 1992. The procedure indicates the steps to be followed from project conception to commissioning in order to ensure that the project is implemented with maximum consideration for the environment.

The procedure for EIA involves the project proposal stage where the project proponent notifies FMEnv of the proposed project in writing.

This stage is followed by the screening phase, during which the Ministry will carry out, an Initial Environmental Examination (IEE) and assign the project into a category based on some of its characteristics such as magnitude, environmental risks and their significance, etc. The location of the project if in Environmentally Sensitive Areas (ESAs) is also an important criterion in project categorization. There are three categories (I, II, III) in FMEnv's EIA/EMP Procedural Guideline. Category 1 projects are subjected to full-scale EIA/EMP. Projects listed in Category II may not require a full-scale EIA/EMP except when such a project is located in an Environmentally Sensitive Area (ESA) and in this case the project will be automatically assigned to Category I. The requirement for Category II projects is a partial EIA/EMP. Category III projects are those expected to have essentially beneficial impacts on the environment. For projects in this category, the Ministry will issue an Environmental Impact Statement (EIS). Projects in this category include family planning programme, environmental awareness projects, etc.

Another stage of FMEnv's EIA/EMP procedure which comes up after the project proposal stage in the scoping stage, the main feature of which is that the proponent will be required to submit a Terms of Reference (TOR) for the proposed EIA study. This stage is followed by actual implementation of the EIA/EMP study, preparation of Draft Final and Final EIA/EMP Reports, review process and approval/certification.

Figure 1.3 below is a schematic summary of the national EIA process.

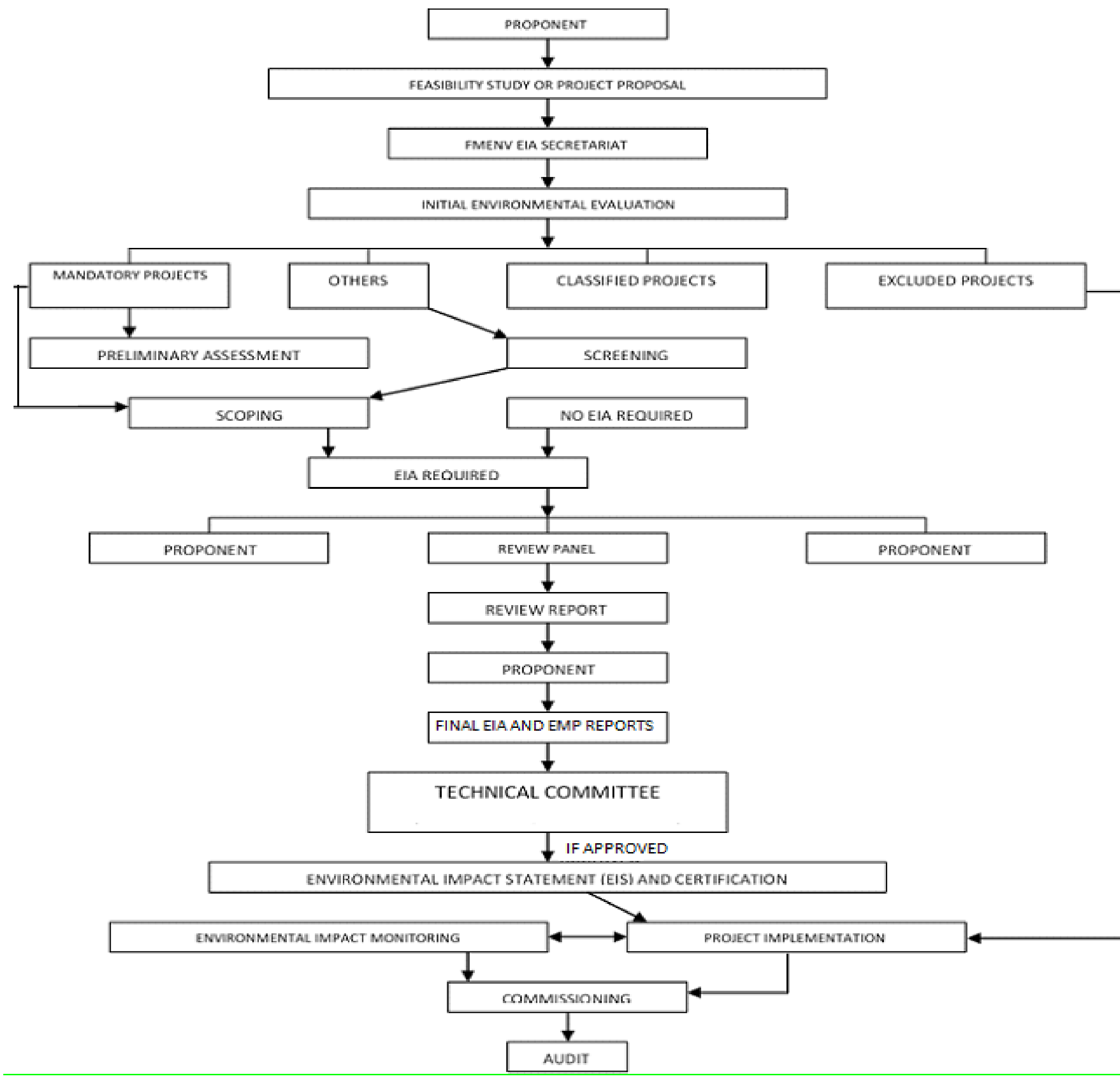

Figure 1. 4: Nigerian EIA Procedure

1.7 ADMINISTRATIVE AND LEGAL FRAMEWORK

This section gives brief discussions on applicable administrative and legal provisions for ensuring environmental protection during implementation and entire life cycle of the proposed project.

1.7.1. Relevant National Policies

A number of policies that play vital roles in environmental protection have been approved by Nigerian government. Some of these policies are outlined in following subsections.

1.7.1.1 National Policy on Environment, 1989 (revised 1999)

The ultimate aim of the National Environmental Policy of Nigeria is the achievement of Sustainable Development of the country as stated in Section 20 of its 1999 Constitution which provides that ''the State shall protect and improve the environment and safeguard the water, air and land, forest and wildlife of Nigeria''. In addition, Nigeria is a signatory to a number of international treaties and conventions governing environmental issues.

In the policy, guidelines and strategies are defined for securing for all Nigerians a quality of environment adequate for their health and well-being; conserving and using the natural resources for the benefit of present and future generations; raising public awareness and promoting understanding of the essential linkages between the environment, resources and development; and cooperation with other countries, international organizations and agencies to achieve optimal use of trans-boundary spaces in order to protect environmental resources.

Environmental protection policy framework in Nigeria is guided by the following environmental concepts:

- ✓ Public Trust Doctrine;

- ✓ Environmental Offsetting Principle;
- ✓ Polluter Pays Principle;
- ✓ User Pays Principle;
- ✓ Precautionary Principle;
- ✓ Pollution Prevention Pays Principle;
- ✓ Inter-generational Equity Principle;
- ✓ Intra-generational Equity Principle; and
- ✓ Participation Principle.

1.7.1.2 National Climate Change Policy and Strategy

Nigeria has a National Adaptation Strategy and Response Plan (NASPA) on Climate Change as well as a Climate Change Department in its Federal Ministry of Environment. Among its other mandates, the Department is to implement the Climate Change Convention and the Kyoto Protocol activities. Nigeria has several policies and strategic initiatives which when properly implemented can mitigate climate change and serve as adaptive measures. Many of the policy initiatives are anticipatory adaptation measures and plans which can be further developed into policy options for climate change response in the country.

1.7.1.2.1 Guiding Principles

The Nigerian climate change policy is guided by a number of principles including the following:

- ✓ The strategic climate change response is consistent with national development priorities;
- ✓ Climate change is addressed within the framework of sustainable development which ensures that response is sensitive to issues of equity, gender, youth, children and other vulnerable groups;
- ✓ National energy use is pursued within the broad context of sustainable development;

- ✓ The policy is integrated with other interrelated policies that promote economic and environmental efficiency;
- ✓ Climate change is cross-cutting and demands application across various governmental, communal, industrial, business and concerned stakeholder sectors;
- ✓ Climate change response provides viable entrepreneurial opportunities.

1.7.1.3 National Policy on Erosion, Flood Control and Coastal Zone Management, (2005)

The above policy and its Action Plan are designed to ensure coordinated and systematic measures in the management and control of the hazards of erosion and floods to reduce their impacts on the people and the environment. Some of the key strategies are as follows:

- ✓ Evolving a mechanism for forecasting, monitoring and control of erosion and floods;
- ✓ Reviewing the land use laws and regulations;
- ✓ Promoting and strengthening training at all levels in erosion and flood prevention, management and control;
- ✓ Creating public awareness to encourage participation.

1.7.2 Legal Provisions

Generally, there are a number of national and international laws and regulations dealing with development, health and environmental matters. The major laws applicable to this project include:

1.7.2.1 Environmental Impact Assessment (EIA) CAP E12, LFN 2004

This deals with considerations of environmental impact in respect of public and private projects.

Section 2 (1) requires an assessment of public or private projects likely to have a significant (negative) impact on the environment.

Section 2 (4) requires an application in writing to the FMEnv before embarking on projects for their environmental assessment to determine approval.

Section 13 establishes cases where an EIA is required and

Section 60 creates a legal liability for contravention of any provision

Federal Ministry of Environment Sectoral and Procedural Guidelines for EIA

FEPA Act, Cap 131, LFN, 1990 allocates powers of environment legislation making and enforcement to the Federal Environmental Protection Agency (FEPA) now (FMEnv). In-line with its functions, defunct FEPA has published the EIA Sectoral Guidelines (revised in September 1995). The guidelines cover major development projects and are intended to inform and assist proponents in conducting EIA studies. In September 1995, FMEnv published EIA Sectoral Guidelines for Infrastructure projects. The guidelines are intended to assist in the proper and detailed execution of EIA studies of infrastructure and projects in consonance with the EIA Act. The guidelines were used to guidethe conduct of this EIA.

1.7.2.2 Forestry Law CAP 55, 1994

This law prohibits any act that may lead to the destruction of or cause injury to any forest produce, forest growth or forestry property in Nigeria. It also prescribes the administrative framework for the management, utilization and protection of forestry resources in Nigeria.

Abiding by this law was one of the considerations that guided the choice of the proposed site for this project.

1.7.2.3 National Environmental Standards and Regulations Enforcement Agency (NESREA) Act

The National Environmental Standards and Regulations Enforcement Agency (NESREA) is a parastatal of the FMENV established in July 2007 by the NESREA Act. NESREA is charged with the responsibility of enforcing all environmental laws, guidelines, policies, standards and regulations in Nigeria. It also has the responsibility to enforce compliance with provisions of international agreements, protocols, conventions and treaties on the environment.

Some of the responsibilities of NESREA include the following:

- ✓ Enforce compliance with laws, guidelines, policies and standards on environmental matters;
- ✓ Liaise with, stakeholders, within and outside Nigeria on matters of environmental standards, regulations and enforcement;
- ✓ Enforce compliance with the provisions of international agreements, protocols, conventions and treaties on the environment including climate change, biodiversity conservation, desertification, forestry, oil and gas, chemicals, hazardous wastes, ozone depletion, marine and wild life, pollution, sanitation and such other environmental agreements as may from time to time come into force;
- ✓ Enforce compliance with policies, standards, legislation and guidelines on the following:
    - i. water quality, Environmental Health and Sanitation, including pollution abatement;
    - ii. sustainable management of the ecosystem, biodiversity conservation and the development of Nigeria's natural resources;
    - iii. sound chemical management, safe use of pesticides and disposal of spent packages thereof; and

iv. regulations on the importation, exportation, production, distribution, storage, sale, use, handling and disposal of hazardous chemicals and waste, other than in the oil and gas sector;

- ✓ Enforce through compliance monitoring, the environmental regulations and standards on noise, air, land, seas, oceans and other water bodies other than in the oil and gas sector;
- ✓ Ensure that environmental projects funded by donor organizations and external support agencies adhere to regulations in environmental safety and protection;
- ✓ Enforce environmental control measures through registration, licensing and permitting Systems other than in the oil and gas sector;
- ✓ Conduct environmental audit and establish data bank on regulatory and enforcement mechanisms of environmental standards other than in the oil and gas sector;
- ✓ Create public awareness and provide environmental education on sustainable environmental management, promote private sector compliance with environmental regulations other than in the oil and gas sector and publish general scientific or other data resulting from the performance of its functions; and
- ✓ Carry out such activities as are necessary or expedient for the performance of its functions.

The Federal Government through NESREA has developed Environmental Regulations which have been published in the Federal Republic of Nigeria Official Gazette and are now in force.

Applicable NESREA regulations relevant to this project are briefly discussed below.

1. National Environmental (**Construction Sector)** Regulations, 2010. S. I. No. 19. The purpose of these Regulations is to prevent and minimize pollution from construction, decommissioning and demolition activities.
2. National Environmental **(Noise Standards and Control)** Regulations, 2009. S. I. No. 35. The main objective of the provisions of this Regulation is to ensure tranquillity of the human environment or surrounding and their psychological wellbeing by regulating noise levels.
3. National Environmental (**Soil Erosion and Flood Control)** Regulations, 2010. S. I. No. 12. The overall objective of these Regulations is to check all earth-disturbing activities, practices or developments for non-agricultural, commercial, industrial and residential purposes.
4. National Environmental **(Control of Vehicular Emissions from Petrol and Diesel Engines)** Regulations, 2010. S. I. No. 20. The purpose of these regulations is to restore, preserve and improve the quality of air. The standards contained herein provide for the protection of the air from pollutants from vehicular emission.
5. National Environmental (**Sanitation and Wastes Control)** Regulations, 2009. S. I. No. 28. The purpose of this Regulation is to provide the legal framework for the adoption of sustainable and environment friendly practices in environmental sanitation and waste management to minimize pollution.
6. National Environmental (**Surface and Groundwater Quality Control)** Regulations, 2010. S. I. No. 22. The purpose of this Regulation is to restore, enhance and preserve the physical, chemical and biological integrity of the nation's surface waters, and to maintain existing water uses.
7. National Environmental **(Permitting and Licensing System)** Regulations, 2009. S. I. No. 29. The provision of this Regulation enables consistent

application of environmental laws, regulations and standards in all sectors of the economy and geographical region.

8. National Environmental **(Ozone Layer Protection)** Regulations, 2009. S. I. No. 32. These provisions seek to prohibit the import, manufacture, sale and the use of ozone-depleting substances.

Thus, a robust EMP was designed which is based on measures that will make sure that the above regulations are respected and strictly adhered to.

1.7.2.4 Factory Act CAP F1, LFN 2004

The Act enjoins the contractor and manufacturing industries to ensure that every worker employed by them works under satisfactory, safe and healthy conditions. They are also obliged to provide necessary information, instructions, training and supervision to ensure the health and safety at work of those other workers engaged in a particular work.

Factory Act will therefore regulate the work conditions that will prevail during both the construction and operational phases of the project.

1.7.2.5 Land Use Act Cap. L5, 2004

The Land Use Act of 1978 vests all land situated in the territory of each State (except land vested in the Federal Government or its agencies) solely in the Governor of the State, who would hold such land in trust for the people and would henceforth be responsible for allocation of land in all urban areas to individual residing in the State and to organizations for residential, agriculture, commercial and other purposes. Similar powers with respect to non-urban areas are conferred on Local Governments. The Law commenced from 27th March 1978.

The above act guided the acquisition of farmlands to be used for the proposed project.

1.7.2.6 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 above provisions would be respected in obtaining building approval and permits from relevant authorities.

1.7.2.7 Criminal Code

The Nigerian Criminal Code makes it an offence punishable with up to 6 month's imprisonment for any person who:

- ✓ Violates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighbourhood, or passing along a public way; or

- ✓ Does any act which is, and which he knows or has reason to believe to be, likely to spread the infection of any disease dangerous to life, whether human or animal.

The above criminal code provisions will also be given regard to in the design of an EMP for the proposed project.

1.7.2.8 State Legislations: States Environmental Protection Edicts

In accordance with Section 24 of the FMEnv Act, Chapter 131 of the Laws of the Federal Republic of Nigeria, 1990, the State Environmental Protection Edicts are enacted. The edict empowers the State Environmental Protection Agencies to establish such environmental criteria, guidelines/specifications or standards for the protection of the state's air, lands and waters as may be necessary to protect the health and welfare of the people. The functions of SEPAs among others include:

- Routine liaison and ensuring effective harmonization with the FMEnv in order to achieve the objectives of the National Policy on the Environment;
- Co-operate with the FMEnv and other relevant regulatory agencies in the promotion of environmental education;
- Be responsible for monitoring compliance with waste management standards; and
- Monitor the implementation of the EIA and Environmental Audit Report (EAR) guidelines and procedures on all developmental policies and projects within the State.

Generally, State laws on environment are still in the evolving stages. Specifically, for EA, the States rely on the EIA Act 86 of the Federal Government.

Sokoto State Ministry of Environment

Sokoto State Ministry of Environment oversees activities involving the environment in Sokoto State. Among its other mandates, the Ministry supervises the Sokoto State Environmental Protection Agency (SEPA).

The ministry has the responsibility of maintaining a clean and healthy environment through provision of sanitation and waste management services as well as oversight of spatial development planning.

Sokoto State Environmental Protection Agency (SEPA)

SEPA is responsible for the protection and improvement of the environment within the State as well as assists in implementation and enforcement of the National Environmental Regulation and Guidelines within Sokoto Stat. In carrying out its duties of environmental protection, SEPA is required to collaborate with relevant Federal and State Ministries, Local Government Councils, statutory bodies, research and educational institutions. Although the primary regulatory authority overseeing environmental concerns of the proposed project lies with FMEnv, SEPA plays a role as a key stakeholder in environmental management of the state through:

- ✓ Protection of environment and biodiversity conservation and sustainable development in Sokoto State;
- ✓ Conduct research on matters relating to environment;
- ✓ Collaborate with federal government through the Federal Ministry of Environment in conducting public investigation on major environmental problems;
- ✓ Monitor the quality of water, air, land and natural resources in the state; and
- ✓ Promote environmental education and awareness.

1.7.2.9 International Treaties and Convention

In addition to the national laws/ regulations supporting the use of EIA as an environmental management tool, Nigeria is also signatory or party to several international conventions and treaties that support the use of standard environmental management tools/ measures for achieving sustainable development. Some of these include:

African Convention on the Conservation of Nature and Natural Resources

This convention was adopted on the 15th of September 1968 in Algiers, Algeria, the African Convention entered into force on the 9th of October 1969. Its objectives are "to encourage individual and joint action for the conservation, utilization and development of soil, water, flora and fauna for the present and future welfare of mankind, from an economic, nutritional, scientific, educational, cultural and aesthetic point of view." It commits signatory parties (the Parties) to adopting "measures necessary to ensure conservation, utilization and development of soil, water, floral and faunal resources in accordance with scientific principles and with due regard to the best interests of the people."

The Parties (Nigeria inclusive) agree to use resources wisely, to manage populations and habitats, to control hunting, capture and fishing, and to prohibit the use of poisons, explosives and automatic weapons in hunting. They also agree to prevent and control water pollution, establish conservation areas and consider ecological factors in development plans.

United Nations Guiding Principles on the Human Environment

Ever since it was formed, the United Nations (UN) has been concerned about negative environmental trends. Thus, at the UN Conference on Human Environment held in Stockholm in 1972, conservation of biological diversity was identified as a priority. The guiding principles established in that convention are formal declarations that express the basis upon which an environmental policy can be built and which provides a foundation for action. Some of the principles include:

Principle 2

The natural resource of the earth, including the air, water, land, flora and fauna and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate.

Principle 4

Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat, which are now gravely imperilled by a combination of adverse factors. Nature conservation, including wildlife, must therefore receive importance in planning for economic development.

Principle 8

Economic and social development are essential for ensuring a favourable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life.

World Heritage Convention

In 1972, the United Nations Educational, Scientific and Cultural Organization (UNESCO) recognised the need to identify and permanently protect the world's special areas and adopted the World Heritage Convention. Founded on the principle of international cooperation, the Convention provides for the protection of the world's cultural and natural heritage places. It came into force in 1975 after being initially ratified by 20 countries.

The Ramsar Convention

The convention was developed and adopted by participating nations at a meeting in Ramsar on February 2, 1971, and came into force on December 21, 1975. The Convention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat) is an international treaty for the conservation and sustainable utilization of wetlands, that is, to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value.

International Labour Organization (ILO) Core Conventions

International Labour Organization (ILO) Core Conventions are as follows:

- ✓ Convention 1973, No. 138 regarding admission of age to employment which is 18years for Hazardous work or 16 under strict conditions, 14 as basic minimum age and 12-14 for light works and
- ✓ Convention 1999 No. 182 regarding worst forms of Child Labour. Under this convention Article 3 below applies;

For the purposes of this convention, the term the worst forms of child labour comprise:

(a) all forms of slavery or practices similar to slavery, such as the sale and trafficking of children, debt bondage and serfdom and forced or compulsory labour, including forced or compulsory recruitment of children for use in armed conflict;

(b) The use, procuring or offering of a child for prostitution, for the production of pornography or for pornographic performances;

(c) The use, procuring or offering of a child for illicit activities, in particular for the production and trafficking of drugs as defined in the relevant international treaties;

(d) Work which, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of children.

The implication of these conventions is that during recruitment of project personnel, under-aged persons would not be considered. Also, no person shall be forced to carry out any activity relating to the project against his or her wish.

Vienna Convention for the Protection of the Ozone Layer

This convention held in 1985 places general obligations on countries to take appropriate measures to protect human health and the environment against adverse effects resulting from human activities which tend to modify the ozone layer.

United Nations Conference on Environment and Development

The Rio 'Earth Summit' of 1992 emphasized the need for the preservation 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, including access to genetic resources and appropriate transfer of relevant technologies, taking into account all rights over those resources and technologies. Nigeria is signatory to these international agreements on the environment. The principles adopted include:

Principle 1

Humans are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

Principle 5

All states and people shall cooperate in the essential task of eradicating poverty as an indispensable requirement for sustainable development, in order to decrease the disparities in standard of living and better meet the needs of the majority of the people of the world.

Principle 17

Environmental Impact Assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.

Convention on Biological Diversity

This convention is the most important of all the international agreements on biodiversity. Negotiated under the auspices of United Nations Environment Programme (UNEP), the Biodiversity Convention was opened for signature in June 1992 at the 'Earth Summit' held in Rio de Janeiro, Brazil, and entered into force in December 1993. It is the first global agreement to cover all aspects of biological diversity: the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the use of genetic resources.

Thus, any biological diversity present on the proposed project site or its surrounding will be protected by the application of this convention.

United Nations Framework Convention on Climate Change

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention enjoys universal membership with 193 countries having ratified.

Under the Convention (entered into force on 21 March 1994), governments:

- gather and share information on greenhouse gas emissions, national policies and best practices;
- launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries;
- cooperate in preparing for adaptation to the impacts of climate change.

This convention is applicable in the implementation of this project in terms of efforts that will be geared towards minimization of greenhouse gas emissions.

The Copenhagen Accord

This Accord reached by some Heads of State, Heads of Government, Ministers and other heads of delegation at the United Nations Climate Change Conference 2009 in Copenhagen, Denmark recommends that deep cuts in global greenhouse gas emission be made. It also underlined the need to pursue various approaches, including opportunities to use markets, to enhance the cost-effectiveness of, and to promote mitigation actions. Figure 1.4 below is a historical timeline of the aforementioned agreements/ conventions.

This accord is also applicable in terms of need to cut down on greenhouse gas emissions.

The Paris Climate Accord

This is a major international treaty arrived at after the expiration of the Kyoto Protocol in 2012. Nigeria is one of the more than 140 countries that ratified this agreement in Paris, France in December 2015. The central aim of the agreement is to strengthen the global response to the threat of climate change by keeping a global temperature rise in this century well below 2 degrees Celsius above pre-industrial levels and to also pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. The agreement also aims to strengthen the ability of countries to deal with the impacts of climate change. To reach these ambitious goals, appropriate financial flows, a new technology framework and an enhanced capacity building framework are being put in place globally, thus supporting action by developing countries and the most vulnerable countries, in line with their own national objectives. The Agreement also provides for enhanced transparency of action and support through a more robust transparency framework.

The Paris Agreement requires all Parties to put forward their best efforts through nationally determined contributions (NDCs) and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts.

HSE Policies and Guidelines of OCP Nigeria Limited

The following are objectives, targets and minimum environmental requirements of OCPNL:

(i) Establish and maintain the highest standards of occupational health, safety and environmental protection at work, so as to prevent personal injury or illness, property damage, fires, security losses and environmental pollution and to ensure that its consumers and customers are provided with products that are safe in use by designing safety into all product and processes;

(ii) Require its staff and contractors working on their behalf to apply health, safety and environmental safeguards; provide them with relevant information and discuss with them related company policies and practices;

(iii) Develop and maintain contingency procedures, in co-operation with authorities and emergency services, in order to minimize harm from accidents; and

(iv) Work with government and others in the development of improved regulations and industry standards, which relate to health, safety and environmental issues.

HSE Commitment will ensure that OCPNL is committed to:

- ✓ Pursue the goal of no harm to people
- ✓ Protect the environment
- ✓ Use material and energy efficiently to provide products and services
- ✓ Develop energy resources, products and services consistent with these aims
- ✓ Consult with stakeholders and publicly report on performance
- ✓ Manage Health, Safety and Environment matters as any other key business activity
- ✓ Promote a culture in which all OCPNL employees, contractors and partners share this Commitment".

In this way OCPNL intends to earn the confidence of the customers, shareholders and society at large, by being a good neighbour and contribute to sustainable development.

In the implementation of these policies, OCPNL will be guided by the following objectives amongst others;

- Collective and personal responsibility;

- Regular consultation and the involvement of stakeholders;
- Utilization of best available equipment, materials, contractors, specialist services and operational methods;
- Maintenance of clean, healthy and safe working environment;
- Provision of appropriate protective clothing and equipment;
- Safeguarding the health and safety of employees and protecting people, property and environment in hazardous/emergency planning/situations within the vicinity of OCPNL area of operations;
- Maintaining adequate provisions for the prevention of fire, fire-fighting, fire evacuation;
- Provide expert professional support on occupational health issues;
- Have certified safety, health and environmental protection specialists;
- Establish and maintain close working relationship with all relevant Government Agencies;
- Report and investigate incidents/accidents with potential damage to workers and environment and take necessary actions; and
- Ensure that OCPNL minimum standards and Nigerian legislations and safety standards are achieved.

1.7.3 The Structure of the Report

In line with the standard national EMP report writing format, this report is presented in six chapters as indicated below:

Chapter 1 is the Introduction chapter. It provides relevant background information on the project, OCPNL (the EIA proponent), the Statutory Regulations and project objectives. In addition, it highlights the national environmental assessment process.

Chapter 2 Justifies why the proposed project should be implemented

Chapter 3 describes the proposed project and processes, namely, type, input and output of raw materials and products, project operation and maintenance and decommissioning.

Chapter 4 presents the bio-physical and socio-economic baseline conditions of the proposed project environment.

Chapter 5 identifies and quantifies the potential and associated beneficial and adverse impacts of the proposed project.

Chapter 6 proffers mitigation and ameliorative measures for the adverse potential impacts identified, while also providing enhancement measures for the identified positive impacts.

Chapter 7 presents the Environmental Management Plan that will be adopted throughout the project cycle. It also includes the Monitoring Plan that will ensure the effectiveness of the mitigation measures and the remediation plans.

Chapter 8 presents the conclusions arrived at as a result of conducting the EIA.

CHAPTER TWO: PROJECT JUSTIFICATION

2.1 NEED FOR THE PROJECT

For Nigeria to become self-sufficient agriculturally, it needs to be self-reliant in the production of agricultural inputs such as herbicides, pesticides and fertilizers which are indispensable in agricultural production. A recurring problem in the Nigerian agricultural sector is dearth of the supply of the right quality fertilizer in sufficient quantities at the right time. In order to boost local production of fertilizer, the Nigerian Government has recently banned importation of fertilizer which further necessitates gearing of efforts by entrepreneurs towards local manufacturing of fertilizer.

Against the above background, the proposed project could not have come at a better time. It is therefore imperative to implement this project so as to solve these problems and boost socio-economic activities in the project area and the country at large. The proposed project will thus go a long way in meeting the critical fertilizer needs of farmers in this key agricultural hub of Sokoto State and Nigeria. The project is therefore anticipated to provide jobs for people in the project area and also boost socio-economic activities in the country.

2.1.1 Project Objectives

Naturally, every development project provides key benefits to its host communities and the general public. The main objectives of this project are to:

- ✓ Make fertilizer available to farmers at the right time and price;
- ✓ Produce 120 ton/hour of of different NPK grades (with the flexibility to add micronutrients and other additives) using DAP, MOP, Urea and Limestone as main macronutrients;
- ✓ Stimulate and contribute to the agricultural development of Sokoto State and by extension Nigeria; and

- ✓ Create both direct and in-direct employment opportunities for substantial number of Nigerians.

2.1.2 Benefits of the project

The key benefits associated with the project are thus as follows:

- ✓ Making fertilizer more available in the project area;
- ✓ Making fertilizer more affordable in the country by increasing its supply;
- ✓ Creation of job opportunities for people in the project area and the country at large;
- ✓ Creation of wealth in the project area and the country; and
- ✓ boosting socio-economic activities in the country.

2.2 PROJECT ALTERNATIVES CONSIDERED

Project alternatives must normally be considered during an EIA process. Alternatives, in relation to a proposed project, mean different ways of meeting the general purpose and requirements of the project and may include the following types of alternatives:

- ✓ Location alternatives;
- ✓ Type of project development to be undertaken;
- ✓ Design or layout of the project development;
- ✓ Technology to be used for the development; and
- ✓ Operational aspects of the development.

It therefore follows that projects such as fertilizer production that may have impacts on the environment may raise issues of concern and alternative causes of actions are always considered. The reason is to assess the effects of these alternatives on the environment against expected benefits.

For this project, four main alternatives were considered in all, three of them against the proposed project which is the fourth alternative. The four alternatives considered were therefore as follows:

- ✓ The ''No project'' option
- ✓ Using other locations
- ✓ Using a different technology for the proposed production process
- ✓ Project execution as proposed

A panel of experts reviewed these alternatives with the project objectives in focus as follows:

2.2.1 No Project Development Option

It is essential that the "no project option" be considered as a first step in mitigation. This alternative implies that the proposed fertilizer production will not be carried out and this implies no investments will be made by OCP Africa Nigeria Limited in the area of fertilizer blending/production.

This means that the identified benefits presented in the previous section will not come into fruition. This alternative is against the desires of the Nigerian Government to boost competitiveness, facilitate manufacturing, industrialization and agricultural self-reliance, which will in turn lead to improved access to social services and improved quality of life.

2.2.2 Using other Project Locations

The location of an industry is an important factor its success. For example, its location to some extent determines access to markets, ease of transportation of raw materials among other things. Kalambaina is a good location for the proposed project considering the fact that Kalambaina area is a designated industrial zone that already hosts Bua Cement factory. The area is also having vast and fertile lands and is one of the agricultural hubs of Sokoto State, where significant farming activities take place. Thus, Kalambaina in Wamakko LGA and its neighbouring Local Government Areas have a large number of potential customers for the fertilizer that will be produced from the proposed factory. Furthermore, Kalambaina, being very close to Sokoto municipal LGAs, enjoys relative peace compared to other locations in the State.

Therefore, other project locations in Sokoto State cannot be effective alternatives to the proposed location in Kalambaina. The option of using other locations would not be more sustainable than the chosen location in Kalambaina and was therefore also rejected.

2.2.3 Producing different fertilizer grades

This alternative entails planning and constructing a blending plant that will produce different grades and blends of fertilizer from the proposed ones.

However, it should be remembered that the proposed production process is a result of an optimized cost-effective engineering design against which several alternative products were considered during the initial design. Producing different blends of fertilizers is not a feasible option as doing so may result in greater negative environmental impacts than going ahead with the proposed project.

Alternative fertilizer production options may also be prohibitively more expensive because the raw materials may have to be imported, whereas the raw materials to be used for the proposed project are locally available in Nigeria.

2.2.4 Project execution as proposed

Taking this option means that the proposed blending plant will be constructed. Current challenges facing farmers in Nigeria which include higher fertilizer cost in the project area as well as longer delivery time. These problems will be minmized as soon as the proposed project is implemented according to the design. The implication of taking this project alternative, in contrast to the "No Project Alternative", is that cheaper, effective and a less environmentally damaging fertilizer blending plant will be delivered at the end of the construction period.

Other implications include enhanced socio-economic impacts to be brought about on the project communities by the execution of the project.

Significant positive environmental impacts will also be made if the project is carried out as proposed due to the numerous benefits accruable to the inhabitants of the project area and those in the extended project's area of influence. For instance, socio-economic, educational and health status of the immediate and extended host communities will improve as a result of the execution of the project. The proposed project thus has a high tendency for discouraging rural-urban drift in its area of influence.

The most important benefits that can be derived from the Kalambaina OCP Africa Fertilizer Blending Plant include the following:

- ✓ Cheaper and effective fertilizer brands will be produced that will facilitate agricultural production in Nigeria; and
- ✓ Socio-economic, educational and health status of residents in and around the project area will be enhanced as a result of job and wealth creation arising from the proposed project.

2.3 VALUE OF THE PROJECT

It has been estimated that about twelve million dollars ($12, 000, 000. 00) will be required for the implementation of the project. The proposed project cost includes feasibility/technical studies and EMP/, mobilization and construction activities as well as installation of production and associated equipment. The project intends to employ over two hundred people in both its constructional and operational phases. Priority will be given to qualified persons from the host community, followed by those from nearby communities. The project would also contribute an overall net positive economic benefit to the nation when its overall potentials for boosting socio-economic activities in the country are considered.

2.4 ENVISAGED SUSTAINABILITY

For any form of development to be environmentally sustainable, it should give due regard to environmental aspects of its proposed activities. It should incorporate mitigation and enhancement measures that will lead to preservation of the existing project environment. The proposed project shall therefore be undertaken according to best environmentally sound industry practice, employing standard and time-tested design, standard construction methods, standard operational procedures and fully trained and qualified personnel that give due regard to environmental considerations. The environmental sustainability of the project is based on the above premise and on the following specific considerations:

- ✓ Time-tested standard engineering designs which will improve the life cycle costs, environmental performance and project economics;
- ✓ All other works shall follow standard and environmentally sound construction methods so as to keep disruption to the environment at acceptable levels;

- ✓ The use of best available technology and effective waste management shall be carried out to enhance environmental protection;
- ✓ Project management shall be carried out by fully trained and qualified personnel who are conversant with general HSE guidelines;
- ✓ Environmental sustainability of the project is predicated on the fact that not much interference is expected with the physical setting of the project area as a result of the project, because the project site has been acquired from existing lands which had already been cleared for farming activities. In addition, adequate Environmental and Social Management Plan, EMP, is to be put in place to ensure minimum environmental disruption and mitigation of significant negative environmental impacts. A good housekeeping practice will also be maintained and the contractor and other stakeholders are expected to implement all the measures stipulated in the EMP.

Envisaged economic sustainability of the project is based on the economic feasibility study conducted for the project, which shows a potentially high return on investment. The economic feasibility was favoured by a big fertilizer demand (in the local and regional markets) and availability of raw materials for the production process, backed by the simplicity of the production machinery and process.

Social sustainability of the project is hinged on the policy of ensuring cordial relationship with stakeholders and communities by the contractor and the proponent through consultation throughout the various phases of the project. It has also been planned that local people will be given priority in terms of employment in the construction phase.

2.5 PROJECT LIFE SPAN

It is expected that the proposed fertilizer blending plant will remain operational, viable and sustained with periodic maintenance by the proponent for at least twenty years.

CHAPTER THREE: PROJECT DESCRIPTION

3.1 THE PROJECT

The proposed project is the construction and operation of OCP Africa Fertilizer Blending Plant, to be located in Kalambaina Industrial Area of Wamakko LGA, Sokoto State.

OCP Africa Nigeria Limited proposes to set up and operate a two hundred thousand tonne per annum (200,000TPA) fertilizer blending plant. The blending unit will be designed to produce one hundred and twenty tonnes per hour (120 TPH) of different sodium, phosphorus and potassium (NPK) grades with the flexibility to add micronutrients and additive agents. The main macronutrients that will be used are diammonium phosphate (DAP), muriate of potash (MOP), Urea and Limestone. Other raw materials such as Ammonium Sulfate, Kieserite and NPS can also be used. These macronutrients will be received by truck either in bags or in bulk, thus the blending plants shall have the flexibility to handle both forms.

3.2 PROJECT LOCATION

The proposed site is located at Kalambaina village in Wamakko LGA of Sokoto State. The size of the land for the proposed project is 10.209 hectares. Although the shape of the land is irregular, the site is bounded by the following four geographic coordinates: $13^{0}03'05.93''$ N, $5^{0}11'10.95''$ E; $13^{0}03'01.1693''$ N, $5^{0}11'14.25''$ E; $13^{0}02'52.74''$ N, $5^{0}11'04.36''$ E; and $13^{0}03'01.83''$ N, $5^{0}10'59.80''$ E.

The site is bounded to the northwest by Kalambaina Amusement Park; to the northeast by Kalambaina Road and to the southeast by the new site for Sokoto State Zakkat and Endowment Commission.

The land was acquired through purchasing from its previous owners through the Sokoto State Ministry of Lands; and a Certificate of Occupancy (C of O) for the land has been obtained, numbered “SOK/G/11140”.

3.2.1 The project’s Direct Area of Influence

The project’s direct area of influence is that part of the project area that may be affected directly by any impact resulting from implementation of the proposed project. In the context of bio-physical and ecological environmental impact, this area can be defined as the premises of the proposed factory and all areas located not more than 500m radius from it. In terms of socio-economic impacts, the project’s direct area of influence will be restricted to the entire Kalambaina Community as well as Wammako and parts of Arkilla communities.

3.2.2 The project’s Extended Area of influence

The project’s extended areas of influence include the entire Kalambaina Town, while the socio-economic area of influence comprises of Kalambaina Town, Sokoto State and the entire country.

3.2.3 The project’s Cumulative Impact Area

The project’s cumulative impact area includes both project’s direct and indirect areas of influence which comprise of Kalambaina and Wamakko towns, Arkilla District as well as the entire Sokoto State and Nigeria at large.

3.3 SCOPE OF WORKS

The proposed project thus involves the following broad key activities:

- Project Design
- Land acquisition
- Permitting and licensing including this EIA
- Site Preparation

- Civil construction
- Installation of machineries
- Commissioning of the facility
- Demobilization

3.4 ACTIVITIES WITHIN PROJECT PHASES

3.4.1 Pre-construction activities

Preconstruction activities for this project include feasibility/technical design and environmental planning. Others are recruitment of semi-skilled and non-skilled workforce, establishment of construction yard and site office.

3.4.2 Construction Phase

3.4.2.1 Site Preparation

The Construction Phase of this project will begin with surveying and clearing of the proposed land. This involves provision of additional fill material for improvement of the low-lying sections of the land through provision of naturally occurring lateritic material as fill.

3.4.2.2 Civil and Steel Structures

The civil and steel structure necessary for the realization of the proposed project in particular includes the following works:

- Foundations of the Bulk Blending unit;
- Storage halls HN and HS;
- Retaining walls for stocks;
- Stairs access, walkways, roofing, siding and railings;
- Access platforms and support for equipment / conveyors;
- Facilities: administrative buildings, locker-room, maintenance workshops, fuel station, electric room, weighing station, car parks.

3.4.2.2.1 Bulk blending unit

Equipment and facilities will be based on massive down to the ground with good supply installation of release for standard ground networks.

3.4.2.2.2 Storage halls

The columns of the structure will be based on massifs down to good soil. Retaining walls with a height of 4.5 will surround each hall to support stocks of materials. The reinforced concrete industrial paving of 15cm minimum thickness, with a peripheral sidewalk of 80cm width counted from the external generator of the storage halls. The industrial paving will also be applied to the entire inner surface of the halls. The pavement will be poured on a dry-stone hedgehog 20cm compacted thickness or dry on a plastic film (polythene) 200 micron thick laid on a well compacted and all comers will be fitted with expansion joints and withdrawals made and processed according to the standards in force.

3.4.2.2.3 Facilities

These will include all foundation works, paving, columns, beams, tile, masonry, plaster and sealing, finishing work, painting, aluminium, flooring and walls, plumbing, air conditioning as well as all works necessary for the operation of buildings.

The assumptions for the estimation of the surfaces of the buildings that will receive the personnel, is as presented in table 3.1 and 3.2 respectively.

Table 3. 1: Estimation of Surfaces of the Buildings that will Receive Personnel

S/No	Building	Dimension (m)
	Warehouse	171 x 90
	Control Room / Laboratory	5 x 5 (2 floors)
	Administrative Building	30 x 15
	Workshop	30 x 10
	Electrical Room	4 x 3
	Gasoil Station	10 x 6
	Canteen	14 x 10
	Locker room	14 x 12
	Drivers Restroom	10 x 8
	Cars Parking	50 x 20
	Truck Parking	110 x 60

Table 3. 2: Estimation of Surfaces of the Buildings that will Receive Personnel

Designation	Nbr	Width (m)	Length (m)	Area (m^2)	Total Area (m^2)	Designation
Administrative building	Offices	2	2,5	3,5	8,75	17,5
	Office for 4 people	1	3,5	5	17,5	17,5
	Open space 15 people	1	5	6	30	30
	Meeting room	2	75	75	Meeting room	2
	Lobby	1	4	6	24	24
	Show room	1	3	4	12	12
	Toilets (2 W, 2M, 1 PMR)	1	1	1,5	18,75	18,75
	IT room	1	2,4	3,2	7,68	7,68
	Kitchenette	1	3	3	9	9
Weight bridge office	for 2 people	1	2,6	2,6	6,76	6,76
Locker room	100	-	-	112	112	Locker room
Canteen	Kitchen	100			0	0
Control room		1	4,7	4,7	22,09	22,09
Laboratory		1	4,7	4,7	22,09	22,09
Workshop	elec, mec, pneu	1	10	11	110	110
Spare parts building		1	5	11	55	55

Washing area		1	4	8	32	32
Check points	for 2 people	3	2,6	2,6	6,76	20,28
Toilets (in front of the main building)		75	3,6	10,3	37,08	37,08
Area for process building (storage in bulk+ blender)		1	171	55	9405	9405
Area for finish products		2	60	35	2100	4200
Cars parking		30				1000
trucks parking		45				6600
drivers area		110				80

3.4.2.2.4 Weighing station

A foundation in the form of a general raft will be provided at the truck weighing station. Entering and exiting trucks will have to go through weighing bridge before joining the unloading raw material area, the loading final product area or the Diesel Truck for the filling of the Diesel Tank.

3.4.2.2.5 Sewage

The sewage of the entire platform against precipitation or rain water will be via a network of water collection channels which will surround the storage halls. These channels will be connected to an underground pipeline system that connects to a cesspool. For building and storage, the downspouts are provided on the roofs to collect water. The threshold side must be at a level higher than that of the sewerage system with a minimum slope of 3%.

3.4.2.2.6 Roads and parkings

A road network is required for the movement of trucks and vehicles. The pavement structure will have to be constituted at least by a bilayer pavement structure.

3.4.2.2.7 Metal framework benefits

Supply, manufacture, transport, unloading, on-site storage, assembly, installation and fixing and anticorrosion protection with paint supply for possible finishing touches on site, including:

- Supply of commercial and/or welded profiles and workshop fabrications;
- Supply of galvanized gratings, metal stairs, ladders with crinoline and balustrades stairs (stolen with standard steps in gratings, etc.);
- Supply and installation of all sealing parts (plates, bolts and other inserts);
- Supply, installation and fixing of the cover and cladding in Nervesco sheet with translucent plates;
- Painting and corrosion protection of metal structures;
- Cladding and roofing.

3.4.2.2.7.1 metallic profiles

All metal profiles required for the execution of structures, commercial profiles and / or PRS are included: Columns, beams, bracing, beams, brackets, anchors, etc. They also take into account all the elements necessary for assembly:

- Shanks, gussets, plates;
- Complete nuts and bolts;

- Anchor plates, rods and anchor wrench and nuts, wedges, spades, etc.

