ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES OF THE PROPOSED AGRO-INDUSTRIAL HUB AT BAGAUDA COMMUNITY, BEBEJI LOCAL GOVERNMENT AREA AND AGRICULTURAL TRANSFORMATION CENTRES IN KURA, DAWANAU, GEZAWA AND BAGWAI, KANO STATE, NIGERIA



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Submitted to:

FEDERAL MINISTRY OF ENVIRONMENT, ABUJA, NIGERIA

JANUARY, 2026

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ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
AIH	Agro-Industrial Hub
ATC	Agricultural Transformation Centre
CSR	Cooperate Social Responsibility
Cu	Copper
dB(A)	decibel (Scale A)
DDC	Department of Development Control
Ec	Electrical Conductivity
EIS	Environment Impact Statement
EMP	Environmental Monitoring Plan
EMS	Environmental Management System
EPRP	Environmental Protection and Rehabilitation Plan
ESMP	Environmental and Social Management Plan
FDI	Foreign Direct Investment
FEPA	Federal Environmental Protection Agency
FGD	Focal Group Discussion
FMAFS	Federal Ministry of Agriculture and Food Security
FMEnv	Federal Ministry of Environment
GHG	Green House Gas
GW	Groundwater
H_2S	Hydrogen Sulphide
HIA	Health Impact Assessment
HIV/AIDS	Human Immuno-Virus / Acquired Immune Deficiency Syndrome
IFAD	International Fund for Agricultural Development
IsDB	Islamic Development Bank
ISO	International Organization for Standardization
KEDCO	Kano Electricity Distribution Company
KNARDA	Kano Agricultural and Rural Development Authority
KNSG	Kano State Government

Kg	Kilogramme
KHz	Kilohertz
Km/hr	Kilometre per hour
KN/m^2	Kilonewton per square metre
KPA	Kilopaschal
KNARDA	Kano State Agricultural Development Program
KNSEPA	Kano State Environmental Protection Agency
KVA	Kilo Volts (amp)
LGA	Local Government Area
MDAs	Ministries Departments and Agencies
Mg/Kg	Milligram per kilogram
mg/l	Milligram per litre
MHz	Mega Hertz
ml	Millimeter
Mn	Manganese
Na	Sodium
NBS	National Bureau of Statistics
ND	Not Detected
NESREA	National Environmental Standards and Regulatory Enforcement Agency
NGO	Non- Governmental Organization
NIMET	Nigerian Meteorological Agency
NISER	Nigerian Institute of Social and Economic Research
PPE	Personal Protective Equipment
PPM	Parts Per Millions
SAPZ	Special Agro-industrial Processing Zones
SEP	Stakeholder Engagement Plan
SHE	Safety Health and Environment
SIA	Social Impact Assessment
SO_2	Sulphur Oxide
SO_4^{2+}	Sulphate ion

SON	Standard Organisation of Nigeria
SOx	Oxides of Sulphur
SPM	Suspended particulate matter
TDS	Total Dissolved Solids
THC	Total Hydrocarbon Content
TOC	Total Organic Compound
TSP	Total Suspended Particles
UN	United Nation
VOC	Volatile Organic Compound
WHO	World Health Organization
Zn	Zinc

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ACKNOWLEDGEMENT

The Kano State Government acknowledges the Federal Ministry of Environment (FMEnv), host communities, concerned stakeholders, Kano State Ministry of Environment and Climate Change, for their support, assistance and understanding during this ESIA study. The State Government wishes to thank all those that have contributed in one way or the other, especially those that supplied information, data and technical details that were used for the production of this report.

EXECUTIVE SUMMARY

ES 1 Background Information

The Federal Government of Nigeria (FGN) proposes to develop a Special Agro-Industrial Processing Zone (SAPZ) program in Kano State. The Special Agro-industrial Processing Zone is a major investment program of the Federal Government of Nigeria (FGN), driven by the Federal Ministry of Agriculture and Food Security (FMAFS) in collaboration with state governments, Development partners, relevant Federal Ministries, Departments and Agencies (MDAs), and private investors to establish agro-processing clusters in areas of high agricultural production across the country. This program aims to build modern agro-processing capacity for the growing local market, create sustainable outlets for farmers, minimize post-harvest losses, generate wealth for farming communities, promote import substitution, and foster job creation particularly for women and youth in agriculture-related sectors. The SAPZ in Kano State receives financing from the Islamic Development Bank (IsDB), and International Fund for Agricultural Development (IFAD).

The SAPZ comprises a central Agro-Industrial Hub (AIH) supported by multiple Agricultural Transformation Centres (ATCs), positioned within key production zones to aggregate community produce for supply to the AIH. The Agro-Industrial Hub will be supported by a network of compact and efficient Agricultural Transformation Centres (ATCs) that will coordinate farmers, their cooperatives and clusters' production (land preparation, planting and input supply), harvesting, agglomeration (primary on-farm storage, preservation and processing), and marketing, activities. The hub will include the installation of various crop processing factories for several commodities.

The proposed AIH site spans 271 hectares of land allocated by the Kano State Government (KNSG) through the Kano State Agricultural and Rural Development Authority (KNARDA), currently under cultivation for food crops.

Despite the economic and social benefits of the proposed Bebeji-AIH, its implementation is however associated with some adverse environmental and social impacts. It is on this basis and in compliance with national, state and international regulations of minimizing impact on the biophysical and socio-economic environment of the proposed AIH in

Bagauda community, that Kano State Government commissioned Fahamu Nigeria Limited to proactively and professionally conduct an Environmental and Social Impact Assessment (ESIA) for the proposed Agricultural Transformation Centre in accordance with the Environmental Impact Assessment (EIA) guidelines of the Federal Ministry of Environment (FMEnv) as contained in the EIA Act Cap E12 LFN 2004, and in accordance with the IsDB Environmental and Social Safeguards Policy (ESSP), IFAD's Social, Environmental, and Climate Assessment Procedures (SECAP, 2021), African Development Bank (AfDB) Integrated Safeguards System (ISS), SAPZ's Environmental and Social Management Framework (ESMS), and other relevant national and international legislation.

ES2 Project Location

The proposed Agro-Industrial Hub (AIH) project site is located directly opposite the Nigerian Law School fence about 30m to the school fence and about 50m to the school gate. The site is situated within latitude 11°34'45.1722"N and longitude 8°23'20.4442"E on about 271 hectares of land. The proposed site area is flat largely covered by scattered trees and shrubs. The project site is used for farming activities with no infrastructural buildings on the site. The access to the proposed project site is off the Kano-Zaria highway approximately 4km south of the main road, leading directly to the proposed project site.

There is a Dam located about 1.5km to the project site within latitude 11°34'46.2711"N and longitude 8°23'11.4279"E. The Dam will serve as its primary source of water and is a potential source of hydroelectric power. This connection will reduce reliance on groundwater extraction. Some of the facilities around the project site is the Kano State Fisheries Institute located about 2.5km from the project site.

ES 3 The Proposed Agro Industrial Hub

The proposed AIH at Bagauda community in Bebeji LGA of Kano State is designed to handle key agricultural products. It is planned to occupy a total area of 271 hectares with the largest portion (30%) being dedicated to the pre-processing area, which handles various agricultural products. The AIH is designed to link smallholder farmers to the agro-processing hub and are centres strategically located in high production areas, with

the aim of serving as aggregation points to accumulate products from the community to supply the agro-processing hub for further value addition, or to send them to centres of great demand for distribution and retail to consumers. The AIH is a rural based development institution to implement integrated initiatives for the rural communities and at selected locations for facilitating agro commodities procurement. AIH is one of the rural development initiatives of SAPZ which would not only promote inclusive rural development but would also serve as a backward linkage to the AIH in terms of raw material sourcing and supplying and forward linkage to agro production zone.

ES 4 Objective of the ESIA

The overall objective of conducting the ESIA is to determine the potentially adverse environmental and social effects of the proposed Agricultural Transformation Centre and develop mitigation measures that can be adopted to reduce or eliminate these adverse effects as well as maximise the potential benefits of the project. The ESIA will be a key component to developing a sustainable intervention that has minimal environmental and social impact. The results of the ESIA will also provide an evidence base to inform policy makers at all level to simplify valuable decision-making and to ensure that the implementation processes of the proposed project activities are thoroughly sustainable. Some of the activities to be carried out during ESIA preparation include; ensuring that AIH activities are environmentally-sound, culturally- appropriate, encouraging community consultations and participation and enhancing social wellbeing of the stakeholders. The ESIA seeks to provide a clear process including action plans that integrates environmental and social considerations into the proposed interventions.

ES 5 Proposed Project Justification

Rural poverty in Nigeria is a multifaceted result of intertwined agricultural, infrastructural, financial, institutional, environmental, demographic, and social constraints that perpetuate poverty in areas critical for the nation's food production (*Journal of Agriculture and Crops Research vol.8, 2022).* A 2021 peer-reviewed study published in *Biomed Journal of Science & Technology Research* confirms that Nigeria ranks among the top 20 countries responsible for 80% of global malnutrition. Findings indicate that poverty, regional disparities, and food insecurity lead to a hyper prevalence

of malnutrition, with the poorest, rural dwellers, and northern residents disproportionately affected. Survey analyses showed rural children especially in the North experience higher rates of stunting, wasting, and underweight compared to urban areas and southern states.

Rural poverty in Nigeria is perpetuated by the interconnected failures of agricultural systems, financial support, land management, infrastructure, environmental stewardship, human resources, governance, and private investment. Addressing these barriers holistically is crucial for breaking the cycle of poverty and unlocking the full potential of Nigeria's vast rural landscape.

Addressing these challenges requires substantial investment in agricultural infrastructure development and capacity building. This investment will help stabilise economic benefits for farmers, reduce post-harvest losses, create market opportunities, and stimulate economic growth. It also helps providing direct and indirect empowerment and job opportunities. Hence, there is an urgent need for the development of primary processing of agricultural produce through value addition, post-harvest management, and women and youth empowerment. All of these can be realized through the construction of Agricultural Transformation Centers. The proposed AIH is expected to facilitate appropriate post-harvest handling, storage and quality management.

It is based on these that Kano State Government, through the Federal Government of Nigeria and the funder Islamic Development Bank (IsDB) has identified and established the Agro Industrial Hub at Bagauda community, Bebeji LGA of Kano State. It is expected that the ATC will address post-harvest crop losses, increase farmers' productivity and contribute to:

- Creating both direct and indirect employment opportunities for the local population and fostering sustainable inclusive economic growth;
- Increased of incomes, reduce wastages, ensure value addition as well as export earnings.
- Improving the capacity of produces' cooperative through training, especially for targeted women and youth groups;
- Supporting productivity enhancement through the introduction of new technologies and agricultural inputs;

- Improving access to infrastructure by supporting investment;
- Facilitating market linkage through, up-takers, out-growers' schemes;
- Facilitating on-farm value addition by targeting limited value chains and linking farmers to the supply chain.

ES 6 Benefits of the Project

It is expected that the proposed AIH will address post-harvest crop losses, increase farmers' productivity and contribute to:

- Creating both direct and indirect employment opportunities for the local population and fostering sustainable inclusive economic growth;
- Increased of incomes, reduce wastages, ensure value addition as well as export earnings.
- Improving the capacity of produces' cooperative through training, especially for targeted women and youth groups;
- Supporting productivity enhancement through the introduction of new technologies and agricultural inputs;
- Improving access to infrastructure by supporting investment;
- Facilitating market linkage through, up-takers, out-growers' schemes;
- Facilitating on-farm value addition by targeting limited value chains and linking farmers to the supply chain.