3.4.2.2.8 Diesel station

Loaders and forklifts operating in the plant will need to be fed by required gas oil. The estimated gas oil requirement for a loader is about 10 litres per hour and for forklifts about 4 liters per hours:

i. 14 litres/hour
ii. 224 (16 hours operation)
iii. 1344 litres/Week (for 6 days)
iv. 5000litres/Month (for 4 weeks)

An estimation of the diesel consumption for a diesel power generator of 450 kVA (cos phi 0,8), power operating at full load we will need:

i. 90 litres / hour
ii. ii. 2160 litres / day (for 24 hours operation)
iii. iii. 10800 litres/week (for 5 days operation)
iv. iv. 43200 litres/month (for 4 weeks)

3.4.2.2.9 Intrusion detection

An anti-intrusion system will be set up and will consist of detectors, thermal cameras, a control panel and alarms. It can be:

i. Wired: a cabling system connects the different devices together.
ii. Wireless radio or infra-red: the devices are powered by batteries and communicate with each other by electromagnetic waves propagating in the air.
iii. Mixed: the detectors are powered by batteries, the other devices, by the electric current and communicate with each other by radio waves. The detection system is used to inform operators at checkpoints and security of

an intrusion attempt. It will cover the entire perimeter fence of the proposed project area.

3.4.2.2.9 Firefighting plan

The objectives of firefighting plan for the proposed project are:

i. To define the general philosophy for application of Active Fire Protection (AFP) and Passive Fire Protection (PFP);
ii. To define areas where passive fire protection is required;
iii. To establish criteria to be used for deciding which equipment needs to be protected by AFP and/or PFP in the areas where it is required; and
iv. To define type of fire against which they have to be protected and required duration of protection.

3.4.2.2.9.1 Identification of fire hazards

Based on proposed project general layout, the properties of handled materials and the nature of activity, the risk identification is given as follows:

i. Administrative buildings: Fire due to a short circuit, wrong tightening cables, electrical overload, etc., on electrical equipment and fire from paper and office equipment (wood, boxes, etc.)
ii. Maintenance and workshops: Fire due to a short circuit, wrong tightening cables, electrical overload, etc., on electrical equipment and fire from hydrocarbon and oil present.
iii. Substation, control room, laboratory: Fire due to a short circuit, wrong tightening cables, electrical overload, etc., on electrical equipment and electrical & control panel.
iv. Gas oil station and parking's: Ignition source (electrical switch, static electrical discharge, trucks engine or a cigarette, etc.,) in the presence of gas oil vapor or overheated oil may cause fire and explosion.

v. Blender and storage Halls: Fire due to a short circuit, wrong tightening cables, electrical overload, forklift and truck engine overheat. In case of a high dust concentration, the explosion risk is preponderant.

The table below summarizes the protection systems for the plant buildings.

Table 3. 3: Fire protection systems

Building	Room / Volume	Main Fire Type	Ext.	Fire Hose Reel	Smoke Venting	Remark
Electrical Technical Room	Room ambiance - Switchgear/ Electrical panel room	MV / LV Electrical origin, combustion of cable insulation material, short circuit	CO_2 + ABC			Inert gas extinguishing system shall be installed. (If applicable)
	Control room	LV Electrical origin, combustion of cable insulation material, short circuit	CO_2 + ABC			Inert gas extinguishing system shall be installed. (If applicable)
	Battery room	Hydrogen emission, Electrical origin, Short circuit	CO^2			All detectors shall be in accordance with ATEX environment. (If applicable)
	Electrical generator	Engine overheat, Gasoil combustion, electrical origin, combustion of cable insulation material, short circuit	CO^2 + ABC			Foam Sprinkler system shall be installed to protect the generator room. (If applicable)
Blender and storage Halls	Ambiance		ABC	X	Natural system	Large volumes with
Maintenance workshop	Ambiance	Hot works, Electrical origin, flammable liquid/solid (oil, grease, paper...)	CO^2 + ABC	X		
Administration	Ambiance	Fire in Paper, plastic, wood, Electrical fire, Smoking	CO^2 + ABC	X		
Gas oil station	Ambiance	Fire in gasoil, oil trucks and engines	ABC Wheeled	X	Containment shall be provided around the storage tanks	**Gas oil station**

3.4.2.2.9.2 fire & gas detection

Detectors will be selected in function of the risk present in the room covered as stated in the Table below.

Table 3. 4: Fire and gas detection system

Building	Room / Volume	Main Fire Type	Nature of Detection Required	Location	Remark
Electrical Technical Room	Room ambiance - Switchgear/ Electrical panel room	MV / LV Electrical origin, combustion of cable insulation material, short circuit	O(SD) M(OH)	Ceiling False ceiling False floor	Inert gas extinguishing system shall be installed. (If applicable)
	Control room	LV Electrical origin, combustion of cable insulation material, short circuit	O(SD) M(OH)	Ceiling False ceiling False floor	Inert gas extinguishing system shall be installed. (If applicable)
	Battery room	Hydrogen emission, Electrical origin, Short circuit	O(SD) + Hydrogen Gas detector	Ceiling	All detectors shall be in accordance with ATEX environment. (intrinsically safe or Explosion protection) (If applicable)
	Electrical generator	Engine overheat, Gas oil combustion, electrical origin, combustion of cable insulation material, short circuit	H(TV)	Ceiling	Foam Sprinkler system shall be installed to protect the generator room. (If applicable)

Blender and storage Halls	Ambiance		Manual alarm call points		Large volumes with dust
Maintenance workshop	Ambiance	Hot works, Electrical origin, flammable liquid/solid (oil, grease, paper...)	O(SD) O(LD)	Ceiling +	
Administration	Ambiance	Fire in Paper, plastic, wood, Electrical fire, Smoking	O(SD) H(TV)	Ceiling False ceiling	
Gas oil station	Ambiance	Fire in gas oil, oil, trucks and engines	Manual alarm call points	Manual alarm call points	Outdoor equipment's

3.4.3. Operational Activities

Operational phase of the project will succeed the construction phase and would be characterized by raw materials processing and fertilizer blending activities which would be followed by packaging in 50kg bags and branding and then distributing to the domestic market or storage.

In this phase of the proposed project, installed equipment would also require routine maintenance.

3.4.3.1 Raw Materials

The basic chemical raw materials for the fertilizer blending process include MOP, DAP and Urea.

3.4.3.1.1 Muriate of Potash

Muriate of Potash or MOP (also known as Potassium Chloride) is the most common potassium source used in agriculture, accounting for about 95% of all potash fertilizers used worldwide.

Potassium helps regulate plant metabolism and affects water pressure regulation inside and outside of plant cells. It is important for good root development. For these reasons, potassium is critical to plant stress tolerance. The chloride content of Potassium Chloride can also be beneficial where soil chloride is low. In circumstances where soil or irrigation water chloride levels are very high, the addition of extra chloride with Potassium Chloride can cause toxicity. However, this is unlikely to be a problem, except in very dry environments, since chloride is readily removed from the soil by leaching.

Potassium Chloride is an excellent source of potassium which aids healthy plant growth disease resistance. Increase plant vigor and helps stiffen steams and aids in fruit formation. Muriate of Potash is good for root and tuber crops like carrots, beets, and potatoes as it promotes healthy root growth.

3.4.3.1.2 Diammonium Phosphate (DAP

Diammonium Phosphate (DAP) is used as a fertilizer. When applied as plant food, it temporarily increases the soil pH, but over a long term the treated ground becomes more acidic than before upon nitrification of the ammonium. It is incompatible with alkaline chemicals because its ammonium ion is more likely to convert to ammonia in a high-pH environment. The average pH in solution is 7.5–8. The typical formulation is 18-46-0 (18% N, 46% P_2O5, 0% K_2O).

3.4.3.1.3 Urea

Urea, also known as carbamide, is an organic compound with chemical formula $CO(NH_2)_2$. It is a colorless, odorless solid, highly soluble in water, and practically non-toxic (LD_{50} is 15 g/kg for rats). When dissolved in water, it is neither acidic nor alkaline. More than 90% of world industrial production of urea is used as a nitrogen-release fertilizer. Urea has the highest nitrogen content of all solid nitrogenous fertilizers in common use. Therefore, it has the lowest transportation costs per unit of nitrogen nutrient.

Many soil bacteria possess the enzyme urease, which catalyzes conversion of urea to ammonia (NH_3) or ammonium ion (NH^{4+}) and bicarbonate ion (HCO_3^-). Thus, urea fertilizers rapidly transform to the ammonium form in soils. Among the soil bacteria known to carry urease, some ammonia-oxidizing bacteria (AOB), such as species of Nitrosomonas, can also assimilate the carbon dioxide the reaction releases to make biomass via the Calvin cycle, and harvest energy by oxidizing ammonia (the other product of urease) to nitrite, a process termed nitrification. Nitrite-oxidizing bacteria, especially Nitrobacter, oxidize nitrite to nitrate, which is extremely mobile in soils and is a major cause of water pollution from agriculture. Ammonium and nitrate are readily absorbed by plants, and are the dominant sources of nitrogen for plant growth. Urea is also used in many multi-component solid fertilizer formulations. Urea is highly soluble in water and is therefore also very suitable for use in fertilizer solutions (in combination with ammonium nitrate: UAN), e.g., in 'foliar feed' fertilizers.

3.4.3.2 The fertilizer blending process

The bulk blending plant shall be designed with a capacity of 120 ton/hour. Typically, the bulk blending plant will consist of the following sections:

i. Raw material unloading
ii. Raw material storage
iii. Raw material feeding
iv. Feeding Macro and Micro nutrients at pre-set proportions
v. Blending / mixing
vi. Product bagging

vii. Bags loading

viii. Final product storage

3.4.3.2.1 Raw materials feeding

Macronutrients will be received by trucks in bulk or in bags and stored separately in hangar. Other materials, i.e. micronutrients, coating oils, etc., will be received either in bags (1 ton, 25 kg, etc.) or in barrels. Raw materials would be emptied directly from the trucks to the pit area. The pit area consists of a hopper that will receive each raw material delivered by the trucks. The hopper would be equipped with a screen mesh that has (30 X 30) mm opening size in order to isolate big lumps coming with the raw material. If the raw materials are delivered in bags, the operator will empty manually the bags into the hopper. From the hopper, each raw material will go through a belt conveyor then is elevated by a belt elevator and stored in bulk in its appropriate area by the mean of a tripper. From the storage area, each raw material would be fed to its hoppers by a front-end loader (for bulk materials) or by forklift (for bagged materials in, e.g. 1-ton bags). There shall be a hoist at the micronutrient hopper level in order to lift the micronutrient big bag and place it using forklift so the operator can safely empty the bags into the hopper(s). All feeding hoppers will be equipped with screen mesh with (30 X 30) mm opening size in order to isolate big lumps coming with raw material(s). Particles size 6 m^3 volume each, while the small hoppers for micronutrients shall be >1 m^3 volume each. Vendors are to recommend the appropriate volumes for macronutrients suitable for plant capacity and specify dimensions. Volumes of macronutrients hoppers shall be selected to minimize the drawdown from hoppers and to provide additional time for operator to re-fill the hopper. Each hopper shall be equipped with digital display screen.

3.4.3.2.2 Blend grade preparation

The blend grade with the right ratios will be prepared by withdrawing a measured quantity of each raw material from the dedicated hopper. Each hopper will sit on four (4) weighing cells to accurately measure withdrawn quantity as per the pre-set formula. Raw materials withdrawal and grades preparation with accurate ratios and quantities shall be automatic and continuous by a pre-set program in the PLC. The system shall be PLC-controlled, come with a digital control panel and managing software allowing simple equipment configuration, blend formulations, automatic dosing control and adjustment, in addition of operations monitoring and control. The control system shall be interfaced with a computer installed in a control room. Metering device for raw materials to be belt conveyors and screw conveyors for micronutrients with variable frequency drives (VFD) to control feed rates. Vendor to propose the suitable feeding and metering devices for base fertilizers and micronutrients to guarantee maximum accuracy taking into consideration the full range of feeding rates and ratios of each raw material in final product. Vendors are to specify the flow range of each discharging equipment and metering device. Feeding monitoring and control system shall have the capability to switch into volumetric metering in case of emergency and/or unstable weight measurement in the hopper. Each hopper shall be equipped with the appropriate isolation valve at outlet nozzle in order to do the necessary maintenance for metering device and discharging equipment without dumping the hopper contents.

Table 3. 5: The production Capacity of the proposed Fertilizer Blending Plant

Production capacity Fertilizer Blending Plant in Wamakko LGA of Sokoto State	200,000 TPY
Product Grade	15-15-15 20-10-10 13-24-16 - 4S-0.3Zn-0.2B-0.2Cu 12-20-20 - 5S-0.3Zn-0.2B-0.2Cu 12-20-20 - 5S-0.3Zn-0.2B 13-26-18 - 3S-0.3Zn-0.1B-0.1Cu 0-23-19 - 10CaO-6S-5MgO-0.9Zn-0.25-B2O3 25-5-5 - 3.95S-2.6MgO 0-15-15 - 3MgO-0.8 B2O3 0-21-19 - 4.5MgO-0.8 B2O3 0-18-9 - 3MgO-0.8B2O3 0-24-12 - 4.5MgO-0.8B2O3

3.4.3.2.3 Mixing and production

Raw materials (base fertilizers and micronutrients) will be fed continuously to blender by means of a belt conveyor. The urea hopper shall be equipped with a dedicated impregnation system, that will allow a pre-treatment of the urea before mixing the overall raw materials, mixing will be ensured via a continuous screw conveyor. Raw materials, together with measured quantities of coating agent and/or dust oil and/or liquid micronutrient, fed by dosing pumps, will be mixed inside the blender. A good mixing and guarantee consistent properties of the final product shall be assured. Oil-based coating and dust suppression agents shall be used instead of water-based agents in order to avoid caking due to higher moisture content in final product. No drying equipment is included in bulk blending plant. The maximum liquid content in the final product that the blender can take will be specified. After the mixing, the product will be fed to a delumper before being sent to the bagging system in order to avoid any lumps going to the bagging system. As a first basis to estimate the space requirement for each raw material, the following ratios have been calculated as shown in table 3.6.

Table 3. 6: Estimated Space Requirements for Each Raw Material

Grade	**DAP (T/T) (18-46-00)**	**Urea (T/T) (46-00-00)**	**MOP (T/T) (00-00-60)**	**Limestone (T/T)**
NPK (20-10-10)	0.22	0.35	0.17	0.27
NPK (15-15-15)	0.33	0.20	0.25	0.23
NPK (11-21-22)	0.46	0.06	0.37	0.12

3.4.3.2.4 Bagging

The blended materials will be discharged continuously into Product Hoppers through the Product Bucket Elevator. Product Hopper will sit on four (4) load cells. Each hopper will feed a Bagging Machine where the product is bagged in 50 kg bags. Bags will be sewed, and either sent to truck by belt conveyor, or alternatively sent to storage by forklift. There are two (2) Bagging Machines A and B that will be running in parallel in order to reach an overall production of 120 T/h. Each machine can produce different bags size from 25 kg to 50 kg (mainly 50 kg). As per market demand, it is possible to use small bags (5 kg to 15 kg).

The process descriptions below are basic and only indicative of a simplified block flow diagram of and process flow diagram.

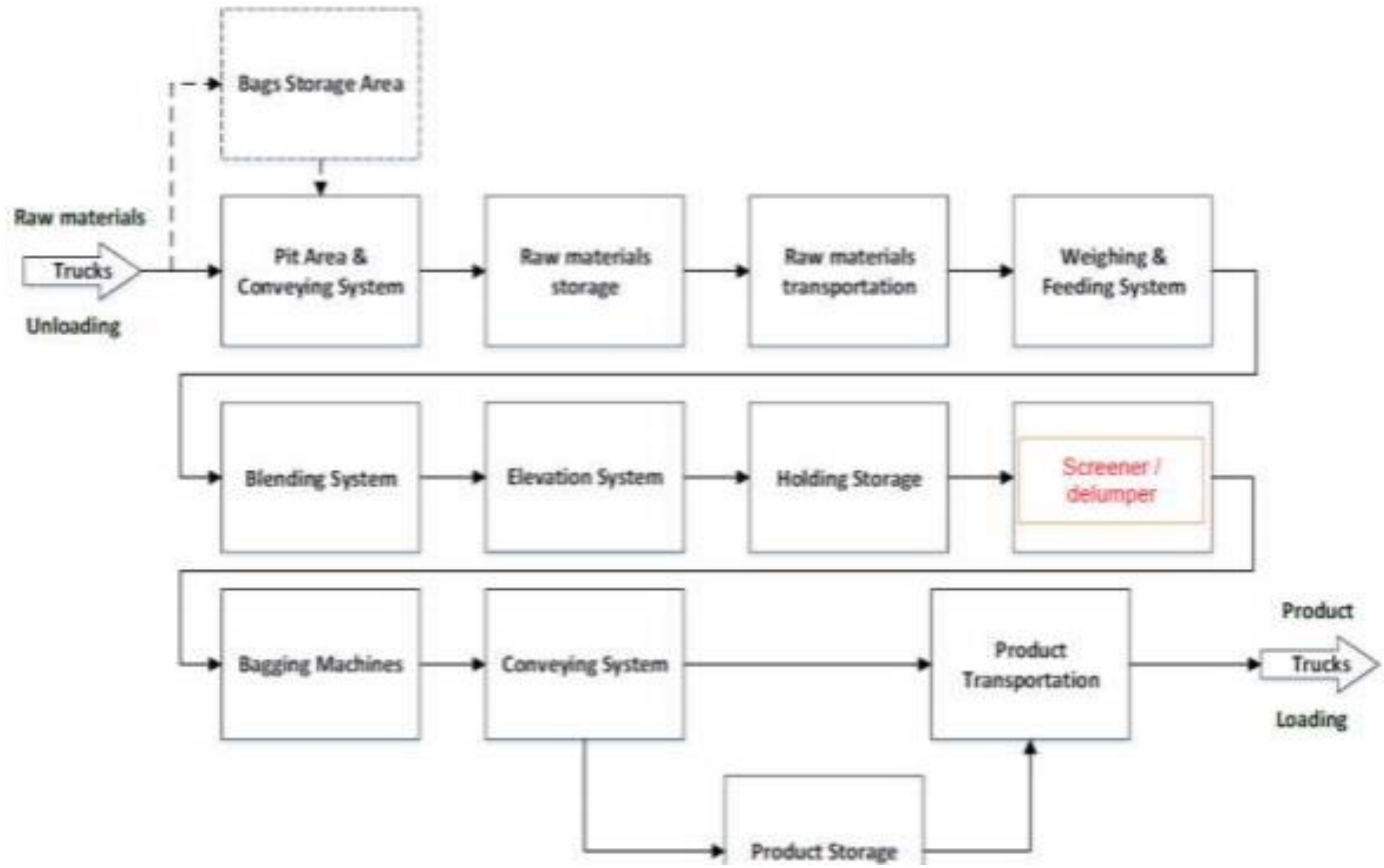

Figure 3. 1: block flow diagram of the fertilizer blending process

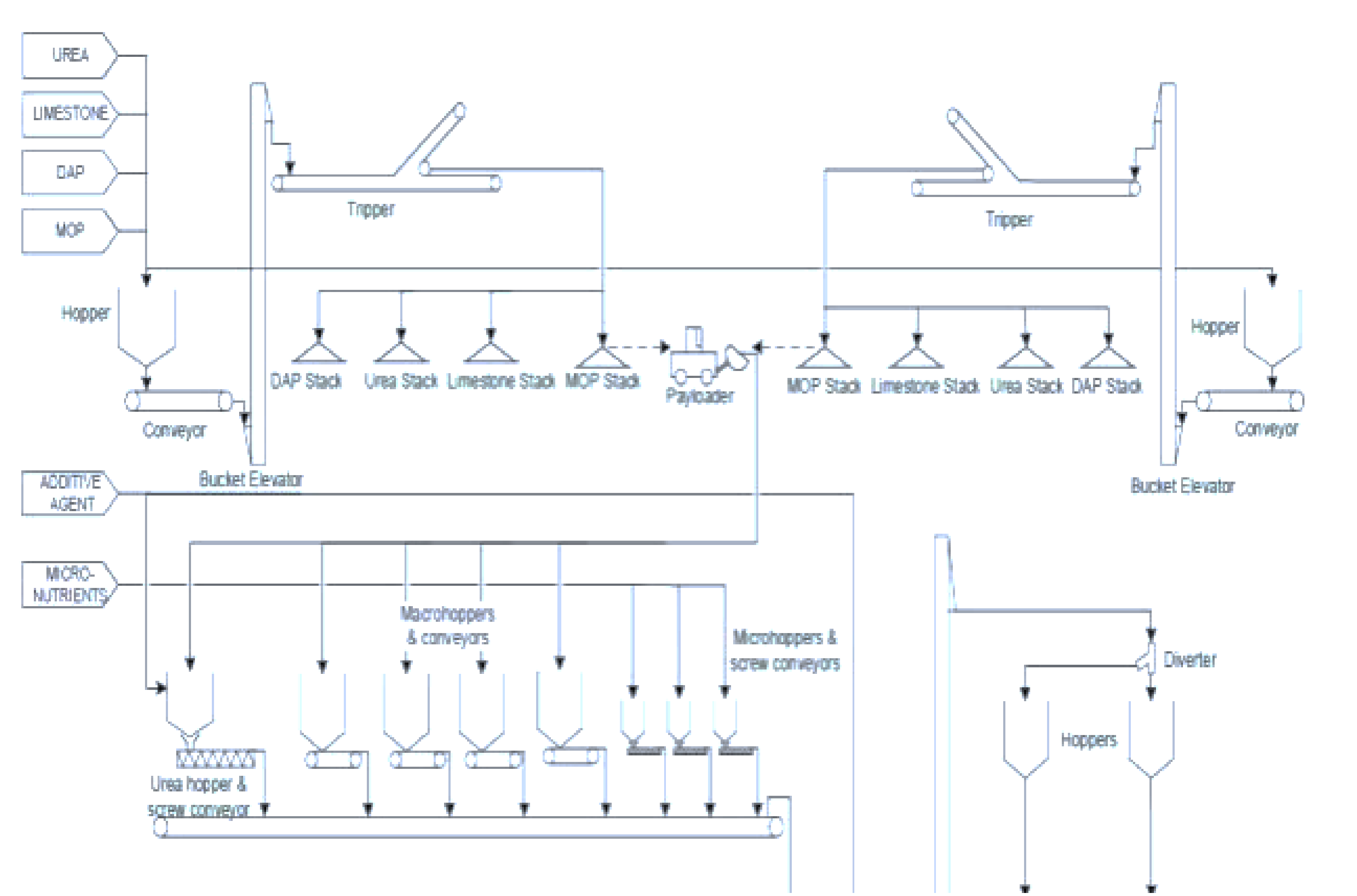

Figure 3. 2: Flow diagram of the proposed fertilizer blending process

3.4.4 Estimated Project Workforce

In the construction phase, the proposed project will directly employ about seventy skilled professionals as well as about eighty to a hundred unskilled employees; in the operational phase, the project will employ twenty-five (25) skilled professionals and about twenty-five to fifty (25-50) unskilled labourers depending on the number of shifts to be operated.

However, during employee recruitment, priority will be given to qualified persons from the host community, followed by those from nearby communities. This will be in accordance with a Local Content Plan to be designed by the contractor and vetted by OCP Africa Nigeria Limited, FMEnv and Sokoto State Ministry of Environment. The Local Content Plan will ensure that whenever possible qualified skilled and non-skilled positions are reserved strictly for people from the project host communities and that on-the-job training is made an integral part of the recruitment policy of the contractor.

3.4.5 Corporate Social Responsibility (CSR)

As part of its Corporate Social Responsibility (CSR), OCP Africa Nigeria Limited has set out its broad objectives on its corporate social responsibility in a Memorandum of Understanding (MOU) it had signed (on the third of February, 2020) with the Host Community in the project area in relation to its peaceful co-existence with the community.

In the course of its operations within the Host Community, the OCP Nigeria Limited, to the best of its abilities, having due regard to compliance with its internal policies and projections, endeavour to:

i. embark on corporate social responsibility projects that will have positive impact on the members of the Host Community particularly in areas such as educational assistance, social development, entrepreneurial training, and infrastructural development;

ii. provide employment opportunities for the indigenes of the Host Community subject to availability of positions and adequate professional and technical qualification of such indigenes; and

iii. perform any other acts or projects which in its opinion will be beneficial to the Host Community.

However, nothing in the above provisions shall oblige the company to execute any of the above-mentioned intervention CSR projects within a particular timeframe and such projects will be executed at any time during the business operational phase of the Company.

3.4.6 Decommissioning Phase

The design life of the proposed factory will be 20 years, which is dependent on proper maintenance. Establishment of the fertilizer factory is part of the medium- and long-term plans to meet the country's fertilizer needs for agricultural production and economic growth; therefore, it is unlikely that the plant would be decommissioned in the near future. It would more likely be upgraded or rehabilitated if this is found to be necessary in the future. However, should decommissioning be required in the long run, the general good practice guidelines for decommissioning of infrastructure as well as the existing environmental legislation of the time would guide appropriate decommissioning of the fertilizer blending plant.

However, at the end of the construction phase the construction area and yard will be rehabilitated according to recommended plans before abandonment.

3.4.7 Project Implementation Schedule

The Gantt chart of figure 3.2 is self-explanatory and briefly summarizes the project scheduling.

According to the proposed schedule, preconstruction phase of the proposed project will last for twelve months, i.e., from January 2020 to December 2020, culminating with obtaining all relevant permits include building development permit, environmental permit, etc.

The construction phase, which will include physical building construction activities and developing related infrastructure as well as installation of production equipment and accessories, is expected to begin in January 2021 and lasts for six months.

The operational phase of the project during which fertilizer production/blending operations and periodic building and plant maintenance activities will be carried out is scheduled to commence in July 2021 and lasts for at least twenty years.

S/N	Activity	Preconstruction Phase	Construction Phase	Operations Phase
		Duration (timeframe)		
		January 2020-December 2020	January 2021-June 2021	July 2021-July 2041
1.	Preconstruction activities, including site acquisition factory design, permits/approvals			
	Construction of buildings and associated structures			
	Installation of production equipment and test-running			
	Demobilization from construction site			
	Operations and periodic maintenance			

Figure 3. 3: Gantt chart for project implementation

CHAPTER FOUR: DESCRIPTION OF PROJECT ENVIRONMENT

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4.1 GENERAL

This chapter presents the physical, chemical, biological, socio-economic and health environments of the proposed project. The environmental characteristics of the proposed project area are essentially required as baseline data for impact assessment, environmental monitoring and future studies.

4.2 BASELINE DATA ACQUISITION METHOD

The environmental baseline data was acquired through desktop research, field observations, sampling and measurements as well as laboratory analysis of collected samples. Field data gathering and sampling activities carried out were restricted to the wet season only and were supplemented with information from literature and other studies.

4.2.1 Literature Review

Through a review of relevant literature on the project environment, some information gaps were identified and this called for field studies, sampling and in-situ measurements, as well as laboratory analysis of collected samples. In other words, field research was used to complement information gathered from desktop research. The fieldwork covered all relevant elements of the ecological and socio-economic environments.

Experts in relevant fields were consulted and via questionnaires, Focus Group Discussions (FGDs) and Key Informant Interviews (KII), public consultations were held with people in the locality of the project area on issues relating to potential ecological and socio-economic impacts of the proposed project. Likewise, a stakeholders' scoping workshop was held on the 6th of February 2020 to further identify relevant issues to be addressed by the EIA.

Prior to field investigations, background and design information on the proposed project was also obtained from the project proponent. Published and unpublished materials about the project area, which included research publications, articles and previous EIA reports (including the EIA Of the Proposed 3rd Line Cement Production Expansion And 48mw Gas Fired Power Plant Project in Kalambaina) were obtained from various sources which included government Departments and Agencies such as National Meteorological Agency, etc. These were used to define the scope of the field work. Demographic and bio-physical characteristics of the project area were also obtained from socio-economic and field surveys, respectively.

4.2.2 Field Work

The study team conducted field visits to investigate issues of interest. These involved visit and inspection of the proposed 10-Hectre project site and its surroundings to establish environmental and socio-economic baseline conditions on which prediction and identification of potential impacts and their corresponding mitigation measures would be based.

A central policy of an EIA is to provide an opportunity for public participation in the design and implementation of a proposed project and throughout its entire life cycle. In this respect, project stakeholders comprising of local communities and their traditional leaders as well as Federal, State and Local Government officials who have roles to play in the implementation of the proposed project were consulted. The consultations proved useful in identifying major environmental and socio-economic concerns associated with the project.

Furthermore, public consultation provided the EIA team with the opportunity to interact with and inform the Project Affected Persons about the environmental safeguards being put in place for the execution of the project as well as its accompanying benefits and to solicit for their opinions and inputs.

A review of the existing baseline information and literature material proved very helpful in the actualization of this study. It provided that basis for gaining deeper understanding of the project and the environmental and social conditions that exist in the project area.

4.2.2.1 Spatial boundary for ecological studies

Spatial boundary considered for the ecological studies in this EIA consisted of areas not more than 500 metres radius from the proposed factory site in Kalambaina town.

4.2.3 In situ Measurements

As recommended by defunct FEPA (1991), in situ measurements were carried out on some physical parameters of the project environment. These parameters included:

- ✓ Air quality;
- ✓ Noise;
- ✓ Suspended particulate matter (SPM), COx, SOx, NOx, NH_3, H_2S, HC; and
- ✓ Water quality (pH, temperature, dissolved oxygen concentration, total dissolved solids, conductivity, turbidity and salinity).

4.2.4. Sampling Criteria

Based on the objectives, water samples were taken from five sampling stations (two for groundwater and three for surface water). Six (6) soil samples and two control soil samples were collected from the project site.

Sampling therefore involved the following components:

i. Soil;

ii. Surface and ground water;

iii. Vegetation; and

iv. Fauna.

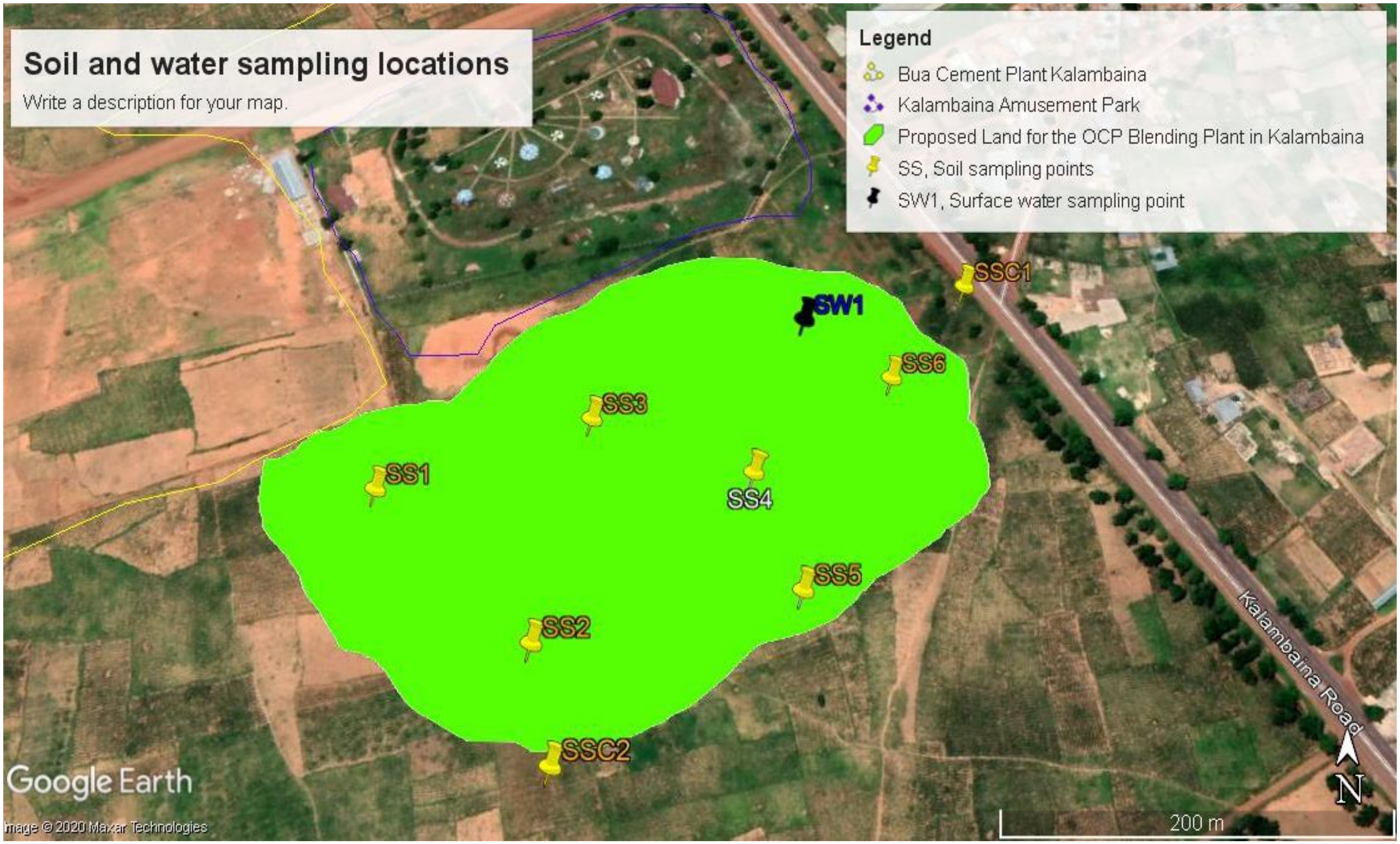


Figure 4.1: Sampling locations

4.2.4.1 Floristic Types/Characterization

Vegetation in the study area was analyzed using the Transects Method. The following attributes were determined.

- ✓ Floristic composition of plant communities;
- ✓ Life form types;
- ✓ Economic/medicinal and useful plants/species;
- ✓ Endangered species.

4. 2.4.1.1 Taxonomic and Herbarium Studies

For the plant taxonomic and herbarium studies, the vegetation samples were flattened and sandwiched between absorbent papers in a way that allowed the plant to look as natural as possible with the essential features of flowers, fruits, and leaves preserved. The samples were then enclosed between 24cm x 30cm wooden corrugated plant presses. The dried specimens were then mounted on special pieces of cardboard (42cm x 28cm) and properly labeled and stored in the herbarium. The plants were identified to the species level with the aid of Nigerian Trees Volume 1 and 2 (Keay, Onochie and Stanfield 1964) and the Flora of West Tropical Africa (Hutchinson and Dalziel, 1968).

4. 2.4.1.2 Vegetation Structure/Life-Form Type

The life-form spectra, the floristic structure and composition of the various plant communities were worked out using the Raunkaerium (1934) life-form classification scheme described below.

1. *Phanerophytes (Woody trees:)*

Megaphanerophytes (Mg); Trees above 30m high

Mesophanerophytes (Me); Trees and shrubs 8-30m high

Microphanerophytes (Mi); Trees and shrubs 2-8m high

Nanophanerophytes (Nano); Shrubs and herbs under 2m high

2. *Chamaephytes (Ch);* Plants with surviving buds close to ground surface

modified in this study to include climbers.

3. *Hemkryptophytes (He);* Plants with surviving buds hidden under soil surface.
4. *Cryptophytes (Cr);* Plants with buds completely concealed in the ground.
5. *Therophytes (Th);* These are annual plants
6. *Epiphytes (Ep);* These are parasitic plants.

4.2.4.2 Flora and Fauna

Quadrant sampling technique with 1.0 m^2 wooden frame quadrant was used at designated sampling points. The organisms were placed on the basis of their taxonomic group or life forms after confirmation with Herbarium matching. For fauna, visual observations with binoculars, nests, sound and fecal remains were used, this was significantly complemented with interview with local people.

4.2.4.3 Soils Sampling

Surface soil was investigated through visual observation and sampling. Composite soil samples were obtained from designated sampling points in 8 locations on the project site. Hand Auger of uniform cross section was used to ensure that reproducible composite soil samples were collected from depths of 0-15cm and 15-30cm. This ensured high quality representative data collection. Surface litter of un-decomposed plant materials were removed to ensure that uncontaminated soil samples were collected. Soil samples were collected in appropriately labeled and sealed polythene bags.

Samples for microbiological analysis were collected in sterile McCarthey bottles and kept under 4^0C in a refrigerated container (cooler). Samples for physico-chemical analysis were air-dried in a dust-free environment while those for microbiological analysis were stored in ice-packed container in the field and transferred to the refrigerator at 4^0C. Physico-chemical analysis of soil samples were carried out using the analytical methods recommended by defunct FEPA (1991).

Plate 4. 1: Soil being sampled on the proposed factory site

4.2.4.3.1 Soil Organisms

Tulgren and Floatation methods were used for the extraction of soil organisms. Surface soil macroscopic organisms from leaf or top soil were picked with forceps and preserved in 4% Formalin prior to identification with Edmonson (1959), Pennak (1978) and Species Diversity Index (Margalef 1975).

4.2.4.4 Microbiological Studies.

Water samples for microbiological studies were collected in 100ml plastic containers which were covered with Aluminum foil and kept in ice-cool container prior to culturing in the laboratory. The water was then analyzed for coliforms using the multiple tube fermentation technique. EC broth was the medium used and MPN Index was determined with MPN Table. The heterotrophic count was determined using the Plate Count Agar upon which aliquots of 0.5ml of serially diluted samples were plated.

4.2.5 Water Quality and Hydro-biological Studies

In-situ measurements for pH, temperature, conductivity and dissolved oxygen were conducted with Pye Unicam meter in the field. For other physiochemical analysis, duplicate water samples were collected in two 1-litre plastic containers, labeled and stored in an insulated refrigerated container and later analyzed in the laboratory according to Lind (1979) and APHA (1985). All samples for laboratory analysis were taken to Zabson Laboratories Limited, located in Masaka, Nasarawa State.

Plate 4. 2Surface water being sampled beneath a bridge on river Sokoto

4.2.6 Socio-Economic Studies

The primary data for the study was obtained from structured questionnaires; Focus Group Discussions (FGDs) and Key Informant Interviews (KII). The questionnaire was designed to generate information on demographic structure and socio-cultural characteristics of the inhabitants as well as local economy and available infrastructure among others. The objective of the group discussions was to identify community's perceptions on the proposed project, problems associated with it, and how such problems may be mitigated. Information from such discussions was used to confirm/cross check the veracity of some of the answers provided in the questionnaires.

4.2.6.1 Spatial boundary for the socio-economic studies

As identified by Beanlands and Duinker (1983), Ecological/Socio-economic Boundaries are the most difficult boundaries to define for an EIA. This is due to the fact that there are both temporal and spatial limitations over which biological, social and economic systems function and the fact that limitations vary widely among species depending upon several factors such as population cycles and recovery rates to pre-impact site conditions. Temporal and spatial variability are dependent upon the particular discipline being studied. However, a simplified spatial boundary considered for the socio-economic studies in this EIA comprised of households located not more than two kilometers away from the proposed project site. This was because settlements within this boundary may be impacted more severely and more directly than those in other locations in the extended project area.

4.3 THE PROJECT AREA

Wamakko (LGA) is one of the 23 LGAs of Sokoto State. It has an area of 697 km² and a population of 179,619 people, (NPC, 2006). The Local Government Area was created out of Sokoto state in 1991. It has ten (10) districts: Dundaye, Gumburawa, Gumbi, Gwuiwa, Wajake, Gedawa, Kalambaina, Arkilla, Gidan Bubu, and Wamkko. Its headquarters is located in Wamakko town, about 10km from Sokoto city, the state capital. The Local Government Area is located to the extreme North West part of the state on lat of 130 7.5528' N - and long 5o 12.5400' E. It is bordered on the North by Tangaza Local Government Area, to the South by Bodinga (LGA) and Yabo (LGA), to the West by Silame (LGA) and to the East by Sokoto north and Kware (LGA).

4.3.1 Climate

The climate of the study area is characterized by a long dry season (October/November-April/May) with a short rainy season (May-September/October), (Singh, 1995). The study area experiences harmattan wind (N-E Trade winds), which are dry, cold, and dusty blowing between the months of November to February.

Generally, the climate varies considerably according to months and seasons. A cool dry (harmattan) season from December to February; a hot dry season from March to May; a warm wet season from June to September; a less marked season after rains during the months of October to November, which is characterized by decreasing rainfall and a gradual lowering of temperature. Also, the relative humidity is always low, being about 40 percent in January and rising to about 55 percent in July.

The climate of Wamakko is referred to as a local steppe climate, i.e. BSh, according to the Köppen-Geiger climate classification. The average annual rainfall is 629 mm. The wettest month is August, with an average of 211 mm. The driest month of the year is January. Table 4.1 below summarizes the monthly average weather conditions of Wamakko LGA.

Table 4. 1: Monthly weather averages for Wamakko (NiMet, 2010-2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Temp (°C)	24.5	26.6	30.4	33.2	32.5	30.2	28.1	26.5	27.5	29.3	27.5	24.6
Min. Temp (°C)	16	17.3	22	25.7	26.1	24.3	23.1	22	22.1	21.8	18.9	16.1
Max. Temp (°C)	33	35.9	38.8	40.8	39	36.2	33.1	31.1	33	36.9	36.1	33.1
Rainfall (mm)	0	0	1	6	38	86	164	211	108	15	0	0

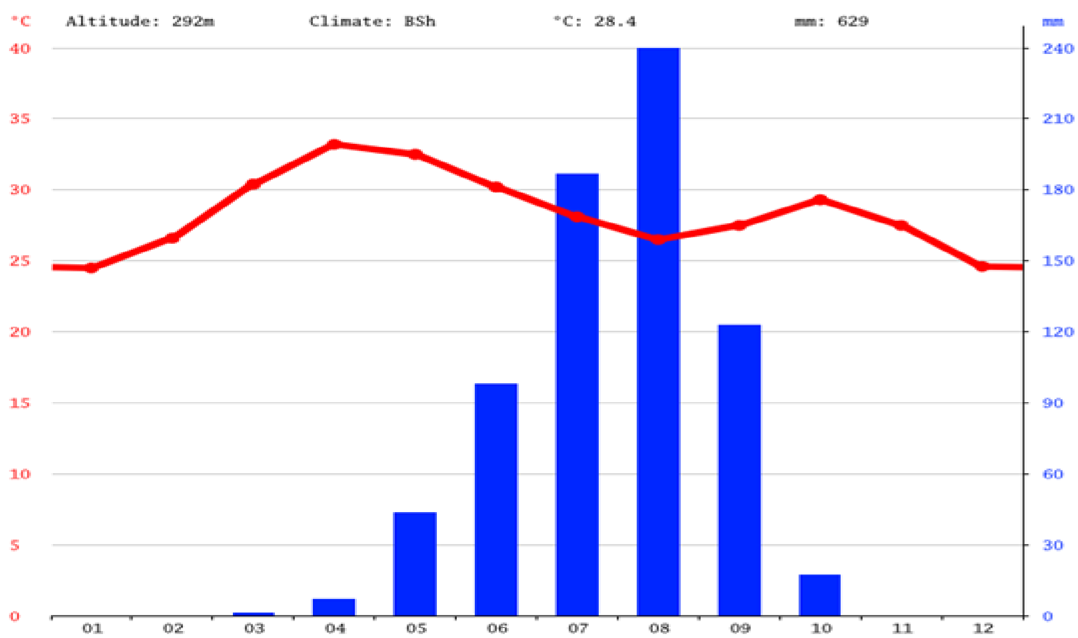


Figure 4. 1: Climate graph of Wamakko town
Based on 2010-2019 data from NiMet

The average annual temperature in Wamakko is 28.4 °C. April is the warmest month of the year with an average temperature of 33.2 °C. The lowest average temperature in the year occurs in January and is around 24.5 °C.