ES 7 Institutional and Legal Framework

The study is guided by a number of relevant national and international environmental and social policies and regulations that are applicable to this project. These include:

- National Policy on the Environment as amended in 2016
- Environmental Impact Assessment (EIA) Act No. 86 of 1992, amended as EIA Act. Cap E12, LFN 2004.
- National Environmental Standards and Regulation Enforcement Agency (NESREA) Act, No. 25, 2007
- National Environmental Protection (Effluent Limitations) Regulations (S.1.8) 1991;

- National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) (S.1.9) 2004;
- National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations (S.1.15) 1991;
- Guidelines and Standards for Environmental Pollution Control in Nigeria 1991;
- Sectoral Guidelines for EIA 1995
- Harmful Wastes (Criminal Provisions) Act No. 42, 1988;
- Environmental Impact Assessment Procedural Guidelines 2011;
- National Guidelines on Environmental Management Systems (EMS) 1999
- National Guidelines on Environmental Audit in Nigeria 1999.
- The National Agricultural Seeds Council Act 2019
- The Agricultural Sector Food Security and Nutrition Strategy (AFSNS) 2016
- Agricultural (Control of Importation) Act Cap A13 LFN 2004
- National Agricultural Land Development Authority Act, 1992
- The Nigerian Urban and Regional Planning Act CAP N138, LFN 2004
- Water Resources ACT, CAP W2, LFN 2004
- Land Use Act Cap L5, 2004
- The Forestry Act, 1994
- Labour Act - CAP. L1 L.F.N. 2004
- Public Health Law CAP 103 LFN 1990
- Child Rights Act 2003
- National Gender Policy 2006
- National Climate Change Policy for Nigeria (2021 – 2030)
- Kano State Refuse Management and Sanitation Law, 2003
- Kano State Pollution Control Law
- Kano State Solid Waste Management Law
- Kano State Ministry of Agriculture and Natural Resources
- Kano State Agricultural and Rural Development Authority (KNARDA)
- Islamic Development Bank’s Environmental and Social Safeguards Policy

- IFAD's Social, Environmental and Climate Assessment Procedures, SECAP 2021
- The African Development Bank Group's (AfDB) Integrated Safeguards System
- UN Framework Convention on Climate Change, 1992
- African Convention on the Conservation of Nature and Natural Resources
- Basel Convention on the Control of Trans-Boundary Movements of Hazardous wastes and their Disposal
- United Nations Guiding Principles on the Human Environment

ES 8 Value of the Project

The total estimated cost of proposed SAPZ project is $71,485,864.70 US dollars to be funded Islamic Development Bank (IsDB) in partnership with International Fund for Agricultural Development (IFAD), through a joint venture between Kano State Government, and other private investors. The IsDB is the major financier with 58.62% followed by IFAD 31.8% and Kano State 9.56%.

ES 9 Envisaged Sustainability

Sustainable designs, construction and installation of equipment including other ancillary facilities will form the proposed project's bedrock to mitigate environmental impact. The general sustainability principles (technological, technical, economic, environmental and social) that shall guide the project are discussed below.

Technological Sustainability

This project shall be undertaken using the best available technology in construction and building industry (from ground work to the finishing). It shall be executed using modern, locally, and internationally accepted materials to achieve public health, safety, security, and environmental aesthetic requirements that will comply with environmental regulations and urban development laws of Nigeria and Kano State.

Technical Sustainability

Kano State Government has set up a highly technical multi-disciplinary project team which includes Architects, town planners, geologist, soil scientist, civil engineers, electrical engineers, structural and mechanical engineers, to prepare the engineering

design of the development, which shall give rise to building construction, plumbing, electrical installations, roofing and painting, in an environmentally friendly manner.

Economic Sustainability

The economic sustainability of the proposed project is anchored in its potential to significantly enhance the agricultural and economic landscape of Kano State and Nigeria as a whole. Key areas of focus for ensuring the project's economic sustainability include: job creation and income generation, market expansion and profit maximisation, value addition and industrial growth and support for local businesses and education

Environmental Sustainability

This project would have some potential negative impacts on the environment. It is the policy of the project proponent to conduct ESIA for her projects by national laws. This ESIA will identify all potential impacts associated with the proposed project and proffer appropriate mitigation/ameliorative measures that will ensure that all the impacts are minimized or completely avoided. However, incorporating the findings and recommendations of this ESIA, and implementing an effective Environmental and Social Management Plan, at the planning, design, construction, operation, and abandonment / decommissioning stages of the proposed project, will ensure its environmental sustainability.

Social Sustainability

In light of the proponent's ongoing talks with the host community and other stakeholders, a cordial connection with the people will be strengthened and maintained. The project's proponent and the host community are both enthusiastic about the project. Consultations with the host community throughout the planning stage revealed that they are pleased with the project and eager to support its full implementation.

ES10 Project Alternatives and Options

Project Alternatives

Location Alternative: The selection of locations for the Agro Industrial Hub (AIH) in Bagauda, was a critical decision influenced by various factors such as the availability of natural resources or favourable environmental conditions (Glasson and Therivel, 2019).

Similarly, the AIH location was chosen based on both economic and logistical criteria, including the availability of infrastructure, proximity to raw material sources, and access to markets. Beyond these practical considerations, the project also prioritized avoiding environmentally sensitive areas, ensuring that the chosen locations would not only support the project's goals but also adhere to sustainable environmental practices. After thorough evaluations, Bagauda of Bebeji LGA was identified as one of the optimal sites for the AIH.

Project Options

No project option: The "no-project option" implies that the construction of the proposed ATC project will not be achieved. This option is considered if there is economic, technical or human capacity deficiencies or that the proponents are unwilling to commence the project or that the regulatory authorities are unwilling to approve the project; thus leading to a "no project option". This option will translate to non-beneficiary by the people and government of Kano State in particular and the nation as a whole. This will also mean that the envisaged positive socio-economic impact on the people and government of Kano State and the nation will not be achieved. This option was rejected because it is not viable. Also associated with this option are; loss of resources already committed to the project, depriving employment opportunities that can be accrued from the project. This is not good for socio-economy, population growth, poverty alleviation, health,expansion and development of the nation. This option was not considered, therefore, the need for the project.

Delayed project option: This option implies that the execution of this project will be delayed until a much later date. Such option is usually taken when conditions are unfavourable for project implementation, such as in a situation where there is war, or host community is deeply resentful of the project. Also, if the economics of the project are unacceptable or unattractive at the time, then a delay may be feasible. But none of these conditions are applicable. In fact, on the contrary, both the economics and the political environment are most favourably disposed towards the project. Therefore, the implication of delaying the project will include the fact that all contractors, workers and equipment that have been mobilized for this project, and procurement, will have to be demobilized.

Also, because of the inflationary trends in Nigeria, such a delay may result in unanticipated increase in project costs, leading to a decrease in final profit accruable from the project. These, and other related problems make it impossible to adopt the delayed project option. Hence, the adoption of **'Go Ahead' option** which implies that the project will be executed as planned.

ES 11 Project Activities

The activities to be undertaken for the implementation of this project is divided into four major phases:

Pre-construction Phase

This phase involves identifying and acquiring suitable land for Agro Industrial Hub (AIH). Site preparation includes clearing vegetation, grading, and setting up drainage systems. Major activities during this phase include: Feasibility Studies, Engineering Design, ESIA Study, Site Clearing and Preparation, Site Yard Setup, Material Procurement and Transportation and Access Road Development.

Construction Phase

This phase involves the physical development of the infrastructure required for the proposed ATCs (Agricultural Transformation Centers). Major activities during this phase include: excavating and burrowing, land filing and compacting, culverts and drains constructing, bituminous road construction, fencing, pavements and surfacing works, clean up and waste management, QA/QC inspections and tests, etc.

Operation and Maintenance Phase

Once construction is complete, the focus shifts to the ongoing management and maintenance of the facilities. Activities during the phase include:

- Commissioning and testing of facilities and equipment.
- Facilitating connections between processors and local farmers, and ensuring a steady supply of raw materials.
- Business model planning
- Workforce recruitments

- Operating and maintaining the project infrastructure and facilities.
- Managing daily operations (e.g., production processes, service delivery).
- Implementing environmental monitoring and management plans.
- Continuous engagement with local communities and stakeholders.
- Conducting routine maintenance and repairs.
- Managing operational waste and emissions.
- Monitoring and ensuring compliance with regulatory requirements.

Decommissioning Phase

Following a period of successful operation, a decommissioning plan will be developed and implemented to ensure the safe, responsible dismantling of facilities and restoration of the site. This plan will consider environmental and social factors throughout the process to manage the impacts of the project. Activities to be carried out during the decommissioning phase include planning for the decommissioning activities, site preparation and mobilisation, destruction and removal of facility buildings, staff compensation and site restoration activities.

ES 12 Environmental and Social Baseline Conditions

For the purpose of this ESIA, Field data gathering was conducted from 3rd – 15th October, 2025 representing dry season sampling by a team of specialist for air quality, noise level, stakeholder consultation and pictorial representations of the proposed site in harmony with bordering features. In-situ measurements were coordinated by Fahamu Nigeria Limited. Secondary data/information was sourced for weather, fauna, vegetation; health, socio-economic from National Population Commission (2006), National Bureau of Statistics (2017-2022) and FMEnv approved EIA reports relating to the project were used to complement those sourced from field visit.

Climate and Meteorology study over Kano State

In Kano, the wet season is muggy and mostly cloudy, the dry season is partly cloudy, and it is hot year round. Over the course of the year, the temperature typically varies from 53°F to 102°F and is rarely below 48°F or above 106°F. Kano experiences extreme seasonal variation in monthly rainfall. The rainy period of the year lasts for 6.3 months,

from April 14 to October 23, with a sliding 31-day rainfall of at least 0.5 inches. The month with the most rain in Kano is August, with an average rainfall of 7.0 inches. The rainless period of the year lasts for 5.7 months, from October 23 to April 14. The month with the least rain in Kano is January, with an average rainfall of 0.0 inches.

Lower dew points feel drier and higher dew points feel more humid. Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night. Kano experiences extreme seasonal variation in the perceived humidity. The muggier period of the year lasts for 6.1 months, from April 20 to October 23, during which time the comfort level is muggy, oppressive, or miserable at least 24% of the time. The month with the most muggy days in Kano is August, with 29.7 days that are muggy or worse. The month with the fewest muggy days in Kano is January, with 0.0 days that are muggy or worse.

The hot season lasts for 2.3 months, from March 17 to May 26, with an average daily high temperature above 98°F. The hottest month of the year in Kano is May, with an average high of 99°F and low of 75°F. The cool season lasts for 1.7 months, from December 4 to January 28, with an average daily high temperature below 89°F. The coldest month of the year in Kano is January, with an average low of 54°F and high of 87°F

Air Quality

The Air Quality levels of the Project Environment were within limits set by the Federal Ministry of Environment and World Health Organization (WHO). Noise level measurements conducted within and around the project site ranged between 50.3dB(A) and 54.0dB(A). These values are below the 55 dB(A) limit stipulated by the National Environmental Standards and Regulations Enforcement Agency (NESREA) for residential areas, and also far less than the Federal Ministry of Environment (FMEnv) permissible hourly exposure limit of 90 dB(A). This indicates that the proposed project environment is generally quiet and does not pose any immediate environmental or public health concern.

Soil

The predominant soil type in Kano State is the ferrugirious tropical soils. Their main features include a sandy surface horizon underlain by weakly developed clayey, mottled and sometimes concreting subsoil. The soil samples at different sampling locations were taken from top soil at a depth of 0 -15cm and 15 – 30cm in each of the sampling points. The result of physical and chemical parameters of soil from the project area is shown in Table 4.6. The soil pH values recorded from the samples show that pH decreases with an increase in soil depth all within the range of 5.94 and 6.12. These values show characteristics acidic tending towards neutrality.

Groundwater

Ground water samples were obtained from the proposed AIH site and Bagauda community. Groundwater result from the study location shows the concentrations of parameters to be generally within the FMEnv and WHO limits for substances and characteristics affecting the acceptability of groundwater for domestic use. The proposed project area is supplied by borehole. Sample of groundwater was sourced from one (1) borehole (within the site). The pH value of the groundwater is 6.81. Neutral to slightly acidic, acceptable. This value falls within the recommended value compared to the Federal Ministry of Environment (FMEnv) limits of 6-9, during the sampling periods.

Surface Water

In-situ measurements were carried out on Surface Water Samples collected from Bagauda Dam in Bagauda community for pH, Electrical Conductivity, Salinity, Total Dissolve Solid (TDS) and Dissolved Oxygen (DO) while physical and chemical parameters where analyzed in the laboratory. Most physiochemical parameters of surface water sample were within NESREA standards.

Vegetation

The proposed project site is a Brownfield with attributes of a Sudan and Guinea savannah. Prominent plant species in the study area include; Ageratun conyzoides (Asteraceae), Anacardium occidentale (Anacadiaceae), Azadirachta indica (Meliaceae), Euphorbia hirta (Euphorbiaceae), Vigna unguiculata (Fabaceae), Parkia biglobosa

(Leguminosae), Sorghum bicolor (Poaceae), Saccharum officinale (Poaceae) and Pennisetum polystachlon.

Fauna

The fauna species observed within the project area were generally few and mostly small invertebrates such as earthworms, Grasshoppers, Butterflies, spiders. Also, vertebrates such as Lizards and birds were sighted within the project area. Based on the IUCN, no threatened or endangered fauna species were recorded in the study area.

ES 13 Socio-Economic Characteristics

The socio-economic survey collated baseline socio-cultural, economic and infrastructure indices of the study area, while the consultation process elicited responses on stakeholders concern and expectations from the proposed project. The host community of the proposed project is Bagauda Community in Bebeji LGA of Kano state.

The socio-economic characteristics of the community based on information gathered through focus group discussions, key informant interviews, direct observation, and surveys are summarized as follows:

- The people of this community are homogeneous in terms of ethnicity and language.
- The community have an estimated population of 1,200 residents.
- Islam is the most prevalent religion in the community with over 98% of respondents being Muslims.
- Borehole, River and hand dug well are found to be the primary source of water in the community.
- Among the social infrastructure in the community are telecommunication mast, primary school and primary health centre.
- 64% of respondents within the community are male, while 36% of respondents are female.
- Farming and trading are the common livelihood activities in the community. However, there are few artisans, drivers and civil servants.

- The community is connected to the national grid for electricity supply. Only few people among the residents have generator or solar as alternative power supply.

Members of the communities were positively disposed to the proposed Project. They believe that the Project will improve the economic values of the communities, impact positively on agriculture and create job opportunity for community members.

ES14 Stakeholder Consultation

Extensive consultations were held on the 6th October 2025 with representatives from the Ministry Agriculture, Traditional Ruler, Bagauda Community, ESIA Consulting team, Community groups (including men, women, farmers, etc) at Bagauda community. The consultation took place at the Institute of Fisheries area the project site to determine people's reaction to the propose project and its social benefits or otherwise (see Appendix 2). The process is summarized below.

- Obtain copies of, or determine the methods for obtaining, any further relevant information that might be available to assist with the ESIA.
- Determine the nature and characteristics of facilities of the proposed project.
- Identify issues that the regulatory bodies consider to be of greatest concern.
- Discuss the level and nature of information that the regulatory authorities require to be included in the ESIA.
- Identify, define and review the relevant regulatory and legislative framework with which the proposed project will be required to comply.

Summary of Issues Identified

Many of these issues were raised by the public during field studies and/or observed by the study team; particularly the community members were concerned with the following:

- Compensation for temporary users of the agricultural land.
- Will they be considered during employment of skilled and unskilled labour at the construction and function stages of the project?

How Concerns were addressed

- Qualified members of the community will be given employment opportunity in both skilled and unskilled labour.
- The ESIA will recommend mitigation measures for addressing specific adverse impacts so that all significant impacts are avoided, reduced to barest minimum or mitigated. He cited examples, that where the project will result in surface water pollution and depleting of the available surface water in the community, there will be need to rehabilitate existing water sources in the project location as a veritable alternative.
- The project proponent will compensate farmers whose livelihood are affected and may lose their crops due to the project. However, it is hoped that the farmers must have harvested their crops before the start of the project.
- The project will mainstream the participation of women farmers and workers, in various employment opportunities created by the project.
- The consultant assured them that their concerns are well noted and will be mainstreamed into the decision framework of the project to ensure project sustainability. All relevant issues were exhausted, and the meeting ended with a closing prayer by a member of the community.

ES 15 Potential Environmental and Social Impact

- The Environmental and Social Impact Assessment focuses on both positive and negative impacts associated with the pre-construction, construction and operational phases. The impacts of the proposed project are seen from the perspectives of effects related to vehicular traffic, air quality, noise level, construction waste management, water supply, runoff water and socio-economy.
- Positive impacts associated with the proposed project include: employment opportunity, reduction of post-harvest losses and wastage, food security, and gains in local and national economy.
- Identified negative impacts during pre-construction phase are: increase in vehicular movement and traffic including potential for road accident, decrease in ambient air quality, increased noise level. Impacts related to construction and

installation activities include: community health and safety due to influx of workers and construction activities, increase in ambient noise level, construction waste management and occupational health and safety hazards. The major impact associated with operation and maintenance phase is occupational health and safety hazard, increase in ambient noise level, waste management and traffic management. The decommissioning phase will have significant impacts on road traffic of the project area.

ES 16 Mitigation Measures

The purpose of mitigation is to identify measures that safeguard the environment and the people affected by a project proposal. Mitigation is both a creative and practical phase of an ESIA process. It seeks to find the best ways and means of avoiding, minimizing and remedying impacts.

Elements of mitigation are organized into a hierarchy of actions which include; first, avoid adverse impacts as far as possible by use of preventative measures; second, minimize or reduce adverse impacts to 'as low as practicable' levels; and third, remedy or compensate for adverse residual impacts, which are unavoidable and cannot be reduced further.

The mitigation measures proposed for this project are summarized below:

- A Traffic Management Plan (TMP) shall be developed and implemented by the project Contractor.
- Appropriate signage and safety measures (barrier, formalized crossing points) to reduce the risk of accidents in the project area shall be provided.
- Construction machinery shall be turned off when not in use.
- Provision of adequate PPE especially gloves, safety boots, and hard hats to workers shall be ensured. All employees will be required to wear the appropriate PPE whilst performing their duties.
- Construction workers shall be provided with appropriate HSE training.
- Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence.

- Construction activities shall be limited to daytime as much as possible.
- A Waste Management Plan shall be developed and implemented.

ES 17 Environmental and Social Management Plan (ESMP)

The ESMP provides the means of assessing the accuracy of the predicted project impacts and the monitoring of the effectiveness of the proposed mitigation measures contained in the ESIA report. The ESMP therefore indicate how the environmental concerns highlighted in the report would be managed. The anticipated impacts of the proposed project, corresponding mitigation measures, residual impact rating, action party, timing, parameters to be monitored and monitoring frequency are provided in the Environmental and Social Management Plan for all the project phases.

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

The estimated cost summary for the ESMP implementation are as follows:

Table ES1: Estimated Budget for the Implementation of ESMP

Item	Responsibility	Cost Estimate in Nigerian Naira (₦)	Cost Estimate in US Dollars (US$)
ESMP Mitigation	Contractors/KNSG	₦22,500,000.00	14,565.93
ESMP Monitoring	KNARDA, SPIU and other MDAs	₦ 8,000,000.00	5,178.99
Training and capacity building	KNARDA, SPIU and other MDAs	₦4,000,000.00	2,589.49
Total		**₦34,500,000.00**	**US$22,334.41**

**1 US$ =N1,544.70 (12/25)*

ES 18 Grievance Redress Mechanism (GRM)

Kano State Government has established a grievance mechanism to receive and act on complains and grievances by beneficiaries or stakeholders against activities being conducted by the Project in the States. However, the likelihood of disputes to occur during the project implementation will be greatly reduced because consultations have already been carried out with some of the affected persons. Nevertheless, in the event that grievances arise this redress mechanism has been prepared. A Grievance Redress Mechanism (GRM) is provided in Chapter 8, which is anchored on the need to provide a forum locally to receive, hear and resolve disputes arising from construction activities and ESIA implementation in the best interest of all parties to forestall the lengthy process of litigation, which could affect the progress of project.

Gender Based Violence (GBV)

Overall, GBV risks in the project area might include Intimate Partner Violence (IPV), public harassment including verbal insults, physical abuse, rape, harmful widowhood practices and women and child trafficking. Targeted support to women under the program could likely exacerbate these risks. Development and implementation of specific GBV risk prevention and mitigation strategies tailored to local contexts will be critical. Guidelines for situation analysis of GBV and safe reporting guidelines in line with international best practices will be implemented. Further, all risks related to labour influx will have to be mitigated by participation of project beneficiaries/communities and involvement of project contractors and contractors' workers and consultant employees in identifying mitigation and implementing measures as contained in the ESIA (Chapter 6) of this report.

ES 19 Conclusion and Recommendation

In conclusion, the ESIA has provided in detail the mitigation measures for identified potential adverse impacts associated with the various phases of the project, and a monitoring program to ensure compliance. With adequate application of mitigation measures, the impacts will be avoided, reduced or mitigated, and in very few cases they may be offset.

It is however recommended that:

- Environmental performance should be regularly monitored to ensure compliance and that corrective measures be taken if necessary. In addition, it is very necessary that this information should be made available to the host community on a regular basis.
- The Environmental and Social Management Plan (ESMP) should be used as an on-site reference document during all phases (Planning, Construction and Operation) of the proposed AIH project.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

The Federal Government of Nigeria (FGN) proposes to develop a Special Agro-Industrial Processing Zone (SAPZ) program in Kano State. The Special Agro-industrial Processing Zone is a major investment program of the Federal Government of Nigeria (FGN), driven by the Federal Ministry of Agriculture and Food Security (FMAFS) in collaboration with state governments, Development partners, relevant Federal Ministries, Departments and Agencies (MDAs), and private investors to establish agro-processing clusters in areas of high agricultural production across the country. This program aims to build modern agro-processing capacity for the growing local market, create sustainable outlets for farmers, minimize post-harvest losses, generate wealth for farming communities, promote import substitution, and foster job creation particularly for women and youth in agriculture-related sectors. The SAPZ in Kano State receives financing from the Islamic Development Bank (IsDB) and in partnership with International Fund for Agricultural Development (IFAD).

The SAPZ comprises a central Agro-Industrial Hub (AIH) supported by multiple Agricultural Transformation Centres (ATCs), positioned within key production zones to aggregate community produce for supply to the AIH. The Agro-Industrial Hub will be supported by a network of compact and efficient Agricultural Transformation Centres (ATCs) that will coordinate farmers, their cooperatives and clusters' production (land preparation, planting and input supply), harvesting, agglomeration (primary on-farm storage, preservation and processing), and marketing, activities. The hub will include the installation of various crop processing factories for several commodities.

The proposed AIH will be located at Bagauda community, Bebeji LGA, Kano State. The site will span across 271 hectares of land allocated by the Kano State Government (KNSG) through the Kano State Agricultural and Rural Development Authority (KNARDA). The site is currently under cultivation being used for farming of maize, soybeans, sorghum, guinea corn, cowpea and groundnut.

Kano State Government commissioned Fahamu Nigeria Limited to carry out an Environmental and Social Impact Assessment (ESIA) for the proposed Agricultural

Transformation Centre (ATC) in Bagauda Community, Bebeji LGA, Kano State in accordance with the EIA guidelines of the Federal Ministry of Environment as contained in the EIA Act Cap E12 LFN 2004, and in accordance IsDB Environmental and Social Safeguards Policy (ESSP), IFAD's Social, Environmental, and Climate Assessment Procedures (SECAP, 2021), African Development Bank (AfDB) Integrated Safeguards System (ISS), SAPZ's Environmental and Social Management Framework (ESMS), and other relevant national and international legislation. This ESIA is guided by all relevant national and international laws covering the entire life cycle of the proposed project i.e. pre-construction, construction, commissioning, operation and decommissioning.