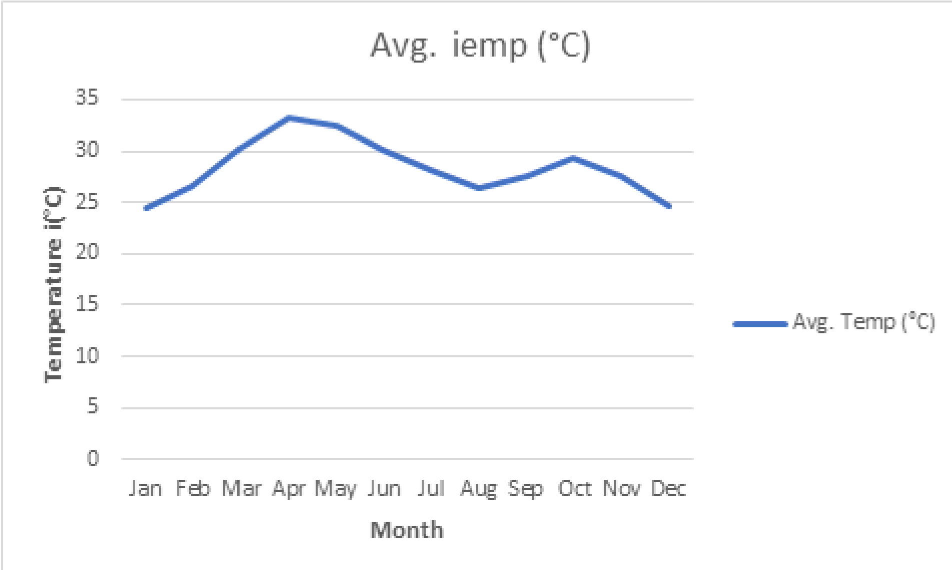


Figure 4. 2: Average monthly temperature profile of Wamakko

4.3.2 Vegetation

The vegetation of the area falls within the Sudan Savannah vegetation zone characterized by soils that are mostly sandy to loamy in texture with some patches of clayey subsoil. An assortment of various species of grasses and legumes, patches of bushes and sparsely distributed indigenous tree species majority of which are thorny tree species, such trees include Acacia nilotica, Faidherbia albida, Zizipus spp, Tamarindus indica, Balanites aegyptiaca, etc, (Ango, et al., 2014).

4.3.3 Relief

The LGA is general composed of undulating plains which generally rise up to about 300 m above sea level.

4.3.4 Geology

The Kalambaina Formation consists of marine white, clayey limestones and shales. The thickness of the formation is quite variable, because of the subsurface dissolution of the limestone. The maximum thickness in the boreholes is over 20 m, but usually only about 12 m of section is exposed in the quarry.

Near the village of Dange, the Kalambaina Formation is reduced to about 5 m, but at Birnin Kebbi, further south, the formation is approximately 18 m thick. The formation is rich in invertebrate fossils, mainly echinoids, corals, nautiloids, lamellibranchs and gastropods. Foraminifera and ostracods have also been described from the formation by Reyment (1965), Kogbe (1976) and Petters (1978). At the type locality, the type sections of the Kalambaina and Gamba Formations are well exposed. The profile consists of the Kalambaina Formation at the base, overlain conformably by the Gamba Formation, which in turn is succeeded by an oolitic ironstone unit. The Kalambaina Formation is generally marly with increasing clay content upwards. The formation is richly fossiliferous. Mega fossils include the shallow-water pelecypod Lucina pharaonis, Panopea sahariensis, Ostrea lamellaris,, Ostrea multicostata, the gastropod Volutilithes muricina, and some nautiloids, Deltoidonautilus molli and Cimomia sudanensis. Echinoids are particularly abundant, especially Linthia sudanensis, Gisortia brevis, and Rhabdocidaris cottreaui have also been reported. The rich microfauna assemblage is similar to those described in the Dange Formation.

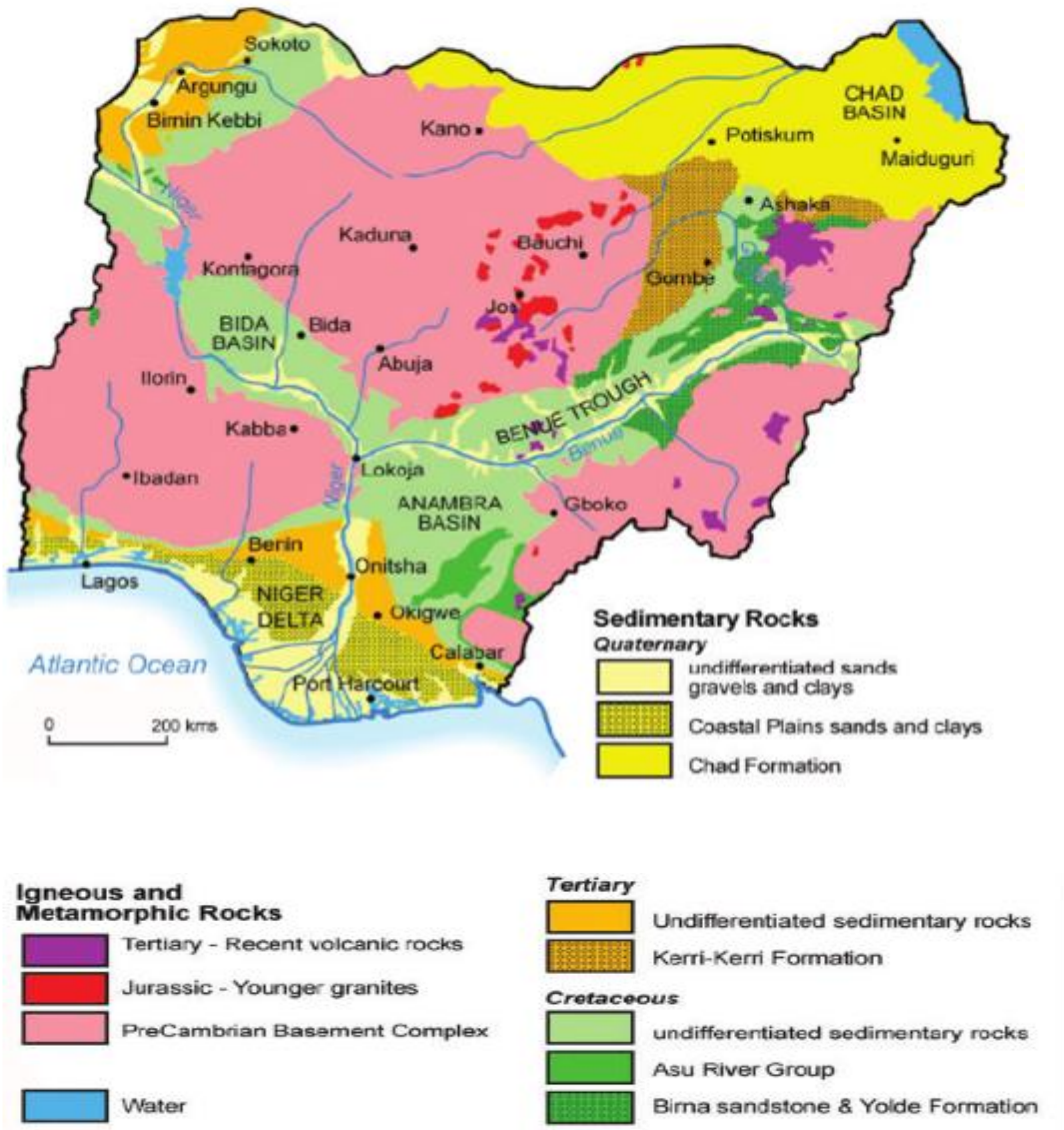


Figure 4. 3: Geology of Nigerian regions
Source: Obaje, N.G., 2009

4.3.5 Soil Resources

Soil in the project area is sandy to loamy in texture with some patches of clayey subsoil. It is relatively easy to cultivate with little leaching hence, it is generally good for cultivation of groundnuts, grains and cotton.

4.3.5.1 Soil Physico-chemical Characteristics

Tables A4 to A11 of Appendix I present the results obtained from the physico-chemical analysis of soil samples from the project area. The trend in baseline concentrations of key potential pollutants from the proposed production process is as presented in the following subsections.

4.3.5.1.1 Phosphate concentration in soil

Phosphate concentrations in top soil samples collected from the proposed factory site ranged from 1.41-2.88mg/Kg, with a mean value of 2.60mg/Kg which is lower than the regulatory limit of 5mg/Kg specified by FMEnv. Figure 4.4a and 4.4b depicts the distribution of phosphate in top and bottom samples respectively.

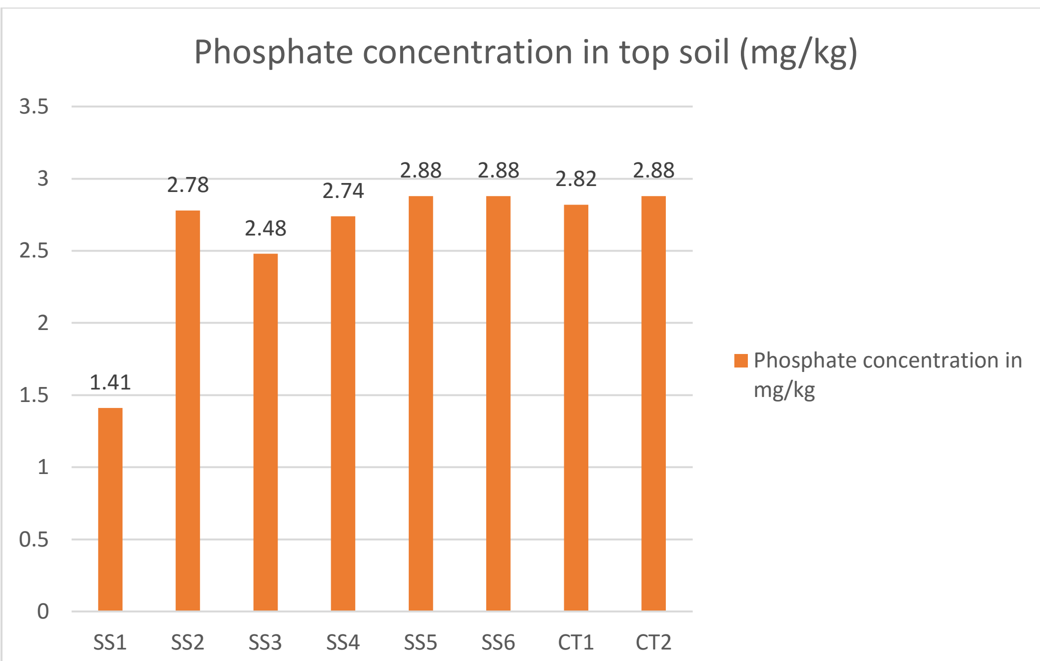


Fig 4.4a

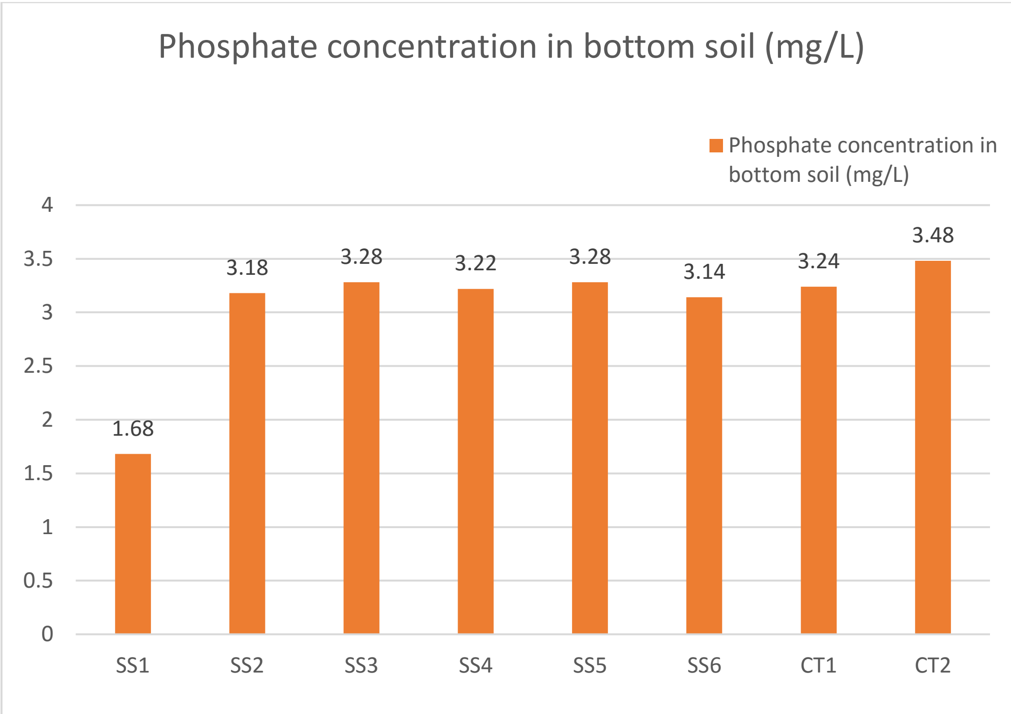


Fig 4.4b

Figure 4. 4: Phosphate concentration profile of soil

4.3.5.1.2 Nitrate concentration

The chart of Figure 4.5 depicts the concentrations of nitrate in top and bottom soil samples collected from the project area. The concentrations for top soil samples ranged from10.0mg/Kg to 18mg/Kg and had a mean of 15.5mg/Kg; while the concentrations for bottom soil samples ranged from16.7mg/Kg to 19.1mg/Kg and had a mean of 18.1mg/Kg which is lower than the upper regulatory limit of 20mg/Kg specified by FMEnv. Therefore, overall, the soil in the project area is free of nitrate contamination.

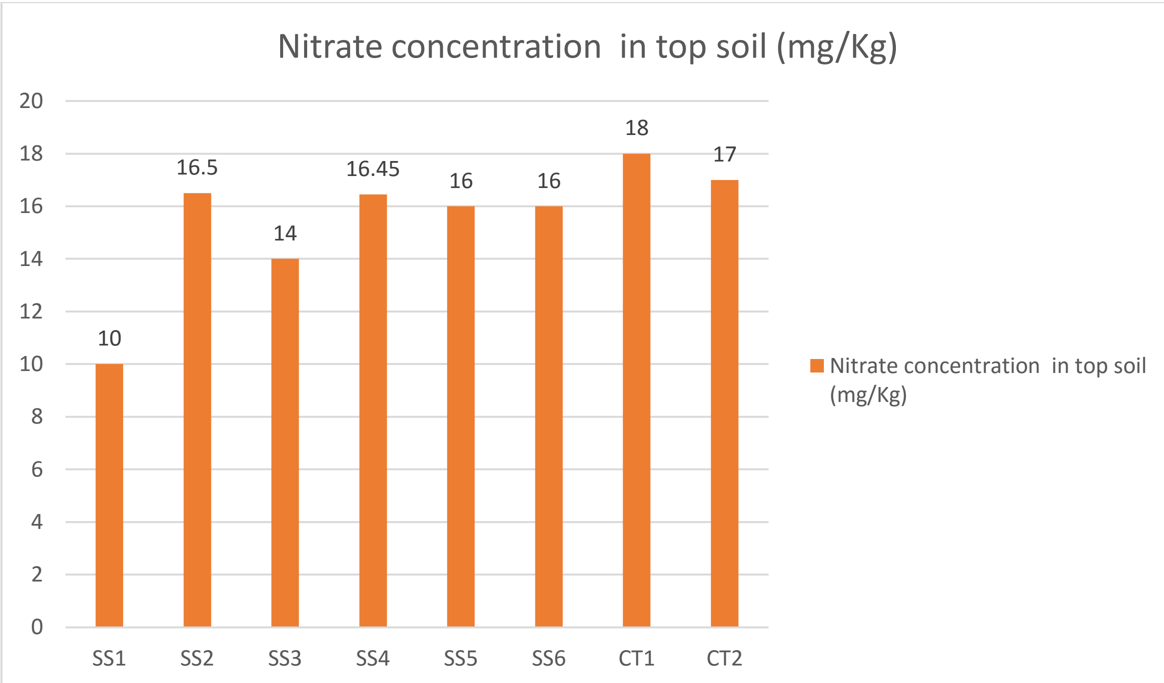


Fig 4.5a

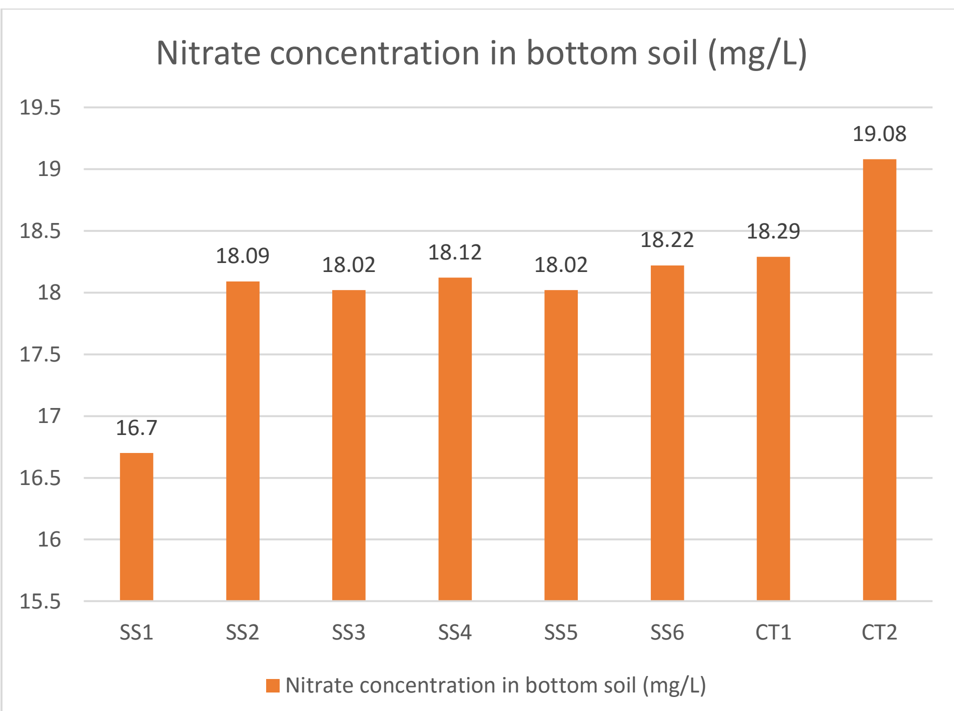


Fig 4.5b

Figure 4. 5: Nitrate concentration of soil samples

4.3.5.1.3 Nitrite concentration in soil

The charts of Figure 4.6 depict the concentrations of nitrite in top and bottom soil samples collected from the project area. The concentrations for top soil samples ranged from 0. 1mg/Kg to 0.9mg/Kg and had a mean of 0.69mg/Kg; while the concentrations for bottom soil samples ranged from 0. 2mg/Kg to 0.6mg/Kg and had a mean of 0.30mg/Kg which was much lower than the upper regulatory limit of 1mg/Kg specified by FMEnv. The soil is therefore also free of nitrite contamination.

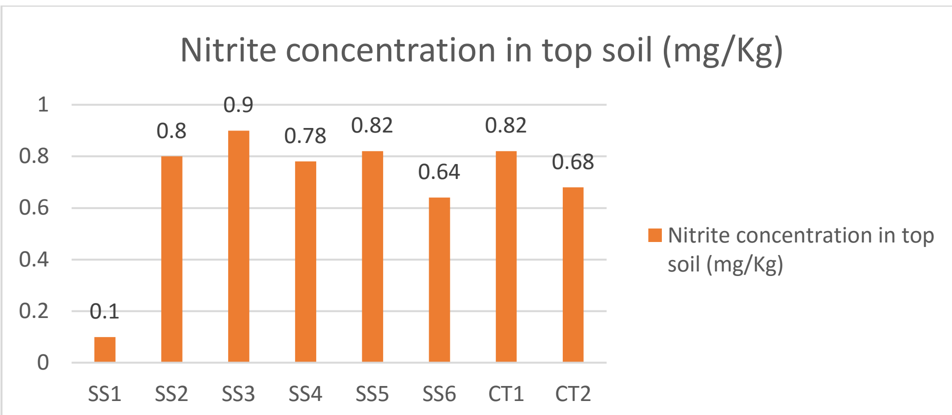


Fig 4.6a

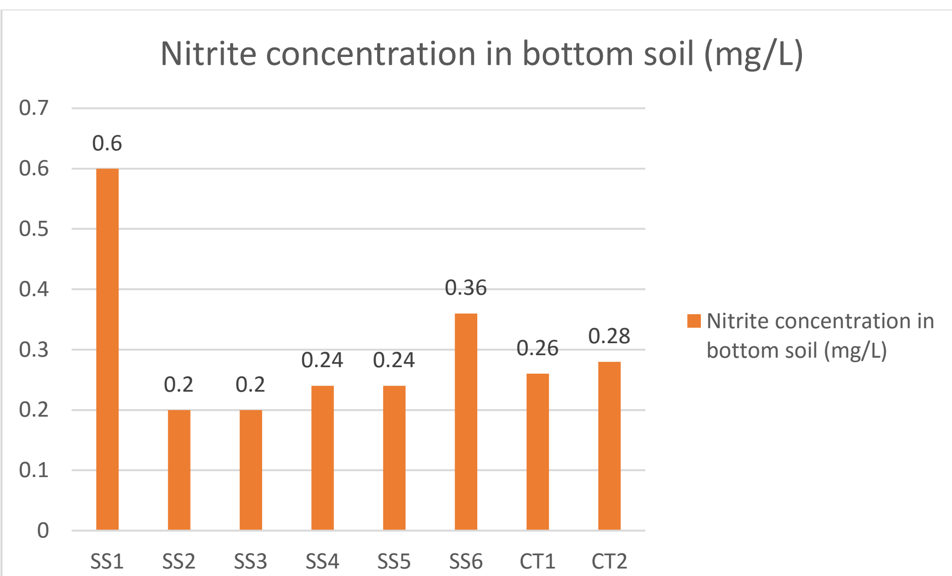


Fig 4.6b

Figure 4. 6: Nitrite concentration of soil

4.3.5.1.4 Sulphate concentration in soil

The charts of Figure 4.7 depict the concentrations of sulphate in top and bottom soil samples collected from the project area. The concentrations for top soil samples ranged from 11.2 mg/Kg to 110.0 mg/Kg and had a mean of 82.2 mg/Kg; while the concentrations for bottom soil samples ranged from to 29.9mg/Kg to 100.0mg/Kg and had a mean of 86.0mg/Kg which was much lower than the upper regulatory limit of 500mg/Kg specified by FMEnv. Overall, the soil is from the project site is also free of sulphate contamination.

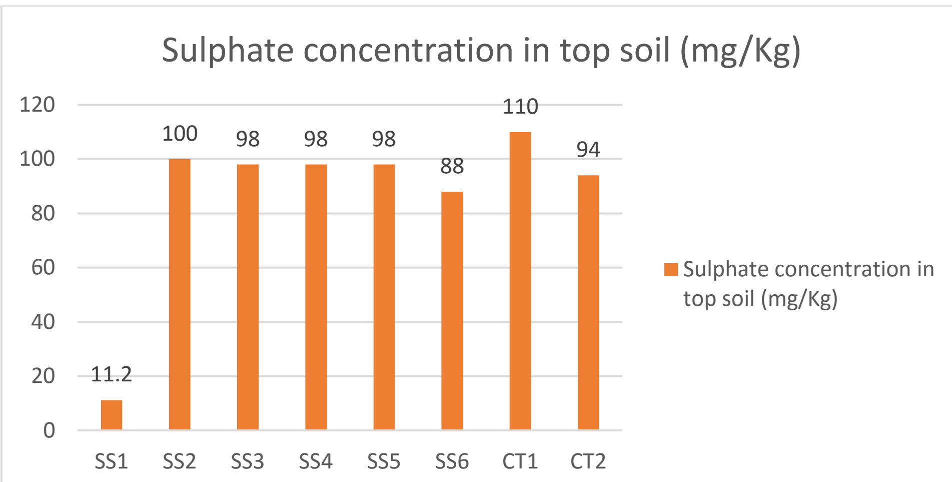


Fig 4.7a

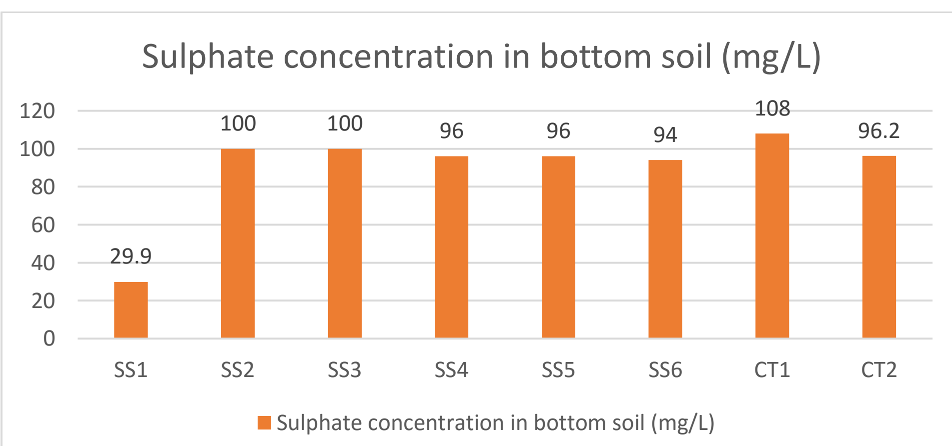


Fig 4.7b

Figure 4. 7: Concentration of sulphate in soil samples

4.3.5.1.6 Heavy Metals in Soil

Low levels of many heavy metals are naturally present in most soils. Pollution problems can arise from discharge of heavy metals–containing waste products from industrial processes and municipal sources, from which toxic amounts may be absorbed by plants or animals. Heavy metals exist in several oxidation states, each with different reactive, toxicological, and bio-concentration potentials. Metals such as Cd, Pb, and Zn are toxic in their cationic form, while others require biochemical transformation to become toxic.

Iron (Fe), Lead (Pb), Copper (Cu), Zinc (Zn), Manganese (Mn), Nickel (Ni) and Cadmium were tested for in analyzed soil samples and the results are presented in the Tables A4-A11 of Appendix I.

Lead

Concentration of Lead in the top soil samples ranged from 0.01-0.03mg/Kg with an average value of about 0.02mg/Kg; while concentration of Lead in bottom soil samples ranged from 0.21-0.28mg/Kg with a mean of 0.25mg/Kg. Overall, lead concentration in both top and bottom soil samples was much lower than the upper regulatory limit of 1mg/Kg set by FMEnv.

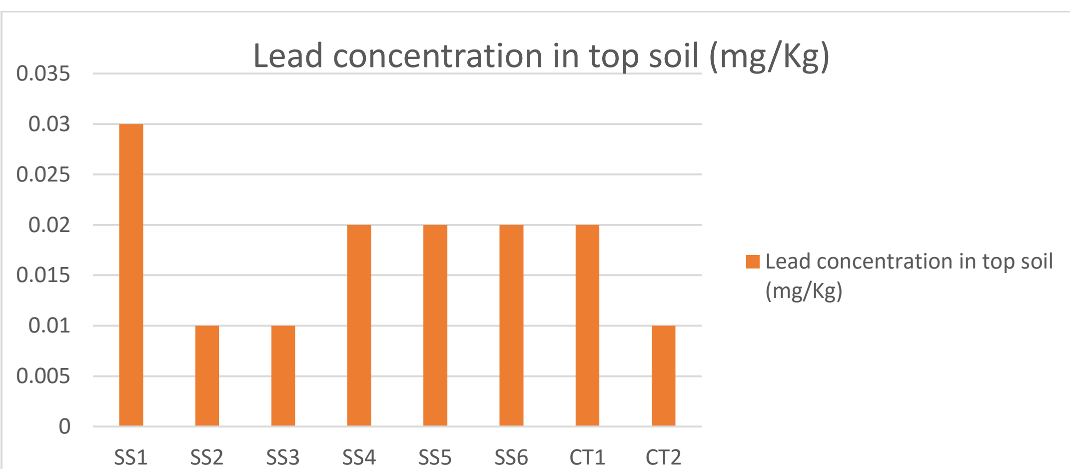


Figure 4.8a

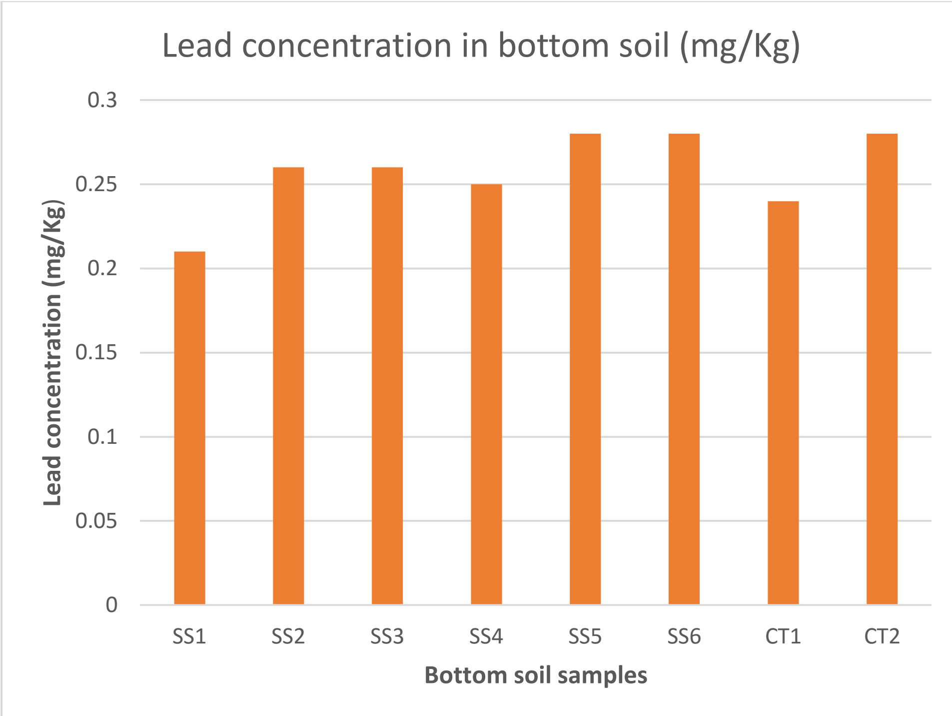


Fig 4.8b

Figure 4. 8: Lead concentration in soil samples

Nickel

Concentration of Nickel in the top soil samples ranged from 0.004-0.015mg/Kg with an average value of about 0.013mg/Kg; while concentration of Nickel in bottom soil samples ranged from 0.012-0.021mg/Kg with a mean of 0.015mg/Kg. However, no regulatory limit has been set by FMEnv.

Figures 4.9a and 4.9b respectively depicts the concentration of Nickel in top and bottom soil samples collected from the project site.

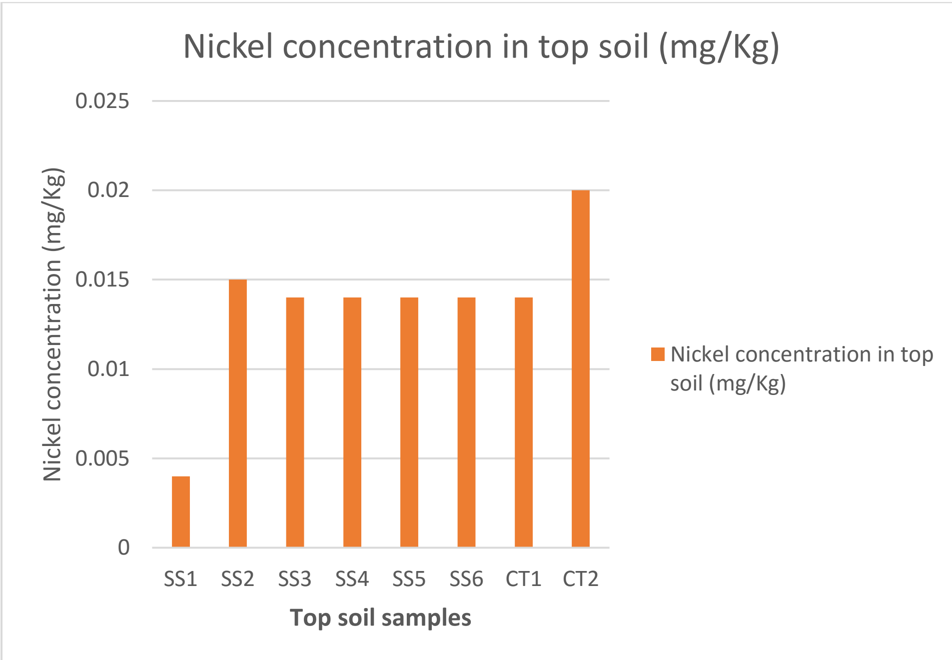


Figure 4.9a

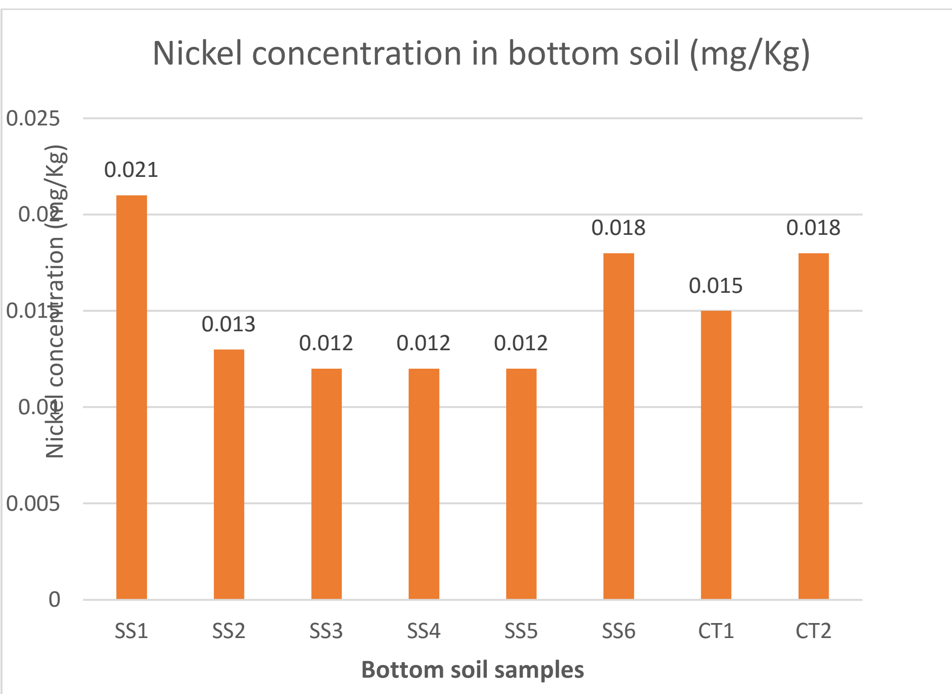
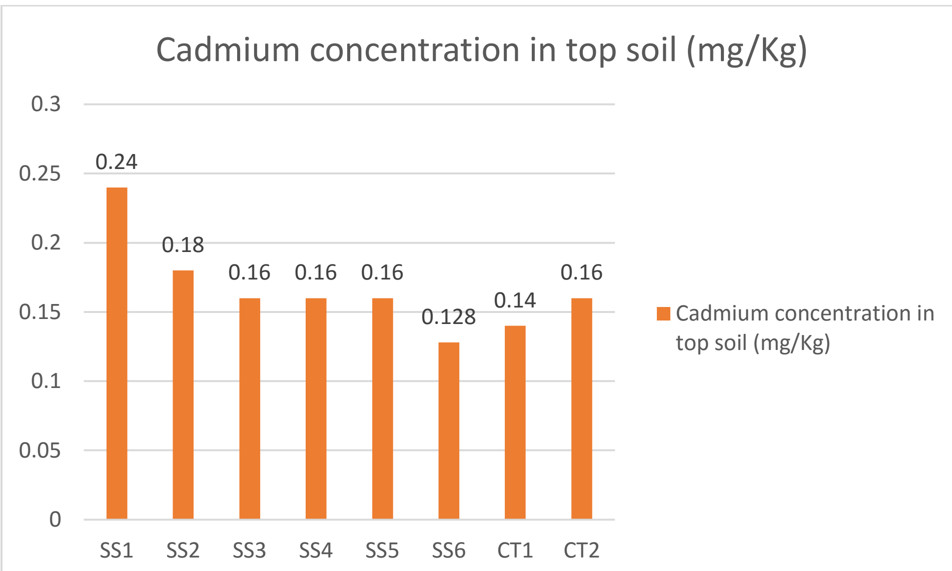


Figure 4.9b:
Figure 4. 9: Nickel concentration in soil samples

Cadmium

Concentration of cadmium in the top soil samples ranged from 0.13-0.24mg/Kg with an average value of about 0.17mg/Kg; while concentration of cadmium in bottom soil samples ranged from 0.01-0.14mg/Kg with a mean of 0.05mg/Kg. Overall, cadmium concentration in both top and bottom soil samples was low, although no upper regulatory limit has been set by FMEnv.



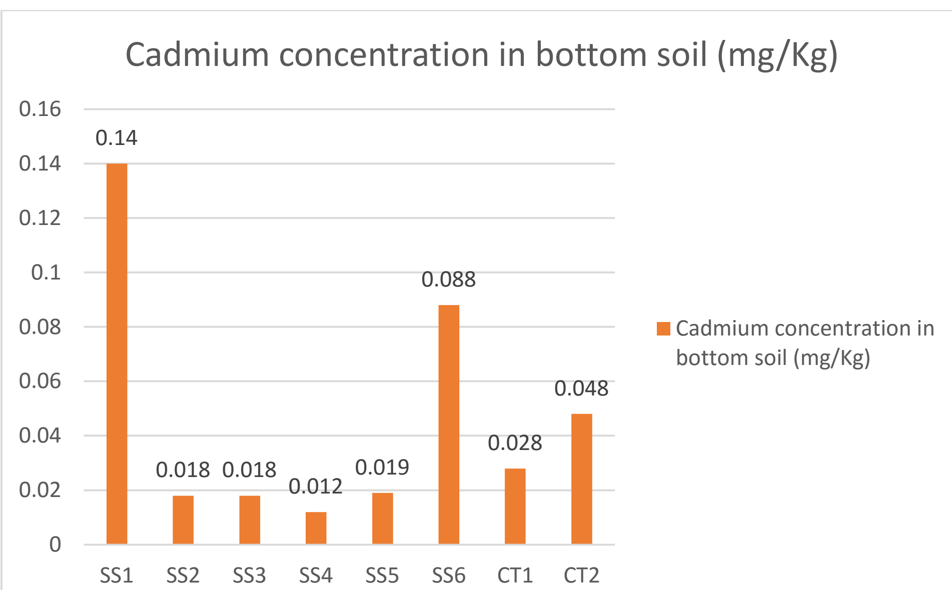


Figure 4. 10: Cadmium concentration in soil samples

Table below summarizes the concentration range for the other heavy metals in both top and bottom soil samples.

Table 4. 2: Concentration range of other metals in soil

Heavy metal	Concentration range (mg/Kg) in top soil	Concentration range (mg/Kg) in bottom soil	FMEnv regulatory limit
Iron (Fe)	4.21-6.45	1.80-2.90	Not specified
Copper (Cu)	0.97-1.27	1.17-1.20	Not specified
Zinc (Zn)	1.31-2.78	1.91-2.70	Not specified
Manganese (Mn)	0.30-0.81	0.92-1.34	Not specified

4.3.6 Water Resources

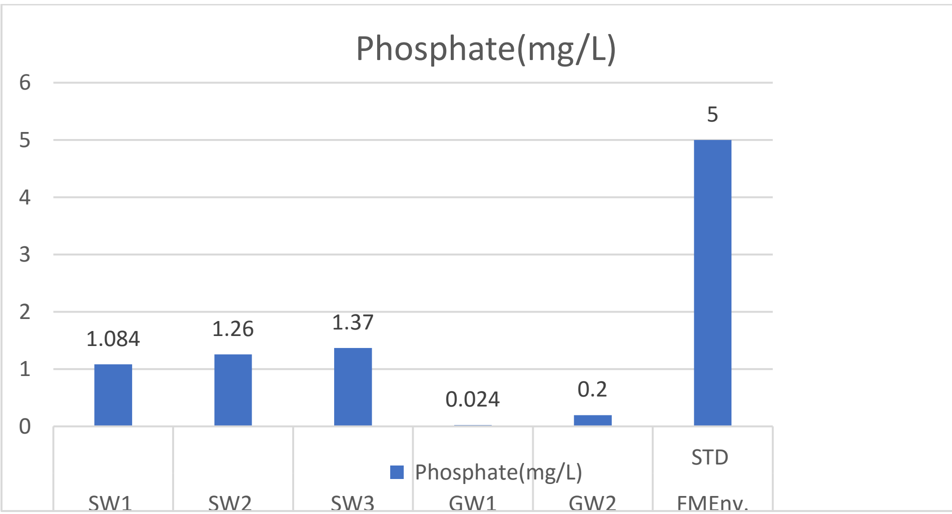
Sampling and analysis of ground and surface water samples was carried out by Zabson Laboratory Services that operate in Mararraba, Nasarawa State.

4.3.6.1 Physico-Chemical Properties of Surface and Ground Water in the Project Area

Three (3) surface water samples and two groundwater samples were collected and labeled SW1, SW2, SW3, GW1 and GW2 respectively. A summary of physico-chemical characteristics of the analysed water samples are presented in Tables A1-A3 in Appendix I of this report and the following subsections present and discuss the results.

4.3.6.1.1 Total Phosphate

Total phosphate concentrations of collected water samples are depicted in the chart below. The concentrations ranged from 0.02 to 1.37mg/L and were lower than the regulatory limit of 5mg/L specified by FMEnv. Baseline water quality in the proposed site is therefore free of phosphate pollution.



Concentration of Phosphate in surface & ground water

4.3.6.1.2 Magnesium

Magnesium concentration in collected water samples are depicted in the chart below. The concentrations ranged from 0.0 to 119.8mg/L with an average value of 44.5 which is lower than the regulatory limit of 50mg/L specified by FMEnv. Baseline water quality in the proposed site is therefore free of magnesium pollution.

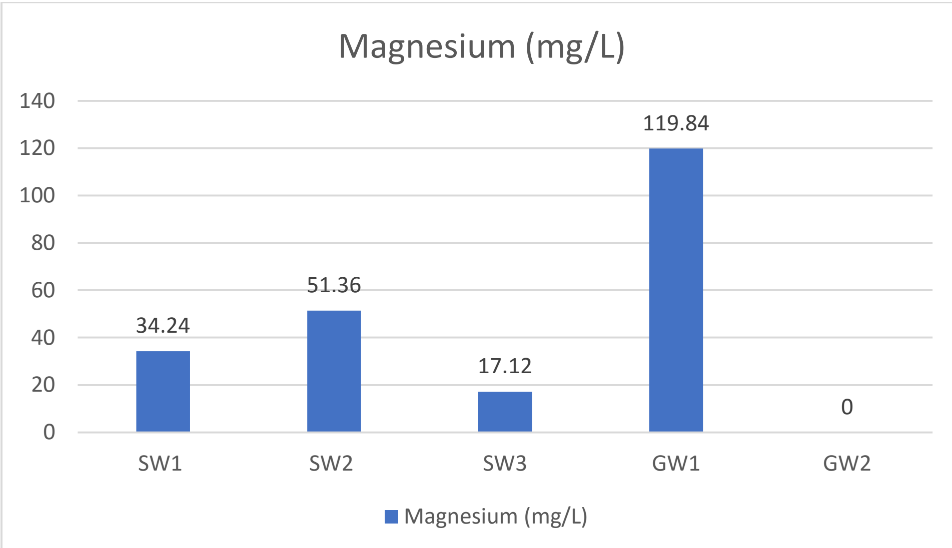


Figure 4. 11Magnesium concentration in water of the project area

Calcium concentration

Calcium concentration in collected water samples are depicted in the chart below. The concentrations ranged from 85.6 to 890.0mg/L with an average value of 383.5mg/L which is much higher than the regulatory limit of 200mg/L specified by FMEnv. Therefore, baseline water quality in the proposed project area shows significant calcium pollution.

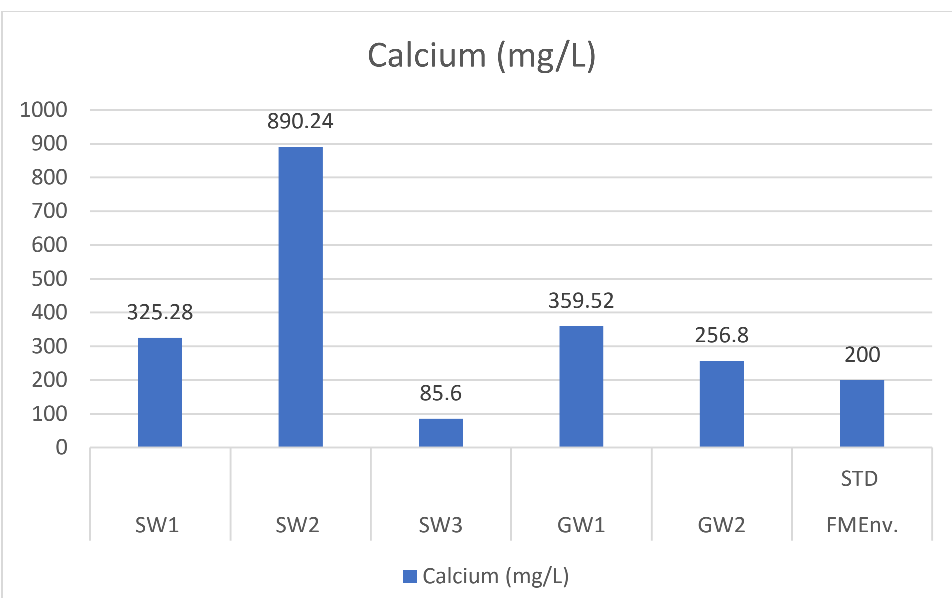


Figure 4. 12: Calcium concentration in water samples

4.3.6.1.8 Total Nitrogen

Total nitrogen concentrations of collected samples are depicted in the chart of Figure 4.13 below. The concentrations ranged from 4.41-24.94mg/L and had a mean concentration of 14.42mg/L. These concentrations were lower than the 31mg/L upper regulatory limit stipulated by FMEnv. It can also be inferred that water in the proposed site is free of nitrates and nitrites contamination.

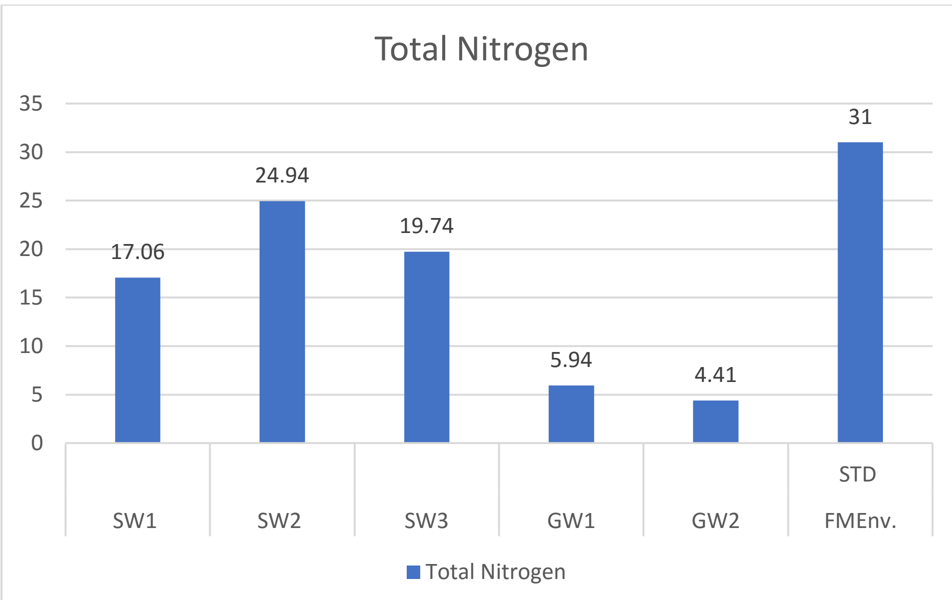


Figure 4. 13: Total nitrogen concentrations of water samples

Carbonate concentration

Carbonate concentrations of collected samples are depicted in the chart of Figure 4.14 below. The concentrations ranged from 43.60-109.00mg/L and had a mean concentration of 65.40mg/L. However, FMEnv has not specified a regulatory limit for carbonate in effluents.

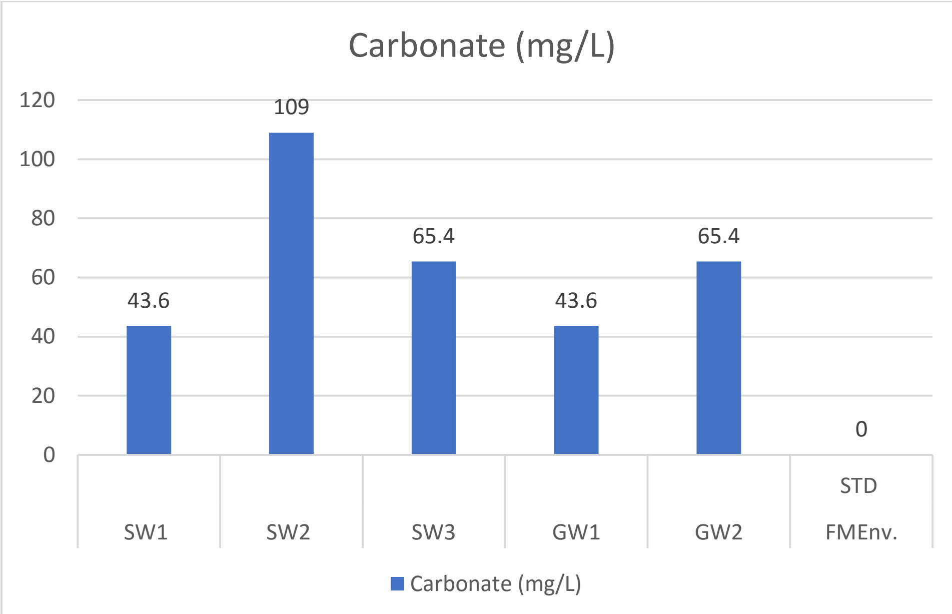


Figure 4. 14: Carbonate concentration

Sulphate concentration

Sulphate concentrations of collected samples are depicted in the chart of Figure 4.15 below. The concentrations ranged from 7.90-100.00mg/L and had a mean concentration of 52.14mg/L. These concentrations were much lower than the 500mg/L regulatory limit stipulated by FMEnv. It can also be inferred that sampled water in the proposed project area is free of sulphate contamination.

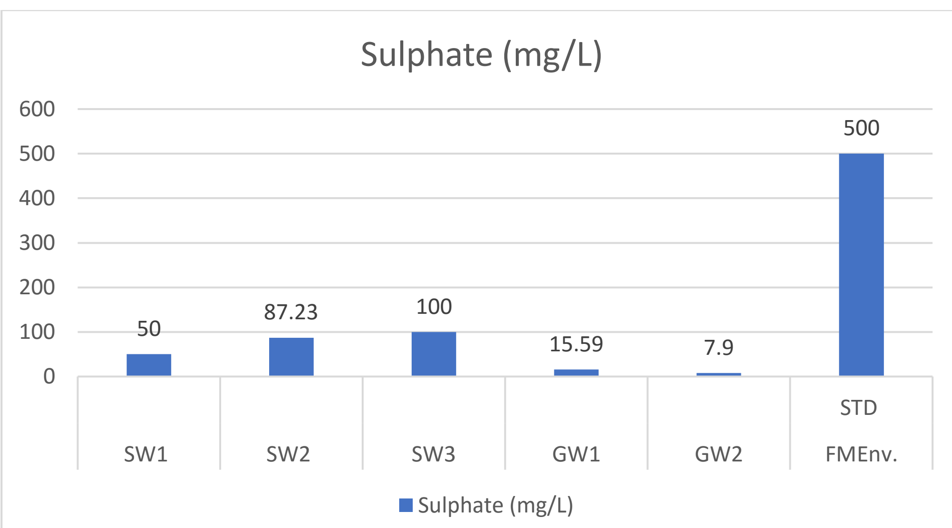


Figure 4. 15: Sulphate concentration in water around the project area

4.3.6.1.12 Heavy metals in water

The availability of trace metals in water is controlled by physical and chemical interactions. These interactions are affected by factors like pH, redox potential, temperature, CO_2 level, the type and concentration of available ligands and chelating agents, as well as types and concentrations of the metal ions. Heavy metals have the potential to bio-accumulate in marine organisms thereby posing a serious danger to human beings through the food chain (Neff, 2002).

Ground and surface water samples from the project area were analyzed for heavy metals. The heavy metals tested for included; copper (CU), iron (Fe), zinc (Zn), aluminium (Al), lead (Pb), manganese (Mn), nickel (Ni) and cadmium (Cd). Concentrations of these heavy metals were found to be well below the upper regulatory limits stipulated by FMEnv, except for cadmium which was higher than the stipulated regulatory limit in all the water samples. Thus, there appeared to be cadmium contamination in the water of the proposed project site.

i. Concentration of iron in water samples

Concentration of iron in analyzed water samples ranged from 0.11mg/L to 1.00mg/L with an average of 0.71mg/L. The concentrations were lower than the regulatory limit of 1.5mg/L. It may therefore be safe to conclude that there is no iron pollution in the water bodies sampled in the project area.

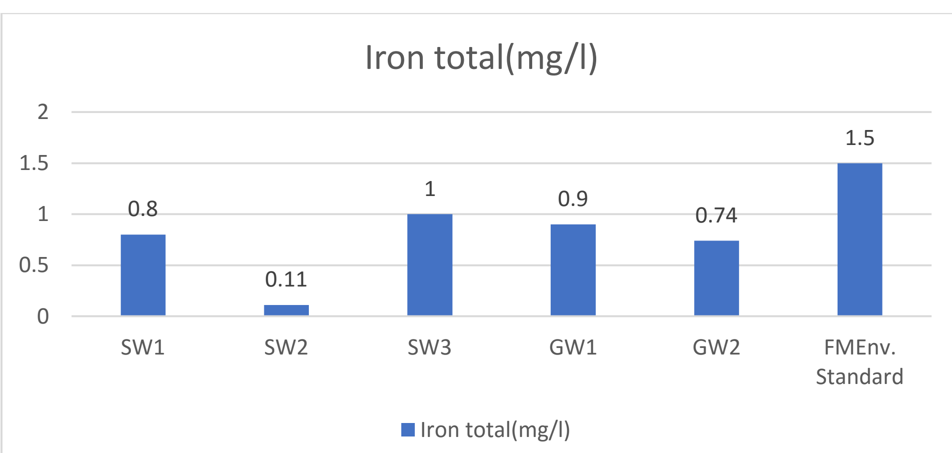


Figure 4. 16: Concentration of iron in water samples

ii. Concentration of Copper in water samples

Concentration of copper in collected water samples ranged from 0.15-1.97 with a mean concentration of 1.00mg/L which was higher than the regulatory limit of 1mg/L set by FMEnv. Therefore, water from the project area shows significant copper contamination.

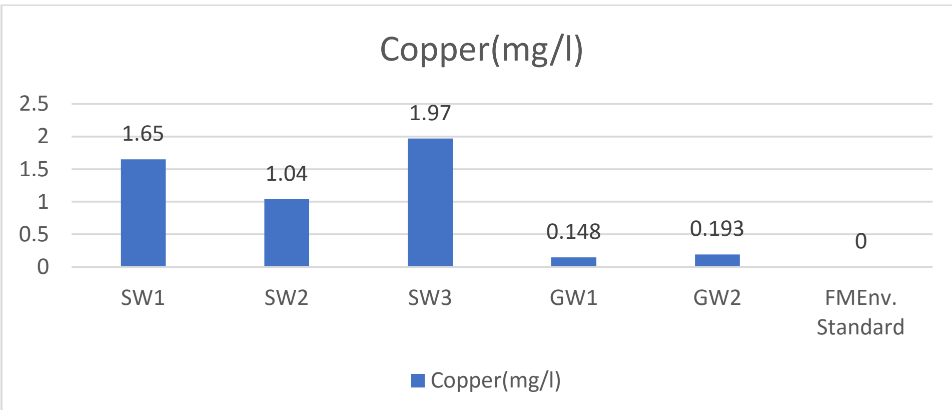


Figure 4. 17: Concentration of copper in water samples

iii. Concentration of Manganese in water samples

Concentrations of manganese in water samples collected from the project area are depicted in the chart of Figure 4.18 below and ranged from 0.21-0.4mg/L. The mean concentration of Manganese was found to be 0.34mg/L which was slightly higher than the regulatory limit of 0.2mg/L set by FMEnv. This shows that the water bodies sampled in the project have slight manganese contamination.

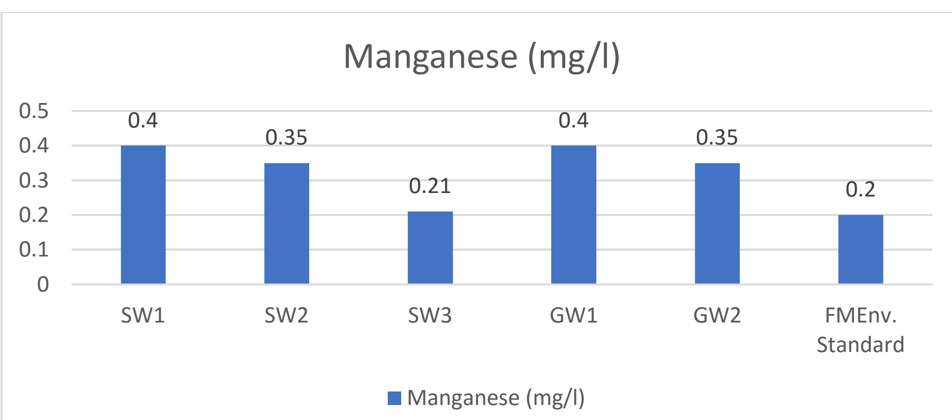


Figure 4. 18: Manganese concentrations in sampled waters

iv. Cadmium in water samples

The chart of Figure 4.19 present concentrations of cadmium in analyzed samples of water collected from the proposed project site. The concentrations ranged from 0.001-0.09mg/L with a mean concentration of 0.02mg/L which was much lower than the maximum concentration of <1mg/L stipulated by FMEnv. This is an indication that the water in the proposed site is free from cadmium contamination.

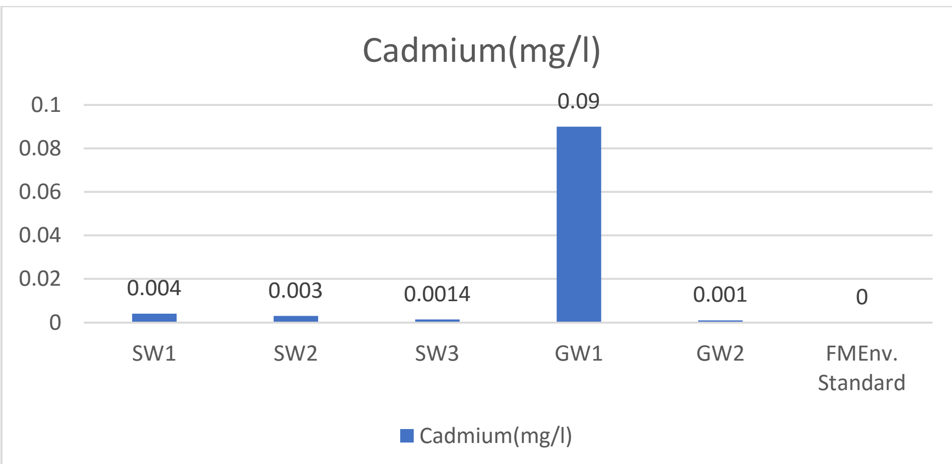


Figure 4. 19: Concentration of Cadmium in water samples

v. Concentration of Zinc

The chart of Figure 4.20 present concentrations of zinc in analyzed samples of water collected from the project site. Zinc had a mean concentration of 2.07mg/L which was lower than the maximum concentration of 3mg/L stipulated by FMEnv. This therefore means that the water at the site has no zinc contamination.

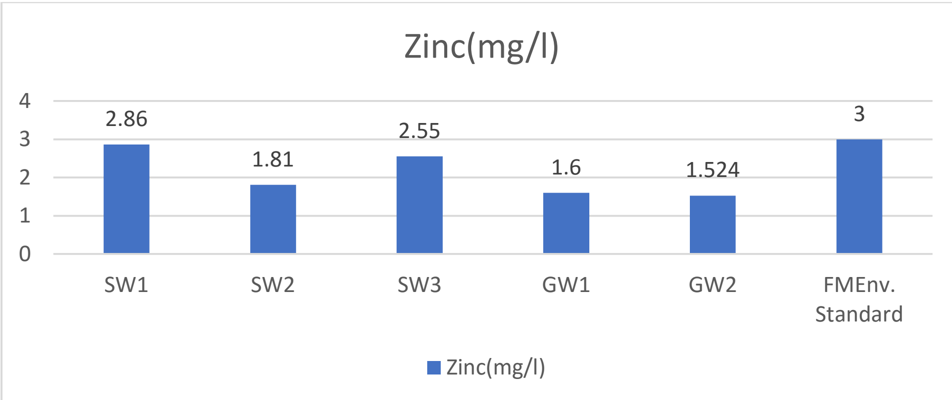


Figure 4. 20: Concentration profile of Zinc in water samples

vi. Concentration of lead

The charts of Figure 4.21, Figure 4.22 And Figure 4.23 depict the concentrations of lead, nickel and aluminium, respectively, in analyzed samples of water collected from the project site. Lead, nickel and aluminium respectively had mean concentrations of 0.01mg/L, 0.08mg/L and 0.16mg/L which were lower than their respective regulatory concentration limits stipulated by FMEnv. This therefore means that the sampled waters have no lead, nickel and aluminium contamination.

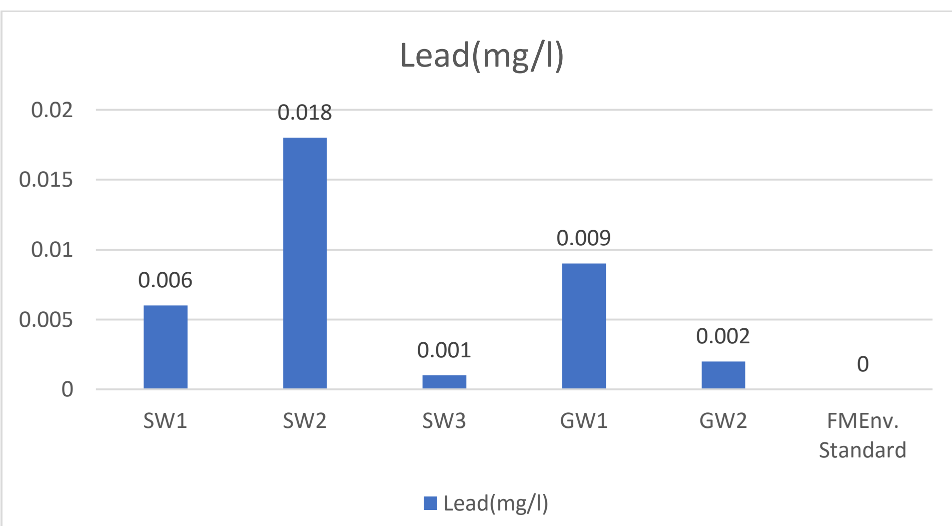


Figure 4. 21: Concentration of lead in water samples

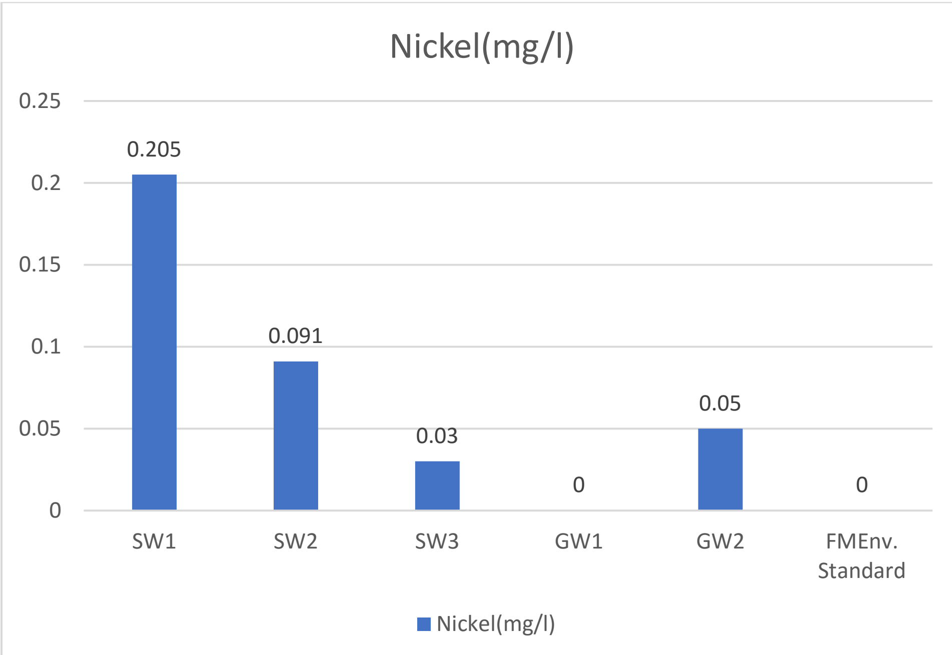


Figure 4. 22: Concentration of nickel in water samples

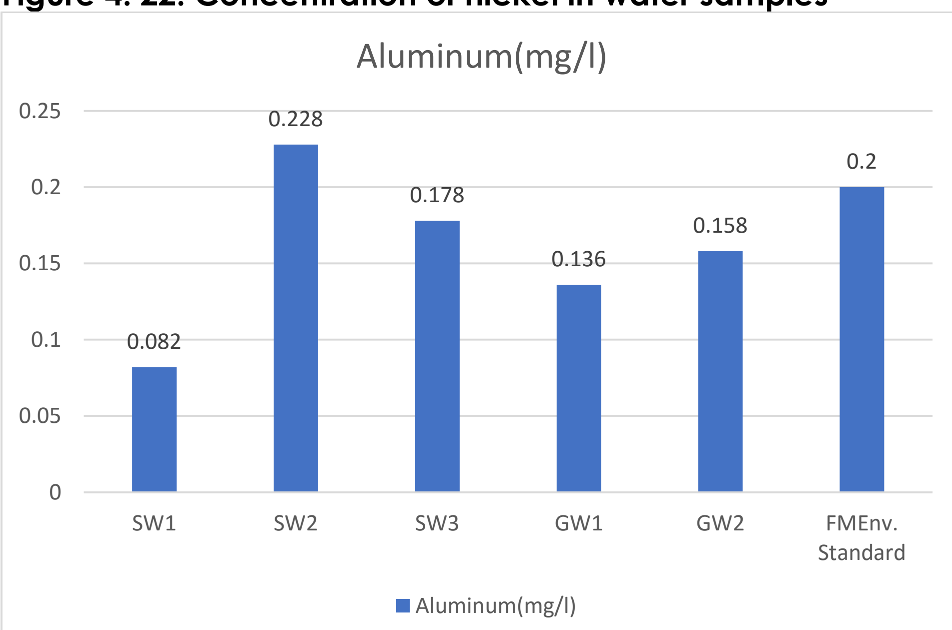


Figure 4. 23: Concentration of aluminium in water samples

4.3.6.2 Microbial analysis of water samples

Results of the microbial analysis conducted on surface and groundwater samples are presented in Table 4.3 below. Microbial analysis of groundwater sample revealed Total Coliform Count of 1600, 1600, 920, 10 and 3.2 for SW1, SW2, SW3, GW1 and GW2 respectively. Thus, the coliform counts for the three surface water samples were much higher than the limit of 400 MPN/100mL set by FMEnv. Similarly, Salmonella sp and Shigella sp counts for three surface water samples were higher than regulatory limit set by FMEnv. Salmonella specie was not detected in both groundwater samples. Shegella was also not found in the groundwater sample, GW2.found in concentration higher than r were not detected in the analyzed ground water sample. E-coli, total hydrocarbon bacteria and protein spp were also found in high concentrations in all the five surface and groundwater samples.

Table 4. 3: Microbial analysis of water samples

Parameters	SW1	SW2	SW3	GW1	GW2	FMEnv. standard
Total coliform (MPN/100ml)	1600	1600	920	10	3.2	400
Salmonella	$6.0x10^1$	$4.4x10^1$	$1.7x10^1$	Nil	Nil	Absent
Shigella	<10	$1.5x10^1$	$2.6x10^1$	$3.3X10^1$	Nil	Absent
E-coli	$4.21x10^3$	$4.91x10^3$	$5.0x10^3$	$3.0X10^2$	$2.6X10^2$	Absent
Total hydrocarbon on bacteria	$5.2X10^5$	$9.92X10^6$	$4.3x10^6$	$2.62X10^3$	$1.0<10^2$	Absent
Protein SPP	$2.3X10^6$	$8.2X10^8$	$4.2x10^6$	$2.2X10^6$	$1.2X10^2$	ABSENT

4.3.7 Air Quality and Noise Level Studies

4.3.7.1 Air Quality

The goal of air quality studies/monitoring is to protect public health and welfare from the harmful effects of air pollutants from industrial and domestic sources. Air pollution is widely accepted to have resulted in serious health and ecological effects, which have been well documented.

The air pollutants from industrial activities that are of greatest concern are Sulphur Oxides (SOx), Nitrogen Oxides (NOx), Particulate Matter (PM), Hydrocarbon (HC) gases, Volatile Organic Compounds (VOCs), Carbondioxide and Carbon Monoxide (CO).

For the proposed project, air quality characteristics were monitored in six (8) stations on the proposed site for the project. The results are tabulated in Table 4.4 below. Overall, results from air quality monitoring showed that the concentrations of gaseous pollutants were all within the limits set by the FMEnv.

Table 4. 4: Air quality and noise characteristics of the proposed site

Sampling point	Coordinate	NH_3 (ppm)	SO_2 (ppm)	H_2S (ppm)	O_2 (ppm)	CO (ppm)	PM (ppm)	Noise (dBA)
Point 1	13’03’01.08” N 5^{0}11’02.33” E	00.3	00.4	0.00	20.8	2	0.05	39.6
Point 2	13^{0}02’58.37” N 5^{0}11’05.42” E	00.4	00.3	00.0	20.4	2	0.06	38.5
Point 3	13^{0}03’02.36” N 5^{0}11’06.37” E	003	00.4	00.0	20.2	4	0.02	42.8
Point 4	13^{0}03’04.28” N 5^{0}11’09.62” E	00.5	00.2	00.0	20.6	2	0.04	38.8
Point 5	13^{0}3’01.54” N	00.4	00.4	00.0	20.4	3	0.06	42.9

	$5^0 11'09.55''$ E							
Point 6	$13^0 02'59.56''$ N $5^0 11'10.51''$ E	000	002	00.0	20.6	1	0.05	59.3
Point 7	$13^0 03'05.06''$ N $5^0 11'13.76''$ E	000	00.4	00.1	20.8	2	0.05	57.2
Point 8	$13^0 02'56.14''$ N $5^0 11'05.86''$ E	001	003	00.0	20.4	1	0.06	59.6
FMEnv regulatory limit								90dB for 8hrs

4.3.7.2 Baseline noise level measurement

Scientific studies have shown that noise becomes offensive and unhealthy when it exceeds a certain limit, the mean tolerable noise exposure limit. For an 8-hour period, the mean tolerable exposure limit is 90 decibels.

Plate 4. 3: Air quality measurements being carried out

Table 4.4 in the previous subsection also presents the result of noise monitoring exercise carried on the proposed project site. The noise level measurements were carried out directly at selected points by using a very sensitive noise level meter. The sensitivity was such that two noise levels differing by 1dB can be distinguished. The main sources of noise in the area were vehicles using the nearby road.

The baseline noise levels recorded were all within the daylight regulatory limits of 90 for an 8-hour period of exposure stipulated by FMEnv.

4.3.7.3 Climate Change risks

The key Climate Change risk identified in the project area are flash floods and gully erosion.

4.3.7.3.1 Flash Floods in the Project Area

According to Nigeria Second National Communication on Climate change, these floods result from heavy and high intensity rainfall (about 80% of the annual rainfall in the project area occurs within three months) compounded with poor watershed management and land use practices. In some places near the project site, the vegetative cover has been destroyed as a result of farming and other land use practices. Likewise, in some of the places off the main roads there is inadequate provision of drainage channels for proper collection of storm water.

4.3.8 Biological Features

Vegetation in the project area mainly composes of bushes and farm lands and is characterized by the coexistence of trees, shrubs and grasses. The vegetation zone in can be described as Sudan-Sahelian Savanna type which combines the characteristics and species of both the Sudan and Sahel Savanna. Extensive farming is practiced in this zone and agricultural produce in the zone include vegetable, fruits and cereals. In particular, maize, guinea corn, rice, cowpea, cotton, groundnut, soy beans, etc. are grown in the region.

4.3.8.1 Flora

The vegetation of the project corridor is characterized in terms of types, density and profile. During field work, various plant species belonging to different families were recorded and comprised of both woody and herbaceous species.

The following tables summarize the results of the plant and animal species identification exercise conducted by the ecologist during the field work.

Table 4. 5: Economic Plant species identified in the project area

S/N	Biological Name	Common Name	Family	Life form	Economic benefit
1.	*Asparagus africanus* Lam.	African Asparagus	Liliaceae	Herb	Used as food and medicine and as treatment against syphilis, gonorrhoea and other STDs
2.	*Acacia albida* Del.	Gawo	Leguminosae (Mimosoideae)	Tree	The pod used as camel food; gum collected like gum Arabic; wood used for making canoes, mortars, and pestles and used in making soap and as a tanning agent for hides.
3.	*Veronia amygdalina* (Wild) Darke	Bitter leaf	Asteraceae	Shrub	Used as food and also serve important ethnomedicinal uses
4.	*Waltheria americana* L.	Sleepy Morning or Monkey Bush	Sterculiaceae	Shrub	Used as medicine against pain, inflammation, diarrhea, wounds, epilepsy, convulsions, anemia, erectile dysfunctions, bladder ailments, asthma, etc.
5.	*Boswellia dalzielli*	Frankin-	Burseracea	Tree	The bark is used to treat fever,

	Hutch	cense tree	e		rheumatism and gastrointestinal problems

Source: Field work, October 2020

Table 4.19 continued

S/N	Biological Name	Common Name	Family	Life form	Economic benefit
6.	Cassia singuena Del. ss	Winter Cassia, Sticky Pod	Leguminosae-Caesalpinioide-ae	Small tree	Used in traditional medicine for treatment of several diseases and ailments.
7.	Cordia africana Lam.	Sudan Teak	Boraginaceae	Small tree /shrub	Serves as timber, coffee, shade tree, agro-forestry crop, honey bee plant and as a draught season food
8.	Maytenus senegalensis (Lam.) Exell.	Bakororo, namijin tsada	Celastraceae	Shrub/ small tree	Leaf used as sauces, condiments, spices, flavourings, pain-killers, eye treatments, etc. leaf and root used as medicine for diarrhoea, dysentery and as fodder
9.	Celtis integrifolia Lam.	Nettle tree, African nettle tree	Ulmaceae	Tree	Leaves use in food as sauces, condiments, spices, flavourings pain-killers in arthritis, rheumatism, small-pox, chicken-pox, measles, etc.
10.	Combretum glutinosum Pers. Ex DC	Kattakarya, taranniyi,	Combreta-ceae	Small tree/ Shrub	Source of yellow/brownish yellow dyes, eaten as a vegetable and used as dressing on wounds. shoots/roots have aphrodisiac

					properties

Source: Field work in October 2020

Table 4.19 continued

S/N	Biological Name	Common Name	Family	Life form	Economic benefit
11.	*Pilostigma reticulatum* (DC) Hochst	Camel's foot Pilostigma	Fabaceae-Caesalpini-oideae	Tree	The bark is used for tying roof rafters of huts or houses and used in the production of baskets, chairs, mats, masks, fishers' nets, cloth, food wraps and tooth brush and for fastening metals parts to handles
12.	*Cadaba farinosa* Forssk	Cadaba bush, herd-boy's fruit	Capparace-ae	Shrub /small tree	Its wood is used for fuel while the leaves and young twigs are edible. It is also used as fodder by different types of husbandry.
13.	*Detarium microcarpum* Guill ex Perr.	Sweet Dattock, Tallow Tree	Caesalpini-aceae	Shrub /small tree	Bark, leaves and roots are widely used because of their diuretic and astringent properties and also used against malaria, leprosy and impotence.
14.	*Gossypium herbaceum* L.	Levant cotton	Malvaceae	Shrub	Fibres used in making clothes, pillows, cushions surgical dressings, etc. Seed used as coffee substitute and in the treatment of herpes, scabies and wounds while oil from the seed is used in salads, cooking and the manufacture of margarines, vegetable shortenings, etc.

Table 4.19 continued

S/N	Scientific name	Common name	Family	Economic importance	Life form
15.	Acacia albida	Goat tree	Mimosoideae	Medicinal	Tree
16.	Anacardium occidentalis	Cashew tree	Anacardiaceae	Edible/medicinal	Small tree
17.	Annona senegalensis	Wild sour sop	Annonaceae	Edible	Tree
18.	*Azadirachta indica*	Neem tree	Meliaceae		Tree
19.	Balanites	Desert date	Balanitaceae	Edible	Shrub
20.	Berlinia grandifolia	Berlinia tree	Fabaceae		Tree
21.	Bombax buonopozense	Red silk cotton tree	Bombacacacae	Edible/medicinal	Tree
22.	Calotropis procera	Giant swallow wort	Asclepiadaceae	Medicinal	Shrub
23.	Chromolaena odorata	Siam weed	Asteraceae	Edible/medicinal	Herb
24.	Corchorus tridens	Bush okra	Malvaceae		Shrub
25.	Detarium	Sweet	Caesalpiniodeae	Medicinal	Tree

	microcarpum	detar			
26.	Eragrostis cilianensis	Love grass	Poaceae		Grass
27.	Eucalyptus globulus	Eucalyptus leaf	Myrtaceae	Medicinal	Tree

Table 4.19 continued

S/N	Scientific name	Common name	Family	Economic importance	Life form
28.	Isoberlina doka		Caesalpinioideae	Edible/medicinal	Tree
29.	Khaya senegalenses	Dry zone mahogany	Meliaceae	Medicinal	Tree
30.	Pennisetum pedicellatum	Desho grass	Poaceae		Grass
31.	Pennisetum polystachion	Mission grass	Poaceae		Grass
32.	Setaria viridis	Wild foxtail	Poaceae		Grass
33.	Sida acuta	Stubborn grass	Malvaceae	Animal feed	Grass
34.	Tectona grandis	Teak	Sterculiaceae		Tree
35.	*Azadirachta indica* A. Juss	Neem tree	Meliaceae	Used in making soap, toiletries, pesticides, fertilizers, resins, lubricants, etc. Also used medicinally	Tree
36.	*Tamarindus indica* L.	Tamarind, Indian nut	Fabaceae	Adds vitamins and minerals, as well as distinctive sour taste, to drinks/ meals	Tree

37.	*Parkii clappertoniana / Parkiabiglobosa*	*Locust bean*	Fabaceae-Mimosoideae	Used against bacterial infections, diarrhea, pneumonia, bronchitis, stomach aches, etc, and for producing Daddawa, a local Nigerian condiment	Tree

Table 4.19 continued

S/N	Biological Name	Common Name	Family	Economic importance	Life form
38.	*Vitellaria paradoxa*	*Shea butter*	Sapotaceae	In the West, used for cosmetics as emollient. In Africa it is used for food, as a major source of dietary fat and for medicinal purposes.	Tree
39.	*Cassia occidentalis* Linn.	Negro coffee, stinking weed	Caesalpiniaceae	*Medicinal uses*	Herb
40.	*Citrus aurantifolia* Christm and *C. limon* (L.)	lemons and limes	Rutaceae	Fruits and medicinal	Tree
41.	*Sterospermum kuthianum* Cham.	Pink jacaranda	Bignoniaceae	Fruit pod and Medicinal application	*Shrub*

Table 4. 6: Common fruits found around the project area

S/N	Biological Name	Common Name	Family	Life form	Economic importance
42.	*Erythrina senegalensis* DC	Coral tree, coral flower	Fabaceae	Small tree	Planted as a hedge and for beautification as well as many traditional medicinal uses
43.	*Cochlospermum tinctorium* A. Rich	Rawaya	Cochlosperma-ceae	Herb	Traditional medicinal uses, the dye is used to colour shea butter and cooking oil to which it also imparts some flavour and Tender young leaves are cooked.
44.	*Hygrophila auriculata* (Schumach) Heine	Talmak-hana	Acanthaceae	Herb	The plant is also used as a vegetable. The whole plant is said to have diuretic properties.
45.	*Mangifera indica*	*Mango*	Anacardiaceae	Tree	Used as edible fruits and medicine
46.	*Carica papaya*	*Pawpaw*	Caricaceae	Non-woody tree	Used as edible fruits and as a treatment for malaria
47.	*Anacardium occidentale*	*Cashew*	Anacardiaceae	Shrub/ Small tree	Derivatives can be used for lubricants, waterproofing, etc. Its pulp can be processed fruit drink or distilled into liquor
48.	*Psidium*	*Guava*	Myrtaceae	Shrub/	It has edible fruits. Its wood can be used to

	quajava			Small tree	make poles, fenceposts and tool handles, in handicrafts and for charcoal and firewood.
49.	*Citrus × sinensis*	Orange	Rutaceae	Shrub/ Small tree	Used for both the juicy fruit pulp and the aromatic peel (rind)
6.	*Solanum lycopersicum L.*	*Tomatoes*	Solanaceae	Forb/ Herb	Used as a delicious food and to treat burns, itching, ulcers, etc

Source: Field work in October 2020

Table 4. 7: Food crops identified within the project Area

S/N	Biological Name	Common Name	Family	Life form	Economic benefit
8.	*Citrus limon* (L.) Osbeck	Lemon	Rutaceae	Shrub / Small tree	Used for culinary and non-culinary purposes primarily for its juice. Its sour taste makes it a key ingredient in drinks
1.	*Pennisetum glaucum (L.) R. Br.*	Pearl Millet	Poaceae	Grass	An important food across the Sahel region of Africa. It is a main staple (along with sorghum) in a large region of northern Nigeria, Niger, Mali and Burkina Faso.
2.	*Zea mays*	*Maize*	Poaceae	Grass	A staple food in many parts of the world, used for corn ethanol, animal feed and other products such as corn starch and syrup
3.	*Vigna unguiculata* (L.)	*Cowpea*	Fabaceae	Herb	A good source of protein and vitamins used as food in various forms and as a fodder crop for cows.
4.	*Arachis hypogaea*	*Peanut/ Groundnut*	Fabaceae	Herb	Used as food in many forms and used to produce edible oil. It is also used as animal feed.

5.	*Manihot esculenta*	Cassava	Euphorbiaceae	Shrub	Used as a staple food, animal feed, laundry starch and potentially in the production of bio-fuels/anti-cancer treatment.

Table 4.21, continued

S/N	Biological Name	Common Name	Family	Life form	Economic benefit
6.	*Oryza sativa*	Rice	Poaceae	Grass	Staple food, its bran is used for oil; hull for fuel, fertilizers and insulations; straws from the leaves and stems are used for weaving roof tops, baskets, hats and bedding for animals.
7.	*Sorghum bicolor*	Sorghum or Guinea corn	Poaceae	Grass	Grain is used as staple food, also used primarily for livestock feed and in ethanol plants as wheat substitutes in gluten-free recipes and products
8.	*Ipomoea batatas (L.) Lam*	*Sweet Potato*	Convolvul-aceae	Herb	Apart from its use as food red sweet potato is used as dye for cloth; purple sweet potato is used as food colouring.
10.	*Piper nigrum* L.	*pepper*	Piperaceae	Herb	Used as a seasoning and also used in traditional medicine

11.	*Hibiscus esculantus*	*okra*	Malvaceae	Herb	Its pods are cooked, pickled, eaten raw, or included in salads. Bast fibre from the stem of the plant has industrial uses and its oil is used as biofuel.

4.3.8.2 Fauna

There is not much wild life in the project area because the area has been opened up for agricultural and other human activities. However, literature review and personal interviews with people in the area have established the most common animals in the project area to be the ones in Table 4.8.

Table 4. 8: Some of the identified fauna in the project area

S/N	Scientific Name	Common Name	Class	IUCN
1.	Butoriedes striata	Striated Heron	Aves	LC
2.	Corvinella corvina	Yellow-billed Shrike		LC
3.	Centropus senegalensis	Senegal Coucal		LC
4.	Corvus albus	Pied Crow		LC
5.	Coracias cyanogaster	Blue-bellied Roller		LC
6.	Cypsiurus parvus	African Palm Swift		LC
7.	Francolinus bicalcaratus	Double-spurred Francolin		LC
8.	Gallinago gallinago	Common Snipe		LC
9.	Halcyon senegalensis	Woodland Kingfisher		LC
10	Lamprotornis caudatus	Long-tailed Glossy Starling		LC
11.	Merops hirundineus	Swallow-tailed Bee-eater		LC

12.	Phoeniculus purpureus	Green Wood-hoopoe		LC
13.	Pogoniulus bilineatus	Yellow-rumped Tinkerbird		LC
14.	Streptopelia semitorquata	Red-eye Dove		LC
15.	Steptopelia	Vinaceous Dove		LC
16.	Turdoides plebejus	Brown Babbler		LC
17.	Turtur abyssinicus	Black-billed Wood Dove		LC
18.	Tockus nasutus	AfricanGrey Hornbill		LC
19.	Vanellus spinosus	Spur-winged Lapwing		LC

Table continued

S/N	Scientific Name	Common Name	Class	IUCN
20.	Rana sp	Bull frog	Amphibian	LC
21.	Xenopus	Web-toed frog		LC
22.	Bufo regularis	Common toad		LC
23.	Zonocerus variegatus	Grasshopper	Insect	DD
24.	Anthene larydas	Common Ciliate Blue Butterfly		DD
25.	Aterica galene	Forest Glade Nymph Butterfly		DD
26.	Belenois Calypso	Calypso Caper White Butterfly		DD
27.	Agama agama	Agama Lizard	Reptile	LC
28.	Naja melanoleuca	Black Cobra		LC
29.	Veranus exanthematicus	Monitor Lizard		DD

30.	Cephalophus maxwelli	Maxwell Duiker	Mammal	LC
31.	Cricetomys gambianus	Giant Rat		LC
32.	Thryonmys swinderianus	Grasscutter		LC
33.	Xerus erythropus	Tree Squirrel		LC

Source: Field work in October 2020

4.4 SOCIO-ECONOMIC STUDIES

The baseline socio-economic studies covered three districts of Wamakko LGA; Wamakko, Arkilla and Kalambaina.

4.4.1 Population

The population of Wamakko LGA (based on the 2006 Census) was 179,619. The Local Government Area was created out of Sokoto state in 1991. The LGA has ten (10) districts: Dundaye, Gumburawa, Gumbi, Gwuiwa, Wajake, Gedawa, Kalambaina, Arkilla, Gidan Bubu, and Wamakko. Its headquarters is located in Wamakko town, about 10km from Sokoto city, the state capital.

The current population was obtained by projecting the 2006 population figure, using a conservative 2.5% population growth rate, as follows:

Using the Geometric Method:

A basic equation for getting a projection of a given population is Nt=P e (r * t); where "Nt" represents the number of people at a future time;
"P" is the population at the beginning time;
"e" is the base of the natural logarithms (2.71828);
"r" is the rate of increase (natural increase divided by 100); and
"t" represents the time period involved.

$Nt = P\ e^{(r * t)} = 179{,}619 \text{ X } 2.71828^{(0.025*14)} = 179{,}619 \text{ X } 1.4191 = 254897$

This population belongs to 11 wards of the LGA. However, the LGA has 10 wards and the socio-economic studies was restricted to just about 1/3rd of the wards located within the municipality of the LGA.

Assuming the wards have equal population, this means about 3/10 of the LGA population will have 3/10X254897 = 76469 people.

Thus, assuming an average family size of 9, an approximate number of households in the study area is 76469/9 = 8,497

Now to determine the sample size for the questionnaire to be administered in these wards, we use Glenn's Formula, which is:

$n=N/(1+Ne^2)$;

Where n = sample size, N = Population and e = Margin of error

Assuming the margin of error is 10%

n will therefore be $= 8497/(1+8497x0.1^2) = 8497/ (85.97) \simeq 99$

This means that 99 copies of the socio-economic questionnaire should be administered across the 3 wards.

Assuming 10% of administered copies of the questionnaire would not be returned, the copies of the questionnaire to be administered should be increased to 109 in order to ensure that at least 100 are returned.

The spacial boundary selected for the socio-economic studies comprised of three districts out of the ten making up Wamakko LGA. These districts are: Wamakko, Arkilla and Kalambaina.

The methodology applied consisted of randomly (using a table of random numbers) selecting one hundred and nine (109) households from the three districts, for administration of the questionnaires. For each house hold, one copy of the questionnaire was administered to the head of the household and where he was absent, his wife or eldest child responded to the questionnaire. Some copies of the questionnaires were instantly retrieved, while others were retrieved later on. Overall, 94 copies were retrieved. The retrieved copies of the administered questionnaire were then analyzed and some key conclusions arrived at.

On the other hand, nine FGDs were conducted targeting the youth, the elderly and women traders within the three districts. In other words, three FGDs, comprising of an average of eight participants, were conducted with each of the three groups (youth, the elderly and women). This was in order to obtain a broad spectrum of views from various age and interest groups.