1.2 Geographic Location and Description of Kano State

Kano State is one of the 36 States of Nigeria, located in the northern region of the country. According to the national census done in 2006, Kano State is the most populous state in Nigeria. The recent official estimates taken in 2016 by the National Bureau of Statistics found that Kano State was still the largest state by population in Nigeria. Kano State borders on Katsina State to the northwest, Jigawa State to the northeast, Bauchi State to the southeast, and Kaduna State to the southwest. The major ethnic groups were the Hausa, Fulani, Barebari (Kanuri), Tuareg, Arab, Nupe and some tribes from the southern Nigeria. The Hausa and Fulani make up the majority of Kano State's population. The Hausa language is the dominant language in the state, as it is in most of Northern Nigeria. Figure 1.1 shows location of Kano State in Nigeria.



Figure 1.1: Map of Nigeria showing the project host State of Kano

1.2.1 Description of project location

The proposed Agro-Industrial Hub (AIH) project site is located directly opposite the Nigerian Law School fence about 30m to the school fence and about 50m to the school gate. The site is situated within latitude 11°34'45.1722"N and longitude 8°23'20.4442"E on about 271 hectares of land. The proposed site area is flat largely covered by scattered trees and shrubs. The project site is used for farming activities with no infrastructural buildings on the site. The access to the proposed project site is off the Kano-Zaria highway approximately 4km south of the main road, leading directly to the proposed project site.

There is a Dam located about 1.5km to the project site within latitude 11°34'46.2711"N and longitude 8°23'11.4279"E. The Dam will serve as its primary source of water and is a potential source of hydroelectric power. This connection will reduce reliance on

groundwater extraction. Some of the facilities around the project site is the Kano State Fisheries Institute located about 2.5km from the project site. Figure 1.2 presents map of Kano showing the project location and figure 1.3 presents the satellite imagery showing the project location.

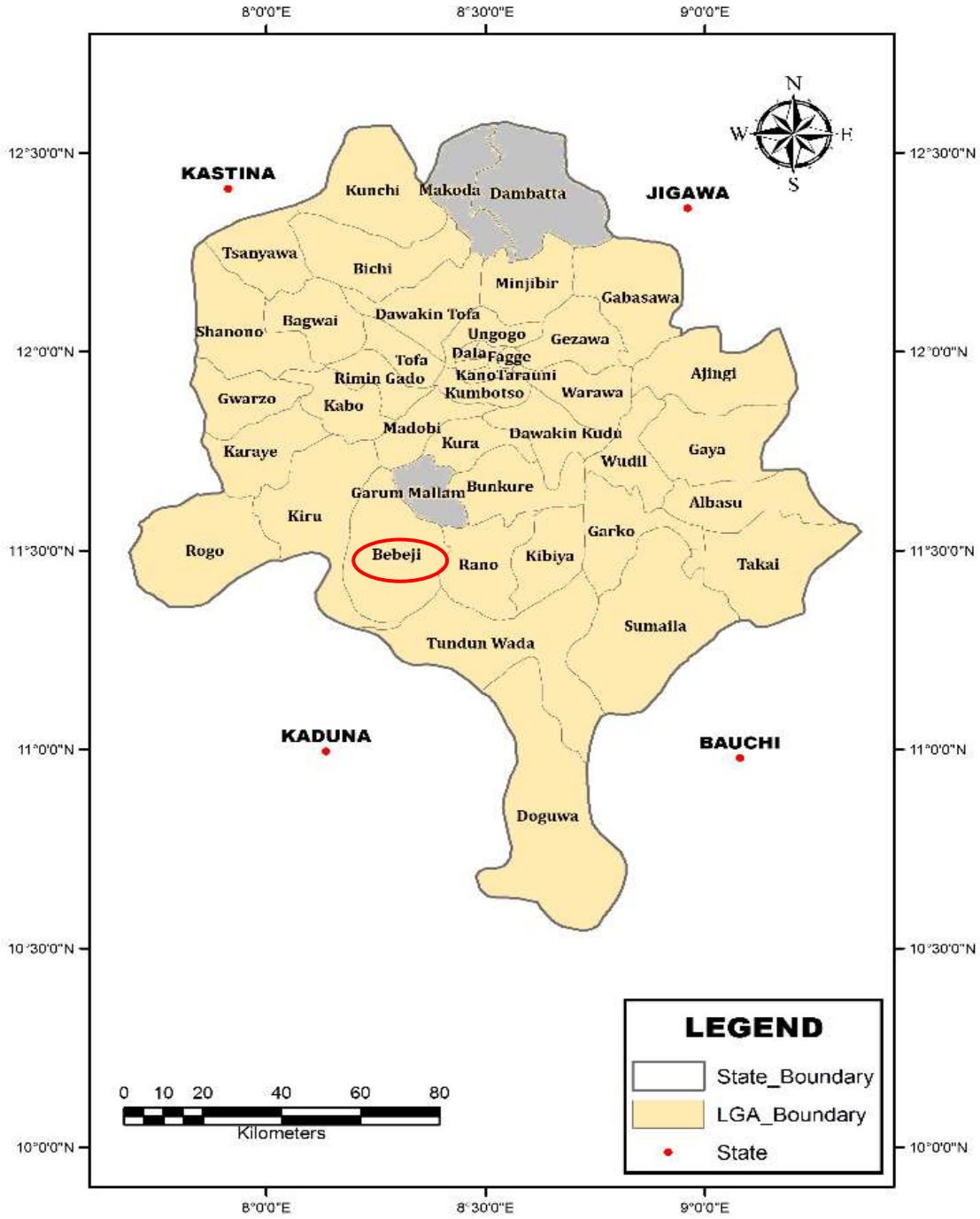


Figure 1.2: Map of Kano state showing the host LGA

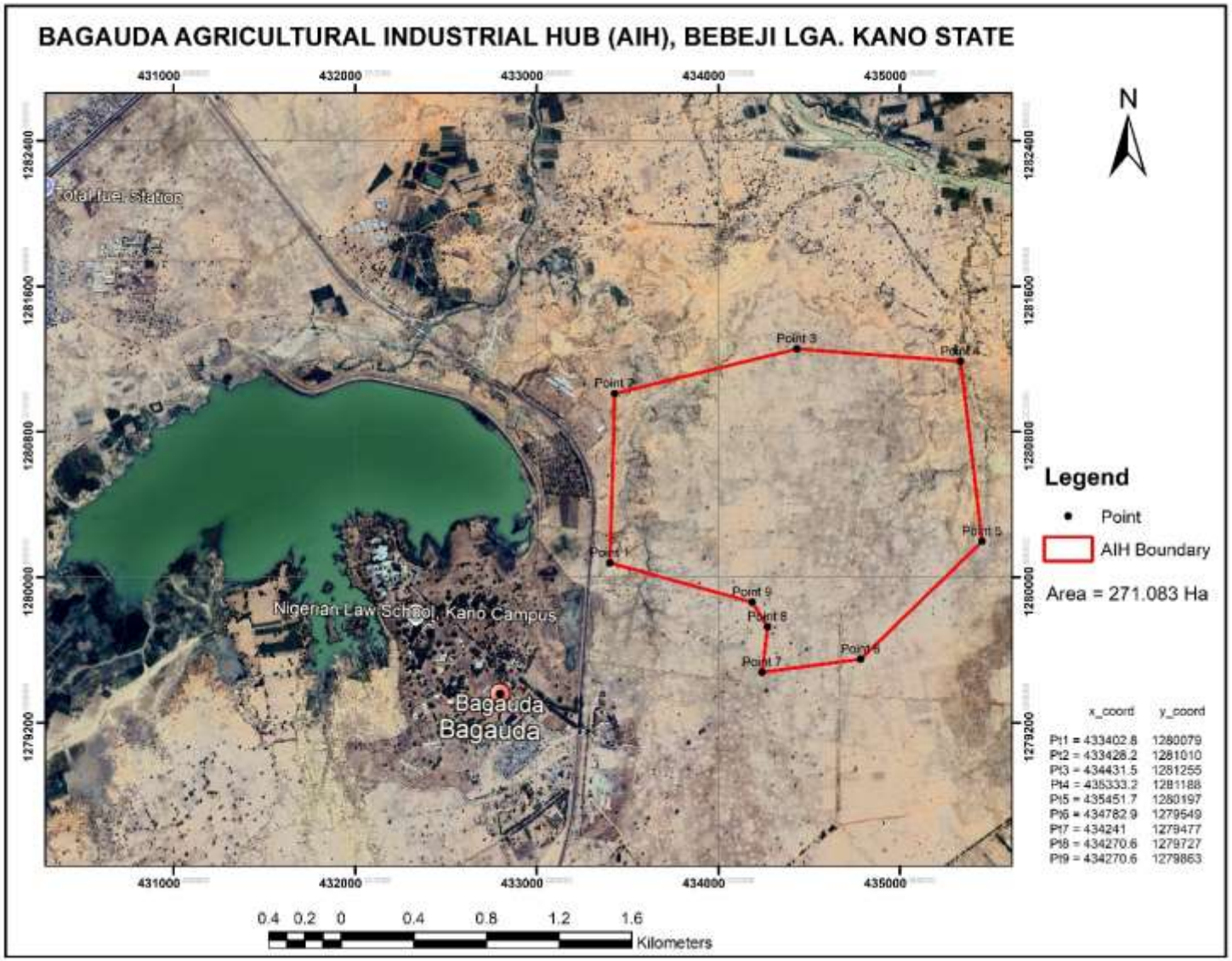


Figure 1.3: Satellite imagery of Bebeji project site

1.3 Objective of the ESIA

The overall objective of conducting the ESIA is to determine the potentially adverse environmental and social effects of the proposed Agricultural Transformation Centre and develop mitigation measures that can be adopted to reduce or eliminate these adverse effects as well as maximise the potential benefits of the project. The ESIA will be a key component to developing a sustainable intervention that has minimal environmental and social impact. The results of the ESIA will also provide an evidence base to inform policy makers at all level to simplify valuable decision-making and to ensure that the implementation processes of the proposed project activities are thoroughly sustainable. Some of the activities to be carried out during ESIA preparation include; ensuring that ATC activities are environmentally-sound, culturally-appropriate, encouraging community consultations and participation and enhancing social wellbeing of the stakeholders. The ESIA seeks to provide a clear process including action plans that integrates environmental and social considerations into the proposed interventions. The following are specific objective of the ESIA:

- To identify project activities that have the potential to negatively impact the bio-physical and socio-economic environment.
- Develop mitigation measures, an Environmental and Social Management Plan (ESMP) and a monitoring scheme
- Identify positive practices and innovations to promote a clean environment and reduce environmental degradation.
- Identify the risks, constraints and opportunities linked to the environment in which the proposed project will operate.

1.4 Scope of the ESIA

The ESIA study is to cover the following as contained in the Terms of Reference (ToR):

- Prepare an overview of the environmental and social contexts relevant to the projects, including an analysis of the legislative, regulatory and administrative framework. This includes but not limited to protection of natural habitats, pollution control, use of agro-chemicals, destruction of vegetation and other relevant environmental issue with which the project will operate.