The Key Informants for the study included traditional rulers such as District Heads of Wamakko, Arkilla and Kalambaina, some Ward Heads as well as Local Government officials and residents of the town. Five KIIs were conducted with each of the three aforementioned groups (traditional leaders, LGA officials and residents of the town).

4.4.1.1 Ethnic Composition

The socio-economic survey revealed a community of people wholly comprising of Hausa and Fulanis.

The table below and the chart of Figure 4.24 present the ethnic composition of the respondents in the three districts surveyed.

Table 4. 9: Ethnic composition

District	Tribe	No of respondents	% Composition
Wamakko	Hausa	32	80.0
	Fulani	8	20.0
	Total	40	100
Arkilla	Hausa	25	96
	Fulani	1	4
	Total	26	100
Kalambaina	Hausa	27	96.4

	Fulani	1	3.6
	Total	28	100

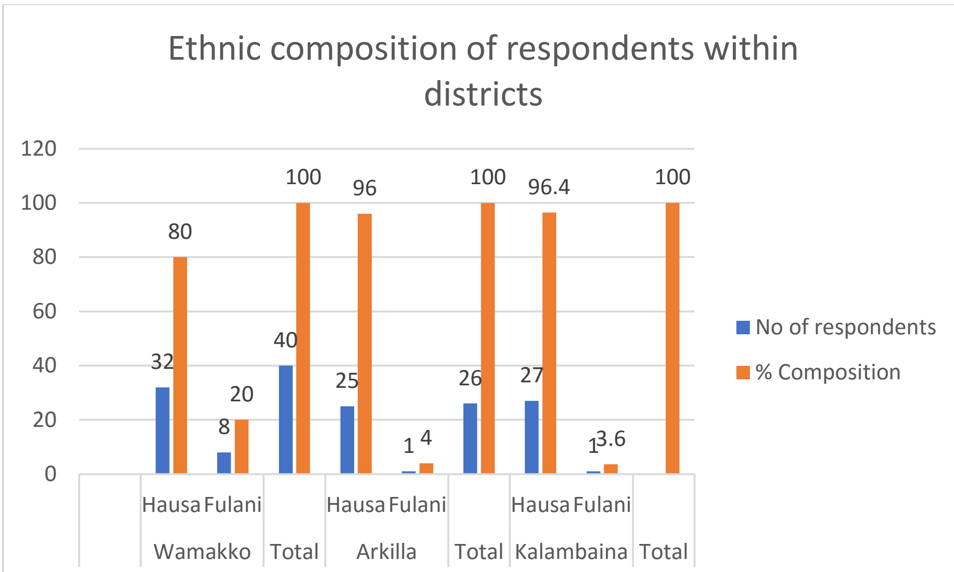


Figure 4. 24: Ethnic composition of population

4.4.1.2 Religious Affiliation of Respondents

Table 4.10 below presents the religious beliefs of respondents in the three districts. Out of 40 household heads in Kalambaina, 39 are Muslims (97.5%), while only one person is a pagan (2.5%). However, the entire respondent household heads in Arkilla and Kalambaina are Muslims.

Figure 4.25 that follows also depict the distribution presented in Table 4.10.

Table 4. 10: Religious composition of household heads

District	Religion		Total
Wamakko	Islam	Others	No. of respondents
	39	1	40
Percentage	97.5	2.5	100
Arkilla	Islam	Others	No. of respondents
	26	0	26
Percentage	100	0	100
Kalambaina	Islam	Others	No. of respondents
	28	0	28
Percentage	100	0	100

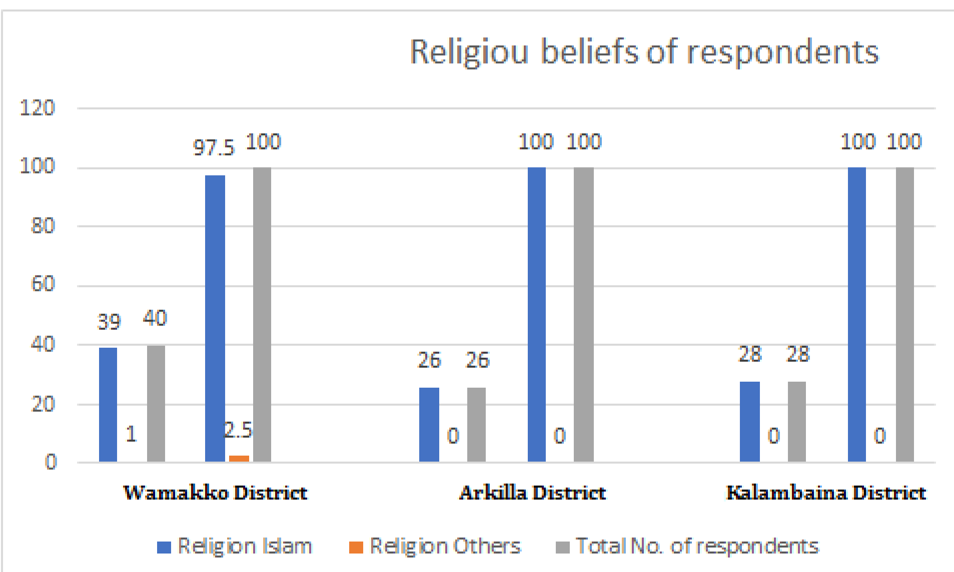


Figure 4. 25 : Religious composition of household heads

4.4.1.3 Age Profile of respondents

Table 4.11 and the chart of Figure 4.26 below present the distribution of the ages of respondents in the three surveyed districts of the project area.

The age distribution of respondents in the area shows a predominance of the working-age population (21 to 60 years), comprising people within the age brackets of 21-30,31-40, 41-50 and 41-60, which cumulatively makes up 85% in Wamakko district and about 96% in Arkilla and Kalambaina districts.

Table 4. 11: Age group distribution of household heads

District	Age group of respondents	No of respondents	Percentage (%)
Wamakko	<21	0	0
	21 – 30	3	7.5
	31 – 40	14	35
	41 – 50	17	42.5
	51 – 60	6	9.9
	>60	0	15
	Total	40	100
Arkilla	<21	1	3.85
	21 – 30	10	38.5
	31 – 40	5	19.2
	41 – 50	5	19.2
	51 – 60	5	19.2
	>60	0	0
	Total	26	100
Kalambaina	<21	0	0

	21 – 30	4	14.3
	31 – 40	4	14.3
	41 – 50	10	35.7
	51 – 60	9	32.1
	>60	1	3.6
Total		28	100

Source: Field survey, October 2020

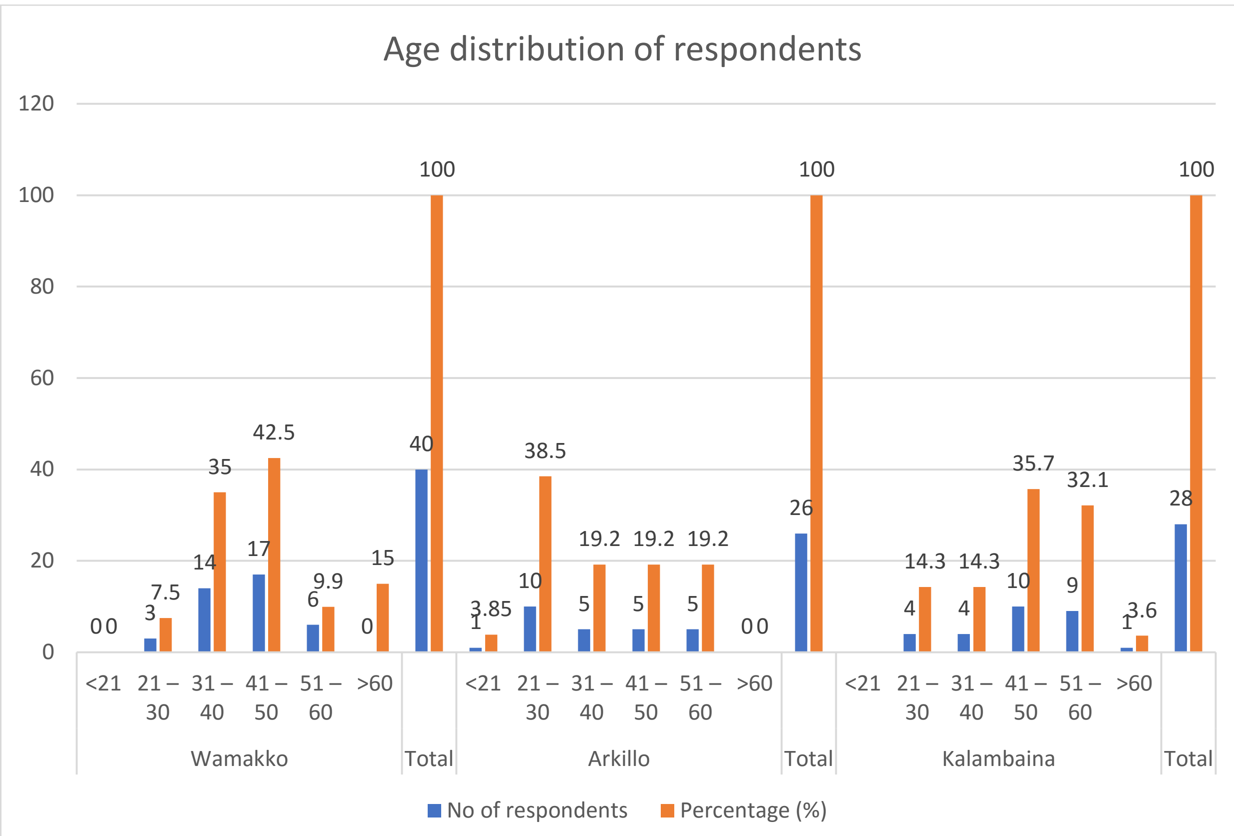


Figure 4. 26: Age distribution of household heads

4.4.1.4 Gender Ratio

Table 4.12 presents the gender ratio of the respondent household heads in the three districts. The chart of Figure 4.27 also depicts the same ratio.

Out of fourty household heads surveyed, thirty-seven (37) are male; while the remaining three (3) are women. Out of twenty-six household heads in Arkilla, twenty-five (25) are male and one (1) is female; while in Kalambaina, the entire respondent household heads are male.

Table 4. 12: Gender distribution of household heads

District	Gender of respondents	No of respondents	Percentage (%)
Wamakko	Male	37	92.5
	Female	3	7.5
	Total	40	100
Arkilla	Male	25	96
	Female	1	4
	Total	26	100
Kalambaina	Male	28	100
	Female	0	0
	Total	28	100

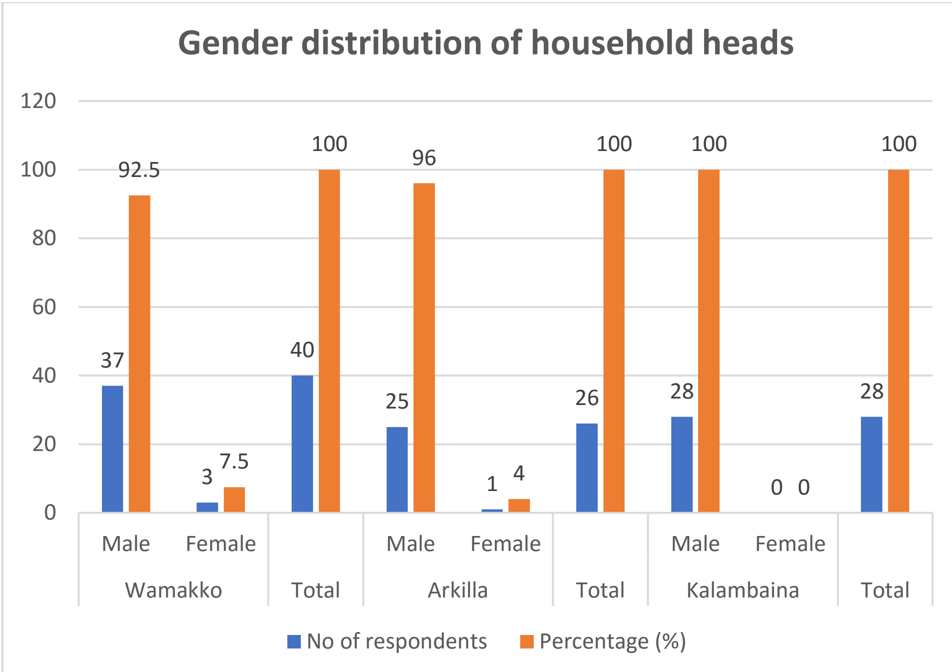


Figure 4. 27: Gender distribution of household heads

4.4.1.5 Marital status of household heads

In Wamakko 33 household heads (about 83%) are married. On the other hand, four (4) household heads (10%) are widowed while three (3) are single. In Arkilla and Kalambaina the ratio of married to single household heads are about 66:34 and 96:4 respectively.

Table 4.13 and Figure 4.28 present the distribution of the above marital status.

Table 4. 13: Marital Status of household heads

District	Marital status	No of respondents	Percentage (%)
Wamakko	Married	33	82.5
	Single	3	7.5
	Divorced	0	0
	Widowed	4	10
Total		40	100
Arkilla	Married	17	65.4
	Single	9	34.6
	Divorced	0	0
	Widowed	0	0
Total		26	100
Kalambaina	Married	27	96
	Single	1	4
	Divorced	0	0
	Widowed	0	0
Total		28	100

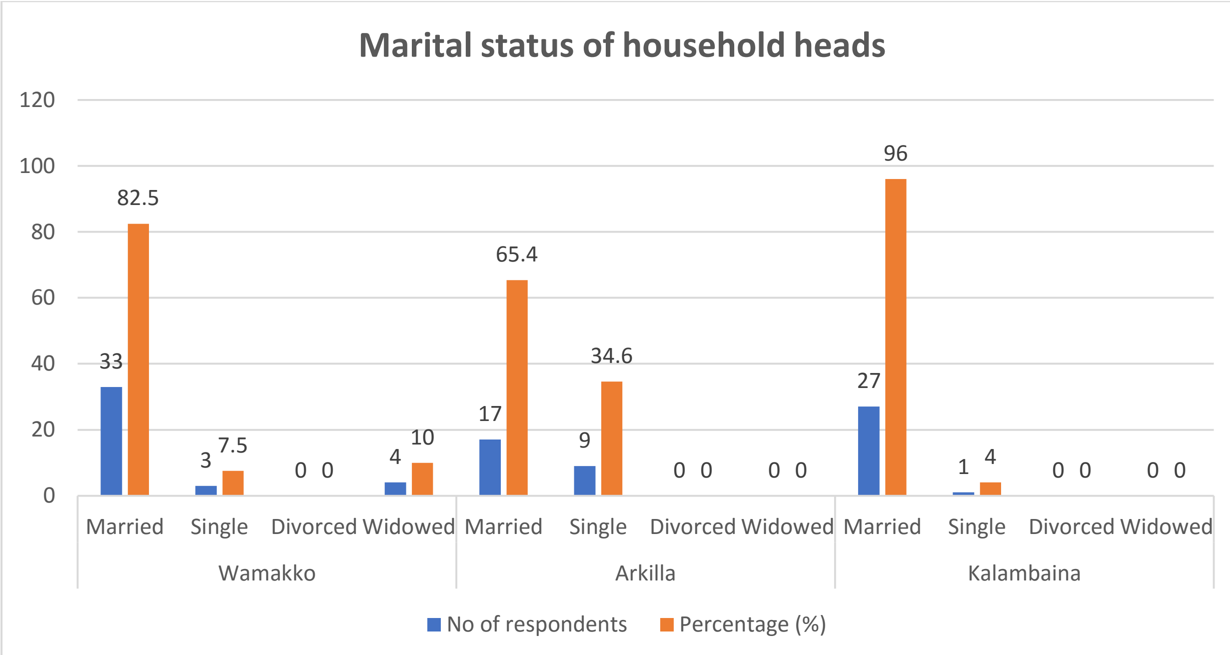


Figure 4. 28: Marital status of household heads

4.41.6 Educational backgrounds of household heads

The chart of Figure 4.29 depicts the educational status of respondents and therefore the educational distribution of people in the project area.

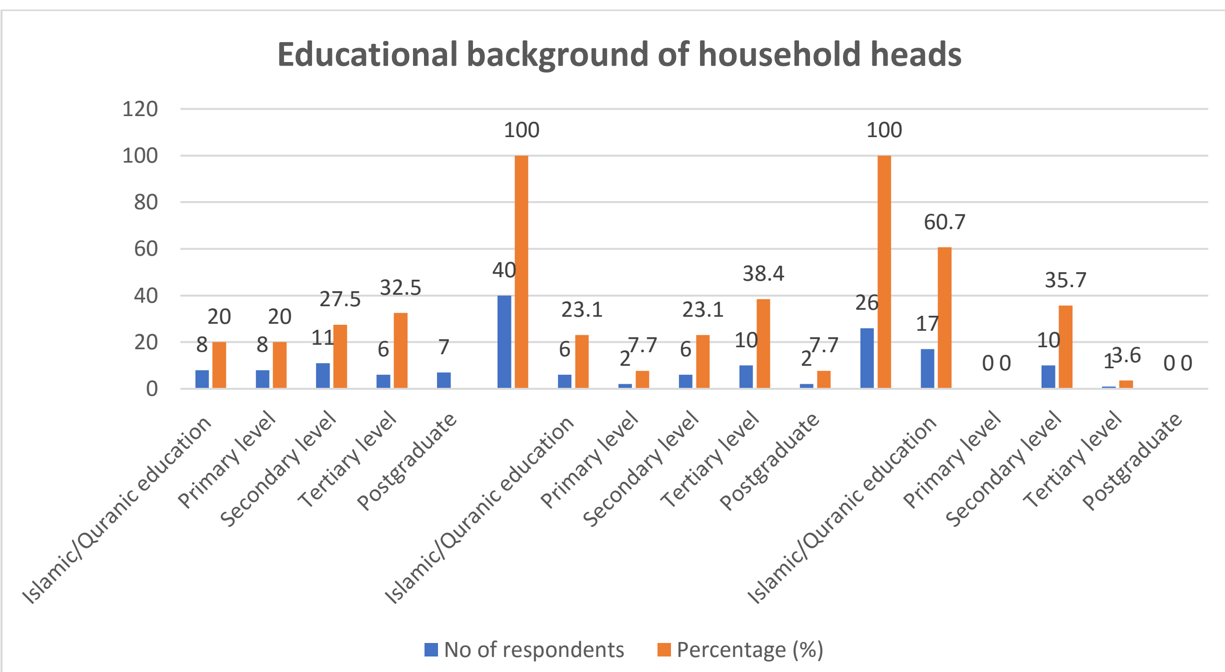


Figure 4. 29: Educational background of household heads

Table 4.14 below present the educational background of household respondents in the project area. For example, 27.5% of respondents in Wamakko have secondary school education, while those with primary education and Islamic/Quranic education constitute 20% each. Respondents with tertiary education and those with postgraduate level of education constitute 15% and 17.5% respectively.

Table 4. 14: Educational qualifications of respondents

District	Educational background	No of respondents	Percentage (%)
Wamakko	Islamic/Quranic education	8	20.0
	Primary level	8	20.0
	Secondary level	11	27.5
	Tertiary level	6	15
	Postgraduate	7	17.5
	Total	**40**	**100**
Arkilla	Islamic/Quranic education	6	23.1
	Primary level	2	7.7
	Secondary level	6	23.1
	Tertiary level	10	38.4
	Postgraduate	2	7.7
	Total	**26**	**100**
Kalambaina	Islamic/Quranic education	17	60.7
	Primary level	0	0.0
	Secondary level	10	35.7
	Tertiary level	1	3.6
	Postgraduate	0	0

Wamakko LGA, being a major LGA has a large number of both public and private educational institutions.

The following plates display some of the public and private primary and secondary schools in the LGA.

Plate 4. 4: Government Day Secondary School Wamakko

Plate 4. 5: Kalambaina Primary School in Kalambaina District

Plate 4. 6: Jagaba International Primary and Secondary schools in Arkilla District

4.4.2 Social Infrastructure

The Quality of life may be represented by the availability of basic social infrastructure in an area. Social infrastructure includes: good road network, storm water drainage, transportation, electricity supply, security, telecommunication, water supply and proximity of social services such as hospital and recreational facilities, etc.

4.4.2.1 Water Supply

Wamakko LGA is supplied with pipe-borne water. There are also boreholes provided by the three tiers of Government, as well as by International Donor Agencies and similar organizations. Other sources of water in the project area include wells and surface water in ponds and rivers. Many households in the project area, especially those in remote parts, use water from hand-dug wells. Table 4.15 and the succeeding chart present the distribution of domestic water sources used by households in the three districts; however, respondents that use pipe-borne water use other sources because of the erratic nature of the supply.

Table 4. 15: Domestic water supply sources for households

District	Source of domestic water	No. of respondents	Percentage (%)
Wamakko	Pipe-borne water	2	5
	Bore-hole	13	32.5
	Well	9	22.5
	River	16	40
	Total	40	100
Arkilla	Pipe-borne water	2	7.7
	Bore-hole	21	80.8
	Well	0	0
	River	3	11.5

	Total	26	100
Kalambaina	Pipe-borne water	5	17.9
	Bore-hole	19	67.9
	Well	2	7.1
	River	2	7.1
	Total	28	100

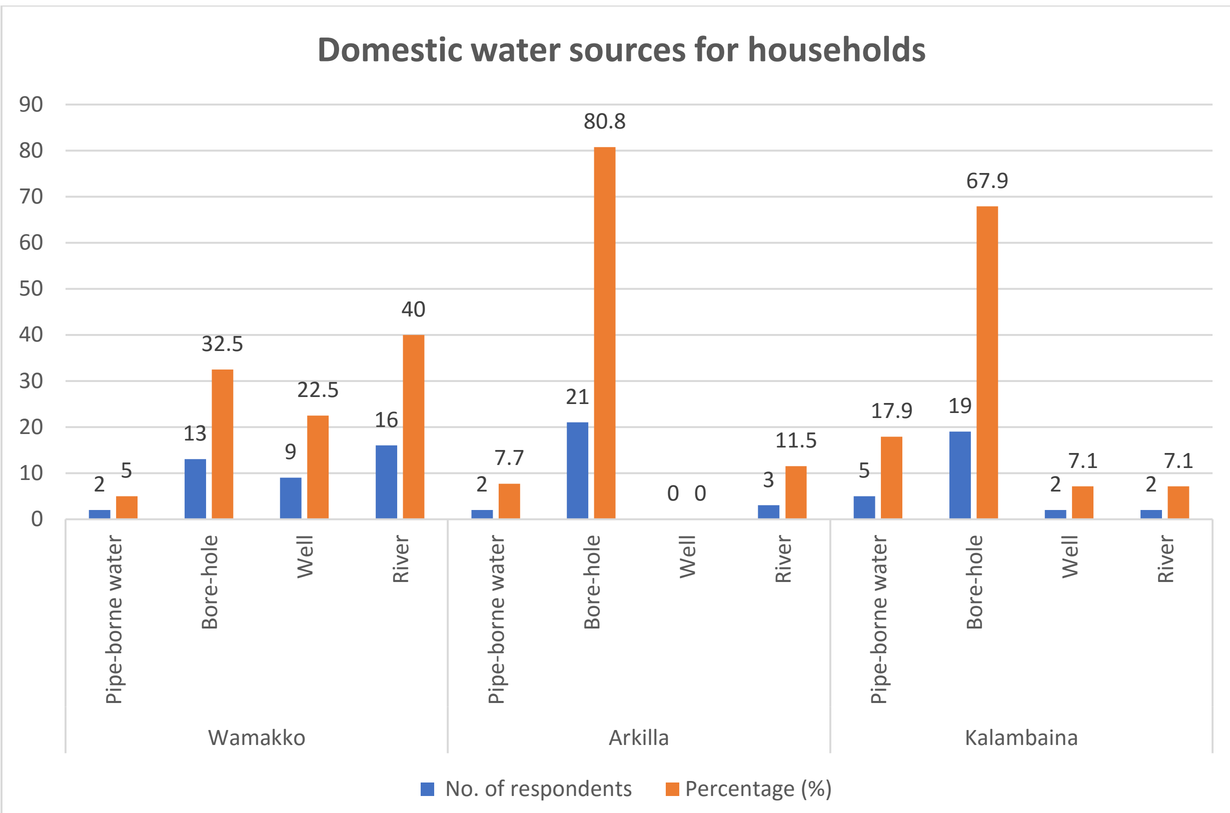


Figure 4. 30: Domestic water sources for households

Plate 4. 7: A Motorized borehole near the palace of Arkilla District Head

4.4.2.2 Electricity

Electricity in Wamakko LGA is provided by Kaduna Electricity Distribution Company (KEDCO). However, as in other parts of the country, a number of reasons have combined to impede a constant supply of electricity in the project area, which led many people in the area to be using private electricity generating sets.

4.4.2.3 Telecommunication

Private telecommunication companies that provide telecommunication services, in form of mobile phone (GSM) and digital data services (Internet) in the project area include MTN, 9Mobile, Airtel and Glo.

4.4.2.4 Transport

Apart from walking, other means of transportation in the study area include motor vehicles, tricycles, motorcycles, bicycles, animals, such as donkeys and camels, as well as animal-driven carts, especially in the rural areas.

Plate 4. 8: A camel being used for the conveyance of agricultural produce

4.4.2.5 Road network

Wamakko LGA enjoys a fairly good tarred road network. However, the tarred road network is more prominent in the town centres, while the rural areas mainly comprise of earth roads.


Plate 4. 9: Typical roads in Wamakko LGA

4.4.3 Security

Wamakko LGA is relatively secure and free from activities of criminals such as kidnappers and armed robbers. With greater collaboration and more commitment from the local vigilante groups, the security situation is relatively good.

4.4.3.1 Major criminal activities

Crime rate is generally low in Wamakko LGA; however, of recent, banditry, cattle rustling, farmers-herders' conflicts and kidnapping are on the increase in some parts of the LGA.

4.4.3.2 Communal land disputes/litigations

Communal land disputes and land litigations are rare in the project area. This is partly as a result of the existence of clear land tenure systems and the system of land inheritance under Sharia adopted by adherents of Islamic religion in the area. Under the system, when a land owner dies his/her heirs both male and female are entitled to their shares in a given ratio, as specified by the Sharia law.

4.4.3.3 Social vices/menace in the study area

To a limited extent, social vices like drug abuse and prostitution take place in the project area, albeit secretly as a result of the Sharia legal system being practiced. People in the area normally frown at such vices, which mainly take place in hidden or isolated areas.

4.4.4 Lifestyles and Values

Sokoto State has banned the sale and drinking of alcoholic beverages in the State, in line with the Sharia law practices. Accordingly, alcoholic drinks are not sold legally in the project area. However, a small number of youths in the area abuse drugs and misuse some medicines such as cough syrups as intoxicants.

The commonest physical exercise/recreational activity is football game, which normally take place at the play grounds of public and private schools.

4.4.5 Markets/heritage sites

The major market in Wamakko is the township market that opens daily. However, Wednesdays and Sundays are designated market days in Kanwuri, Rugga area and Kaura Kimba area both in Wamakko. These markets attract more traders from neighbouring communities and therefore witness high volumes of transactions.

There are no very prominent cultural heritage sites in the project area.

4.4.6 Community Perception and Needs

Following public consultations and meetings with community members in the three districts, community stakeholders raised a number of issues and concerns which significantly bordered on employment and economic development. The meetings conducted at all locations show that the project communities firmly support the implementation of the proposed project. At each Key Informant Interview (KII) or FGD, residents of the town expressed their desire to be given job opportunities during the construction and operational phases of the project. The communities also expressed the view that since unemployment rate is high in the area, the Project Contractor should give the first opportunities for employment to members of their communities. Furthermore, the communities believe that there will be short and long-term direct and indirect benefits to the local economy through supply of construction materials and services such as accommodation, transport and catering for the construction workers as well as through job and wealth creation in the operational phase of the proposed project.

The communities are enthusiastic about the proposed project development and consider it a step in the right direction in terms of realizing the agricultural potentials of the area as well as the potentials for job and wealth creation. Overall, they believe that the project will bring about a significant positive impact on the socio-economy of the area.

Major needs of the communities include improved electricity supply as well as improved healthcare and educational systems that can cope with the increasing population in the town. Other needs of the community include improvement of the road network and drainage systems in the area.

In terms of the proposed project, the most significant need of the people is provision of employment opportunities to the local people in both the constructional and operational phases of the project.

4.4.7 Land Use Pattern

Major land use observed in the project area is agricultural, followed by residential, institutional and commercial and to a much lesser extent recreational. Agricultural land use in the project area is in form of farming/orchards and rearing of animals. People in the project area are predominantly farmers. Institutional land use is mostly in form of schools and administrative and office accommodation.

The present land use surrounding the proposed site is a mixture of industrial, agricultural and residential land uses.

Plate 4. 10: Agricultural land use on the outskirts of Kalambaina town

4.4.7.1 land ownership structure

Land ownership in the area include private, family, community and institutional ownerships. Private and family ownerships mainly involve residential and business buildings as well as land parcels owned by individuals and families in the project area. On the other hand, community ownership is for lands and properties commonly used by members of the community, such as cemeteries, markets, motor parks, town squares, etc. Institutional ownership of land in the area is for lands and properties belonging to Local, State and Federal Governments.

4.4.8 Housing and Settlement Pattern

The three districts in the project area enjoy a predominantly linear settlement pattern with single houses arranged linearly along streets in the residential districts. However, the villages nearby have dispersed and nucleated settlement patterns. Residential densities range between low to high. However, the high-density areas predominate. A relatively low-density area is the outskirts of Kalambaina town shown in the plate below.

Plate 4. 11: A light density residential development at the outskirts of Kalambaina town

Housing types in the study area are both modern and traditional. Along major streets, houses made of cement and concrete blocks predominate, while in other smaller settlements in the outskirts and neighbouring villages, houses are mostly made of mud. Some of these houses were built of mud but rendered with cement/concrete. The shapes of the houses are rectangular with rectangular doors of about 2 meters high and 1 meter in width. The doors are wooden. The heights of the houses are normally 3 to 4 meters and most roofs were made of zinc.

Toilet systems in the area are mainly water closet (WC) system and pit latrines. The modern houses are invariably characterized by the use of WCs, while the traditional houses use pit latrines.

Plate 4. 12: Housing type in Kalambaina District

Plate 4. 13A street in Kalambaina town

Plate 4. 14: Streets in Kalambaina District showing linear town planning

4.4.9 Waste Management

Most people in the study area dispose of their domestic waste by open dumping. Sometimes they openly burn such waste after gathering it over a long period of time. The residue of the burnt refuse is later moved to farms as manure.

Plate 4. 15: Refuse dump site in Kalambaina District

Sewage from some houses are sometimes allowed to flow along the streets. However, SEPA is seriously enforcing environmental compliance with environmental laws.

4.4.10 Occupation

People in the project area are predominantly peasant farmers. Other occupations engaged in by people in the project area include mechanical artisanship, hawking, masonry, civil service, etc. the municipalities of the three districts are mostly characterized by petty trading which involves sale of food stuffs, provisions, clothing etc.

Motorcycles operators popularly called 'Okada' make money conveying people around the districts and to nearby communities. They were seen, during the survey, on township roads picking up and 'dropping' residents.

Plate 4. 16: Road-side restaurants in Arkilla District

Results from the occupational survey conducted in Wamakko show that some respondents have multiple streams of incomes.

Plate 4. 17: Trading activities along a street in Arkilla District

Plate 4.17 above shows some trading activities that take place along a major road in Arkilla District of the project area.

Plate 4. 18: Local rice-milling activities in Kalambaina District

4.4.11 Income distribution

Table 4.16 and the chart of Figure 4.31 present the average monthly income distribution of respondent household heads. The monthly income distribution in the study area shows that more than half of the household heads in all the three districts surveyed have average monthly income in the lowest income bracket of N10, 000 - N40, 000. The survey shows that 57.5% of households in Wamakko belong to this lowest income bracket, while household heads in Arkilla and Kalambaina have 76.9% and 57,1% respectively, in the lowest income bracket. On the other hand, cumulatively only a mere 22.5% have average monthly income above N100, 000 in Wamakko district, while in Arkilla only 7.7% of household heads have monthly incomes above N100, 000. According to the household survey In Kalambaina district, no household head earns an average monthly income above N100, 000.

Table 4. 16: Income distribution of respondents

District	Average monthly	No of	Percentage

	income	respondents	(%)
Wamakko	10000-40000	23	57.5
	41000-70000	4	10
	71000-100000	4	10
	110000-140000	2	5
	>140000	7	17.5
	Total	40	100
Arkilla	10000-40000	20	76.9
	41000-70000	3	11.5
	71000-100000	1	3.9
	110000-140000	0	0
	>140000	2	7.7
	Total	26	100
Kalambaina	10000-40000	16	57.1
	41000-70000	7	25.0
	71000-100000	5	17.9
	110000-140000	0	0
	>140000	0	0
	Total	28	

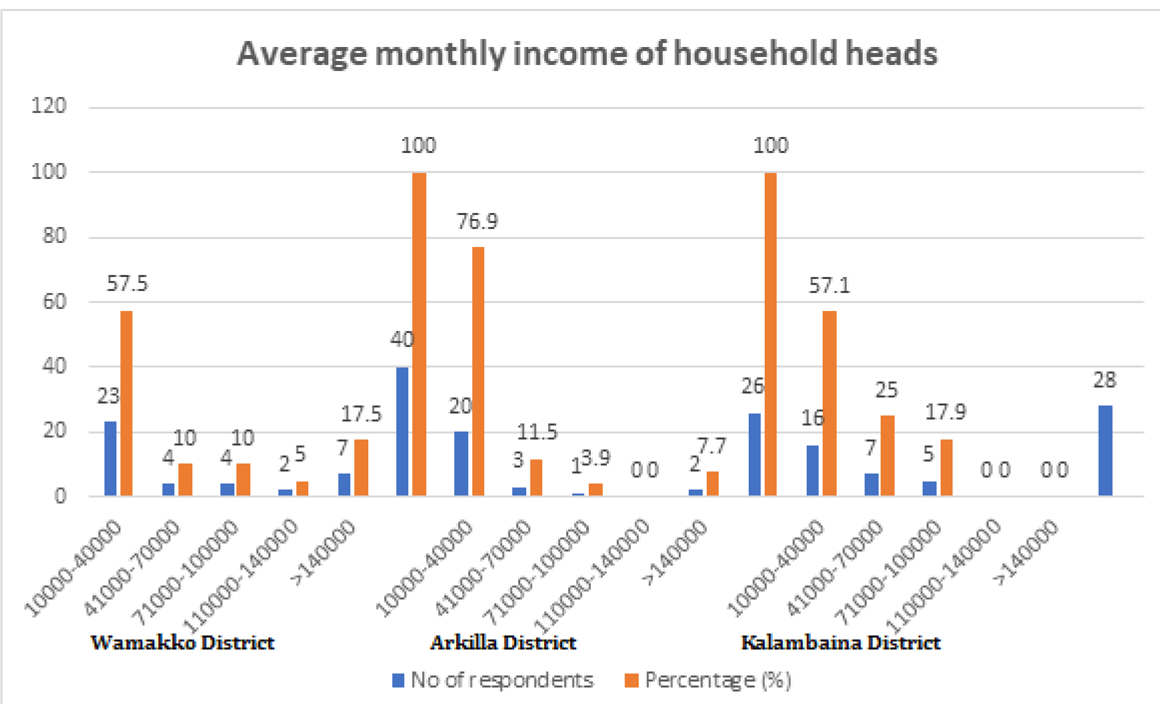


Figure 4. 31: Average monthly income of household heads

4.5 HEALTH ENVIRONMENT

Health baseline data acquisition was carried out to establish a data base for subsequent monitoring and evaluation of potential impacts that may result from the project.

4.5.1 Health Services

The survey carried out in the project area shows that there is a four-wheel approach in the treatment of ailments by respondents. Respondents make use of government hospitals, private clinics, off-the-shelf self-medication and also resort to consulting herbal and traditional alternative health practitioners, including traditional birth attendants and traditional orthopedic practitioners. Numerous public and private medical facilities are available in the study area. These include an orthopedic hospital in Wamakko town, numerous Primary Health Care clinics, dispensaries. There is also a rural ambulance service in Wamakko LGA that caters for the residents of the rural areas in the LGA. The plates that follow show some of the available health care infrastructure in the LGA.

Plate 4. 19: Entrance gate of Orthopaedic hospital in Wamakko town

Plate 4. 20: A local dispensary in Kalambaina district

4.5.2 Common Ailments and Causative Factors

It was established, through hospital records, administered questionnaires and Focused Group Discussions that the commonest ailments include malaria, typhoid fever, ulcers, cardiovascular diseases and diabetes. It was also established that certain ailments could be seasonal, environmental and/or occupational. Measles, heat rash and cough were said to be rampant in the hot season. Rheumatism is a major ailment in old adults. Typhoid fever, diarrhea and dysentery in children that take place occasionally may be linked to unhygienic living environment and polluted water.

4.6 TRADITIONAL ADMINISTRATION

4.6.1 Emirate System

The emirate system of traditional local administration was practiced in all the predominantly Muslim States of Northern Nigeria. Prior to the colonial invasion, the Emir appointed officials to assist in making his governing task easier. Such a decision by the Emir showed that even with the outright centralisation of power in the emirate system, there was still some delegation of power similar to a democratic system of government. Each official in the Emir's cabinet had a unique role to play. For example: the ***Waziri*** was the Prime Minister and was the closest to the Emir; ***Galadima*** was in charge of the capital and oversaw matters that pertained to the capital of the emirate; ***Madawaki*** was the commander of the army.

When an external conflict arose, the Emir summoned the Madawaki through the Waziri. While the Madawaki led the army, ***Dogari*** was in charge of the police and the ***Maaji*** managed the Treasury department.

Other title holders of the traditional emirate include the three ***Sarkins*** of the emirate who were also quite close to the Emir. ***Sarkin Fada*** saw to the welfare and running of the Palace. The ***Sarkin Pawa*** was the head of the butchers in the emirate. ***Sarkin Ruwa,*** oversaw fishing activities in the emirate. Each one of these officials were sought out when it came to running the activities of the emirate; however, the Emir still had served as the preeminent voice of authority and had the power to relinquish any officer of his position.

The Emirate system due to its landmass and population was further subdivided into districts. These districts were supervised by officials known as ***Hakimis***. The Hakimis were responsible for the collection of taxes and had the power to appoint village heads (***Dagachis***) who made the collection of taxes easier. The emirates also had ***Alkali*** courts, led by Alkali judges. These judges ruled based on the precepts of Sharia law and delivered judgment on issues such as marriage, murder, debt to mention a few. Court cases that were of greater consequence to the emirate were heard in the Emir's palace with the Emir as the judge.

The British employed to great success the Emirate system for its Indirect Rule and because of the centralised power structure of the Emirate, the British Indirect Rule approach quickly prospered.

The project area is within the Sultanate of Sokoto. The Sultan is the head of the Sultanate who has historically been the head of the entire emirates of the Northern Nigeria and also the leader of all the Muslim faithfuls in the country. The three districts in the project area, namely, Wamakko, Arkilla and Kalambaina, are all headed by Hakimis (District Heads) who are appointed by the Sultan.

In a typical emirate, the Mai Anguwa is the closest to the residents and all disputes and misunderstandings are first reported to him for settlement. The Mai Anguwa reports to the Dagachi (Village Head) or Magaji, who in turn is answerable to the Hakimi (District Head). The District Head reports to the Emir. In terms of information/instructions from the emir to the people, the hierarchy trickles down from the emir to the people in the communities. The traditional hierarchy is schematically depicted in Figure 4.32 below.

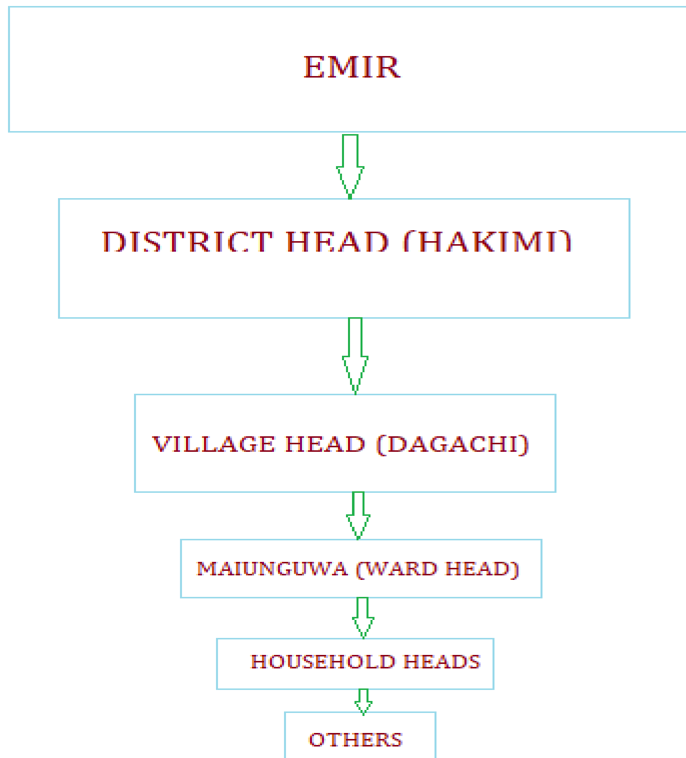


Figure 4. 32: Traditional leadership hierarchy in the study area

4.7 PUBLIC CONSULTATION

Consultations were carried out with the project affected communities and relevant institutional stakeholders. Consultations were carried out with due regards for the desire to ensure Broad Community Support (BCS) and with reference to informed consultation participation. The consultation process was carried out in conjunction with dissemination of relevant environmental and social information to concerned stakeholders.

4.7.1 Consultation Process

Consultation is defined as the process of exchanging information about the environmental and socio-economic implications of a proposed project, which is being subjected to an EIA process, with Project Affected Persons, designated bodies, organizations or persons with environmental responsibilities or interests. The purpose of the consultation exercise conducted for this project was to provide an opportunity for stakeholders to offer valuable inputs, which will assist the project team and other agencies of the Federal Government of Nigeria and Sokoto State in making decisions and recommendations throughout the project phases. It is essential for the project stakeholders to have the opportunities to participate in and provide input early on and throughout the impact assessment process. With timely and meaningful input, concerns can be identified, considered and appropriately addressed before final decisions are made.

The Nigerian Government stipulates that stakeholders be consulted in order for them to have the opportunity to express their views and provide relevant inputs on a proposed project before it is implemented. Through this process, stakeholders and the general public have an opportunity to contribute to the overall project design by raising concerns and making recommendations. In addition, consultation brings about commitment of project stakeholders by creating the needed sense of ownership and being valued by the project proponents.

4.7.2 Objectives of Consultation

The main objectives of consultations carried out for this EIA were to:

- ✓ Inform stakeholders about the proposed project and its potential benefits as well as discuss environmental and social issues associated with the project and solicit for their views and concerns;
- ✓ Collect relevant information for the project design;
- ✓ To identify and mitigate impacts before the project gets underway;
- ✓ To avoid conflicts by addressing issues of concern early and continuously in the life of the project; and
- ✓ To ensure that any fears or apprehension about the nature, scale and impacts of the project have been fully addressed.

4.7.3 Stakeholders Consulted

The proposed project has a wide range of stakeholders representing various and sometimes differing views on the relationships between the project, economic development and environmental protection. The primary stakeholders consulted were:

- ✓ Sokoto State Ministry of Environment;
- ✓ Sokoto Environmental Protection Agency;
- ✓ The Traditional Councils in the three districts of the project area; and
- ✓ All affected communities in the three districts of the project area.

Stakeholder consultation for the proposed project took several forms which include, institutional consultations, questionnaire administration, personal interviews, FGDs, as well as stakeholder/scoping workshop, which was conducted on 3rd of February 2020.

Stakeholders were consulted directly through visitations and Focused Group Discussions. Some of the stakeholders consulted are shown in the plates below and in Appendix V.

Plate 4. 21: MD SEPA flanked on both sides by members of the EIA team

Plate 4. 22: Consultation with Secretary of Wamakko LGA and council members

The Secretary of Wamakko LGA, who represented the LGA Chairman who was somewhere else on official engagement. The LGA Secretary expressed the optimism of the LGA Council on the prospects of the proposed project on the socio-economic development of Wamakko LGA. He called on the project proponent to be wary of false indigeneship claims by people they may be dealing with. He also advised the proponent to engage in robust CSR programmes for the benefit of the project communities and to extend employment and procurement opportunities to the local people, in order to ensure a mutually beneficial relationship with the host communities.

The three District Heads of Wamakko, Arkilla and Kalambaina, on their part also expressed their happiness and optimism about the proposed project development. They called on the project proponent to ensure that the project communities are given priority in terms of employment in both the constructional and operational phases of the proposed project, and to also package good CSR programmes so as to ensure a harmonious relationship with the host communities.

Plate 4. 23: Consultation with the District Head of Wamakko (Baraden Wamakko)

Plate 4. 24: Consultation with the District Head of Arkilla

Plate 4. 25: Consultation with the District Head of Kalambaina

4.7.4 Brief Outcomes from community cconsultations

Communities in the three districts of Wamakko, Arkilla and Kalambaina were also consulted via FGDs and personal interviews. Throughout the consultation process, the project background, design concepts and its social and environmental consequences were briefly presented to ensure that the stakeholders understand the issues at hand and their context for better commitment.

Highlights of the consultation process in the project communities include the following:

- ✓ Attendance at all the consultation were appreciable and cut across the different strata of the communities;
- ✓ The team was well received at all the visited communities;
- ✓ The communities emphasized the need for the proponent to ensure that a competent company is considered for the construction work to ensure timely completion and avoid abandonment of the project midway through;
- ✓ Community stakeholders also want the proponent to compel the construction company to consider some of their youths for employment during the constructional phase of the project;

- ✓ Community stakeholders also want the proponent to consider some of their youths for employment in the operational phase of the project; and
- ✓ Community leaders assured the EIA team that they would continue to give moral support to the proponent in the implementation of the project.

4.7.5 Summary of Responses and concerns

The outcome of the consultation with the various stakeholders and beneficiaries of the project is summarized in forms of expressed appreciations and concerns in as follows.

4.7.5.1 Appreciations

The following positive impacts that would potentially be generated by the proposed project were appreciated by the communities:

- ✓ Boosting of agricultural productivity in the area;
- ✓ Creation of wealth in the project area;
- ✓ Reduction of crime in the project area as a result of youth employment;
- ✓ Creation of employment in the constructional phase of the project; and
- ✓ Provision of jobs, in the operational phase of the project, to especially youth in the local communities.

4.7.5.2 Concerns/Observation

The objectives of the project were made known to the stakeholders. A major concern expressed by communities in the project area is that of youth employment in both the construction and operations phases of the project.

On its part, OCP Africa Nigeria Limited, has an MOU on its plans for discharging its corporate social responsibility.

The following plates show cross sections of participants who attended the Community Scoping/Stakeholders' Workshop that was held on 3rd February, 2020.

Plate 4. 26: MD SEPA delivering a speech

Plate 4. 27: One of the EIA consultants making a comment

Plate 4. 28: A scene from the Stakeholder Scoping Workshop

Plate 4. 29: Cross section of participants at the scoping/stakeholders' workshop

Plate 4. 30: A stakeholder seeking for clarification on the proposed project

Plate 4. 31: Sokoto State Commissioner for Women Affairs, government officials and participants at the workshop

Plate 4. 32 SEPA with other government officials, participants and the EIA consultants

4.7.6 Future Consultations

Further consultations would be carried out throughout the project cycle time so as to realize overall objectives of the consultation process. Submission of the EIA report is not the end of the EIA process. Key stakeholders would continuously be engaged throughout the project life cycle in several capacities including, but not limited to:

- ✓ Disclosure of the finalized EIA report as stipulated by law;
- ✓ Dialogue with authorities and regulators involved in inspection and monitoring;
- ✓ Technical collaboration on design modification where desirable (as appropriate); and
- ✓ Interacting with communities during the operational phase to get feedback on the effectiveness of mitigation and enhancement measures.

CHAPTER FIVE: ASSOCIATED AND POTENTIAL IMPACTS OF THE PROPOSED PROJECT

5.1: INTRODUCTION

All major development projects have environmental and/or socio-economic impacts. If the objectives of such projects must be realized, the associated and potential environmental, socio-economic and health impacts of the projects must be identified, evaluated and adequately mitigated. In general, these impacts are the resultant changes in environmental parameters, in space and time, compared with what would have happened had the project not been undertaken. The parameters may be related to any of the environmental characteristics such as air quality, water quality, noise levels or local occupational employment. There are direct and indirect impacts which may sometimes correlate with short – run and long run impacts. For some impacts however, the distinction between short run and long run impact may relate to the distribution between the construction and operational stages of the project. Although the greatest concern about impacts is their negative aspect, some impacts are positive and should therefore be enhanced. However, whether positive or negative, impacts can vary considerably in magnitude, extent and in significance.

5.2 IMPACTS ASSESSMENT METHODOLOGY

This section identifies relevant issues associated with the proposed project and defines the nature of the potential impacts.

Analysis of impacts identifies the following:

- ✓ Types of impact;
- ✓ Predicts the magnitude of impact;
- ✓ Probability of occurrence of impact;
- ✓ Extent of the impact; and

- ✓ Determines the overall significance of the impact.

5.3 ENVIRONMENTAL AND SOCIAL IMPACTS

Potential impacts were assessed using the methodology described below.

Firstly, relevant issues were described as they relate to particular project activities and those aspects of the activities that are likely to result in impacts. The nature of the impacts was then described, after which the significance of the impacts was determined.

The following definitions are applicable to the assessment process:

- ✓ An **activity** is a distinct process or task undertaken by an organization for which a responsibility can be assigned. Activities also include facilities or pieces of infrastructure that are possessed by an organization.
- ✓ An **environmental aspect** is an element of activities of organizations or their products and services which can interact with the natural or human environment. The interaction of an aspect with the environment may result in an impact.
- ✓ **Environmental and social impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to adverse air quality. Receptors can comprise of, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as aquifers and flora.

Impacts on the environment can lead to changes in existing conditions; the impacts can be direct, indirect or cumulative.

Direct impacts refer to changes in environmental components that result from direct cause-effect consequences of interactions between the environment and project activities. Indirect impacts result from cause-effect consequences of interactions between the environment and direct impacts. Cumulative impacts refer to the accumulation of changes to the environment caused by the project and other ongoing or planned human activities.

5.4 DESCRIPTION OF ASPECTS AND IMPACTS

The findings of the environmental investigations form the basis for prediction of impacts. Once a potential impact has been determined during the scoping process, it is necessary to identify which project activity will cause the impact, its probability of occurrence as well as its magnitude and extent (spatial and temporal). This information is important for evaluating the significance of the impact, and for defining mitigation and monitoring strategies.

The aspects and impacts identified will therefore be described according to the definitions below:

5.4.1 Extent

The extent for each aspect, receptor and impact will be defined. The geographical coverage (spatial scope) description will take account of the following factors:

- ✓ The physical extent/distribution of the aspect, receptor and proposed impact; and
- ✓ The nature of the baseline environment within the area of impact.

For example, the impacts of noise are likely to be more confined to a smaller geographical area than the impacts of atmospheric emissions, which may be experienced a long distance away. The significance of impacts also varies spatially. Many will be significant only within the immediate vicinity of the site or within the surrounding community, whilst others may be significant at a local (project) or regional (district) level.

The **extent** of the impact will be rated as shown in Table 5.1 below.

Table 5. 1: Rating for extent of impacts

S/No	Extent	Scale of magnitude
	Localized (At localized scale i.e. along the road corridor or 500m on either side of the ROW in extent)	1
	Study area (The proposed ROW and 2km on either side of it)	2
	Regional (Covers the region where the road passes)	3
	National (At country level)	4
	International (Beyond Nigeria)	5

5.4.2 Duration

Duration refers to the time span over which a positive or negative change caused by the aspect may be experienced by the environment.

The assessment method will rate time periods for impact duration in table 5.2 below.

Table 5. 2: Impact duration rating

S/No	Duration of impact	Rating
	Very short (0 – 1 Years)	1
	Short term (1 – 5 Years)	2
	Medium term (5 – 15 years)	3
	Long term (>15 years)	4
	Permanent	5

5.4.3 Magnitude

The **magnitude** of an environmental or social impact is determined by the degree of change to the baseline condition, and includes consideration of the following factors:

- ✓ The reversibility of the impact;
- ✓ The sensitivity of the environmental receptor;
- ✓ The impact duration, its permanency and whether it increases or decreases with time; Whether the aspect is controversial or would set a precedent; and
- ✓ The threat to environmental and health standards and objectives.

Magnitude of impacts was rated according to the scale in Table 5.3 below.

Table 5. 3: Impact magnitude rating

S/No	Impact Magnitude	Rating
1.	Small (will have no effect on the physical, biological or social environment)	0
2.	Minor (will cause a minimal impact on physical, biological or social environment)	2
3.	Low (will cause a slight impact on the physical, biological or social environment)	4
4.	Moderate (will result in a physical, biological or social environment component or process continuing but in a modified way)	6
5.	High (physical, biological or social environment or component or process is altered to the extent that they temporarily cease to exist or operate)	8
6.	Very high (results in complete destruction of physical, biological or social environment components and permanent cessation of	10

	the processes)	

5.4.4 Probability of impact

The **probability** or **frequency** of impact means how often an aspect may impact either positively or negatively on the environment. In other words, the probability of an impact expresses the likelihood of an impact occurrence.

The probability rating used for the assessment is summarized in Table 5.4 below.

Table 5. 4: Impact probability rating

S/No	Impact probability	Rating
	Highly improbable (<20% chance of occurring)	1
	Improbable (20 – 40% chance of occurring)	2
	Probable (>40% - 70% chance of occurring)	3
	Highly probable (>70% - 90% chance of occurring)	4
	Definite (>90% - 100% chance of occurring)	5

5.5 ASSESSING THE SIGNIFICANCE OF IMPACTS

The purpose of impact assessment is to assign overall relative significance to predicted impacts associated with a proposed project, and to determine the methods to be used in avoiding, mitigating or managing anticipated impacts. For this study the information presented above was summarized in a tabular form and significance was assigned based on reasonable deductions. Significance was determined before and after application of appropriate mitigation measures.

A "significant impact" for the purposes of this study is: "An impact which, either in isolation or in combination with others, could in the opinion of the specialist, have an influence on the decision-making process, including the specification of mitigation measures."

5.6 DETERMINATION OF SIGNIFICANCE OF IMPACTS

Environmental significance rating is an attempt to evaluate the importance of a particular impact, the likelihood and consequence of which has already been assessed by the relevant specialist. The description and assessment of the aspects and impacts undertaken is presented in a consolidated table with the significance of the impacts assigned using the process and matrix (Table 5.5) below.

The sum of the first three characteristics (extent, duration and magnitude) provides a total score for the **Consequence** of each impact. The last characteristic determines the **Probability** of the potential impact. The product of **Consequence** and **Probability** represents the **Significance** of the impact.

Table 5. 5: Significance Assessment Matrix

		CONSEQUENCE (Extent + Duration + Magnitude)																			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Probability	**1**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
	3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
	4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

In order to evaluate impacts and mitigation thresholds, the ratings in Table 5.6 were used.

Table 5. 6: Impact and mitigation ratings

S/No.	Rating	Range	Interpretation
1.	Low	<30	Whenever impact would not have a direct influence on the decision to go ahead with the project as proposed
2.	Medium	30-60	Whenever impact could influence the decision to go ahead with the proposed project in the area unless it is effectively mitigated
3.	High	>60	Whenever the impact would definitely have an influence on the decision process to develop in the area

5.7 POTENTIAL IMPACTS ASSOCIATED WITH THE PROJECT

The proposed project is expected to generate both positive and negative impacts on the physical and socio-economic environments of the project area. The project will require construction works over an area of about ten Hectares (10Ha).

Prior to the commencement of the construction phase, the project will require the cessation of farming activities on the site proposed for the project. Construction work will involve excavation for foundation footings, building construction for administration and process units, as well as road pavement construction. Similarly, maintenance and repair activities in the operational phase will involve carrying out periodic building and equipment maintenance.

The sources of impact are grouped by project phases as follows:

- ✓ Pre-construction;
- ✓ Construction;
- ✓ Operation; and
- ✓ Decommissioning

Table 5.7 explains these sources of impacts.

Table 5. 7: Sources of environmental and socio-economic impacts

S/No.	Source of Impact	Description of Impact
1.	**Preconstruction Phase**	
	Displacement of farmers from the factory site	Resettlement of farmer (s) affected by the project
2.	**Construction Phase**	
	Site preparation	Site preparation activities, including establishment of storage facilities
	Transportation and traffic	Road transportation of materials, equipment and workers to and from the site, including fueling and maintenance of vehicles and machinery
	Construction activities	Construction of the building structures
	Management of wastes and hazardous materials	Management and storage of waste, hazardous substances and other materials
	Procurement of materials, goods and services	Purchases required for the factory such as processing equipment
	Presence of workers	Presence of workers which could lead to potential abuse of local population, including gender based-violence and potential increase in STDs
3.	**Operational Phase**	
	Fertilizer blending and production operations	HSE impacts resulting from operations
	Equipment maintenance operations	HSE and other socio-economic impacts arising from presence of

		maintenance workers
	Waste and hazardous materials management	Solid waste management and hazardous material transportation

5.8 ENVIRONMENTAL AND SOCIAL COMPONENTS

Environmental and social components are the elements of the physical, biological and socio-economic environment that are likely to be affected by one or more sources of impact. The components identified for this project are listed in Table 5.8. The study focused only on these components.

Table 5. 8: Environmental and social components

S/No.	Component		Description
1.	**Physical Environment**	Soil	Physical and chemical characteristics of the soil in the project area, including vulnerability to erosion
		Water	Physical and chemical characteristics of surface water and groundwater
		Air quality	Physical and chemical characteristics of the air
		Noise	Noise, vibrations
2.	**Biological Environment**	Terrestrial flora	Terrestrial plant communities
		Terrestrial fauna	All terrestrial and semi-aquatic animal species and their habitats
3.	**Socio-economic Environm**	Employment and economic development	Local and regional economic development and employment

		Land use	Land uses: agricultural, livestock rearing, etc.
		Infrastructure	Electricity supply, local road network, etc.
		Cultural and archeological heritage	Religious, cultural or historical sites and structures
		Public health and safety	Population well-being and health, including Sexually Transmitted Infections (STIs)

5.8.1 Positive impacts

The proposed fertilizer blending plant project will yield benefits to both the formal and informal economy of the project area and the entire country. For example, residents of the project area could be temporarily employed during the construction phase for unskilled and semi-skilled work. The stakeholders consulted had observed that they expect their youth to be employed in the operational phase of the project. Community stakeholders also expect their women to be engaged to provide catering services to construction workers.

Additionally, it is expected that as a result of the influx of workers in the construction phase, there will be a demand for temporary housing and lodging services which is identified as a benefit to the project communities.

Establishment of the fertilizer blending plant will significantly contribute to provision of fertilizer in this part of the country which is expected to, apart from solving the problems associated with inadequacy of the existing supply, go a long way in providing new business opportunities for supporting industries such as transportation, banking and insurance.

5.8.2 Negative impacts

The main impacts on the socio-economic environment are the temporary loss of farm land by the owners of the land parcel that has been acquired for the establishment of the factory.

Other impacts may occur during construction and maintenance works but will be of temporary nature. These may include traffic accidents, noise, degradation of water quality and soil contamination by poor waste management or accidental spill of hydrocarbons. However, negative impacts that may occur during the construction phase will be localized and of a short-term duration. There may also be negative impacts in the operational phase of the project, which may include air, soil and water pollution problems.

5.8.3 Identification of potential environmental and social impacts

Identification of the potential environmental and social impacts was carried out using an "environmental matrix", in which one axis identifies the project's sources of impacts while the other axis identifies the biophysical and socio-economic components of the project. Table 5.9 presents these interactions and will be the basis for the impact evaluation.

Table 5. 9: Impact identification matrix

		ENVIRONMENTAL COMPONENT										
		Physical Environment					Biological Environment	Social Environment				
SOURCES OF IMPACT BY PHASE		Soil	Surface water	Groundwater	Air quality	Noise	Terrestrial ecology	Employment and economic development	Land use	Infrastructure	Community health and safety	Workers health and safety
	PRE-CONSTRUCTION PHASE											
	Land acquisition and displacement of farming activities							**N**	**N**			
	CONSTRUCTION PHASE											
	Site preparation				**N**	**N**		**P**			**N**	**N**
	Transportation and traffic				**N**	**N**		**N/P**		**N**	**N**	**N**
	Construction activities	**N**				**N**					**N**	**N**
	Management of wastes and hazardous materials	**N**	**N;**	**N**							**N**	**N**

Table 5.9, continued

	ENVIRONMENTAL COMPONENT										
	Physical environment					Biological environment	Social environment				
SOURCES OF IMPACT BY PHASE	Soil	Surface Water	Groundwater	Air quality	Noise	Terrestrial ecology	Employment and economic development	Land use	Infrastructure	Community health and safety	Workers health and safety
Procurement of materials, goods and services							**P**				
Presence of workers							**N/P**			**N**	**N**
Operational Phase											
Operating the factory				**N**	**N**				**N**		**N**
Transportation and traffic				**N**	**N**					**N**	
Maintenance of factory					**N**					**N**	**N**
Waste management	**N**	**N**	**N**							**N**	
Presence of maintenance workers										**N**	**N**

Key: N = Negative impact; P = Positive impact; and N/P = Negative and positive impacts

5.9 ASSESSMENT OF POSITIVE IMPACTS: PRE-CONSTRUCTION PHASE

5.9.1 Potential impacts on project communities

Positive impacts expected in this phase include a slight boost to the local economy in terms of increase in demand for goods and accommodation as a result of presence of some of the project personnel carrying out preliminary studies and works in the construction area. Both goods and services such as food supplies will be required during the pre-construction phase.

An assessment of the positive impacts to be created during the pre-construction phase of the proposed project is given in Table 5.10 below.

Table 5. 10: Impact significance of boost to local economy

Enhancement status	Extent	Duration	Magnitude	Probability
Without enhancement	Study area	Short term	Low	Probable
	2	2	4	3
	Result: (+24) Low positive			
Enhancement measures	OCPAN will encourage its pre-construction consultants to source for as many goods as are required by them in the project communities to enable them to benefit from the available economic opportunities			
With enhancement	Study area	Short term	Medium	High
	4	2	6	3
	Result: (+36) Low positive			

5.10 ASSESSMENT OF NEGATIVE IMPACTS: PRE-CONSTRUCTION PHASE

This phase of the project is not expected to generate many negative impacts. However, there will be negative impacts that will be consequent upon land acquisition and relocation by farmers on the existing plot of land dedicated for the proposed project.

Table 5. 11: Impact significance on land acquisition and resettlement

Enhancement status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Very short	Moderate	Definite
	2	1	6	5
	Result: (-45) High negative			
Mitigation measures	Farmers that have grown crops should be allowed to sale or harvest their crops prior to commencement of construction activities;			
With mitigation	Study area	Very short	Low	Improbable
	2	1	4	2
	Result: (-14) Low negative			

5.10 ASSESSMENT OF POSITIVE IMPACTS: CONSTRUCTION PHASE

5.10.1 Potential impacts on employment

The proposed project is expected to generate direct and indirect employment opportunities for both semi-skilled and unskilled workers. Direct employment will include for jobs in constructing the factory. Indirect employment will be generated through increased business opportunities and induced economic growth both at the local, regional and national levels through procurement of goods and services required in the execution of the project.

Creation of employment opportunities during the construction phase would be the most important benefit for the communities in the project area. Unemployment and under-employment levels are generally high in the area and expectations on job opportunities are high among the people of the area.

The proposed project will lead to a marked increase in individual income for many Nigerians. This will be as a result of increased purchases (from local, regional and national markets) and employment generated by construction activities.

Potential impacts associated with direct and indirect employment in the construction phase of the project are assessed in Table 5.12 the table below.

Table 5. 12: Significance of employment impact

Enhancement status	Extent	Duration	Magnitude	Probability
Without enhancement	Regional	Short term	Low	Probable
	3	2	4	3
	Result: (+27) Low positive			
Enhancement measures	✓ OCPANL will direct its Project Contractor to give priority to the local community during recruitment of construction personnel; ✓ Project Contractor shall also ensure opportunities for skill acquisition and capacity building are given to the local employees; ✓ The Project Contractor shall whenever possible, source for expert employees locally first, then regionally and nationally before engaging international experts; and ✓ In all cases, the traditional local authorities shall be consulted when recruiting local workers			
With enhancement				
	Regional	Short term	Moderate	Definite
	3	2	6	5
	Result: (+55) Medium positive			

5.10.2 Potential impacts on economic development

The proposed project is of such magnitude that it will impact positively on the economy of the project area and by extension the entire country.

Implementation of the proposed project is expected to stimulate economic growth through:

- ✓ Provision of fertilizer which will enhance agricultural productivity in the area;
- ✓ Attraction of new businesses (in both the formal and informal sectors), especially those that will be facilitated by the presence of the factory;
- ✓ Increased revenue as a result of secondary employment and creation of small businesses; and
- ✓ Increase in tax revenue generation through direct and indirect taxes on goods and services associated with the project.

An assessment of the positive impacts that will be created in the construction phase resulting from implementation of the proposed project is given in Table 5.13 below.

Table 5. 13: Impact significance on economic development

<table>
<tr><th>Enhancement status</th><th>Extent</th><th>Duration</th><th>Magnitude</th><th>Probability</th></tr>
<tr><td rowspan="3">Without enhancement</td><td>Regional</td><td>Short term</td><td>Low</td><td>Probable</td></tr>
<tr><td>3</td><td>2</td><td>4</td><td>3</td></tr>
<tr><td colspan="4">Result: (+27) Low positive</td></tr>
<tr><td>Enhancement measures</td><td colspan="4">✓ OCPANL shall encourage the Project Contractor to source for as many materials required for construction purposes as possible locally, prioritizing from the region to the rest of the Country, before resorting to importation; and
✓ Community Liaison Personnel shall be used by Project Contractor to manage expectations and target local service providers</td></tr>
<tr><td>With enhancement</td><td>Regional</td><td>Short term</td><td>Moderate</td><td>Definite</td></tr>
<tr><td></td><td>3</td><td>2</td><td>6</td><td>4</td></tr>
<tr><td></td><td colspan="4">Result: (+44) Medium positive</td></tr>
</table>

5.11 ASSESSMENT OF NEGATIVE IMPACTS – CONSTRUCTION PHASE

5.11.1 Impacts on the physical environment

5.11.1.1 Soils

The proposed project will require the removal of vegetation in the existing farm lands on the proposed project site.

Similarly, movement of construction plant and equipment such as trucks, Four-Wheel Drive (4WD) vehicles, etc. will lead to a compaction of soils along the access roads used during the construction phase of the project.

Construction equipment used for the project, if not well-serviced, may cause fugitive spills due to leaks and lead to surface and subsurface soil contamination.

Soils may also be contaminated through accidental spills caused during field refueling. Based on the above facts, the impact assessment on soils resulting from the construction phase activities is given in Table 5.14 below.

Table 5. 14: Significance of impact on soils

Enhancement status	Extent	Duration	Magnitude	Probability
Without Mitigation	Study area	Short	Minor	Probable
	1	2	2	3
	Result: (-15) Low positive			
Mitigation measures	✓ Regularly service and maintain construction equipment; ✓ Restrict construction activities and movement of equipment to existing roads; ✓ Implement erosion and sediment control plans in the rainy season, in areas within the site identified as having high erosion potential; and ✓ Hazardous materials must be stored in a manner that prevents interaction with each other or with the environment			
With mitigation	Study area	Short term	Small	Probable
	1	2	0	3

	Result: (-9) Low negative

5.11.1.2 Water

Vegetation removal in some areas can increase soil erosion, causing sediment to be transported and deposited into waterbodies, especially during rainy season. This could lead to the deterioration of water quality of these water bodies.

In the construction phase, ground and surface water may be exposed to contamination by spills or leaks of contaminants. Sources of impacts to groundwater are the same as for soil in the project area. Hazardous materials from leaking construction equipment or from accidental spillage may be washed down during the rainy season into ground and surface water and this could lead to adverse water quality.

The significance of the impacts on water resources during the construction phase is given in Table 5.15 below.

Table 5. 15: Significance of impact on ground and surface water resources

Enhancement status	Extent	Duration	Magnitude	Probability
Without Mitigation	Study area	Short	Minor	Probable
	2	2	2	3
	Result: (-18) Low negative			
Mitigation measures	✓ Regularly service and maintain construction equipment; and ✓ Hazardous materials must be stored in a manner that prevents interaction with each other or with the environment.			
With mitigation				
	Study area	Short term	Small	Improbable
	2	2	0	2
	Result: (-8) Low negative			

5.11.1.3 Noise

Construction work will be carried out close to existing homes and farm lands. The construction plant and equipment used for construction work will most likely cause temporary noise emissions which may cause nuisance to neighboring residences, businesses and farmers.

The significance of the impacts associated with air quality and noise are given in Table 5.16 below.

Table 5. 16: Impact significance of noise

Enhancement status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Short	Low	Highly probable
	2	2	4	4
	Result: (-32) Medium negative			
Mitigation measures	✓ The Project Contractor shall limit the construction times to daylight hours and only in exceptional cases will they work beyond daylight hours; ✓ The Project Contractor shall select low-noise construction equipment; and ✓ The Project Contractor shall locate noisy equipment far away from communities			
With mitigation				
	Study area	Short term	Minor	Probable
	2	2	2	3
	Result: (-18) Low negative			

5.11.2 Impacts on the biological environment

5.11.2.1 Biological environment-terrestrial vegetation alteration

In the construction phase, local vegetation will be removed from the land already acquired for the proposed factory. Vegetation clearing will lead to a permanent loss of terrestrial habitats on the site. However, since no endangered species have been identified on the land and the area to be impacted is relatively small and the existing vegetation has a wide spread population over the area, terrestrial vegetation will not be significantly affected.

Table 5. 17: Impact significance of habitat alteration

Enhancement status	Extent	Duration	Magnitude	Probability
Without mitigation	Project area	Permanent	Low	Probable
	1	5	2	3
	Result: (-24) Low negative			
Mitigation measures	✓ Restrict vegetation clearing to just the actual area where the buildings would be erected; and ✓ Replant native vegetation on exposed soils wherever possible			
With mitigation				
	Study area	Short term	Minor	Probable
	1	2	2	3
	Result: (-15) Low negative			

5.11.2.2 Biological environment – Alien Invasive Plant Species

Alien Invasive Plant Species (AIPS) are introduced in the environment through construction plant, equipment, and containers imported into the country that have not undergone decontamination. The propagules of AIPS attach themselves to construction plant and equipment and get introduced into the project environment through interactions with native soils.

Once introduced into the landscape, AIPS usually displace indigenous plant species and do not provide good habitat and forage for animal species in the project area. In areas where AIPS are introduced, the landscape in terrestrial habitat changes significantly with other plant species displaced or suppressed. The AIPS pose unusual characteristics which lack management measures. For instance, some AIPS could be poisonous when eaten by animals.

The proposed project will most likely require the importation of operational equipment. Lack of appropriate enforcement, by Nigerian authorities, of equipment inspection and decontamination procedures will create opportunities for introduction of AIPS in the project area. If contaminated construction plant and equipment is used, chances of AIPS being introduced into the indigenous environment are high. This could leave Nigerian Government with a new problem to deal with in the operational phase of the project. The impact of introducing AIPS into the project area is assessed in Table 5.18 below.

Table 5. 18: Impact significance of AIPS

Enhancement status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Long term	Low	Probable
	3	4	4	3
	Result: (-33) Medium negative			
Mitigation measures	✓ Contractor shall develop and implement an AIPS prevention strategy which shall include monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas; and ✓ Any alien invasive plant found on site should be controlled as soon as possible			
With mitigation	Study area	Short term	Minor	Probable
	3	3	2	3

	Result: (-24) Low negative

5.11.3 Impacts on the social environment

5.11.3.1 Impact on farming

OCPANL has already acquired land for the proposed project from farmers in the project area. The size of the land is about 10 hectres. The farmers may be affected adversely as they will have to look for new areas to resettle and perform their farming activities. Table 5.19 below assess the significance of this impact.

Table 5. 19: Impact significance of land use

Enhancement status	Extent	Duration	Magnitude	Probability
Without enhancement	Study area	Short term	Low	Definite
	2	2	3	5
	Result: (-35) Medium negative			
Enhancement measures	✓ OCPANL should allow farmers that have grown crops to sale or harvest their crops prior to commencement of construction activities;			
With enhancement	Study area	Short term	Minor	Improbable
	2	2	2	2
	Result: (-12) Low negative			

5.11.3.2 Impacts on existing traffic and roads

In the construction phase, construction equipment and materials will be transported to the construction yard and site. This may have negative impacts, such as disrupting traffic and lowering the integrity of existing highways and local/township roads, if the Project Contractor does not comply with the speed and axle load limits.

Table 5.20 presents the impact significance on infrastructure.

Table 5. 20: Impact significance on traffic and damage to roads

Enhancement status	Extent	Duration	Magnitude	Probability
Without Mitigation	Regional	Short	Low	Probable
	3	2	3	3
	Result: (-24) Low negative			
Mitigation measures	✓ The Project Contractor shall ensure compliance with speed and axle load requirements of all road classes to be used in transporting equipment and materials for construction work; and ✓ The Project Contractor shall devise and implement an effective Traffic Management Plan for deployment of equipment to construction areas.			
With Mitigation	Regional	Short	Minor	Improbable
	3	2	2	2
	Result: (-14) Low negative			

5.11.3.4 Community health and safety

In the construction phase, communities living near the proposed factory site may be exposed to construction related impacts such as accidents with construction equipment.

Likewise, the proposed project has the potential to result in spread of Sexually Transmitted Infections (STIs) such as HIV/AIDS as a result of migrant workers interacting with community members.

Table 5.21 presents the analysis of significance of impacts on community health and safety.

Table 5. 21: Significance of impacts on community health and safety

Enhancement status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Long term	Low	Highly probable
	2	4	3	4
	Result: (-36) Medium negative			
Mitigation measures	✓ The Project Contractor shall develop and implement a written Emergency Response Plan (ERP) for the construction phase; ✓ Project Contractor shall create awareness in the project communities on the dangers of illicit sexual relationship; and ✓ The Project Contractor shall sensitize members of the project community on dangers and practical means of protection against communicable diseases and STDs.			
With mitigation	Study area	Long term	Minor	Improbable
	2	4	2	2
	Result: (-16) Low negative			

5.11.3.5 Health and safety of workers

The proposed project will employ many workers in both the mobilization and construction phase. The majority of unskilled workers to be recruited will be from the project community and they will most likely have minimal Health, Safety and Environment (HSE) knowledge, skills and competencies.

Consequently, lack of development and implementation of risk control measures such as Safe Work Procedures (SWP), adequate supervision and untrained workforce could potentially lead to safety and health incidents. The table below presents impact assessment on health and safety of workers.

Table 5. 22: Significance of impacts on health and safety of workers

Enhancement status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Short term	Moderate	Probable
	3	2	6	3
	Result: (-33) Medium negative			
Mitigation measures	✓ The Project Contractor shall develop and implement an Occupational Safety and Health (OSH) Management System which is in line with Nigerian Factory Act and other relevant legal provisions; ✓ Project Contractor shall develop and implement an S&H training program for all workers that are employed during the construction phase of the project; ✓ Project Contractor shall ensure that every employee working at the project site is provided with appropriate and adequate PPE; and ✓ Project Contractor shall ensure educating employees on the detrimental effects of drug and alcohol abuse, the risk and concerns relating to HIV/AIDS and other health risk-related activities.			
With mitigation	Study area	Short term	Minor	Improbable
	3	2	2	2
	Result: (-14) Low negative			

5.11.3.6 Potential impacts on traffic

Use of heavy, medium and light construction vehicles in the project area could lead to automobile accidents. Lack of enforcement of speed limits, and non-use of competent drivers, overloading of construction vehicles may also worsen the situation. Table 5.23 summarizes the traffic impact significance assessment.

Table 5. 23: Significance of impacts on traffic and safety of road users

Enhancement status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Short term	Moderate	Probable
	2	2	6	3
	Result: (-30) Medium negative			
Mitigation measures	✓ Project Contractors shall ensure that its drivers comply with set road safety standards; and ✓ Non-regular loads shall be transported to avoid times of the day when traffic volumes are likely to be high;			
With mitigation	Study area	Short term	Low	Improbable
	2	2	4	2
	Result: (-16) Low negative			

5.11.3.7 Archaeological/Cultural heritage

The proposed factory will be located close to a cemetery. There is therefore a potential for adversely impacting on this cemetery. However, the proponent proposes fencing this cemetery as part of his Corporate Social Responsibility (CSR) and this measure will minimize potential impacts on the cemetery.

Table 5.24 below gives an assessment of the significance of the impact on cultural/archeological heritage.

Table 5. 24: Significance of impacts on cultural heritage

Enhancement status	Extent	Duration	Magnitude	Probability

Without mitigation	Study area	Medium term	Low	Probable
	2	3	4	3
	Result: (-27) Low negative			
Mitigation measures	Prior to the commencement of any construction work, Project Contractor shall construct a perimeter fence around the cemetery. This action shall form an integral part of the Environmental and Social Management Plan (EMP) which the Project Contractor shall develop and implement for the project.			
With mitigation	Study area	Medium term	Minor	Improbable
	2	3	2	2
	Result: (-14) Low negative			

5.12 ASSESSMENT OF POSITIVE IMPACTS-OPERATIONS PHASE

5.12.1 Socio-economic impacts

The following subsections highlight some of the positive socio-economic impacts of the proposed project in its operational phase.

5.12.1.1 Increasing the availability and affordability of fertilizer

The proposed factory when completed will go a long way in making fertilizer more available in the local markets. Increased availability of fertilizer in the markets will bring about a reduction in its cost, owing to a cut in transportation cost and this will ultimately make fertilizer more affordable to farmers in the project area. Table 5.25 below presents the assessment of the impact significance of increased fertilizer availability.

Table 5. 25: Impact significance on fertilizer availability

Enhancement status	Extent	Duration	Magnitude	Probability
Without enhancement	Regional	Long term	Medium	Probable
	3	4	6	3

	Result: (+39) Medium positive			
Enhancement measures	OCPANL should encourage local business men to take up distributorship/dealership from it; and OCPANL should give these business men special incentives so as to encourage them			
With Enhancement	Regional	Long term	High	Highly probable
	3	4	8	4
	Result: (+60) Medium positive			

5.12.1.2 Stimulating agricultural development in the project area

Establishment of the fertilizer blending plant in the project area will encourage more people to engage in farming so as to take advantage of the increased affordability of fertilizer in the area. Other entrepreneurs may also be encouraged, by improved agricultural activities in the area, to set up services as well as agro-based industries such as those for the production of improved seedlings, farm implements, etc.

Table 5.26 below summarizes the impact assessment method.

Table 5. 26: Impact significance on stimulation of agricultural development

Enhancement status	Extent	Duration	Magnitude	Probability
Without enhancement	Regional	Long term	Moderate	Probable
	3	4	6	3
	Result: (+30) Low positive			
Enhancement measures	SOSG should encourage local business men to set up agro-based industries in the project area; and			

	SOSG should give these business men special incentives so as to encourage them.			
With Enhancement	Regional	Long term	High	Probable
	3	4	8	3
	Result: (+45) Medium positive			

5.12.1.3 Improved regional and national economy

Wamakko LGA and neighbouring LGAs are very important to Sokoto State in terms of agricultural production; and the proposed fertilizer blending plant is expected to impact positively on the economy of these LGAs, as well as on the regional and national economies. The proposed project will increase local fertilizer production which will consequently facilitate agricultural production which will in turn impact positively on local and national economies. Economic benefits will include higher efficiency in agricultural production as well as improvement in the quality and quantity of agricultural produce. With the existing rich agricultural lands, irrigation schemes as well as suitable conditions for extensive subsistence and commercial farming in the project area, the proposed project is of strategic importance to commerce and trade as well as food and economic security in the entire country.

Table 5.27 below presents an assessment on the significance of the impact of the proposed project on regional economy.

Table 5. 27: Impact significance of improved regional economy

Enhancement status	Extent	Duration	Magnitude	Probability
Without enhancement	Region	Long term	Low	Probable
	3	4	4	3
	Result: (+33) Medium positive			
Enhancement measures	✓ Farmers should be encouraged to form cooperative societies so as to benefit from various agricultural			

	financing schemes being executed by both SOSG and Federal Government; ✓ Farmers should be encouraged by both SOSG and FGN, through appropriate financing schemes, with agricultural production incentives; and ✓ Federal Government should ensure an enhanced security provision especially in rural areas to protect farmers from activities of bandits and other criminals such as kidnappers and armed robbers.			
With enhancement	Region	Long term	High	Highly probable
	3	4	8	4
	Result: (+60) Medium positive			

5.12.1.4 Direct and indirect employment opportunities

The proposed fertilizer blending factory will, in its operational phase, provide direct and indirect jobs for people in the project area. Direct jobs will be for people that will man daily production operations of the plant, while indirect jobs will be inform of service provision to the plant employees such as by food vendors, local worker transport business, etc.

Significance of direct and indirect job creation is assessed in Table 5.28 below.

Table 5. 28: Significance of direct and indirect job creation

Enhancement status	Extent	Duration	Magnitude	Probability
Without enhancement	Study area	Long term	Moderate	Probable
	2	4	6	3
	Result: (+36) Medium positive			
Enhancement measures	✓ OCPANL should give preference to the people of the project area when recruiting for employee; and ✓ OCPANL should make sure that people from the project area are given opportunity to provide			

	essential services such as food and transportation to factory employees			
With enhancement	Study area	Long term	High	Highly probable
	2	4	8	4
	Result: (+56) Medium positive			

5.12.1.5 Reduction in crime rate

Provision of employment opportunities for people in the project area will go a long way in reducing crime rate in the area. In every community, crime rate is generally associated with unemployment. It therefore follows that provision of employment to the people in the project area, especially the youth, will lead to a reduction in the rate of committing crime in the project area.

Impact significance of reduction in crime rate in the project area as a result of the project is assessed in Table 5.29 below.

Table 5. 29: Significance of reduction in crime rate

Enhancement status	Extent	Duration	Magnitude	Probability
Without enhancement	Study area	Long term	Minor	Probable
	2	4	2	2
	Result: (+16) Low positive			
Enhancement measures	✓ OCPANL should give preference to the people of the project area when recruiting for employee; ✓ OCPANL should make sure that people from the project area are given opportunity to provide essential services such as food and transportation to factory employees; and ✓ OCPANL should support local security arrangements operated by vigilante groups in the project area.			
With	Study area	Long term	Low	Highly probable

enhancement	2	4	4	4
	Result: (+40) Medium positive			

5.13 ASSESSMENT OF NEGATIVE IMPACTS-OPERATIONS PHASE

5.13.1 Socio-economic impacts

5.13.1.1 Health and safety of factory workers

In the operational phase of the project, there is potential for negative impacts on health and safety of factory workers which may be as a result of inappropriate/non-use of PPE kits or HSE procedures. For example, accidents and injuries may result from falls from heights, insertion of body parts into moving machine/engine parts. Similarly, physical unprotected contact with some of the process chemicals such as urea may result in irritation of eyes, skin or respiratory track as well as infections such as dermatitis.

Impact significance of health and safety of workers is assessed in Table 5.30 below.

Table 5. 30: Impact significance of health and safety of workers

Enhancement status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Long term	Low	Probable
	2	4	4	3
	Result: (-30) Medium negative			
Mitigation measures	✓ Provisions of Nigerian Factory Act 1978 shall be strictly adhered to by OCPANL; ✓ Adequate provision of PPE kits such as hand gloves, safety boots, safety harness should be made to relevant factory workers by OCPANL; ✓ Safety training should be given to all fresh employees and periodic re-training of every personnel should be ensured by OCPANL;			

	✓ Fire-fighting equipment should be provided at strategic locations within the factory premises; ✓ First Aid Kits shall be provided and made easily accessible in every process department; and ✓ Ambulance and emergency medical team should be provided and be ready for medical emergencies.			
With mitigation	Study area	Long term	Minor	Improbable
	2	4	2	2
	Result: (-16) Low negative			

5.13.1.2 Environmental pollution from mismanagement of waste

Wastes from the proposed factory, if mismanaged, can pose treats to the immediate and extended environments of the project area. For example, liquid waste may impact negatively on ground water and downstream surface water resources of the project area. Similarly, some of the chemical waste may negatively impact on the project environment. For example, urea, if present in waste from the production process may produce toxic algal blooms in neighbouring farms and downstream water resources.

Impact significance of mismanaged waste is assessed in Table 5.31 below.

Table 5. 31: Impact significance of mismanaged waste

Enhancement status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Long term	Low	Probable
	2	4	4	3
	Result: (-30) Medium negative			
Mitigation measures	✓ All waste categories should be segregated and managed appropriately; ✓ Accredited waste managers should be employed to treat and dispose of various categories of waste; ✓ Toilets should be provided at suitable places and			

	maintained appropriately; and ✓ Good house-keeping should be ensured in all work areas and offices;			
With mitigation	Study area	Long term	Minor	Improbable
	2	4	2	2
	Result: (-16) Low negative			

5.13.1.3 Reduction in electricity supply to communities

In the operational phase of the project, there may be a negative impact on electricity supply to communities near the factory. This may happen as a result of electricity demand of the factory, which may necessitate reduction of supply to the communities, so as to accommodate and meet up with the demand from the factory. However, this impact may be mitigated by ensuring that the factory as much as possible procures separate electricity distribution facilities, such as transformers and distribution lines, for its electricity supply.

Impact significance of potential reduction in electricity supply to the project communities is assessed in Table 5.32 below.

Table 5. 32: Impact significance of reduction in electricity supply

Enhancement status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Long term	Moderate	Probable
	2	4	6	3
	Result: (-36) Medium negative			
Mitigation measures	✓ The factory shall be supplied by an industrial distribution line that feeds the Funtua Textiles Ltd and Funtua Water Works; ✓ The factory shall have separate transformer and distribution lines from those used by the communities; and ✓ At times of electricity shortages, electricity shall only be supplied to the factory during the day time, while the factory uses its private electricity generating sets at			

	night.			
With mitigation	Study area	Long term	Low	Improbable
	2	4	4	2
	Result: (-20) Low negative			

5.13.1.4 Health and safety of communities in the project area

In the operational phase of the project, there may be a negative impact on the health and safety of communities in the project in form of transmission of communicable diseases. This may be as a result of presence of alien operational or maintenance workers who may interact with the local communities through casual illicit sex.

Table 5.33 below summarizes the significance assessment of the impact on health and safety of communities from sexual interaction with alien workers.

Table 5. 33: Impact significance on health and safety of communities

Enhancement status	Extent	Duration	Magnitude	Probability
Without mitigattion	Study area	Long term	Moderate	Probable
	2	4	6	3
	Result: (-36) Medium negative			
Mitigation measures	✓ Factory employees and project communities shall be sensitized on dangers of improper sexual relationship and behaviours; ✓ Employees and communities shall be sensitized on the need to protect themselves against communicable diseases; and ✓ Communities and employees shall be trained on methods of protection against communicable and sexually transmitted diseases.			
With mitigation	Study area	Long term	Minor	Improbable
	2	4	2	2
	Result: (-16) Low negative			

CHAPTER SIX: MITIGATION MEASURES

6.1 INTRODUCTION

The rationale for impact quantification and significance has been discussed in Chapter 5; the results indicate that various components would be impacted positively or negatively. This chapter presents remedies for the identified potential negative impacts as well as enhancement measures for the positive impacts that are likely to result from the execution of the proposed project. The mitigation measures proposed in the various phases of this project will ensure minimal negative impacts of the proposed project on the environment.

Apart from identifying and predicting the likely impacts that may arise from the project development, there is need to provide abatement strategies and cost–effective environmental controls to ensure that environmental resources are harnessed in a sustainable manner. In order to preserve the present integrity of the environment, certain measures have been recommended to mitigate the impacts identified in this study; enhancement measures are also proffered for the positive impacts. The mitigation measures are provided to ensure that potential and associated negative impacts of the various project activities on the biophysical, socio-economic and health environments eliminated or reduced to as low as reasonably possible (ALARP).

6.2 MITIGATION MEASURES

Mitigation measures are activities aimed at reducing the severity, avoiding or controlling project impacts and where possible they are used to enhance environmental quality through designed alternatives, scheduling or other means. Mitigation may be in form of avoidance (alternative action taken to avoid impact), compensatory payment of money or replacement in kind for losses or recreation of lost/damaged habitat. These set of mitigations took into account the environmental laws in Nigeria as well as international principles of sustainable development and best available technology relevant to the proposed development.