- Review the IsDB's Environmental and Social Safeguards Policy, and the Integrated Safeguards System of the African Development Bank with emphasis on the requirements for an ESIA.
- Undertake a gap assessment of national policies and regulations in relation to (IsDB/AfDB) environmental and social safeguards policies and standards with measures to fill any gaps.
- Review relevant and related documentation on environment and social risk management.
- Describe the proposed project by providing a synoptic description of the project's relevant components and presenting plans, maps, figures and tables
- Provide a description of the geographical areas to be considered in the environmental baseline and in the identification of impacts.
- To generate environment and social baseline information within the study environment and affected persons before the project implementation.
- Engage in consultations with primary stakeholders in order to obtain their views on, and preoccupations about the project. These consultations shall occur during the preparation of the reports to identify key environmental and social issues or impacts and the proposed mitigation/enhancement measures
- Analyze the data obtained and predict the environment and social impacts (positive and negative) and device measures and mitigation strategy for each.
- Develop a smart work plan template for mitigating environmental and social risks associated with construction and operation in consultation with the relevant government agencies.
- Develop an Environmental and Social Management Plan (ESMP) for the work.
- Recommendation on specific impact identification for monitoring and evaluation methodologies to be used in the ESMP.
- Prepare a concise ESIA report with findings, conclusions, and recommendations.
- Submit the report for approval by relevant authorities (FMEnv).
- Work with Kano State Government to obtain final ESIA approval from the Federal Ministry of Environment (FMEnv).

1.5 ESIA Procedural Guidelines

This procedure prescribes the steps to be followed in the EISA process from project conception to commissioning and post commissioning impact mitigation, to ensure that the project is implemented with maximum consideration for environment. This ESIA study was conducted in compliance with this guideline. The Federal Ministry of Environment (FMEnv) developed guidelines to be used by project proponents in conducting ESIA, in compliance with the EIA Act. Accordingly, the ESIA process, shall follow the following steps sequentially as outlined in the procedural guideline and illustrated in figure 1.4

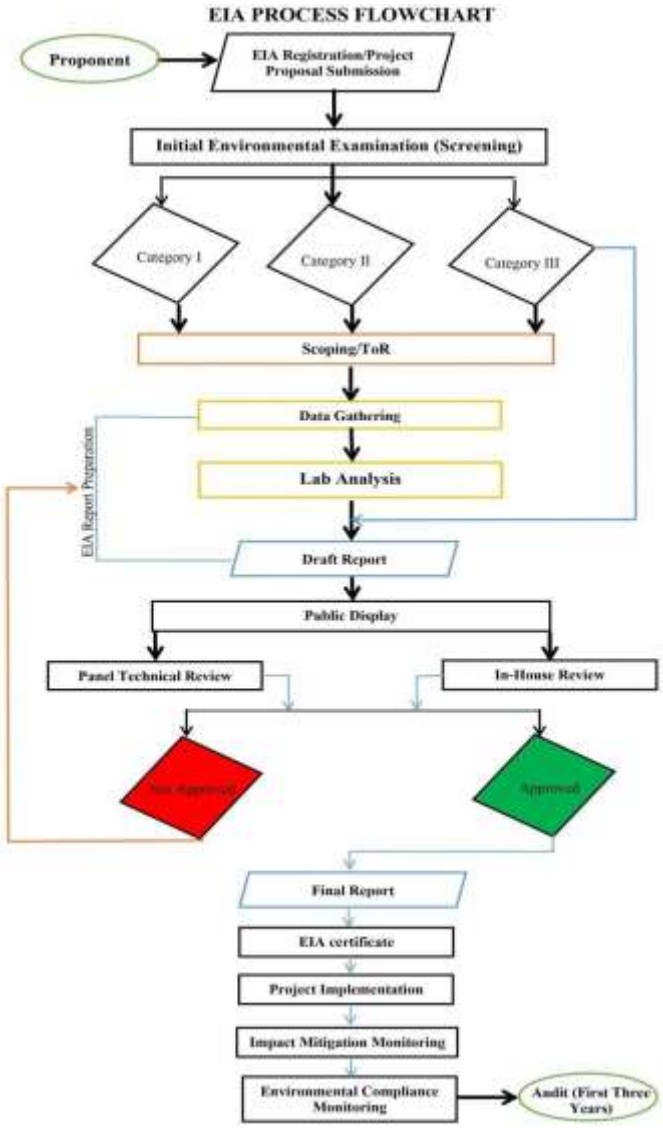


Figure 1.4: EIA flowchart in Nigeria

1.6 Legal and Administrative Framework

The study is guided by a number of relevant national and international environmental and social policies and regulations that are applicable to this project. The synopsis below is

some of the legal and administrative instruments on which the preparation of this ESIA was premised.

1.6.1 National Environmental Legislation

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

1.6.2 Federal Ministry of Environment Regulations

The Federal Government of Nigeria promulgated the Federal Environmental Protection Agency (FEPA) by Act No. 58, 1988, CAP. E12 L.F.N. 2004. The Act establishes the Federal Environmental Protection Agency with the responsibility of protecting and preserving the environment, monitoring and assisting in the enforcement of environmental laws and co-operating with relevant authorities on matters and facilities relating to environmental protection. The Federal Ministry of Environment, (FMEnv) upon establishment in 1999, took over the powers and functions of the Federal Environmental Protection Agency (FEPA). The Minister for Environment is empowered to establish standards in certain environmental areas like water quality, effluent limitations, air quality, atmospheric protection, ozone protection, noise control, and control of hazardous and waste removal methods by virtue of the provisions of the defunct FEPA. In exercise of its power, the Ministry had since made about 20 Guidelines by way of Regulations for different aspects of environmental protection and preservation.

1.6.3 National Policy on the Environment

Environmental management in Nigeria is based on the National Policy on the Environment (1989), revised in 1999 and 2017. The Policy states that Nigeria is committed to

safeguarding the country's natural and built environment for the use of present and future generations. It prescribed guidelines for achieving sustainable development in fourteen vital sectors of the nation's economy, namely: Human Population; Land Use and Soil Conservation; Water Resources Management; Forestry, Wildlife and Protected Natural Areas; Marine and Coastal Area Resources; Sanitation and Waste Management; Toxic and Hazardous Substances; Mining and Mineral Resources; Agricultural Chemicals; Energy Production; Air Pollution; Noise in the Working Environment; Settlements; Recreational Spaces, Green Belts, Monuments, and Cultural Property. This commitment demands that efficient resource use and the reduction of environmental impacts be a core requirement of all developmental activities. The strategic objective of the Policy is to coordinate environmental protection and natural resources conservation for sustainable development. Some specific regulations include:

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

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

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

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

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

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

1.6.3.2 EIA Act CAP E12 LFN 2004

The EIA Act is the primary Act governing EIA studies in Nigeria. It was promulgated to enable the prior consideration of an EIA on specified public or private projects. The Act sets out the procedure to be followed and methods to be used in undertaking an EIA. ***Section 2(2)*** of the Act requires that where the extent, nature, or location of the proposed Project or activity is such that it is likely to significantly affect the environment, an EIA must be undertaken in accordance with the provisions of the Act.

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

1.6.3.3 National Environmental Impact Assessment Procedural and Sectoral Guidelines

In response to the promulgation of the EIA Act, the Federal Ministry of Environment developed National EIA Procedural Guidelines and other sets of guidelines on various sectors of the national economy. Applicable to this study is the EIA Sectoral Guidelines for Agricultural Sector. The guidelines have been developed by the Federal Ministry of Environment to assist proponents in conducting a detailed environmental and social assessment of all new major projects within the agricultural sector in Nigeria. This ESIA study has taken into consideration the relevant provisions of the guidelines, including the applicable mitigation measures.

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

Administered by the Ministry of Environment, the National Environment Standards and Regulations Enforcement Agency (NESREA) Act of 2007, repealed the Federal Environmental Protection Agency (FEPA) Act. It is the embodiment of laws and regulations focused on the protection and sustainable development of the environment and its natural resources. The following sections are worth noting:

Section 7 provides authority to ensure compliance with environmental laws, local and international, on environmental sanitation and pollution prevention and control through monitory and regulatory measures.

Section 8 (1)(K) empowers the Agency to make and review regulations on air and water quality, effluent limitations, control of harmful substances and other forms of environmental pollution and sanitation.

Section 27 prohibits, without lawful authority, the discharge of hazardous substances into the environment. This offence is punishable under this section, with a fine not exceeding, N1, 000,000 (One Million Naira) and an imprisonment term of 5 years. In the case of a company, there is an additional fine of N 50,000, for every day the offence persists. This project will comply with NESREA regulations, including conducting EIA, environmental audit every three years after commissioning, obtain permit before disposing hazardous wastes, etc.

Regulations (under NESREA)

National Effluent Limitation Regulations

Section 1 (1) requires industry facilities to have anti-pollution equipment for the treatment of effluent.

Section 3 (2) requires a submission to the agency of a composition of the industry's treated effluents.

National Environment Protection (Pollution Abatement in Industries and Facilities producing Waste) Regulations (1991).

Section 1 Prohibits the release of hazardous substances into the air, land or water of Nigeria beyond approved limits set by the Agency.

Section 4 and 5 requires industries to report a discharge if it occurs and to submit a comprehensive list of chemicals used for production to the Agency.

1.6.3.5 National Environmental Regulations

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

National Environmental Protection (Effluent Limitation) Regulations, 1999, makes it mandatory for industries to install anti-pollution and pollution abatement equipment on site. The regulation is specific for each category of waste generating facility with respect to limitations of solid and liquid discharges or gaseous emissions into the environment. o

National Environmental Protection (Management of Solid and Hazardous Waste) Regulations, 1999, defines the requirements for groundwater protection, surface impoundment, land treatment, waste piles, and landfills. It describes the hazardous substances tracking program with a comprehensive list of acutely hazardous chemical products and dangerous waste constituents. It also states the requirements and procedure for inspection, enforcement and penalty.

Pollution Abatement in Industries Generating Wastes Regulations imposes restrictions on the release of toxic substances and stipulates requirements for pollution monitoring units, machinery for combating pollution and contingency planning by industries, submission of lists and details of chemicals used by industries to FMEnv, permits for the storage and transportation of harmful or toxic waste and the waste generator's liability. The Act also provides regulations on strategies for waste reduction, permissible limits of discharge into public drains, protection of workers and safety requirements, environmental audit (or environmental impact assessment for new industries) requirements and penalties for contravention.

1.6.4 Agricultural Framework

1.6.4.1 Agricultural (Control of Importation) Act Cap A13 LFN 2004

The Agricultural (Control of Importation) Act regulates the import of agricultural items to prevent the spread of plant diseases and pests. This is done by controlling the import of plants, seeds, soil, and other agrarian materials that could be contaminated. The Act helps protect local agriculture and biodiversity.

1.6.4.2 The National Agricultural Seeds Council Act 2019

The Act regulates the seed industry in Nigeria. It aims to ensure high-quality seeds are available to farmers by promoting seed production, controlling seed registration, and preventing the sale of poor-quality seeds. This Act is important for the project because it guarantees the use of certified seeds that will improve agricultural productivity and overall project success.

1.6.4.3 The Agricultural Sector Food Security and Nutrition Strategy (AFSNS) 2016

The AFSNS is a strategy to improve food security and nutrition for all citizens. It recognises that agriculture is critical for many Nigerians, but food production hasn't kept up with population growth. The AFSNS objective includes to:

- Increase food security at all levels (national, community, household)
- Reduce malnutrition, especially in children and women
- Prevent diet-related diseases
- Improve people's knowledge of nutrition
- Build stronger food and nutrition systems
- Integrate food security into government agricultural plans

Federal Ministry of Agriculture and Food Security (FMAFS)

The Federal Ministry of Agriculture and Food Security (FMAFS), formerly known as the Federal Ministry of Agriculture and Rural Development (FMARD), was established in 1966 with a clear vision to ensure food security and promote agricultural sustainability in Nigeria. With a focus on empowering farmers, facilitating market access, and promoting sustainable practices, we strive to cultivate a resilient and prosperous agricultural sector. The Federal Ministry of Agriculture and Food security is responsible for the formulation and implementation of policies and strategies in the Nigeria’s agricultural sector, to sufficiently provide food for an increasing population, adequate supply of raw materials to a growing industrial sector, effectively expand the market for crop, agro and agro-allied products, continually create employment opportunities, and to widely diversify the economy, for national development. The Ministry provides resources to the sector for the implementation of various projects and programmes. The efforts is complemented with the support and

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

1.6.4.4 National Agricultural Land Development Authority Act, 1992

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

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

1.6.5 Other Relevant Statutory and Policy Documents

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

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

Section 30 (3) requires a building plan to be drawn by a registered architect or town planner.