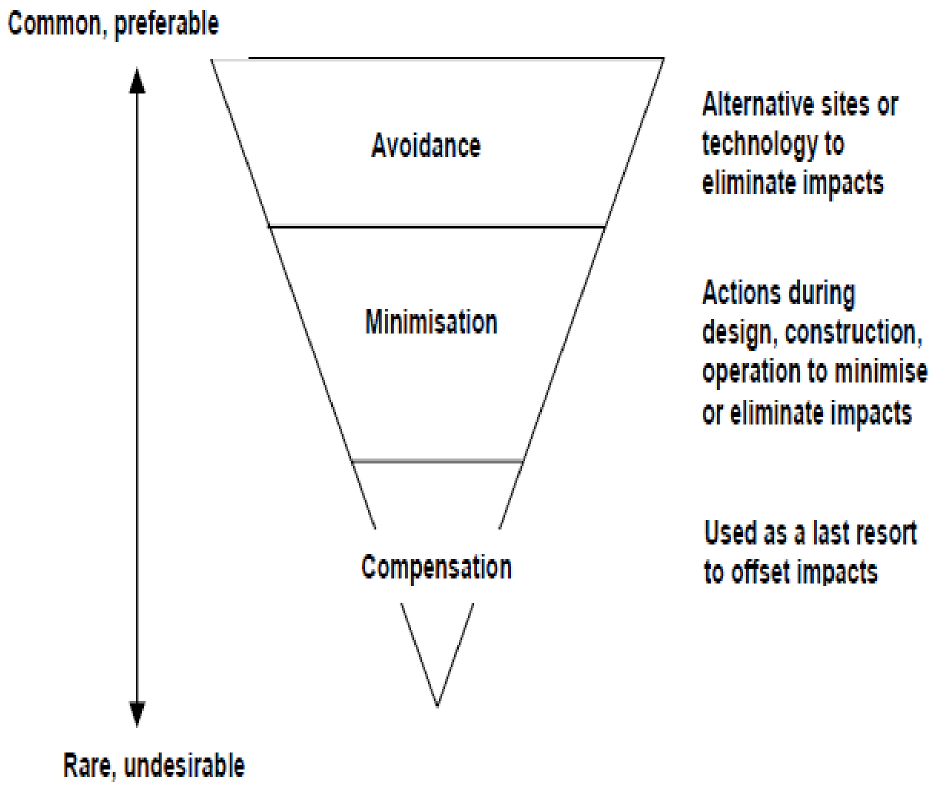
The main essence of mitigation measures in an EIA is to ensure safeguarding both the environment and socio-economic aspects of the proposed project environment. Mitigation is both a creative and practical phase of an EIA process. It seeks to find the best ways and means of avoiding, minimizing and remedying impacts. The main objectives of providing mitigation measures include the following:

- ✓ Finding better alternatives and ways of doing things;
- ✓ Enhancing the environmental and social benefits of a proposal;
- ✓ Avoiding, minimising or remedying adverse impacts; and
- ✓ Ensuring that residual adverse impacts are kept within acceptable levels.

Elements of mitigation are organized into a hierarchy of actions:

- ✓ Firstly, avoid adverse impacts as far as possible by use of preventative measures;
- ✓ Secondly, minimise or reduce adverse impacts to 'as low as practicable' levels; and
- ✓ Thirdly, remedy or compensate for adverse residual impacts, which are unavoidable and cannot be reduced further.

A three-step process of mitigation can be applied to relate the hierarchy of elements to the stages of the EIA process when they are typically applied. Generally, as project design becomes more detailed, opportunities for impact avoidance narrow and the concern is then to minimize and compensate for unavoidable impacts. However, these distinctions are not rigid and opportunities for creative mitigation should be sought at all stages of project planning. Figure 6.1 presents the hierarchy of action steps to mitigate impacts.



Source: UNEP, 2002

Figure 6. 1: The Elements of Mitigation

Step One: Impact Avoidance

This step is most effective when applied at an early stage of project planning. It can be achieved by:

- ✓ Not undertaking certain projects or elements that could result in adverse impacts;
- ✓ Avoiding areas that are environmentally sensitive; and
- ✓ Putting in place preventative measures to stop adverse impacts from occurring.

Neither the proposed project nor any of its elements will result in any significant adverse effect on the environment. Moreover, the proposed site for the project is not environmentally sensitive. Equally important is the fact that preventive measures have been designed to ensure that the project is implemented in a sustainable manner.

Step Two: Impact Minimisation

This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:

- ✓ Scaling down or relocating the proposal;
- ✓ Redesigning elements of the project; and
- ✓ Taking supplementary measures to manage the impacts.

Step Three: Impact Compensation

This step is usually applied to remedy unavoidable residual adverse impacts. It can be achieved by:

- ✓ Rehabilitation of the affected site or environment;
- ✓ Restoration of the affected site or environment to its previous state or better; and
- ✓ Replacement of the same resource values at another location.

Environmental enhancements/ mitigations are essential and shall therefore be undertaken in the various phases of the proposed project, that is, during pre-construction (including those already undertaken), construction/installation and operation phases of the project.

The measures being proposed are specific, measurable, achievable, relevant and time-bound (SMART) to the proposed project. The measures also took into account the environmental laws in Nigeria, and internationally and the principles of sustainable development and best available technology.

Most of the likely impacts due to the proposed project which are majorly during construction and operation stages have been considered in the design and implementation plan of the proposed project. Additional measures have been suggested herewith which might include sound operational procedures, good maintenance schedule and good housekeeping.

The mitigation measures proposed for the predicted impacts were based on the following considerations among others:

- ✓Environmental laws in Nigeria, with emphasis on permissible limits for waste streams
- ✓Best Available Technology for Sustainable Development
- ✓Feasibility of application of the measures in Nigeria
- ✓Concerns of stakeholders during consultation meetings, etc.

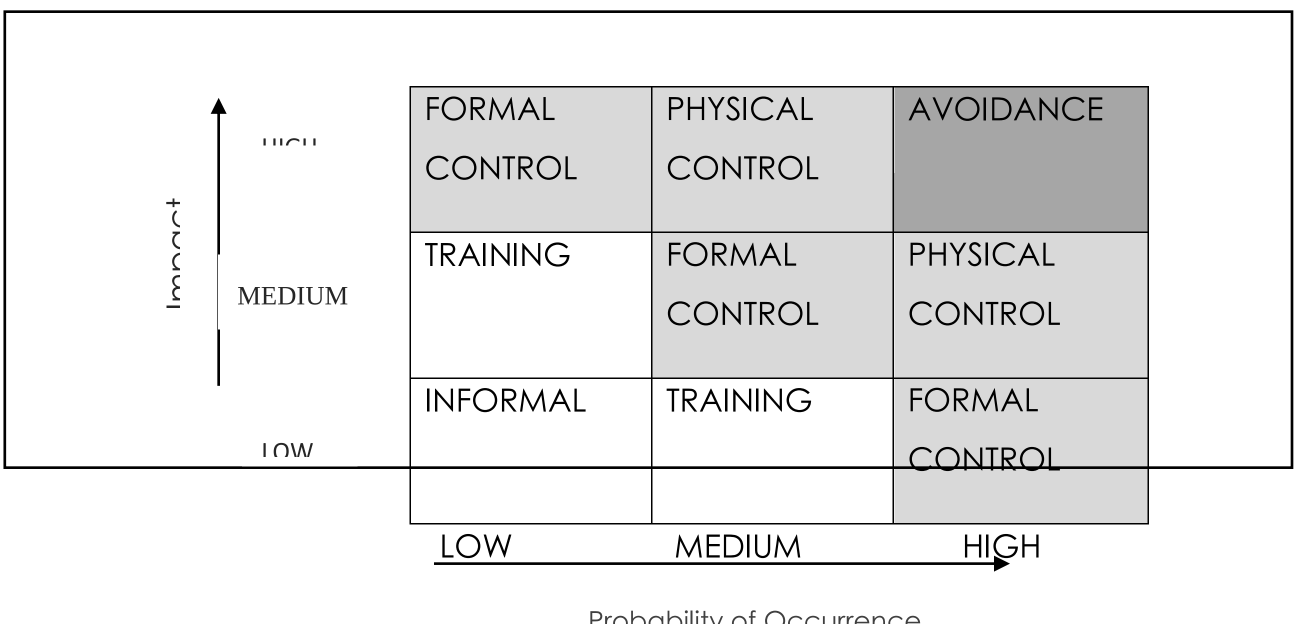


Figure 6. 2: Matrix for Determination of Mitigation Measures

Source: UNEP 2002

The description of the mitigation requirements is explained below:

- ✓ **Formal Control:** Involves the application of documented policy, process or procedure in mitigating the impacts of project activities.
- ✓ **Informal Control**: Involves the application of sound judgment and best practice in mitigating the impacts of project activities.
- ✓ **Physical Control:** Involves application of physical processes/ instruments, not necessarily requiring any special technology, in order to mitigate the impacts of a project activity.
- ✓ **Avoidance:** Involves the modification of plans, designs or schedules in order to prevent the occurrence of an impact or impacts.
- ✓ **Training:** Involves personnel awareness in specific/specialised areas

The measures are summarized in the following tables.

Table 6. 1: Mitigation and enhancement measures for pre-construction phase

S/No	Impact	Mitigation measures
1.	Land acquisition	✓ OCPANL shall allow all PAPs that have grown crops on the proposed factory site to sale or harvest their crops prior to commencement of construction activities; ✓ In case PAPs are not allowed to harvest their crops, they shall be compensated for their agricultural crops at the most current market rates;
2.	i.Erosion ii.Subsidence iii.Compaction	✓ At construction site, the topography of the graded surface shall be designed to minimize uncontrolled flow of runoff; ✓ Earthworks shall be planned and designed by appropriately trained personnel and must be designed for the appropriate soil type, topography and factory usage
3.	Ground water pollution	✓ Fuel and chemical storage shall be designed in line with best practice
4.	Air pollution	✓ Contractor shall select 'low-emission' construction equipment/machinery
5.	Noise pollution	✓ Plan to locate noisy equipment as far as practicable from receptors; ✓ Plan to appoint a Community Liaison Officer (CLO) to establish a complaint response programme to identify and resolve any noise related concerns at an early stage
6.	Socio-economic impacts on communities	✓ Plan for local employment and procurement; ✓ Unbundle large procurement contracts to be more suitable for local suppliers; ✓ Local expectations regarding project benefits should be carefully managed by means of appropriate stakeholder consultation throughout the lifecycle of the project; ✓ Develop a project-specific Community Health, Safety and Security Plan (CHSSP);and

		✓ Construction scheduling must include rehabilitation of disturbed areas;

Table 6. 2: Mitigation and enhancement measures for construction phase

S/No	Impact	Mitigation and enhancement measures
1.	Employment and job creation	✓ OCPANL shall direct its Project Contractor to give priority to the local community during recruitment of construction personnel; ✓ Project Contractor shall also ensure opportunities for skill acquisition and capacity building are given to the local employees; ✓ The Project Contractor shall whenever possible, source for expert employees locally first, then regionally and nationally before engaging international experts; and ✓ In all cases, the traditional local authorities shall be consulted when recruiting local workers
2.	Local economic development	✓ OCPANL shall encourage the Project Contractor to source for as many materials required for construction purposes as possible locally, prioritizing from the region to the rest of the country, before resorting to importation; and ✓ Community Liaison Personnel shall be used by Project Contractor to manage expectations and target local service providers
3.	Soil pollution and degradation	✓ Contractor shall regularly service and maintain construction equipment; ✓ Contractor shall restrict construction activities and movement of equipment to existing roads; ✓ Contractor shall implement erosion and sediment control plans in the rainy season, in areas within the site identified as having high erosion potential; and

Table 6.2 continued

S/No	Impact	Mitigation measures
		✓ Hazardous materials shall be stored in a manner that prevents interaction with each other or with the environment
4.	Surface and groundwater pollution	✓ Contractor shall regularly service and maintain construction equipment; and ✓ Hazardous materials must be stored in a manner that prevents interaction with each other or with the environment.
5.	Noise pollution	✓ The Project Contractor shall limit the construction times preferably to daylight hours and only in exceptional cases will he work beyond daylight hours; and ✓ The Project Contractor shall locate noisy equipment far away from communities
6.	Vegetation destruction	✓ Contractor shall restrict vegetation clearing to just the actual area where the buildings would be erected; and ✓ Replant native vegetation on exposed soils wherever possible
7.	Alien Invasive Plant Species (AIPS)	✓ Contractor shall develop and implement an AIPS prevention strategy which shall include monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas; and ✓ Any alien invasive plants found on site shall be controlled as soon as possible

Table 6.2 continued

S/No	Impact	Mitigation measures
8.	Traffic problems and destruction of roads	✓ The Project Contractor shall ensure compliance with speed and axle load requirements of all road classes to be used in transporting equipment and materials for construction work; ✓ The Project Contractor shall devise and implement an effective Traffic Management Plan for deployment of equipment to construction site; ✓ Project Contractors shall ensure that his drivers comply with set road safety standards; and ✓ Non-regular loads shall be transported to avoid times of the day when traffic volumes are likely to be high;
7.	Community health and safety	✓ The Project Contractor shall develop and implement a written Emergency Response Plan (ERP) for the construction phase; ✓ Project Contractor shall create awareness in the project communities on the dangers of illicit sexual relationship; and ✓ The Project Contractor shall sensitize members of the project community on dangers and practical means of protection against communicable diseases.
8.	Workers' health and safety	✓ The Project Contractor shall develop and implement an Occupational Safety and Health (OSH) Management System which is in line with Nigerian Factory Act and other relevant legal provisions;

Table 6.2 continued

S/No	Impact	Mitigation measures
		✓ Project Contractor shall develop and implement an S&H training program for all workers that are employed during the construction phase of the project; ✓ Project Contractor shall ensure that every employee working at the project site is provided with appropriate and adequate PPE; ✓ Project Contractor shall provide First Aid kits on site and station a standby ambulance for evacuation of accidents victims requiring higher level of urgent treatment than can be provided on site; ✓ Project Contractor shall ensure educating employees on the detrimental effects of drug and alcohol abuse, the risk and concerns relating to HIV/AIDS and other health risk-related activities.

Table 6. 3: Mitigation and enhancement measures for the operations phase

S/No	Impact	Enhancement measures
1.	Availability and affordability of fertilizer	✓ OCPANL shall encourage local business men to take up distributorship/dealership from it; and ✓ OCPANL shall give the local business men special incentives so as to encourage them
2.	Stimulating agricultural development	✓ SOSG should encourage local business men to set up agro-allied factories in the project area; and ✓ SOSG shall give the business men special incentives so as to encourage them
3.	Improvement in regional economy	✓ Farmers shall be encouraged to form cooperative societies so as to benefit from various agricultural financing schemes being executed by both SOSG and Federal Government; ✓ Farmers shall be advised to take insurance for their investment through appropriate schemes so as to reduce their operational risks; and ✓ Federal Government shall ensure an enhanced security provision especially in rural areas to protect farmers from activities of bandits and other criminals such as kidnappers and armed robbers.
4.	Direct and indirect employment opportunities	✓ OCPANL shall give preference to the people of the project area when recruiting for employees; and ✓ OCPANL shall make sure that people from the project area are given opportunity to provide essential services such as food and transportation to factory employees;

Table 6.3 continued

S/No	Impact	Mitigation measures
		This may be by, for example, providing shops for food vendors outside the factory premises.
5.	Reduction of crime rate	✓ OCPANL shall give preference to the people of the project area when recruiting operations personnel; ✓ OCPANL shall make sure that people from the project area are given opportunity to provide essential services such as food and transportation to factory employees; and OCPANL shall support local security arrangements operated by vigilante groups in the project area.
6.	Health and safety of factory workers	✓ Provisions of Nigerian Factory Act 1978 shall be well adhered to by OCPANL; ✓ Adequate provision of HSE kits such as hand gloves, safety boots, safety harness shall be made to relevant factory workers by OCPANL; ✓ Safety training shall be given to all fresh employees and periodic re-training of every personnel shall be ensured by OCPANL; ✓ Fire-fighting equipment shall be provided at strategic locations within the factory premises; ✓ First Aid Kits shall be provided in every process department; and ✓ Ambulance and emergency medical team shall be provided and be ready for medical emergencies.

Table 6.3 continued

S/No	Impact	Mitigation measures
7.	Health and safety of communities	✓ Factory employees and project communities shall be sensitized on dangers of improper sexual relationship and behaviours; ✓ Employees and communities shall be sensitized on the need to protect themselves against communicable diseases; and ✓ Communities and employees shall be trained on methods of protection against communicable and sexually transmitted diseases.
8.	Waste management	✓ All waste categories shall be segregated and managed appropriately; ✓ Accredited waste managers shall be employed to treat and dispose of various categories of waste; ✓ Toilets shall be provided at suitable places and maintained appropriately; and ✓ Good house-keeping shall be ensured in all work areas and offices;
9.	Reduction in electricity supply to communities	✓ The factory shall be supplied by a separate industrial distribution line; ✓ The factory shall have separate transformer and distribution lines from those used by the communities; and ✓ At times of electricity shortages, electricity shall only be supplied to the factory during the day time, while the factory uses its private electricity generating sets at night.

CHAPTER SEVEN: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

7.1 INTRODUCTION

This chapter presents the Environmental Management Plan (EMP) designed for the proposed OCP Africa Fertilizer Blending Plant project in Kalambaina.

An Environmental Management Plan is an environmental management tool that stipulates strategies and procedures for managing potential environmental impacts associated with a proposed project. EMP of a proposed project defines the actions that are needed to be taken, at specific times by specified parties (stakeholders), in order to address the issues raised in the impact identification process, during the lifecycle of the project, from design through construction and operation to decommissioning. EMP is a dynamic document which should be responsive to changes in situation, unforeseen circumstances, and the results of project monitoring and review. This therefore means that the provisions in the plan can be modified in line with new realities in project implementation or newly acquired or additional information on potential or identified impacts.

7.2 OBJECTIVE OF THE EMP

The objective of this EMP is to minimize and manage bio-physical and socio-economic impacts of the proposed project in all its phases, especially the constructional and operational phases. The EMP outlines specific mitigation measures and management interventions that are needed to minimize potentially negative and enhance potentially positive impacts of the project. The EMP incorporates mitigation and enhancement measures that were developed as part of the outcomes of the EIA process. It further incorporates international best practice to ensure effective and efficient management of impacts.

This EMP shall be treated as a dynamic document and changes should be made to it as required through project evolution, while retaining the underlying principles and objectives on which the document is based.

In order to ensure the EMP stays relevant, OCPANL in conjunction with Project Contractor and regulatory authorities must review the document periodically. Any and all proposed changes being considered must be discussed and agreed to by all parties involved. The changes must then be submitted to the Federal Ministry of Environment for its information and approval.

Anticipated impacts of the proposed project, corresponding mitigation measures, action party, timing, monitoring parameters and monitoring frequency are provided in the Plan for construction, operation and decommissioning activities. The EMP provides the procedures and processes that shall be incorporated into the organization's activities to measure and check, in a continuous nature, the compliance with, and effectiveness of the mitigation and enhancement measures recommended for managing the identified negative and positive impacts of the proposed project throughout its life cycle.

Application of an EMP usually starts from the pre-construction phase, when all the mechanisms required for effective implementation of recommended mitigation and enhancement measures are put in place. Other components of the EMP usually find application in the constructional and operational phases and their implementation should be monitored for compliance with relevant regulatory standards.

In view of the foregoing, the EMP presented in this section of the report has taken into consideration, all specific project activities covering site preparation/construction phase and the project operation/maintenance phase; predicted impacts of the proposed project as contained in Chapter Five;

and the prescribed mitigation measures for controlling or completely eliminating the identified negative impacts of the proposed project.

7.3 RESPONSIBILITIES AND INSTITUTIONAL ARRANGEMENTS

The key stakeholders involved in this project include; OCP Africa Nigeria Limited (OCPANL), the project contractor, Federal Ministry of Environment, Sokoto State Ministry of Environment, Sokoto Environmental Protection Agency as well as the affected/ direct beneficiary communities.

The project contractor shall be responsible for implementation of the EMP falling under the scope of his contract. OCPANL shall undertake monitoring of the EMP for all the phases of the project. This shall be done in close collaboration with the Federal Ministry of environment (FMEnv) and Sokoto State Ministry of Environment.

To ensure the success of the environmental management of this project, the entire project team and other relevant stakeholders should be properly mobilized and oriented on the necessity and methods for sound and environmentally responsible project delivery. OCPANL is expected to convey and discuss the contents of the EMP with the Contractor and his project personnel. FMEnv and SEPA and their local offices and project host communities are also expected to be part of the monitoring programme to be carried out under the EMP. Good relations and interactions between the contractor and other stakeholders and exchange of timely information on project scheduling, duration of construction works and other issues that may arise will go a long way in avoiding social conflicts. Communication channels between the contractor, host communities and other stakeholders should always be open to ensure proper and timely response to any complaint that may arise during project execution.

7.4 ENVIRONMENTAL MONITORING PLAN

The Environmental Monitoring Plan will ensure that the environmental integrity of this project is fully developed covering the project activities from site preparation, through construction, commissioning, operation, decommissioning and abandonment. The plan relates to the handling of hazardous materials and wastes, emission and discharge monitoring, site inspection and auditing, adverse weather preparedness, and decommissioning. The plan takes account of national and international standards for (environmental) planning, such as the International Standards Organization, the Health, Safety and Environment Management System. The programme will help to verify the effectiveness of the prescribed mitigation measures and help in the implementation of the EMP through;

- ✓ Effective integration of EMP into project design, from construction through to abandonment;
- ✓ Environmental monitoring of development phases including operations and close down;
- ✓ Specific training of staff and contractors to enhance environmental awareness; and
- ✓ Sustained consultation with all stakeholders at all times on the project development.

The environmental monitoring program for this project will serve as an integral part of the operational activities and is expected to generate the requisite information for environmental management and information dissemination.

It is anticipated that monitoring will be conducted during all phases of the project. This plan will play a pivotal role in ensuring that the trends for specific parameters are tracked and it will provide information on compliance with legislative norms, set guidelines or desirable operational limits; and form the basis for corrective actions and modification of activities where necessary. The frequency of sampling will depend on the time and location of project activities and results derived from monitoring data.

7.4.1 Monitoring Objectives

The aim of monitoring is to verify the predicted impacts of the project, and to ensure that any unforeseen impacts are detected early enough and appropriately mitigated. The programme will keep relevant records to ensure compliance with recommended environmental procedures. The monitoring plan will ensure that stipulated mitigation measures during construction and operation phases are implemented. Other specific objectives of the monitoring plan are to:

- ✓ Check the effectiveness of suggested mitigation measures;
- ✓ Demonstrate that the project activities (construction and operation) are carried out in accordance with the prescribed mitigation measures and regulatory procedures; and
- ✓ Provide early warning signals whenever an impact indicator approaches a critical level.

Impact indicators are defined in terms of threshold levels, and regulation and enforcement standards. Implementation of the EMP will allow for control and management of the timing, location and level of impacts and potentially provide the data for the empirical verification or validation of various predictive models of action/impact relationships.

7.4.2 Monitoring Requirements

A monitoring program requires a number of components to ensure effective results. These include:

- ✓ Relevant baseline data;
- ✓ Verifiable objective indicators for each project and project component for which monitoring will be conducted;
- ✓ An independent body responsible for monitoring;

- ✓ Those responsible for monitoring must have the capacity for such;
- ✓ Monitoring on a regular basis; and
- ✓ An effective monitoring reporting mechanism including feedback and commitment to action on monitoring results and recommendations.

The following tables (Tables 7.1-7.4) present summary of the EMP for the various phases of the proposed project.

Table 7. 1: EMP for the Pre-construction Phase

S/ No.	Receptor	Project Activity	Impact	Mitigation	Responsib-ility
1.	Soil resources	i. Design of earthworks ii. Design of site layout	i. Erosion ii. Subsidence iii. Compaction	Earthworks must be planned and designed by appropriately trained personnel and must be designed for the appropriate soil type, topography, climatic conditions etc. At construction sites, the overall topography of the graded surface should be designed to minimize the uncontrolled flow of runoff	Contractor Contractor
2.	Ground water	Design of fuel and chemical storage facilities	Pollution	Design fuel and chemical storage in line with best international practice	Contractor
3.	Air quality	Plant and equipment selection	Air pollution	✓ Select 'low-emission' construction vehicles and machinery when planning works;	Contractor
4.	Noise	Design of site layout	Noise pollution	i. Plan to locate noisy equipment as far as practicable from receptors ii. Plan to appoint a Community Liaison Officer (CLO) to establish a complaint response programme to identify and resolve any noise related concerns at an early stage	Contractor

Table 7.1 continued

S/No.	Receptor	Project Activity	Impact	Mitigation	Responsibi-lity
5.	Local population	i. Employment ii. Procurement iii. Public relations iv. HSE planning v. Design of earthworks	i. Landlessness ii. Local opportunities iii. Social pathologies iv. Social conflict v. Health and safety	✓ Plan for local employment and procurement; ✓ Unbundle large procurement contracts to be more suitable for local suppliers; ✓ Local expectations regarding project benefits should be carefully managed by means of appropriate stakeholder consultation throughout the lifecycle of the project; ✓ Develop a project-specific Community Health, Safety and Security Plan (CHSSP);and ✓ Construction scheduling must include rehabilitation of disturbed areas;	OCPANL and Contractor

Table 7. 2: EMP for the Construction Phase

S/N	Receptor	Project Activity	Impact	Mitigation	Responsib-ility
1.	Socio-economy of project area	Employment of construction personnel	Provision of jobs to people in the project area	✓ OCPANL shall direct its Project Contractor to give priority to the local community during recruitment of construction personnel; ✓ Project Contractor shall ensure opportunities for skill acquisition and capacity building are given to the local employees; and ✓ The Project Contractor shall whenever possible, source for expert employees locally first, then regionally and nationally before engaging any international expert.	Project contractor
2.		Local economic empowerment	Provision of business opportunities to people in the project area	✓ OCPANL shall encourage the Project Contractor to source for as many materials required for construction purposes as possible locally, prioritizing from the region to the rest of the country, before resorting to importation; and ✓ Community Liaison Personnel shall be used by Project Contractor to manage expectations and target local service providers;	OCPANL

Table 7.2 continued

S/No.	Receptor	Project Activity	Impact	Mitigation	Responsi-bility
3.	Soil resources of the project area	Construction activities	Soil pollution and erosion	✓ Regularly service and maintain construction equipment to prevent oil leakage/spillage; ✓ Restrict construction activities and movement of equipment to existing roads; ✓ Implement erosion and sediment control plans in the rainy season, in areas within the site identified as having high erosion potential; and ✓ Hazardous materials must be stored in a manner that prevents interaction with each other or with the environment	Project contractor
4.	Surface and ground water resources	Operating of construction machinery	Water pollution	✓ Regularly service and maintain construction equipment to prevent leakage/spillage; and ✓ Hazardous materials must be stored in a manner that prevents interaction with each other or with the environment.	Contractor

Table 7.2 continued

S/No.	Receptor	Project Activity	Impact		Responsi-bility
5.	Project environment	Operating of construction machinery	Noise pollution	✓ The Project Contractor shall limit the construction times preferably to daylight hours and only in exceptional cases will he work beyond daylight hours; and ✓ The Project Contractor shall locate noisy equipment far away from communities	Contractor
6.	Plant bio-diversity	Construction activities	Destruction of vegetation	✓ Restrict vegetation clearing to just the actual area where the buildings would be erected; and ✓ Replant native vegetation on exposed soils wherever possible	Contractor
7.	Project environment	Presence of construction and factory equipment	Infestation by Alien Invasive Plant Species	✓ Contractor shall develop and implement an AIPS prevention strategy which shall include monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas; and ✓ Any alien invasive plants found on site shall be controlled as soon as possible	Contractor and OCPANL

Table 7.2 continued

S/N	Receptor	Project Activity	Impact		Responsi-bility
8.	Road infrastructure and project communities	Transportation of procured materials for implementation of project	Traffic disruption and destruction of roads	✓ The Project Contractor shall ensure compliance with speed and axle load requirements of all road classes to be used in transporting equipment and materials for construction work; ✓ The Project Contractor shall devise and implement an effective Traffic Management Plan for deployment of equipment to construction site; ✓ Project Contractors shall ensure that its drivers comply with road safety regulations; and ✓ Non-regular loads shall be transported to avoid times of the day when traffic volumes are likely to be high;	Contractor

Table 7.2 continued

S/N	Receptor	Project Activity	Impact		Responsi-bility
9.	Communities in the project area	Presence of construction workers	Community health and safety	✓ The Project Contractor shall develop and implement a written Emergency Response Plan (ERP) for the construction phase; ✓ Project Contractor shall create awareness in the project communities on the dangers of illicit sexual relationship; and ✓ The Project Contractor shall sensitize members of the project community on dangers and means of protection against communicable diseases and STIs.	Contractor

Table 7.2 continued

S/No.	Receptor	Project Activity	Impact		Responsi-bility
10.	Construction employees	Construction activities	Workers health and safety	✓ The Project Contractor shall develop and implement an Occupational Safety and Health (OSH) Management System which is in line with Nigerian Factory Act and other relevant legal provisions; ✓ Project Contractor shall develop and implement an S&H training program for all workers that are employed during the construction phase of the project; ✓ Project Contractor shall ensure that every employee working at the project site is provided with appropriate and adequate PPE; ✓ Project Contractor shall provide First Aid kits on site and station a standby ambulance for evacuation of accidents victims requiring higher level of urgent treatment than can be provided on site; ✓ Project Contractor shall ensure educating employees on the detrimental effects of drug and alcohol abuse, the risk and concerns relating to HIV/AIDS and other health risk-related activities.	Project Contractor

Table 7. 3: EMP for the Operations Phase

S/No.	Receptor	Project Activity	Impact	Mitigation	Responsib-ility
1.	Socio-economy of the project area	Operating the fertilizer blending plant	Availability and affordability of fertilizer	✓ OCPANL shall encourage local business men to take up distributorship/dealership from it; and ✓ OCPANL shall give these business men special incentives so as to encourage them	OCPANL
2.	Socio-economy of the project area	Operating the fertilizer blending plant	Stimulating agricultural development	✓ SOSG shall encourage local business men to set up agro-based factories in the project area; and ✓ SOSG should give these business men special incentives so as to encourage them	SOSG
3.	Socio-economy of the project area	Operating the fertilizer blending plant	Improvement in regional economy	✓ Farmers shall be encouraged to form cooperative societies so as to benefit from various agricultural financing schemes being executed by both SOSG and Federal Government; ✓ Farmers shall be provided with incentives investment through appropriate schemes so as to reduce their operational risks; and ✓ Federal Government shall ensure an enhanced security provision especially in rural areas to protect farmers from activities of bandits and other criminals such as kidnappers and armed robbers.	FGN and SOSG

Table 7.3 continued

S/No.	Receptor	Project Activity	Impact	Mitigation/Enhancement	Responsi -bility
4.	Socio-economy of the project area	Operating the fertilizer blending plant	Direct and indirect employment opportunities	✓ OCPANL shall give preference to the people of the project area when recruiting employees; and ✓ OCPANL shall make sure that people from the project area are given opportunity to provide essential services such as food and transportation to factory employees; this may be by, for example, providing shops for food vendors outside the factory premises.	OCPANL
5.	Socio-economy of the project area	Operating the fertilizer blending plant	Reduction of crime rate	✓ OCPANL shall give preference to the people of the project area when recruiting operations personnel; ✓ OCPANL shall make sure that people from the project area are given opportunity to provide essential services such as food and transportation to factory employees; and ✓ OCPANL shall support local security arrangements operated by vigilante groups in the project area.	OCPANL

Table 7.3, continued

S/No.	Receptor	Project Activity	Impact	Mitigation	Responsib-ility
6.	Socio-economy of the project area	Operating the fertilizer blending plant	Adverse effects on health and safety of factory workers	✓ Provisions of Nigerian Factory Act 1978 shall be strictly adhered to by OCPANL; ✓ Adequate provision of PPE kits such as hand gloves, safety boots, safety harness should be made to relevant factory workers by OCPANL; ✓ Safety training shall be given to all fresh employees and periodic re-training of every personnel shall be ensured by OCPANL; ✓ Fire-fighting equipment shall be provided at strategic locations within the factory premises; ✓ First Aid Kits shall be provided and made accessible in every process department; and ✓ Ambulance and emergency medical team shall be provided and be ready for medical emergencies.	OCPANL
7.	Socio-economy of the project area	Operating the fertilizer blending plant	Adverse effects on health and safety of communities	✓ Factory employees and project communities shall be sensitized on dangers of improper sexual relationship and behaviours;	OCPANL

Table 7.3 continued

S/No.	Receptor	Project Activity	Impact	Mitigation	Responsib-ility
				✓ Employees and communities shall be sensitized on the need to protect themselves against communicable diseases and STIs; and ✓ Communities and employees shall be trained on methods of protection against communicable and sexually transmitted diseases.	
8.	Project environment	Presence of employees and production operations	Environment-al pollution	✓ All waste categories shall be segregated and managed appropriately; ✓ Accredited waste managers shall be employed to treat and dispose of various categories of waste; ✓ Toilets shall be provided at suitable places and maintained appropriately; and ✓ Good house-keeping shall be ensured in all work areas and offices;	OCPANL
9.	Communities in the project area	Production operations	Reduction in electricity supply to communities	✓ The factory shall be supplied by a separate industrial distribution line; ✓ The factory shall have separate transformer and distribution line from those used by the communities; and ✓ At times of electricity shortages,	Distribution Company (KEDCO)

				electricity shall only be supplied to the factory during the day time, while the factory uses its private electricity generating sets at night.	

Table 7. 4: Environmental Monitoring Programme for the Construction Phase

S/N	Impact	Proposed Mitigation	Responsible Party	Targets to Achieve	Monitoring Method	Monitoring Period	Monitor. Indicators
1.	Employment	Give priority to people from project communities	OCPANL	Improve the socio-economic well-being of project communities	Monitoring visits by regulators	3-monthly (quarterly)	Personnel record of contractor
2.	Procurement opportunities	Give priority to people from project communities	OCPANL and regulators	Improve the socio-economic well-being of project communities	Monitoring visits	3-monthly (quarterly)	Procurement records of contractor and field verification
3.	Soil pollution	i. Regular maintenance of equipment; ii. Restrict movement of equipment to existing roads; iii. Implement erosion control measures in the rainy season.	Contractor	i. Compliance with water use regulations ii. Minimize social conflicts over water sources	i. Sampling of physico-chemical parameters and microbiologi-al parameters	Three-monthly water quality monitoring from commenc-ement of earthworks	i. Relevant water quality parameters to include BOD, COD, TSS etc ii. Disharmony and social conflicts

Table 7.4 continued

S/N	Impact	Proposed Mitigation	Responsible Party	Targets to Achieve	Monitoring Method	Monitoring Period	Monitoring Indicators
		iv. Appropriate storage of hazardous materials					
4.	Water pollution	i. Regular maintenance of construction equipment; ii. Store hazardous materials appropriately	Contractor	To prevent water pollution	i. Visual observation of construction equipment and storage facilities	3-monthly inspection	Physical conditions of construction equipment and storage facilities
5.	Noise pollution	i. Limit construction time to daylight hours ii. Locate noisy equipment far away from communities	Contractor	To minimize noise pollution	Physical examination of location of noisy construction equipment	Monthly	Nature and location of noisy equipment

Table 7.4 continued

S/N	Impact	Proposed Mitigation	Responsible Party	Targets to Achieve	Monitoring Method	Monitor. Period	Monitor. Indicators
6.	Vegetation destruction	i. Restrict vegetation clearing to actual work areas ii. Replant native vegetation on exposed soils	OCPANL/ Contractor	To minimize vegetation destruction	Visual observation of areas cleared of vegetation	3-monthly	Nature of cleared areas
7.	Proliferation of Alien Invasive Plant Species (AIPS)	i. Implement an AIPS prevention strategy which shall ii. Rehabilitate disturbed areas iii. Control any alien invasive plants found on site ASAP	OCPANL/ Contractor	To prevent proliferation of AIPS	Physical inspection of construction site	3-monthly	Physical condition of vegetation on construction site
8.	Traffic problems and destruction of roads	i. Comply with speed and axle load requirements of vehicles	OCPANL/ Contractor	To prevent traffic accidents	Physical inspection of material delivery and	3-monthly	Loading and driving manner of drivers

Table 7.4 continued

S/N	Impact	Proposed Mitigation	Responsible Party	Targets	Monitoring Method	Monitor. Period	Monitor. Indicators
		ii. Devise and implement an effective Traffic Management Plan for deployment of equipment to construction site; iii. Ensure that drivers comply with road safety rules iv. Non-regular loads shall be transported at periods when traffic is low	Contractor	and destruction of roads	driving manner of construction drivers		
9.	Community health and safety	i. Create awareness in the project communities on the dangers of illicit sexual relationship; and ii. Sensitize members of community on means of protection against communicable diseases.	OCPANL	To safeguard community health and safety	Field inquiries on evidence of community sensitization	At the start of constructi-on work	Feedback from interaction with communit-ies

Table 7.4 continued

S/N	Impact	Proposed Mitigation	Responsible Party	Targets to Achieve	Monitoring Method	Monitoring Period	Monitor. Indicators
10.	Workers' health and safety	i. Develop and implement an Occupational Safety and Health (OSH) Management System in line with Nigerian Factory Act and other relevant legal provisions; ii. Develop & implement an S&H training for all construction workers	Contractor	To safeguard construction workers' health and safety	Field inquiries on evidence of workers' sensitization	At commenc-ement of construction work	Feedback from interaction with workers
		iii. Provide employees with adequate and appropriate PPEs; iv. Provide First Aid kits on site and a standby ambulance for evacuation of accident victims; v. Educate employees on the effects of drug and alcohol abuse, HIV/AIDS and other health risk-related	OCPANL and federal and state regulators	To safeguard construction workers' health and safety	Field inquiries on evidence of workers' sensitization	At commenc-ement of construction work	Feedback from interaction with workers

		activities					

Table 7. 5: Environmental Monitoring Programme for the Operations Phase

S/N	Impact	Proposed Mitigation	Responsible Party	Targets	Monitoring Method	Monitoring Period	Monitoring Indicators
1.	Availability and affordability of fertilizer	i. Encourage local business men to take up distributorship/ dealership; and ii. Give incentives local business men	OCPANL	To encourage business-men to develop the local fertilizer market	Market survey to investigate market penetration by fertilizer	At the initial phase of fertilizer production	Level of produced fertilizer penetration in local markets
2.	Stimulating agricultural development	i. SOSG should encourage local business men to set up agro-allied factories in the project area; and ii. SOSG should give these business men special incentives so as to encourage them	Federal and State regulators	To encourage business men to develop more agricultural activities in the project area	Field survey to determine other areas of agricultural development	One year after start of operations	Level of other agricultural activities
3.	Improvement in regional economy	i. Encourage farmers to form cooperative societies;	Federal and State Governm-ents	i. To benefit from agricultural financing schemes	Field survey	One year after start of operation	Level of participation of farmers

Table 7.5 continued

S/N	Impact	Proposed Mitigation	Responsible Party	Targets	Monitoring Method	Monitor. Period	Monitor. Indicators
		ii. Advise farmers to insure their investments; iii. Ensure an enhanced security provision especially in rural areas		ii. To reduce farmers' risks iii. To protect farmers from activities of criminals			In various schemes
4.	Direct and indirect employment opportunities	i. Give preference to people of the project area when recruiting for employees; and ii. Give opportunity to people of the project area to provide services such as food and transportation to factory employees	OCPANL	To provide employment for people in the project area	Visits to the factory	At the start of operations	Status of provision of services to factory employees

Table 7.5 continued

S/N	Impact	Proposed Mitigation	Responsib-le Party	Targets	Monitoring Method	Monitoring Period	Monitoring Indicators
5.	Reduction in crime rate	i. Give preference to people of the project area when recruiting operations personnel; ii. Ensure that they are given opportunity to provide essential services to factory employees; and iii. Support local security arrangements in the project area.	OCPANL	To provide employment for people in the project area	Visits to the factory	At the start of operations	Indigene status of factory employees and other service providers
6.	Health and safety of factory workers	i. Adhere to provisions of Nigerian Factory Act 1978; ii. Provide adequate PPEs to relevant employees; iii. Give regular safety training to all employees;	OCPANL	To safeguard the health and safety of factory workers	Visits to the factory	At the start of operations	Status of factory in terms of emergency prepared-ness

Table 7.5 continued

S/N	Impact	Proposed Mitigation	Responsible Party	Targets	Monitoring Method	Monitoring Period	Monitoring Indicators
		iv. Provide fire-fighting equipment within the factory premises v. Provide First Aid Kits and emergency ambulance and medical team against medical emergencies.	OCPANL				
7.	Health and safety of communities	i. Sensitize communities on dangers of improper sexual relationship and behaviours; ii. Sensitize communities on ways of protecting themselves against communicable diseases	OCPANL	To safeguard the health and safety of communities against communic-able diseases	Field investigation to confirm sensitization efforts of OCPANL	At start of operations	Feedback from interaction with communities in the project area

Table 7.5 continued

S/N	Impact	Proposed Mitigation	Responsible Party	Targets	Monitoring Method	Monitoring Period	Monitor. Indicators
8.	Waste management	i. Segregate all waste categories should be segregated and managed appropriately; ii. Employ accredited waste managers to treat and dispose of various categories of waste; iii. Provide toilets at suitable places and maintain them appropriately; and	OCPANL	To safeguard general project environm-ent	Physical inspection visit to the factory	Bi-annually after the start of operations	Status of waste management in the factory
8.	Waste management	iv. Ensure good house keeping in all work areas and offices	OCPANL	To safeguard general project environm-ent	Physical inspection visit to the factory	Bi-annually after the start of operations	Status of waste management in the factory

9.	Reduction in electricity supply to communities	i. Supply electricity to the factory through the industrial distribution line; ii. Install a separate transformer from that used by the communities; and iii. At times of electricity shortages, supply the factory with electricity during the day time, while it utilizes its private electricity generating sets at night.	Local DISCO	To minimize disruption of electricity supply to the project communities	Physical inspection visit to the factory	At start of operations	Nature of electricity supply to the factory

7.5 SITE REHABILATION ACTIVITIES

Over time, it has been discovered that the lifespan of any industrial production project is primarily hinged on a number of factors, including; the design parameters and construction materials; availability of raw materials and feedstock; acceptability of the end-product; maintenance and technological development. The design life of the proposed fertilizer blending plant, depending on proper maintenance, is at least 20 years. This, in effect, means that the plant will be expected to be fully operational for at least 20 years, and may be more, if it is still in good shape. In fact, the plant may more likely be upgraded or at least rehabilitated for an extended life span.

Therefore, should the project require decommissioning, it would be distant enough to assume that the existing legislative context and receiving environment would have changed. Decommissioning would then need to comply with the relevant legislation of the time and guidance may be required from the relevant environmental authority of the time and the most feasible option for the end use of the various components of the production plant would then be determined.

Since the proposed project is not expected to be decommissioned in the near future and given the known fact that projects always have both positive and negative impacts on their physical and social environments, especially in the construction phase; it is important to put in place plans to recover and/or restore the project site to its original state at the end of the construction phase. This requires a good understanding of all the environmental components of the project in the ecosystem during the construction phase.

On the other hand, impacts of dismantling the process equipment and demolishing the built area are likely to be similar to those that may occur in the construction phase. A decommissioning EMP would therefore need to be developed and approved by the relevant authority of the time, so as to effectively manage these impacts. The plan must include management measures in order to mitigate unavoidable negative impacts to acceptable levels. Similarly, any potential positive impacts, e.g. job creation must also be managed in order to maximize the benefits.

This section of the report will therefore be restricted to providing an overview of the various site rehabilitation activities that will be carried out at the end of the construction phase.

7.5.1. Rehabilitation of Construction Activities

The following structures will be affected:

- ✓ Concrete structures;
- ✓ Excavation for septic tank; and
- ✓ Access road running into the factory

Temporary concrete structures will need to be broken up and their rubble taken to an approved waste dump site or used to rehabilitate impacted areas. The exposed surface must be tested for contamination by FMEnv accredited laboratory. If any contaminants are found, the contaminated soil shall be removed along with the concrete to an acceptable waste disposal site. Re-vegetation must also be carried out.

Access road, if untarred, is to be checked for any substantial spillage of contaminants including oils and fuels.