Section 39 (7) establishes that an application for land development would be rejected if such development would harm the environment or constitute a nuisance to the community.

Section 59 makes it an offence to disobey a stop-work order. The punishment under this section, is a fine not exceeding N10,000 (Ten thousand naira) and in the case of a company, a fine not exceeding N50,000.

Section 72 provides for the preservation and planting of trees for environmental conservation. The project shall be implemented in line with requirements of this Act, including obtaining development permit from Kano State Government.

1.6.5.2 Land Use Act Cap L5, 2004

Land Use Act No. 6 was enacted in 1978 (revised in 1990 and 2004). The Act vests all land in the urban areas of each state under the control and management of the governor of the state. The governor of the state holds the land in trust for the people of the state and is solely responsible for the allocation of land in all urban areas to individuals who reside in the state and to organizations for residential, agricultural and commercial purposes. All other land in the state subject to conditions under the Land Use Act is under the control and management of the local government. The Act divests traditional owners of land and vests such land in the state governor for the benefit and use of all Nigerians. It provides the processes through which land maybe acquired by the federal government.

1.6.5.3 Harmful Waste (Special Criminal Provisions) ACT CAP H1, LFN 2004

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

Section 6 provides for a punishment of life imprisonment for offenders as well as the forfeiture of land or anything used to commit the offence.

Section 7 makes provision for the punishment accordingly, of any conniving, consenting or negligent officer where the offence is committed by a company.

Section 12 defines the civil liability of any offender. He would be liable to persons who have suffered injury as a result of his offending act. The project will generate wastes including construction wastes and transformer oils at substations and other harmful wastes. These wastes shall be handled, treated, and disposed of in accordance with the relevant requirements of this Act.

1.6.5.4 The Forestry Act, 1994

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

1.6.5.5 The Endangered Species Act, CAP E9, LFN 2004

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

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

Section 5 defines the liability of any offender under this Act.

Section 7 provides for regulations to be made necessary for environmental prevention and control as regards the purposes of this Act. Certain sections of the line route of this project, will pass through natural areas that serve as wildlife habitats which will be impacted by the project. Hence, the project activities shall be carried out to comply with relevant provisions of this Act.

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

The factories Act, as contained in the Laws of the Federation of Nigeria 1990, seeks to legislate, and regulate the conduct of health and safety in the Nigerian workplaces. It was enacted in June1987 with the desire to protect the workers and other professionals against exposure to occupational hazards. The director of factories at the Federal Ministry of Employment, labor and productivity is responsible for the administration of the provisions or requirements of this Act.

Section 13 allows an inspector to take emergency measures or request that emergency measures be taken by a person qualified to do so, in cases of pollution or nuisances. This Act deals with working conditions at work sites, including construction sites, such as the type to be undertaken under the Project. Hence, the occupational health and safety requirements applicable to construction sites, as well as other work sites to be used by the project shall be subjected to the provisions of this Act.

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

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

Sections 54 to 58 which deal with employment of women, prescribed period of absence from work for nursing mothers and allows her half an hour twice a day during her working hours to attend to the baby for a period of up to six months after she resumes work.

Section 55 also exempted women from night work, except when they are employed as nurses.

Sections 59-64 deal with employment of young people.

1.6.5.8 Public Health Law CAP 103 LFN 1990

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

1.6.5.9 Workers' Compensation Act, 1987

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

1.6.6 National Gender Policy 2006

The main goals of this policy are:

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

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

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

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

1.6.8 National Climate Change Policy for Nigeria (2021 – 2030)

The Federal Executive Council approved a comprehensive strategy policy on climate change: the overarching objective of the policy is to promote low-carbon, high-growth

economic development and build a climate-resilient society through the achievement of the following targets.

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

1.6.9 National Action Plan on Gender and Climate Change (2020)

This National Action Plan, based on a series of informed consultations with different stakeholders, using inclusive participatory approaches (Government Ministries, Departments and Agencies, women, youth, farmers, persons with disability, elderly persons), moves from the need to guide the implementation of gender and climate change-related policies, strategies, programmes, negotiations and actions at Federal, State and Local Government levels, as the negative impact of climate change is considered a serious threat to the social and economic realities of people, especially women, living in Nigeria. This Action Plan covers the period 2020-2025 and its priority sectors include: Agriculture, Forestry and Land Use; Food Security and Health; Energy and Transport; Waste Management; Water and Sanitation. The implementation of the Action Plan will be governed by a participatory research involving the government at all levels, academic and research institutions, women and youth groups, private sector and other non-state actors, as well as development partners. In line with Nigeria's intention to empower and respond to the needs of women in the context of climate change, this National Action Plan focuses on effective strategies for integrating gender into the implementation of national climate change initiatives, including the Paris Agreement and the Nationally Determined Contributions (NDC). The Action Plan presents milestones for ensuring that in building a climate-resilient Nigeria, the important and critical roles of women, youth and other vulnerable groups are carried along in the implementation of relevant national policies and strategies. Concerning the implementation of the linkage between gender issue and climate change in its priority sectors, the Plan defines specific objectives, action steps and timeline, indicators, responsible institutions and outcomes. Main objectives regarding Agriculture, Forestry and Land Use are: improving agriculture related infrastructure to adapt to the effects of climate change; enhancing local communities' participation in forestry and agricultural sector; encouraging women to acquire education in agriculture and forestry and increasing their access to land; ensuring gender responsive budgeting. Food Security and Health's objectives focus on: integration of gender and climate change in national health policy and programs; ensuring alternative livelihood opportunities for women affected by climate change in urban and rural settings; promotion of gender sensitive health care delivery services related to climate change; improving disease surveillance programs.

Energy sector points out: the need for awareness on the relationship between climate change, energy and gender; the importance of supporting women to gain knowledge in energy technologies; the reduction of emissions of greenhouse gases and the increasing of budget allocation on climate change and gender programs. Waste Management objectives are: integrate climate change and gender in waste management system; promote effective waste management practices in communities; create access to finance women participation in waste management business. Water and Sanitation aims at: building technical capacity of women in water management; increase access to safe drinking water in rural and urban communities; development of gender-based programs for integrated water resources management.

1.6.10 The Penal Code (Northern States) Federal Provisions Act, formerly Cap 89, Laws of Northern Nigeria, 1963 and now CAP 345 LFN 1990.

This Act supplements the Penal Code of the Northern States with respect to offences against the state (treason, sedition, customs offences).

1.7 State Ministry of Environment and Climate Change (Kano State)

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

1.7.1 Kano State Environmental Protection Agency (KASEPPA)

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

1.7.2 Local Government Area

Statutory function of refuse management is domiciled with the Local Government Councils under their primary healthcare departments as contained in Act No 12 of 1989. Local Government Areas being the constitutionally recognized third tier of government in Nigeria which is also to ensure economic planning and development of the communities under their area of influence. The common interest of these communities, traditional association and administrative convenience of the communities is equally administered by the local government councils.

1.8 International Guidelines and Conventions

In addition to the national laws/regulations, Nigeria is signatory or party to several international conventions and treaties that support the use of Environmental studies as the key tool for achieving environmentally sustainable development. This ESIA shall be guided by the international environmental and social regulations from IsDB where applicable. All other relevant international guidelines and conventions, and industry best management practices shall also apply, including the international financing community. The international conventions, to which Nigeria is a signatory, relevant to this project are as follows:

- African Convention on the Conservation of Nature and Natural Resources
- Convention on Biological Diversity - Endangered Species (Control of International Trade and Traffic)
- Conservation of Migratory Species of Wild Animals (1973)
- Convention to Combat Desertification (1994)
- United Nations Framework Convention on Climate Change (UNFCCC) 1992.
- International Union for Conservation of Nature and National Resources (IUCN) Guideline, 1996.
- Public Health Legislations and Regulations.
- The Rio Declaration on Environment and Development
- The Kyoto protocol, Montreal Protocol on Substances that Deplete the Ozone Layer, 1987.
- The African Convention on the Conservation of Nature and Natural Resources, 1968.

- Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) - Human and Peoples' Rights on the Rights of Women in Africa in 2005
- Convention on the Elimination of All Forms of Violence against Women
- ILO Occupational Safety and Health Convention, 1981

1.8.1 IsDB's Environmental and Social Safeguards Policy (ESSP)

The primary objective of the IsDB's ESSP is to achieve environmental and social soundness in IsDB-financed projects by systematically assessing potential positive and adverse impacts across the project lifecycle. ESIA supports informed decision-making through comparison of feasible alternatives and proportional risk management.

The ESSP is triggered by the SAPZ Project because of the following factors:

- *Construction Activities:* Site clearing, earthworks, foundation and substructure works, road construction, processing and storage facilities, cold storage, and utility infrastructure.
- *Operational Activities:* Agro-processing, storage and handling of produce, water and energy consumption, agrochemical use, and logistics activities.
- *Resource Demand:* High water usage for irrigation and processing, energy demand for processing and cold storage, and construction material requirements.
- *Environmental and Social Impacts:* Temporary vegetation loss, soil erosion, dust and noise emissions, wastewater and solid waste generation, community health and safety risks, and potential disruption of local livelihoods.

Application of ESSP ensures these risks are systematically assessed, mitigated, and monitored to support environmentally sustainable and socially inclusive agro-industrial development.

IsDB Environmental and Social Norms (ESN1–ESN10)

ESN1: Assessment and Management of Environmental and Social Risks and Impacts: ESN1 is triggered due to the wide-ranging environmental and social risks associated with land preparation, infrastructure development, agro-processing, and logistics. Key environmental effects include soil disturbance, vegetation loss, dust and noise emissions, wastewater discharge, and waste accumulation. Social risks include labor-community interactions, land-

use changes, and occupational health hazards. *Mitigation measures* include the preparation and implementation of site-specific Environmental and Social Management Plans (ESMPs) for all AIH and ATC sites.

ESN2: Labour and Working Conditions: The engagement of both skilled and unskilled workers in construction and operational phases triggers ESN2. Risks include unsafe working conditions, exposure to agrochemicals, ergonomic stress, long working hours, and potential child or forced labor. *Mitigation* involves adherence to national labor laws, provision of PPE, occupational health and safety (OHS) training, fair employment practices, and establishment of grievance mechanisms.

ESN3: Resource Efficiency and Pollution Prevention: The SAPZ Project involves water abstraction, energy use, agro-processing effluents, solid waste, and transport emissions.

ESN3 is triggered to promote resource efficiency and minimize environmental pollution. *Recommended measures* include water recycling, use of energy-efficient equipment, proper effluent treatment, waste segregation and composting, and cleaner transport practices.

ESN4: Community Health, Safety and Security: Construction, transport, and agro-processing activities increase risks to community safety and health, including traffic accidents, dust and emission exposure, chemical hazards, and occupational interactions with community members. *Mitigation measures* include traffic management, hazard signage, controlled access, community awareness programs, and coordination with local security agencies.

ESN5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement: Substantial land acquisition for AIH and ATCs may affect smallholder farmers, pastoralists, and local communities. ESN5 is triggered to address economic displacement, loss of access to land, and livelihood disruption. *Mitigation measures* include stakeholder consultation, compensation frameworks, livelihood restoration, and resettlement planning.

ESN6: Biodiversity Conservation and Sustainable Management of Living Natural Resources: Land clearing, irrigation, and agrochemical application can affect local habitats

and biodiversity. ESN6 is triggered to ensure sustainable natural resource management. *Measures* include habitat avoidance, buffer zones, integrated pest management (IPM), and rehabilitation of degraded areas.

ESN8: Cultural Heritage: Construction activities may uncover archaeological sites, artifacts, or culturally significant locations. ESN8 is triggered to protect Kano State's tangible cultural assets. Mitigation involves implementing a chance-find procedure, training staff to recognize cultural materials, halting works when discoveries occur, and liaising with heritage authorities.

1.8.2 International Fund for Agricultural Development (IFAD)

Social, Environmental and Climate Assessment Procedures (SECAP)

SECAP is triggered due to the project's scale, multi-site agricultural production, processing facilities, and potential impacts on land, water, biodiversity, and local communities. Environmental risks include soil erosion, water depletion and contamination, agrochemical runoff, waste generation, and biodiversity disturbance. Social risks include labor influx, land use changes, and pressure on local services.

SECAP Scope and ESIA Requirements

The ATC require comprehensive ESIAs to assess environmental, social, and climate risks. ESIA outputs include Environmental and Social Management Plans, mitigation measures for land and water impacts, biodiversity conservation strategies, and stakeholder engagement frameworks.

Resettlement and Livelihood Measures

Land acquisition and potential economic displacement trigger SECAP's resettlement provisions. Measures include fair compensation, replacement land or productive assets, alternative livelihood opportunities, agricultural input provision, and skills training for affected persons.

Stakeholder Engagement and Disclosure

Stakeholder engagement is embedded in SECAP to ensure meaningful participation, information disclosure, and grievance redress. Engagement targets communities, farmers,

women, youth, and vulnerable groups. Methods include community meetings, information boards, digital platforms, and continuous feedback mechanisms.

Climate Risk Integration

Climate screening identifies risks such as temperature rise, irregular rainfall, flooding, and water scarcity. Adaptation measures include climate-resilient crops, efficient irrigation (e.g., drip irrigation), water storage, soil erosion control, and strategic infrastructure siting to avoid flood-prone areas, ensuring the long-term sustainability of the ATC operations.

1.8.3 African Development Bank's Environmental and Social Policies

AfDB is a multilateral development bank and, in keeping with global best practices as other international financial institutions such as the World Bank and the Department of International Development (DFID), it has adopted environmental and social policies, guidelines and procedures to ensure that its operations avoid adverse impacts on people and the environment. Its safeguard policies and processes cover three Global Environmental Facilities (GEF) Minimum Standards namely:

- Environmental and Social Impact Assessment,
- Involuntary Resettlement, and
- Accountability and Grievance Systems.

The Bank has adopted various environmental and social policies and procedures to ensure its projects to meet these minimum standards to prevent, minimize or mitigate any potential adverse impacts on people, communities, and the environment. Such policies have also influenced the preparation of this ESIA.

AFDB Integrated Safeguard Systems (ISS)

The International Safeguard Systems (ISS) of the AfDB was first initiated in the year 2013. It aimed at addressing environmental and social challenges faced by its member countries on their pathway to economic development. Its overall objectives align with the sustainable development goal (SDGs) with focus on environmental and social challenges. The ISS is a framework comprise ten (10) Operational Safeguard (OSs) put in place to aid economic management of borrowing countries, to attain success on intended economic and social projects funded by the AfDB. As such, the ISS is being

emphasized in Environmental and Social Impact Assessment (ESIA) mandated by the AfDB to identify and proffer solutions to anticipated challenges from the execution of intended economic and social projects (African Development Bank Groups, 2023). In summary, projects supported by the Bank shall meet the requirements of all the following E&S OSs, as applicable, Table 1.1:

Table 1.1: Summary of Operational Safeguard Policies

S/N	Environmental and Social Operational Safeguards	Brief Description
1	**OS1** Assessment and Management of Environmental and Social Risks and Impacts	This applies to all project activities as it establishes the importance of the borrower's existing Environmental and Social Framework in addressing the risks and impacts of a project activities.
2	**OS 2:** Labour and Working Condition	This operational standard will ensure borrower's compliance with labour laws and regulations, develop and implement labour management plans and promote fair labour practices and safe working conditions.
3	**OS 3:** Resources Efficiency and Pollution Prevention and Management	This operational safeguards will ensure the promotion of sustainable use of resources, including energy, water and raw materials; this will be achieved with minimized adverse impacts on human health and environment by avoiding or minimize pollution from project activities.
4	**OS 4:** Community Health, Safety and Security	This anticipate and avoid adverse impacts on the health and safety of project affected communities during the project or operational lifecycle from both routine and non-routine circumstances, it also ensures that the safeguarding of personnel and property through the provision of public or private security is carried out in a manner that avoids minimizes risks to the project affected communities and in a manner consistent with international human rights standards and principle.
5	**OS 5:** Land Acquisition Restrictions on Access to Land and Land Use, and Involuntary Resettlement	This set to avoid involuntary resettlement where feasible or minimize resettlement impacts where involuntary resettlement is deemed unavoidable after all alternative project designs have been explored.
6	**OS 6:** Habitat and Biodiversity Conservation, Sustained Management of Living Natural Resources	This is to protect and conserve biodiversity and different habitats, promote sustainable management of living natural resources effectively into sustainable economic development.
7	**OS 7:** Vulnerable Groups	This is to ensure that vulnerable groups and individuals are identified as early as possible within the project area of influence (AoI) and that engagement is meaningful, taking into account individuals and communities specialties.
8	**OS 8:** Cultural Heritage	This operational safeguards is set to protect cultural heritage from adverse impacts of project activities and support its preservation and promote meaningful consultation with stakeholders regarding cultural heritage as a means to identify and address risks and impacts related to cultural heritage
9	**OS 9:** Financial Intermediaries	This set how the financial intermediaries will manage environmental and social risks impact associated with the subproject that it finance

10	**OS 10:** Stakeholder Engagement and Information Disclosure	This is to establish a systematic approach to stakeholder engagement that will help the project identifies stakeholders and build and maintain a constructive relationship and channels of communication with, particularly project affected persons

Gender Policy

The policy is based on the premise that Africa has pronounced, region-specific gender characteristics directly relevant to its economic and social development. It considers the international agenda, which calls for transformation to achieve full and equal partnership between men and women. Gender has become an issue for development intervention. First, inequalities continue to exist between women and men despite significant improvements in the absolute status of women and gender equality in most African countries. The following guiding principles form the basis of the Bank's assistance in the area of gender/women empowerment:

Gender analysis will be integral to all Banks' policies, programs, and projects. Gender analysis will be conducted for all Bank interventions to design interventions that respond to the needs and priorities of both men and women. Experience has shown that women and men differ in the way they respond to and/or benefit from development, and in the absence of specific attention to differences between women and men, planning for "the people" can result in the exclusion of women or men as participants or beneficiaries of planned change.

Attention will be paid to the cooperative relationship between women and men. The concept of gender implicitly embodies a culture that entails cooperation and interdependence between men and women rather than separation. It is oriented toward equitable and sustainable development, with women and men as equal partners in decision-making. Focus on women without taking into account their relations with men can undermine the objective of reducing disparities. Women do not live in isolation, and by addressing them as such, development practitioners must strive to empower both men and women to transform relations between them by taking into account the needs and interests of both genders and ensuring that all benefit equally from development.

Women's economic empowerment will be considered as key to sustainable development. Women in Africa are active in a variety of economic areas. Moreover, they often shoulder

the primary responsibility for the well-being of the family. However, due to legal and customary barriers, women lack access to credit, which impedes their effective economic participation.

Experience has shown that providing credit services to women enhances productivity and promotes efficient lab allocation. In addition, compared to men, women who possess economic means invest more in education and their children's health. Measures will, therefore, be taken to support Regional Member Country (RMC) initiatives that target women entrepreneurs and producers in both formal and informal sectors and which adopt innovative lending policies and practices;

Although women may face some common difficulties due to how a particular society defines gender, other important factors such as class, race, ethnicity, and religion also contribute to their position in society. Thus, activities targeting an undifferentiated category, "women," may provide opportunities to some women and, at the same time, leave other groups disadvantaged. The program and project will take account of the differences between women, and a strategic choice will be based on the use of the mainstreaming strategy/target input.

Targeted projects for women or men and gender mainstreaming are not incompatible responses. The question is one of strategic and operational choice depending on a particular situation. Targeted intervention may be required to address the disadvantages and limitations experienced by women as a consequence of the way the gender concept is conducted in a specific context. Thus, projects should be designed to address gender disparities or target issues affecting women, such as ownership of land, access to credit or legal literacy. Similarly, activities could target the special gender division of labour and male responsibility in reproductive health issues.

This policy codifies the Banks' formal commitment to the gender mainstreaming approach. It seeks to define a more systematic approach to planning development interventions so that they can address the priorities of women as well as men for greater efficiency, effectiveness, and sustainability, unlike the former Women in Development (WID) policy. This policy focuses on gender relations, which shape outcomes for both men and women. With the introduction of the gender analytical framework, the fundamental social nature and gender

differences that result in inequalities between women and men gain greater visibility. The policy adopts the concept of "gender mainstreaming" as a key strategy for overcoming women's exclusion from decision making and access to any control over development resources and benefits.

1.9 ESIA Report Structure

This ESIA Report was presented in a concise format containing all studies, processes, analyses, tests and recommendations for the proposed ATC project. Below is the indicative Table of Contents and description of the contents embedded for the ESIA report:

- **Preliminary Section:**

  This includes the Cover Page, Table of Contents, List of Acronyms and their Definitions, List of Tables, List of Figures, List of Plates and Executive Summary

- **Chapter 1: Introduction:**

  This chapter provides the basic information about the proposed project in Kano State. The sub-headings include but not limited to: Background; Objective of the ESIA; Scope of Work for the ESIA; Legal and Administrative Framework.

- **Chapter 2: Project Justification:**

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

- **Chapter 3: Project and Process Description:**

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

- **Chapter 4: Environmental and Social Baseline Conditions:**

  This presents the Description of the project environmental baseline conditions including but not limited to the climatic elements, soil and geology, vegetation, drainage, water and air quality and socio-economic;

- **Chapter 5: Potential environmental and social impact identification and evaluation:**

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

- **Chapter 6: Environmental and Social Management Plan (ESMP):**

  This chapter presents the ESMP that will be adopted throughout the project life cycle. It also proffers mitigation and ameliorative measures that would be adopted to eliminate or reduce to acceptable levels significant adverse impacts identified.

- **Chapter 7: Decommissioning Plan:**

  This chapter briefly presents the details of decommissioning plan at the end of the project life cycle.

- **Chapter 8:**

  Stakeholder Consultation and Grievance Redress Mechanism

- **Chapter 9: Summary, Conclusion and Recommendations:**

  This is the final chapter and it provides the conclusion and recommendation from the study.

- **References:**

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

- **Appendixes**

CHAPTER TWO

PROJECT JUSTIFICATION

2.1 Need for the Project

Rural poverty in Nigeria is a multifaceted result of intertwined agricultural, infrastructural, financial, institutional, environmental, demographic, and social constraints that perpetuate poverty in areas critical for the nation's food production (*Journal of Agriculture and Crops Research vol.8, 2022).* A 2021 peer-reviewed study published in *Biomed Journal of Science & Technology Research* confirms that Nigeria ranks among the top 20 countries responsible for 80% of global malnutrition. Findings indicate that poverty, regional disparities, and food insecurity lead to a hyper prevalence of malnutrition, with the poorest, rural dwellers, and northern residents disproportionately affected. Survey analyses showed rural children especially in the North experience higher rates of stunting, wasting, and underweight compared to urban areas and southern states.