Temporary construction yard;

Rehabilitation will be necessary for compacted earth and un-compacted earth platforms. Compacted and un-compacted earth platforms will be rehabilitated according to the methods described above.

Spoil Dumps

Spoil material shall be the last option; however, permanent spoil dumps would be established if required. Spoil material shall be minimized through use in filling of erosion gullies, stone pitching, and any other construction-related use. The exact locations of spoil dumps should be negotiated with nearby landowners, local administrators, and officials, and compensation paid as per the accepted procedure. No spoil dumps will be allowed in drainage areas where they will block drainage channels. Permanent spoil dumps should be shaped 1v: 3h, top soiled and vegetated. Care must be taken to ensure that the material is adequately compacted to allow for safe access.

Re-vegetation Process

The basic re-vegetation steps, which need to be adapted to the project-specific environmental conditions, are detailed below.

- ✓ Prepare the area to be re-vegetated for top soiling – this may require soil ripping and/or scarifying, and digging of steps or terraces. The scarification should take place to a depth of 150mm. If ridges are made, they should be about 100mm high and about 400mm wide.
- ✓ Replace stored topsoil on the slope to be re-vegetated to a depth of between 75mm and 150mm (depending on the soil and slope conditions). The topsoil should be spread when it is dry by means of hand raking or mechanical balding and trimmed to a uniform thickness of not less than 100mm.
- ✓ Apply seeds or grass sods according to the supplier's specifications. The seed must be fresh, good quality seed as specified in the sod mix, certified by the supplier and free from contamination by seeds of other species.
- ✓ If the indigenous grass seeds are used, they should be placed close together and label put on each. Gaps between the sods should be filled in with topsoil.
- ✓ Mulch should be applied to protect the seeded area from erosion. The mulch must be excessively fresh and green or in an advanced stage of decomposition as it could smother growth. It must be applied to a depth and manner that will prevent erosion by wind and water, but not completely block out the rays of sunlight to the soil or prevent penetration by young plants.
- ✓ Protect the re-vegetated area from excessive trampling and any other factor that might cause erosion or compaction. No construction

equipment, trucks or heavy equipment should be allowed onto re-vegetated areas.

- ✓ Ensure that suitable temporary and permanent drainage protection is installed parallel with the re-vegetation process.
- ✓ Water the seeded/planted area on a regular basis (according to need, but on average of twice per week).
- ✓ Institute an appropriate maintenance and monitoring program for a minimum of one year. This program should include, monitoring of the success of seed germination, growth of the plants, removal of invasive weeds, replanting of areas where re-vegetation has not been successful once the cause of the inhibiting factor has been identified and remedied. Repair of any funnels or erosion channel by the contractor must not allow erosion to develop on a large scale before implementing repairs.

Seed Mixes

Alternative seed mixes are provided for use under the various topographical condition of Nigeria. Vetiver grass (Vetiveria zizaniodes) for stabilization of steep slopes and erosion areas, are readily available, should a suitable indigenous mix not be available. The seeds applied by utilizing a combination of hand seeding with local labour (for minor work) and hydro seeding (for major grassing works). Vetiver grass (Vetiveria zizanioides) is not indigenous but is sterile and will not be invasive.

CHAPTER EIGHT: CONCLUSIONS

8.1 CONCLUSIONS

The proposed OCPANL Fertilizer Blending Plan could not have been proposed at a better time, considering the drive for self-sufficiency in agricultural production by the present Administration, which calls for increased local fertilizer production. The proposed project, when executed, will enhance the socio-economic status of communities in its zone of influence. The impact of the project on development of the agricultural potential of the area will be immense, as it will significantly improve food and cash crop production, livestock farming and most importantly the security of the region.

The Environmental Impact Assessment for the proposed project was carried out in compliance with existing national and international guidelines and regulations. Relevant stakeholders were duly consulted during the study so as to ensure the success of the implementation of the environmental and socio-economic management framework for the project.

The study has investigated the baseline conditions of the project area, identified the potential environmental impacts of the project and proffered appropriate mitigation measures to be carried out under the Environmental Management Plan designed for the project. The associated and potential impacts of the proposed project were identified and include operational/equipment noise, potential for soil erosion and water pollution. Other identified impacts of the proposed project include generation of construction and domestic wastes as well as the potential for occupational accidents and spread of communicable diseases such as HIV/AIDs and other STDs.

On the other hand, the proposed project is expected to, in the construction phase, boost local trading activities as well as provide employment and procurement opportunities for the local community.

In its operational phase, the project is expected to enhance the socio-economic status of the communities in the project area as well as the regional and national economies. A potential negative impact identified in the operational phase of the project is occupational hazards from daily production operations.

Although the project is expected to produce some negative impacts, most of which are expected to occur in the constructional phase, these impacts can be mitigated by strictly implementing appropriate actions stipulated in the project design and EMP.

In conclusion, the proposed project is environmentally and socially justified and acceptable to the entire project stakeholders, as long as the Environmental Management Plan is strictly implemented. The project is therefore recommended for an integrated implementation with the Environmental Management Plan.

8.2 RECOMMENDATIONS

In order to ensure the success of the environmental and social management of the proposed project, the following are recommended:

- ✓ Recommendations presented in the EMP should be strictly implemented to mitigate/enhance the identified potential environmental and socio-economic impacts of the project;
- ✓ Stakeholders and the general public should be fully involved in monitoring the constructional and operational phases of the project to ensure the success of the project;
- ✓ Since the contractor will be expected to strictly implement the EMP developed in this report, there is a need to ensure strict supervision and continuous monitoring by FMEnv, SEPA and OCPANL;

- ✓ Continuous engagement with the construction and operations employees as well as the project communities will be necessary for the long-term management of the project; and
- ✓ Federal Ministry of Environment should approve and issue a certificate of compliance for the implementation of the project.

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APPENDIX I: ANALYTICAL RESULT FOR SOIL SAMPLES

ZABSON LABORATORY SERVICES LTD

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Nasarawa State.
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LABORATORY ANALYSIS

Date sample collected: 23/10/2020

Time sample collected: 09:47am-12:05 pm

Date sample delivered to the Lab: 24/10/2020

Time sample received in the lab: 4:37 pm

SAMPLE RECEPTION IN THE LABORATORY

Samples of Water and Soil were received for physical, chemical and bacteriological analysis.

S/N	**Item Description**	**Quantity**
1.	Surface Water Samples	3
2.	Ground Water Samples	2
3.	Soil Samples	8
	TOTAL	13

SAMPLE TYPE **SOIL**

QUANTITY **100G EACH**

PRESERVATION METHOD **AIR DRYING**

Table A4. Physico-chemical properties of Soil Sample 1

S/N	PARAMETER	Point 1 SS1 TOP (mg/kg) except stated otherwise	POINT1 SS1 BOTTOM (mg/kg) except stated otherwise	FMEnv> Limit (mg/kg)
A.	**PHYSICAL TEST**			
1.	pH	8.4	8.4	NS
2.	TEMPERATURE (^{0}C)	37.5	39.0	< 40
3.	PARTICLE SIZES/TEXTURE	SAND/CLAY/SILT 12.0/49.28/33.86	SAND/CLAY/SILT 4.68/69.24/20.94	NS
4.	POROSITY (%)	50.0	56.6	NS
5.	MOISTURE CONTENT	0.94	0.03	NS
6.	BULK DENSITY (g/dm^3)	1.44	1.36	NS
B.	**ORGANICS**			
7.	TOTAL ORGANIC MATTER	4.0	4.4	NS
C.	**EXCHANGEABLE IONS**			NS
8.	PHOSPHATE	1.41	1.68	5
9.	CHLORIDE	8.09	7.26	600
10.	NITRATE	10.0	16.7	20
11.	SULPHATE	11.2	29.9	500
12.	SULPHITE	0.365	0.010	NS
13.	MAGNESSIUM	6.04	7.09	NS
14.	NITRITE	0.10	0.60	<1
15.	CALCIUM	4.40	4.91	NS
D.	**HEAVY METALS**			
16.	LEAD	0.030	0.21	<1
17.	IRON	4.21	2.90	NS
18.	COPPER	0.967	1.201	NS
19.	MANGANESE	0.81	1.34	NS
20.	NICKEL	0.004	0.021	NS
21.	ZINC	1.314	1.912	NS
22.	CADMIUM	0.24	0.140	NS

SAMPLE TYPE **SOIL**

QUANTITY **100G EACH**

PRESERVATION METHOD **AIR DRYING**

TABLE A5: PHYSICAL/CHEMICAL PROPERTIES OF SOIL SAMPLE 2

S/N	PARAMETER	POINT 2 SS2 TOP (mg/kg) except stated otherwise	POINT 2 SS2 BOTTOM (mg/kg) except stated otherwise	FMEnv. LIMIT (mg/kg)
A.	**PHYSICAL TEST**			
1.	pH	8.0	8.2	NS
2.	TEMPERATURE (^{0}C)	37.6	38.5	< 40
3.	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 4.56/52.26/36.70	SAND/SILT/CLAY 8.6/44.62/40.76	NS
4.	POROSITY (%)	56.66	60.00	NS
5.	MOISTURE CONTENT	1.58	1.55	
6.	BULK DENSITY (g/dm^3)	0.58	0.63	NS
B.	**ORGANICS**			
7.	TOTAL ORGANIC MATTER	5.20	11.20	NS
B	**EXCHANGEABLE IONS**			
8.	PHOSPHATE	2.78	3.18	5
9.	CHLORIDE	13.80	14.17	600
10.	NITRATE	16.50	18.09	20
11.	SULPHATE	100.00	100.00	500
12.	SULPHITE	0.008	0.050	NS
13.	MAGNESSIUM	5.70	5.11	NS
14.	NITRITE	0.80	0.20	<1
15.	CALCIUM	3.63	3.89	NS
D.	**HEAVY METALS**			
16.	LEAD	0.01	0.26	<1
17.	IRON	6.30	1.80	NS
18.	COPPER	1.068	1.172	NS
19.	MANGANESE	0.30	0.94	NS
20.	NICKEL	0.015	0.013	NS
21.	ZINC	2.771	2.695	NS
22.	CADMIUM	0.18	0.018	NS

SAMPLE TYPE **SOIL**

QUANTITY **100G EACH**

PRESERVATION METHOD **AIR DRYING**

TABLE A6: PHYSICAL/CHEMICAL PROPERTIES OF SOIL SAMPLE 3

S/N	PARAMETER	POINT 3 SS3 TOP (mg/kg) EXCEPT STATED	POINT 3 SS3 BOTTOM (mg/kg) EXCEPT STATED	FMEnv. LIMIT (mg/kg)
A.	**PHYSICAL TEST**			
1.	pH	8.2	8.4	NS
2.	TEMPERATURE (^{0}C)	37	38	< 40
3.	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 52.96/10.34/36.70	SAND/SILT/CLAY 44.62 /40.76/14.62	NS
4.	POROSITY (%)	58.66	62.00	NS
5.	MOISTURE CONTENT	1.56	1.45	
6.	BULK DENSITY (g/dm^3)	0.58	0.63	NS
B.	**ORGANICS**			
7.	TOTAL ORGANIC MATTER	10.20	9.20	NS
B	**EXCHANGEABLE IONS**			
8.	PHOSPHATE	2.48	3.28	5
9.	CHLORIDE	12.80	15.17	600
10.	NITRATE	14.00	18.02	20
11.	SULPHATE	98.00	100.00	500
12.	SULPHITE	0.009	0.050	NS
13.	MAGNESSIUM	5.60	5.12	NS
14.	NITRITE	0.90	0.20	<1
15.	CALCIUM	3.60	3.89	NS
D.	**HEAVY METALS**			
16.	LEAD	0.01	0.26	<1
17.	IRON	6.20	1.80	NS
18.	COPPER	1.062	1.174	NS
19.	MANGANESE	0.32	0.98	NS
20.	NICKEL	0.014	0.012	NS
21.	ZINC	2.780	2.695	NS
22.	CADMIUM	0.16	0.018	NS

SAMPLE TYPE **SOIL**

QUANTITY **100G EACH**

PRESERVATION METHOD **AIR DRYING**

TABLE A7. PHYSICAL/CHEMICAL PROPERTIES OF SOIL SAMPLE 4

S/N	PARAMETER	POINT 4 SS4 TOP (mg/kg) except stated otherwise	POINT 4 SS4 BOTTOM (mg/kg) except stated otherwise	FMEnv. LIMIT (mg/kg)
A.	**PHYSICAL TEST**			
1.	pH	8.0	8.2	NS
2.	TEMPERATURE (^{0}C)	37.6	38.5	< 40
3.	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 4.56/52.26/43.18	SAND/SILT/CLAY 8.6/44.62/46.78	NS
4.	POROSITY (%)	56.00	60.00	NS
5.	MOISTURE CONTENT	1.54	1.56	
6.	BULK DENSITY (g/dm^3)	0.59	0.62	NS
B.	**ORGANICS**			
7.	TOTAL ORGANIC MATTER	5.80	10.20	NS
B	**EXCHANGEABLE IONS**			
8.	PHOSPHATE	2.74	3.22	5
9.	CHLORIDE	13.60	14.14	600
10.	NITRATE	16.45	18.12	20
11.	SULPHATE	98.00	96.00	500
12.	SULPHITE	0.009	0.045	NS
13.	MAGNESSIUM	5.90	5.12	NS
14.	NITRITE	0.78	0.24	<1
15.	CALCIUM	3.64	3.92	NS
D.	**HEAVY METALS**			
16.	LEAD	0.02	0.25	<1
17.	IRON	6.45	2.80	NS
18.	COPPER	1.064	1.180	NS
19.	MANGANESE	0.34	0.94	NS
20.	NICKEL	0.014	0.012	NS
21.	ZINC	2.721	2.694	NS
22.	CADMIUM	0.16	0.012	NS

SAMPLE TYPE **SOIL**

QUANTITY **100G EACH**

PRESERVATION METHOD **AIR DRYING**

TABLE A8: PHYSICAL/CHEMICAL PROPERTIES OF SOIL SAMPLE 5

S/N	PARAMETER	POINT 5 SS5 TOP (mg/kg) EXCEPT STATED	POINT 5 SS5 BOTTOM (mg/kg) EXCEPT STATED	FMEnv. LIMIT (mg/kg)
A.	**PHYSICAL TEST**			
1.	pH	8.2	8.4	NS
2.	TEMPERATURE (^{0}C)	37.0	38.0	< 40
3.	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 11.04/52.26/36.70	SAND/SILT/CLAY 14.92/44.62/40.46	NS
4.	POROSITY (%)	58.60	62.00	NS
5.	MOISTURE CONTENT	1.56	1.42	
6.	BULK DENSITY (g/dm^3)	0.56	0.66	NS
B.	**ORGANICS**			
7.	TOTAL ORGANIC MATTER	5.40	11.00	NS
B	**EXCHANGEABLE IONS**			
8.	PHOSPHATE	2.88	3.28	5
9.	CHLORIDE	14.60	14.14	600
10.	NITRATE	16.00	18.02	20
11.	SULPHATE	98.00	96.00	500
12.	SULPHITE	0.020	0.040	NS
13.	MAGNESSIUM	5.80	5.12	NS
14.	NITRITE	0.82	0.24	<1
15.	CALCIUM	3.65	3.85	NS
D.	**HEAVY METALS**			
16.	LEAD	0.02	0.28	<1
17.	IRON	6.40	1.90	NS
18.	COPPER	1.066	1.174	NS
19.	MANGANESE	0.34	0.92	NS
20.	NICKEL	0.014	0.012	NS
21.	ZINC	2.772	2.696	NS
22.	CADMIUM	0.16	0.019	NS

SAMPLE TYPE **SOIL**

QUANTITY **100G EACH**

PRESERVATION METHOD **AIR DRYING**

TABLE A9: PHYSICAL/CHEMICAL PROPERTIES OF SOIL SAMPLE 6

S/N	PARAMETER	POINT 6 SS6 TOP (mg/kg) except stated otherwise	POINT 6 SS6 BOTTOM (mg/kg) except stated otherwise	FMEnv. LIMIT (mg/kg)
A.	**PHYSICAL TEST**			
1.	pH	8.0	8.0	NS
2.	TEMPERATURE (^{0}C)	37.0	38.0	< 40
3.	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 11.04/52.26/36.70	SAND/SILT/CLAY 14.62/44.62/40.76	NS
4.	POROSITY (%)	59.62	60.00	NS
5.	MOISTURE CONTENT	1.52	1.58	
6.	BULK DENSITY (g/dm^3)	0.60	0.62	NS
B.	**ORGANICS**			
7.	TOTAL ORGANIC MATTER	5.60	10.20	NS
B	**EXCHANGEABLE IONS**			
8.	PHOSPHATE	2.88	3.14	5
9.	CHLORIDE	14.60	14.42	600
10.	NITRATE	16.00	18.22	20
11.	SULPHATE	88.00	94.00	500
12.	SULPHITE	0.021	0.042	NS
13.	MAGNESSIUM	5.62	5.48	NS
14.	NITRITE	0.64	0.36	<1
15.	CALCIUM	3.82	3.95	NS
D.	**HEAVY METALS**			
16.	LEAD	0.02	0.28	<1
17.	IRON	6.41	2.88	NS
18.	COPPER	1.268	1.178	NS
19.	MANGANESE	0.34	0.98	NS
20.	NICKEL	0.014	0.018	NS
21.	ZINC	2.471	2.495	NS
22.	CADMIUM	0.128	0.088	NS

SAMPLE TYPE **SOIL**

QUANTITY **100G EACH**

PRESERVATION METHOD **AIR DRYING**

TABLE A10: PHYSICAL/CHEMICAL PROPERTIES OF SOIL SAMPLE 7

S/N	PARAMETER	POINT 7 CT1 TOP (mg/kg) except stated otherwise	POINT 7 CT1 BOTTOM (mg/kg) except stated otherwise	FMEnv. LIMIT (mg/kg)
A.	**PHYSICAL TEST**			
1.	pH	8.0	8.2	NS
2.	TEMPERATURE (^{0}C)	37.6	38.5	< 40
3.	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 8.82/56.48/34.70	SAND/SILT/CLAY 11.92/45.62/42.46	NS
4.	POROSITY (%)	58.00	64.50	NS
5.	MOISTURE CONTENT	1.8	1.58	
6.	BULK DENSITY (g/dm^3)	0.54	0.66	NS
B.	**ORGANICS**			
7.	TOTAL ORGANIC MATTER	6.20	10.20	NS
B	**EXCHANGEABLE IONS**			
8.	PHOSPHATE	2.82	3.24	5
9.	CHLORIDE	12.82	15.10	600
10.	NITRATE	18.00	18.29	20
11.	SULPHATE	110.00	108.00	500
12.	SULPHITE	0.007	0.040	NS
13.	MAGNESSIUM	5.78	5.14	NS
14.	NITRITE	0.82	0.26	<1
15.	CALCIUM	3.44	3.90	NS
D.	**HEAVY METALS**			
16.	LEAD	0.02	0.24	<1
17.	IRON	6.34	1.64	NS
18.	COPPER	1.048	1.146	NS
19.	MANGANESE	0.38	0.64	NS
20.	NICKEL	0.014	0.015	NS
21.	ZINC	2.571	2.790	NS
22.	CADMIUM	0.14	0.028	NS

SAMPLE TYPE SOIL

QUANTITY 100G EACH

PRESERVATION METHOD AIR DRYING

Table **A11: PHYSICAL/CHEMICAL PROPERTIES OF SOIL SAMPLE 8**

S/N	PARAMETER	POINT 8 CT2 TOP (mg/kg) except stated otherwise	POINT 8 CT2 BOTTOM (mg/kg) except stated otherwise	FMEnv. LIMIT (mg/kg)
A.	**PHYSICAL TEST**			
1.	pH	8.2	8.4	NS
2.	TEMPERATURE (^{0}C)	36.6	38.0	< 40
3.	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 10.54/54.66/34.80	SAND/SILT/CLAY 15.32/44.22/40.46	NS
4.	POROSITY (%)	58.60	62.40	NS
5.	MOISTURE CONTENT	1.53	1.58	
6.	BULK DENSITY (g/dm^{3})	0.54	0.60	NS
B.	**ORGANICS**			
7.	TOTAL ORGANIC MATTER	6.20	10.20	NS
B	**EXCHANGEABLE IONS**			
8.	PHOSPHATE	2.88	3.48	5
9.	CHLORIDE	12.84	15.27	600
10.	NITRATE	17.00	19.08	20
11.	SULPHATE	94.00	96.20	500
12.	SULPHITE	0.076	0.058	NS
13.	MAGNESSIUM	5.72	4.92	NS
14.	NITRITE	0.68	0.28	<1
15.	CALCIUM	3.69	3.92	NS
D.	**HEAVY METALS**			
16.	LEAD	0.01	0.28	<1
17.	IRON	7.20	2.80	NS
18.	COPPER	1.062	1.180	NS
19.	MANGANESE	0.36	0.74	NS
20.	NICKEL	0.020	0.018	NS
21.	ZINC	2.651	2.692	NS
22.	CADMIUM	0.16	0.048	NS

APPENDIX II: ANALYTICAL RESULTS FOR WATER SAMPLES

SAMPLE TYPE: **SURFACE WATER**
VOLUME/ QUANTITY: **2LITRES**
PRESERVATION METHOD: **REFRIDGERATION**

Table A1: Physico-chemical properties of surface water

S/N	PARAMETERS	SW1 (surface water on the project site)	SW2 Sokoto River/BUA	FMEnv. STD
A.	**Physical test**			
1.	Odour	Unobjectionable	Unobjectionable	Ns
2.	Temperature (^{O}c)	27.9	27.4	<40
3.	PH	7.60	8.20	6-9
4.	Dissolved Oxygen (mg/L)	4.44	7.25	2-8
5.	Conductivity (µs/Cm)	434	952	1000
6.	Total Dissolved Solids (mg/L)	144	317.3	2000
7.	Turbidity (NTU)	8.6	10.2	5
8.	Total Suspended Solids (mg/L)	0.0560	0.9040	30
B	**Chemical Test**			

9.	Total Hardness (mg/L)	359.52	941.60	150
10.	Total Alkalinity (mg/L)	20	20	100
11.	Magnesium (mg/L)	34.24	51.36	50
12.	Calcium (mg/L)	325.28	890.24	200
13.	Carbonate (mg/L)	43.60	109.00	NS
14.	Total Chlorine (mg/L)	0.848	0.748	0.2
15.	Sulphate (mg/L)	50.00	87.23	500
16.	Phosphate(mg/L)	1.084	1.26	5
17.	Nitrate as nitrogen(mg/l)	16.50	18.84	20
18.	Nitrite as nitrogen(mg/l)	0.508	0.102	<1
19.	Ammonia as nitrogen(mg/l)	0.05	6.0	10
20.	Biochemical oxygen demand (mg/l)	45.00	37.00	30
21.	Chemical oxygen demand (mg/l)	160.00	160.00	80
C	**Heavy metals**			
22.	Lead(mg/l)	0.006	0.018	<1
23.	Cadmium(mg/l)	0.004	0.003	<1
24.	Manganese (mg/l)	0.40	0.35	0.2
25.	Copper(mg/l)	1.65	1.04	<1
26.	Iron total(mg/l)	0.80	0.11	1.5
27.	Nickel(mg/l)	0.205	0.091	<1
28.	Zinc(mg/l)	2.86	1.81	3
29.	Aluminum(mg/l)	0.082	0.228	0.2
BACTERIOLOGICAL TEST				
30.	TOTAL COLIFORM (MPN/100ml)	1600	1600	1600
31.	Salmonella	6.0×10^{1}	4.4×10^{1}	ABSENT
32.	Shigella	<10	1.5×10^{1}	ABSENT
33.	E-coli	4.21×10^{3}	4.91×10^{3}	ABSENT

34.	Total hydrocarbon on bacteria	$5.2X10^5$	$9.92X10^6$	ABSENT
35.	Protein SPP	$2.3X10^6$	$8.2X10^8$	ABSENT

SAMPLE TYPE: SURFACE WATER
VOLUME/ QUANTITY: 1 LITRE
PRESERVATION METHOD: REFRIDGERATION

Table A2: Physico-chemical properties of surface water Sample 3

S/N	**Parameters**	**Sw3 Rima River**	**Fmenv. Std**
A.	**Physical Test**		
1.	Odour	Unobjectionable	-
2.	Temperature (^{O}C)	28.6	<40
3.	PH	7.4	6-9
4.	Dissolved Oxygen (mg/L)	8.16	2-8
5.	Conductivity(µs/cm)	105.00	1000
6.	Total Dissolved Solids (mg/L)	35.00	2000
7.	Turbidity (NTU)	6.7	5
8.	Total Suspended Solids (mg/L)	0.0729	30
B	**Chemical Test**		
9.	Total Hardness (mg/L)	102.72	150
10.	Total Alkalinity (mg/L)	15	100
11.	Magnesium mg/L)	17.12	50
12.	Calcium (mg/L)	85.6	200
13.	Carbonate (mg/L)	65.4	Ns

14.	Total Chlorine (mg/L)	0.307	0.2
15.	Sulphate (mg/L)	100.00	500
16.	Phosphate (mg/L)	1.37	5
17.	Nitrate as Nitrogen (mg/L)	13.32	20
18.	Nitrite as Nitrogen (mg/L)	0.424	1
19.	Ammonia as Nitrogen (mg/L)	6.0	10
20.	Biochemical Oxygen Demand (mg/L)	17.2	30
21.	Chemical Oxygen Demand (mg/L)	68.9	80
C	**Heavy Metals**		
22.	Lead (mg/L)	0.001	<1
23.	Cadmium (mg/L)	0.0014	<1
24.	Manganese (mg/L)	0.21	<1
25.	Copper (mg/L)	1.970	<1
26.	Iron Total (mg/L)	1.00	20
27.	Nickel (mg/L)	0.03	<1
28.	Zinc (mg/L)	2.55	<1
29.	Aluminium(Mg/L)	0.178	0.2
D	**Bacteriological Test**		
30.	Total Coliform Count (Mpn/100ml)	920	1600
31.	Salmonella	$1.7x10^{1}$	Absent
32.	Shigella	$2.6x10^{1}$	Absent
33.	E-Coli	$5.0x10^{3}$	Absent
34.	Total Hydrocarbon Bacteria	$4.3x10^{6}$	Absent
35.	Protein Spp	$4.2x10^{6}$	Absent

SAMPLE TYPE: GROUNDWATER
VOLUME/ QUANTITY: 1 LITRE
PRESERVATION METHOD: REFRIDGERATION

Table A3: Physico-chemical properties of groundwater samples

S/N	Parameters	GW1 Bakin Kuso	GW2 Kano Rogo	FMEnv. Standard
A.	**PHYSICAL TEST**			
1.	Odour	Unobjectionable	Unobjectionable	-
2.	Temperature (^{O}C)	28.4	28.7	<40
3.	pH	8.0	7.4	6-9
4.	Dissolved Oxygen (mg/L)	8.39	8.19	2-8
5.	Conductivity (µs/cm)	165	339	1000
6.	Total Dissolved Solids (mg/L)	55	113	2000
7.	Turbidity (NTU)	0.9	0.4	5
8.	Total Suspended Solids (mg/L)	0.0073	0.0038	30
B.	**Chemical Test**			

9.	Total Hardness (mg/L)	479.36	256.8	150
10.	Total Alkalinity (mg/L)	10	3	100
11.	Magnesium (mg/L)	119.84	Nil	50
12.	Calcium (mg/L)	359.52	256.8	200
13.	Carbonate (mg/L)	43.6	65.4	NS
15.	Sulphate (mg/L)	15.59	7.90	500
16.	Phosphate (mg/L)	0.024	0.200	5
17.	Nitrate as Nitrogen (mg/L)	5.65	3.60	20
18.	Nitrite as Nitrogen (mg/L)	0.284	0.804	<1
19.	Ammonia as Nitrogen (mg/L)	0.004	0.005	10
20.	Biochemical Oxygen Demand (Mg/L)	9.40	33.00	7.5
21.	Chemical Oxygen Demand (Mg/L)	77.60	135.30	30
C	**Heavy Metals**			
22.	Lead (mg/L)	0.009	0.002	<1
23.	Cadmium (mg/L)	0.090	0.001	<1
24.	Manganese (mg/L)	0.40	0.35	0.2
25.	Copper (mg/L)	0.148	0.193	<1
26.	Iron Total (mg/L)	0.90	0.74	1.5
27.	Nickel (mg/L)	ND	0.050	<1
28.	Zinc (mg/L)	1.600	1.524	3
29.	Aluminum (mg/L)	0.136	0.158	0.2
	BACTERIOLOGICAL TEST			
30.	Total Coliform Count (MPN/100ml)	10	3.2	1600
31.	Salmonella		_	ABSENT
32.	Shigella	$3.3X10^1$	_	ABSENT
33.	E-Coli	$3.0X10^2$	$2.6X10^2$	ABSENT
34.	Total Hydrocarbon Bacteria	$2.62X10^3$	$1.0<10^2$	ABSENT

	Protein Spp	$2.2X10^{6}$	$1.2X10^{2}$	ABSENT

APPENDIX III: ATTENDANCE FOR CONSULTATION MEETINGS

WAMMAKO LGA COUNCIL 15/10/20

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED OCP AFRICA PHOSPHATE FERTILIZER BLENDING PLANT AT KALAMBAINA, WAMMAKKO LOCAL GOVERNMENT AREA, SOKOTO STATE

ATTENDANCE FOR SOCIO-ECONOMIC CONSULTATION

S/N	Name	Address	Phone No.	Signature
1	Alh. Shiitu M. Bello	Secretary Wamakko L.G.	08038686985	[signature]
2	Chika Chinarus S.	AANR	07061592757	[signature]
3	Abubakar Muhd	Concillor Wamakko LGA	07067549301	[signature]
4	SHEHU Aliyu Riwai	D.P.M	08069715884	[signature]
5	Muntale Bairno	AFANL Wamakko LGA	08067405905	[signature]
6	Bala Shiroma	Sentin Noma	08036620423	[signature]
7.	Hassan Umar	Staff officer Wmk LGA	08069260607	[signature]

DISTRICT HEAD'S PALACE WAMMAKO

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED OCP AFRICA PHOSPHATE FERTILIZER BLENDING PLANT AT KALAMBAINA, WAMMAKKO LOCAL GOVERNMENT AREA, SOKOTO STATE

15/10/2020

ATTENDANCE FOR SOCIO-ECONOMIC CONSULTATION

S/N	Name	Address	Phone No.	Signature
1	Alh. Ahmu	Wammakko	08060 [illegible] 1444	
2	Bavache	District Head		
3	ABUBAKAR ALIYU	WAMAKKO	08067260430	
4	Bello YAR, WAMMAKKO	WAMMAKKO	07062855639	Bello
5	ALHJ BUBA	WAMAKKO	07044910424	
6	AJIYA Bello	WAMAKKO	07037852689	
7	ABUBAKAR NAGWAGGO	SEPA, Sokoto	0909057 4731	

DISTRICT HEAD OF KALAMBAINA'S PALACE

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED OCP AFRICA PHOSPHATE FERTILIZER BLENDING PLANT AT KALAMBAINA, WAMMAKKO LOCAL GOVERNMENT AREA, SOKOTO STATE 15/10/2020

ATTENDANCE FOR SOCIO-ECONOMIC CONSULTATION

S/N	Name	Address	Phone No.	Signature
1	District Head of Kalambaina Abubakar Amadu	Kalambaina	0806563[illegible]97 09090571931	[illegible]
2	ABUBAKAR NAGWAGGO	SEPA, SOKOTO		[illegible]
3.	MUBARAK TAMAR	NMYN	08032979055	[illegible]
4.	Engr. Abdulkadir Isa	IAQEL	08065301557	[illegible]
5.	MADAKI GOWON	ZABSON LAB	0806722459 66	[illegible]
6.	Muhammad, Malami	FMEnv Abuja	08068305873	[illegible]
7.	SULE AJIYA	AJIYAN KALAMBAINA	08031384738	[illegible]
8.	ABDULLAHI AMADU	SARDAUNAN G/GANDU	08107379936	[illegible]
9.	MALAMI SHEHU	MAGAJIN RINI	08036724063	[illegible]
10.	ABUBAKAR CHIKA	MAJIDADIN KALAMBAINA	08036497597	[illegible]
11.	ABDULLAHI MARAFA	MARAFAN KALAMBAINA	08168724432	ABDULLahi
12.	MUHTAR AHMAD	MAI'ANGUWAR TAMBALAWA	0810[illegible]	muhtar
13.	AMADU BELLO	AJIYAN KANROGO	08139390322	Amadu
14.	HAKIMI UMARU	HAKIMIN GIRABSHI	08162623633	[illegible]

Arkilla District 15/10/2020

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED OCP AFRICA PHOSPHATE FERTILIZER BLENDING PLANT AT KALAMBAINA, WAMMAKKO LOCAL GOVERNMENT AREA, SOKOTO STATE

ATTENDANCE FOR SOCIO-ECONOMIC CONSULTATION

S/N	Name	Address	Phone No.	Signature
1.	Alhaji Hassan Liman	Arkilla Ubandoma	08088289 3152	080328 3152
2.	Magajin Arkilla Magaji	Arkilla Magaji	0806322 0739	
3.	Sarkin Kurmin Arkilla Liman	Arkilla Liman	0703427 3337	Abu
4.	Aliyu Shamaki	Arkilla	070392733 39	Aliyu
5.	Zayyanu Giroma	Arkilla	080686807 56	
6	Abubakar Bunu	Arkilla	0803415 9579	Abubakar
7	Abubakar Nagwaggo	SEPA, Sokoto	09090571 931	
8	Muhammad Malami	FMEnv Abuja	08068305823	

Arkilla District 15/10/2020

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED OCP AFRICA PHOSPHATE FERTILIZER BLENDING PLANT AT KALAMBAINA, WAMMAKKO LOCAL GOVERNMENT AREA, SOKOTO STATE

ATTENDANCE FOR SOCIO-ECONOMIC CONSULTATION

S/N	Name	Address	Phone No.	Signature
1.	Alimu Hassan Liman	Arkilla Ubandoma	08082893152	080328 3152
2.	Magajin Arkilla Magaji	Arkilla Magaji	08063220739	
3.	Sarkin Kusun Arkilla Liman	Arkilla Liman	07034273337	Abu
4.	Alimu Shamaki	Arkilla	07039273339	Abu
5.	Zayyanu Garoma	Arkilla	08068680786	
6	Abubakar Bunu	Arkilla	08034159579	Abubakar
7	Abubakar Nagwaggo	SEPA, Sokoto	09090571931	
8	Muhammad Malami	FMEnv Abuja	08068305823	

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED OCP AFRICA PHOSPHATE FERTILIZER BLENDING PLANT AT KALAMBAINA, WAMMAKKO LOCAL GOVERNMENT AREA, SOKOTO STATE

15TH OCTOBER, 2020

ATTENDANCE FOR SOCIO-ECONOMIC CONSULTATION

S/N	Name	Address	Phone No.	Signature
1.	Kasimu Muh'd	SEPA SOKOTO	08065672846	[signature]
2	ABUBAKAR NAGWAGGO	SEPA SOKOTO	08086054076	[signature]
3.	Muhammad Malami	FMEnv, Abuja	08068305877	[signature] 15-10-2020

APPENDIX IV: SAMPLE OF ADMINISTERED QUESTIONNAIRES

SOCIO-ECONOMIC SURVEY QUESTIONNAIRE

FOR

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED OCP AFRICA PHOSPHATE FERTILIZER BLENDING PLANT AT KALAMBAINA, WAMMAKKO LOCAL GOVERNMENT AREA, SOKOTO STATE

COMMUNITY………

LOCAL GOVERNMENT AREA……………………………………………………………………………………………

DATE……………………………………………………………….

1) Name of Respondent……………………………2) Age……………………………3) Tribe………………………………
4) Gender……………………………5) Marital Status…………………………………6) State the No of your wives……………………and children/defendants……………………………………………………………………….

7) Religion………………………………………8) Sect/Denomination…………………………………………………..

9) Monthly income…………………………………………………….

10) Educational background: a) Primary b) Secondary c) Tertiary d) Postgraduate

e) Islamic/Quranic f) Others (specify)……………………………………….. g) Uneducated

11) What are the educational institutions in your community?

12) What are the domestic water sources available in your community? a) Pipe borne water b) Borehole c) Well d) River e) pond

13) Which of the above water sources do you use? …………………………………………………………………

14) What are the available electricity sources in your community?..

15) Which electricity sources do you use?...….

16) What mobile telecommunication networks do you have in your community?..........................

………

17) What are the common means of transportation used in your community?..............................

18) What type of house do you leave in? please can you fully describe it?.....................................

19) What type of toilet system do you use?...

20) How do you dispose your domestic waste?..

21) What are the health facilities available to people in your community?.....................................

…….

22) What are the prevalent diseases/health problems in your community?..................................

……

23) What are the major security challenges being experienced in your community?..............................

…….

24) Are there any criminal activities /social vices that take place in your community?.....................................

25) If yes, what are they?...........................

……

26) How often do you experience communal and land disputes?..

……

27) What are the major economic activities in your community?..

…….

28) What are the major agricultural crops grown in your community?..

…….

29) What domestic animals are commonly reared in your community?..

…….

30) What wild animals are commonly found in your community?...

……

31) How many markets do you have and how do they operate?..

…….

32) Does your community have any cultural heritage/religious sites?..

…….

33) What ecological problems does your community experience?..

……

34) What are the most serious infrastructural challenges faced by your community?.....................

………

35) What are your fears and expectations on the proposed project?...

PERSONAL INTERVIEW GUIDE FOR FGD AND KII

Whenever possible conduct KII and FGD in Hausa language for better understanding of the local people and their feed back

a) Present key characteristics of the proposed project;

b) Scope issues of concern to the communities;

c) Solicit information on the community's areas of interest with respect to the proposed project, i.e., fears, expectations, etc.; and

d) Recording of interviews for each stakeholder consultation meeting.

FGD AND KII AGENDA

1. Introduction to the ESIA team;

2. Overview of project activities in the pre-construction, construction and operational phases;

3. Solicitation of comments, questions and queries;

4. Question and answer (Q&A) session;

5. Any Other Business (AOB).

ALLOT (NIGERIA) LIMITED

PROPOSED FUNTUA FERTILIZER BLENDING PLANT PROJECT BY GREENTIDE LTD

SOCIO-ECONOMIC IMPACT ASSESSMENT (SIA) QUESTIONNAIRE

1. Name ____________

2. State____________________________

3. LGA____________________________

4. Name of Town/ Village /Community________________________

5. Status of respondent:

(a) Head of family (b) Wife (c) Others (specify) ____________________

6. Gender and Age of respondent (a) Male / / (b) Female /

7. Religion of respondent________________________

8. Marital Status (a) Married (b) Single (c) Divorced (d) Widowed (e) Separated

9. Level of Education/Qualification

(a) None (b) Primary Level (c) Secondary Level (d) Higher Education

10. How many wives do you have ________? (a)One (b) Two (c) More than two

11. Number of dependants in your household

(a) No of males (b) No of Females (c) Total persons

12. How many adult members (18 - 60 years) of your household are employed/unemployed (Including Self-employment?)

(a) No. employed (b) No. unemployed

13. What are your Main and Secondary Occupations?

Main occupation: (a) farming (b) Mining (c) Craft making (d) Trading (e) Civil Service (f) Company employment (g) Self-employment (i) Housewife (j) Fishing (h) Other, please specify

Secondary occupation: (a) farming (b) Mining (c) Craft making (d) Trading (e) Civil Service (f) Company employment (g) Self-employment (h) Housewife (j) Fishing (h) Other, please specify (i) None

14. What is your average monthly income?

(a) N10,000 – N29,000 (b) N30,000 –N60,000 (c) N70,000 –N100,000 (d) Above N100, 000

15. What toilet system do you use in your home?

16. How do you dispose of your refuse/waste?

17. What type of health facility is used by your family?

(a) Dispensary (b) Private clinic (c)Government hospital (d) Other, please specify

18. What do you believe are the most common illnesses in this community?

19. What is the most important (frequently used) source of water for domestic utilization in your community?

(a) Pipe borne water (b) Bore Hole (c) Well (d) Rain water (e) Streams/Ponds (f) others, please specify____________________

20. What is the source of electricity you use and what is the quality of the supply?

21. Do you have access to mobile telecommunication system and internet?

22. What type of crops do you grow and what animals do you rear? ________________

23. What are your expectations regarding the proposed fertilizer blending plant?

24. What problems associated with the proposed project do you foresee?

ENVIRONMENTAL IMPACT ASSESSMENT OF PROPOSED FUNTUA FERTILIZER BLENDING PLANT PROJECT

PERSONAL INTERVIEW GUIDE FOR FGD AND KII

Whenever possible conduct KII and FGD in Hausa language for better understanding of the local people and their feed back

a) Present key characteristics of the proposed project;

b) Scope issues of concern to Funtua Community;

c) Solicit information on the community's areas of interest with respect to the proposed project, i.e., fears, expectations, etc.; and

d) Recording of interviews for each stakeholder consultation meeting.

FGD and KII Agenda

1. Introduction to the ESIA team;

2. Overview of project activities in the pre-construction, construction and operational phases;

3. Solicitation of comments, questions and queries;

4. Question and answer (Q&A) session;

5. Any Other Business (AOB).

APPENDIX V: PICTURES FROM THE COMMUNITY SURVEY AND ENGAGEMENT

Plate A 1 : At the end of a FGD with youths in Kalambaina

Plate A 2: At the end of FGD session with community members in Kalambaina

Plate A 3: End of a FGD with a group of women in Kalambaina

Plate A 4: End of a FGD with a group of men in Kalambaina

Plate A 5: MD SEPA delivering a speech at the stakeholders' workshop

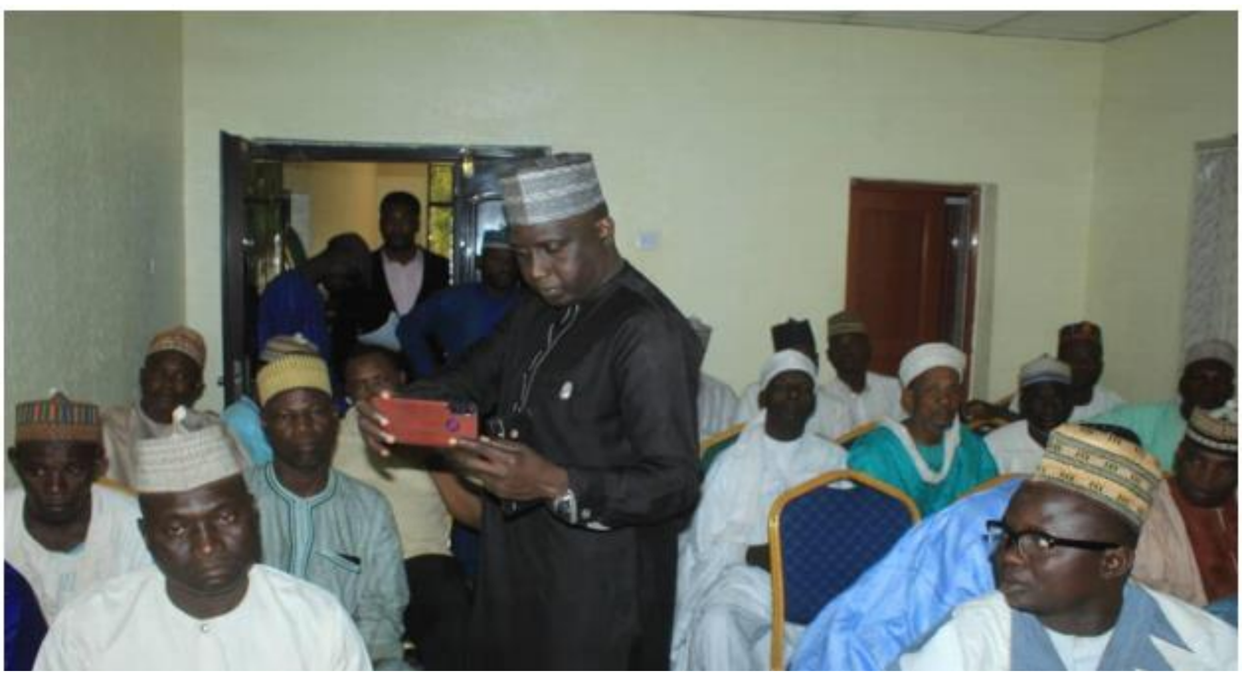

Plate A 6: Cross section of participants at the stakeholders' workshop

Plate A7:

Plate A8

Plate A9

Plate A 7-A10: scenes at the stakeholder/scoping workshop in Sokoto