Rural poverty in Nigeria is perpetuated by the interconnected failures of agricultural systems, financial support, land management, infrastructure, environmental stewardship, human resources, governance, and private investment. Addressing these barriers holistically is crucial for breaking the cycle of poverty and unlocking the full potential of Nigeria's vast rural landscape.

Addressing these challenges requires substantial investment in agricultural infrastructure development and capacity building. This investment will help stabilise economic benefits for farmers, reduce post-harvest losses, create market opportunities, and stimulate economic growth. It also helps providing direct and indirect empowerment and job opportunities. Hence, there is an urgent need for the development of primary processing of agricultural produce through value addition, post-harvest management, and women and youth empowerment. All of these can be realized through the construction of Agricultural Transformation Centers. The proposed ATC is expected to facilitate appropriate post-harvest handling, storage and quality management.

It is based on these that Kano State Government has identified and established the Agricultural Transformation Centre at Bagauda community, Bebeji LGA of Kano State. It is

expected that the ATC will address post-harvest crop losses, increase farmers' productivity and contribute to:

- Creating both direct and indirect employment opportunities for the local population and fostering sustainable inclusive economic growth;
- Increased of incomes, reduce wastages, ensure value addition as well as export earnings.
- Improving the capacity of produces' cooperative through training, especially for targeted women and youth groups;
- Supporting productivity enhancement through the introduction of new technologies and agricultural inputs;
- Improving access to infrastructure by supporting investment;
- Facilitating market linkage through, up-takers, out-growers' schemes;
- Facilitating on-farm value addition by targeting limited value chains and linking farmers to the supply chain.

2.2 Benefits of the Project

It is expected that the ATC will address post- harvest crop losses, increase farmers' productivity and contribute to:

- Creating both direct and indirect employment opportunities for the local population and fostering sustainable inclusive economic growth;
- Increased of incomes, reduce wastages, ensure value addition as well as export earnings.
- Improving the capacity of produces' cooperative through training, especially for targeted women and youth groups;
- Supporting productivity enhancement through the introduction of new technologies and agricultural inputs;
- Improving access to infrastructure by supporting investment;
- Facilitating market linkage through, up-takers, out-growers' schemes;
- Facilitating on-farm value addition by targeting limited value chains and linking farmers to the supply chain.

2.3 Value of the Project

The total estimated cost of proposed SAPZ project is $71,485,864.70 US dollars to be funded Islamic Development Bank (IsDB) in partnership with International Fund for Agricultural Development (IFAD), through a joint venture between Kano State Government, and other private investors. The IsDB is the major financier with 58.62% followed by IFAD 31.8% and Kano State 9.56%.

2.4 Envisaged Sustainability

This section discusses some measures to ensure the sustainability of this project under different components that would contribute to the project achieving its sole purpose without detrimental effects to the environment, people and the finances of the proponent. Sustainable designs, construction and installation of equipment including other ancillary facilities will form the proposed project's bedrock to mitigate environmental impact. The general sustainability principles (technological, technical, economic, environmental and social) that shall guide the project are discussed below.

2.4.1 Technological Sustainability

This project shall be undertaken using the best available technology in construction and building industry (from ground work to the finishing). It shall be executed using modern, locally, and internationally accepted materials to achieve public health, safety, security, and environmental aesthetic requirements that will comply with environmental regulations and urban development laws of Nigeria and Kano State. Equipment and systems that save resources including energy and use of solar systems, and water conservation are considered for this project without compromising on cost or availability factors. These technologies are rooted in BATNEEC (Best Available Technology Not Entailing Excessive Costs), considering both the initial capital and overtime cost savings.

Asphalt mixers, crushers, and other construction equipment and machinery considered for this project are those incorporated with pollution control devices like dust arrestors/ precipitators, emission control, noise abatement devices, and desulfurization devices. The equipment and vehicles with the highest levels of combustion efficiency, capacity to use cleaner fuels like bio-diesel, and enhanced safety features will be considered for this proposed project.

2.4.2 Technical Sustainability

Kano State Government has set up a highly technical multi-disciplinary project team which includes architects, town planners, geologist, soil scientist, civil engineers, electrical engineers, structural and mechanical engineers, to prepare the engineering design of the development, which shall give rise to building construction, plumbing, electrical installations, roofing and painting, in an environmentally friendly manner.

Equipment and machinery put in place by the proponent for this project are those whose operation will not have adverse effects on the environment in terms of noxious gases emission, noise, and vibration. Installation of any equipment will be undertaken with a firm understanding of the implications of its impact on process mass balance, electrical capacity, and other process services. The operation of the equipment will comply with instruction manuals and safety data sheet that will be submitted by the manufacturers of the equipment. The project activities will be done in such a way that health, safety and environment will be respected.

2.4.3 Economic Sustainability

The economic sustainability of the proposed project is anchored in its potential to significantly enhance the agricultural and economic landscape of Kano State and Nigeria as a whole.

Key areas of focus for ensuring the project's economic sustainability include:

- **Job Creation and Income Generation:** The project is expected to create hundreds of jobs, both skilled and unskilled, during the construction and operational phases. By employing local labour and engaging local partners, the project will stimulate economic activity in the surrounding communities, leading to increased household incomes and improved living standards.
- **Market Expansion and Profit Maximisation:** With the high demand for agricultural products like cassava, maize, rice, and tomatoes, as well as processed cereals for livestock feeds, the ATC project will tap into these lucrative markets to maximise profits through the production and processing of these high-demand products, ensuring a steady return on investment and sustaining the project economically

- **Value Addition and Industrial Growth:** By integrating advanced agro-processing technologies and best industrial practices, the project will add significant value to raw agricultural products. This value addition will not only increase the profitability of local farmers but also contribute to the industrial growth of Kano State, positioning it as a key player in Nigeria's agricultural economy thereby ensuring economic sustainability of the proposed project.
- **Support for Local Businesses and Education:** The project will support the development of local businesses and vocational education programmes, ensuring that the local workforce is equipped with the necessary skills to sustain and grow the agro-industrial sector. This investment in human capital will have long-term economic benefits, fostering entrepreneurship and innovation within the state.

2.4.4 Environmental Sustainability

This project would have some potential negative impacts on the environment. It is the policy of the project proponent to conduct ESIAs for her projects by national laws. This ESIA will identify all potential impacts associated with the proposed project and proffer appropriate mitigation/ameliorative measures that will ensure that all the impacts are minimized or completely avoided. However, incorporating the findings and recommendations of this ESIA, and implementing an effective Environmental and Social Management Plan, at the planning, design, construction, operation, and abandonment/decommissioning stages of the proposed project, will ensure its environmental sustainability.

2.4.5 Social Sustainability

In light of the proponent's ongoing talks with the host community and other stakeholders, a cordial connection with the people will be strengthened and maintained. The project's proponent and the host community are both enthusiastic about the project. Consultations with the host community throughout the planning stage revealed that they are pleased with the project and eager to support its full implementation.

The project will attract a lot of improvements in the social wellbeing of the project host community. Some category of jobs including some sub-contracting services shall be employed from the community, resulting in financial upliftment and reduction in the

number of unemployed indigenes and Nigerians. Kano State holds a comparative advantage in terms of availability of labour. The project is expected to result in a better standard of living of the project host community with better access to education and health facilities through provision of such facilities in the centre and increased financial capacity, reduced crime rate and social vices through profitable engagement of the local population, continuous stakeholders' engagements and consultations, improvement in mental health caused by socio-economic related depressions, capacity building through training and empowerment programmes, establishment of a grievance mechanism, security surveillance of the centre particularly from acts of terrorism due to the security challenge of the proposed project state.

2.5 Project Alternatives and Options

2.5.1 Project Alternatives

Alternative Location:

The selection of locations for the Agro Industrial Hub (AIH) in Bagauda, was a critical decision influenced by various factors such as the availability of natural resources or favourable environmental conditions (Glasson and Therivel, 2019). Similarly, the AIH location was chosen based on both economic and logistical criteria, including the availability of infrastructure, proximity to raw material sources, and access to markets.

Beyond these practical considerations, the project also prioritized avoiding environmentally sensitive areas, ensuring that the chosen locations would not only support the project's goals but also adhere to sustainable environmental practices. After thorough evaluations, Bagauda of Bebeji LGA was identified as one of the optimal sites for the AIH.

Further details on the selection criteria are provided below:

- Agricultural Land: Bagauda is a highly productive agricultural area, ensuring a reliable supply of raw materials for the AIH, with competitive logistics and cost-effectiveness.
- Logistics and Connectivity: Bagauda is well-connected by good road networks. This connectivity minimises transportation costs and ensures the efficient movement of goods, which is vital for the seamless operation of the AIH.
- Legal and Feasibility Considerations: Strategically chosen within Kano State, the site at Bagauda belongs to Kano State Government. This has helped to avoid potential legal complications associated with cross-regional procurement. This foresight ensures smooth operations and long-term sustainability, addressing any legal challenges that could arise from other jurisdictions.

2.5.2 Project Options

No project option

The “no-project option” implies that the construction of the proposed AIH project will not be achieved. This option is considered if there is economic, technical or human capacity deficiencies or that the proponents are unwilling to commence the project or that the regulatory authorities are unwilling to approve the project; thus leading to a “no project option”. This option will translate to non-beneficiary by the people and government of Kano State in particular and the nation as a whole. This will also mean that the envisaged positive socio-economic impact on the people and government of Kano State and the nation will not be achieved. This option was rejected because it is not viable. Also associated with this option are; loss of resources already committed to the project, depriving employment opportunities that can be accrued from the project. This is not good for socio-economy, population growth, poverty alleviation, health, expansion and development of the nation. This option was not considered, therefore, the need for the project.

Delayed project option

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

CHAPTER THREE

PROJECT DESCRIPTION

3.1 Introduction

This chapter provides a detailed description of the proposed Agro Industrial Hub (AIH), focusing on the design and implementation in Bagauda, Bebeji LGA, Kano State. It outlines the project components and project location descriptions, as well as the various project phases: pre-construction, construction, operation and maintenance, and decommissioning. Each phase includes descriptions of the specific activities involved, enabling a clear understanding of the project's scope and extent, as well as all potential sources of biophysical and socio-economic impacts. Additionally, this chapter presents the waste management strategy, detailing the various waste streams, types, and management strategies. A project schedule is also provided to offer a timeline for the implementation and completion of the project.

3.2 The Project

The SAPZ will be made up of two building blocks which include the Agricultural Transformation Centre (ATC) which is a community-based rural institution within the host community, supported with provision of quality production drivers for the production of feedstock and the Aggregation Centre (AC) for primary storage, and the Agro-Industrial Hub (AIH) that will be equipped with desirable infrastructure to create modern agro-processing environment where secondary value addition will take place. The Agro-Industrial Processing hub (AIH) will draw its processing feedstock from the ATC where activities of the production clusters and Aggregation Centres are being coordinated.

The key design features of the program are the following:

- Support economic and social development programs of the Federal Government of Nigeria (FGN) and Kano State;
- Contribute to rural infrastructure development;
- Improve access to agricultural markets;
- Increase agricultural production and productivity;
- Stimulate the adoption of agricultural technology;

- Facilitate climate smart agricultural production and processing practices;
- Increase value addition and agro-processing; and
- Increase skills acquisition and job creation for all actors along the value chain, including the smallholder farmers, women and youth.

Plate 3.1 showing project site location and its surroundings while figure 3.1 presents the satellite imagery of the project site. The project site belongs to Kano State Government. Hence, no new land acquisition is required and issue of compensation and resettlement is redundant.





Proposed project site location with scattered trees and shrubs



Heaps of sand along the road corridor



untarred access road under renovation





Dam area





Nigerian Law School, Bagauda





Entrance gate, Nigerian Law School Bagauda



Kano Fisheries Institute, Bagauda

Plate 3.1: Proposed Bagauda AIH Project site and its surroundings

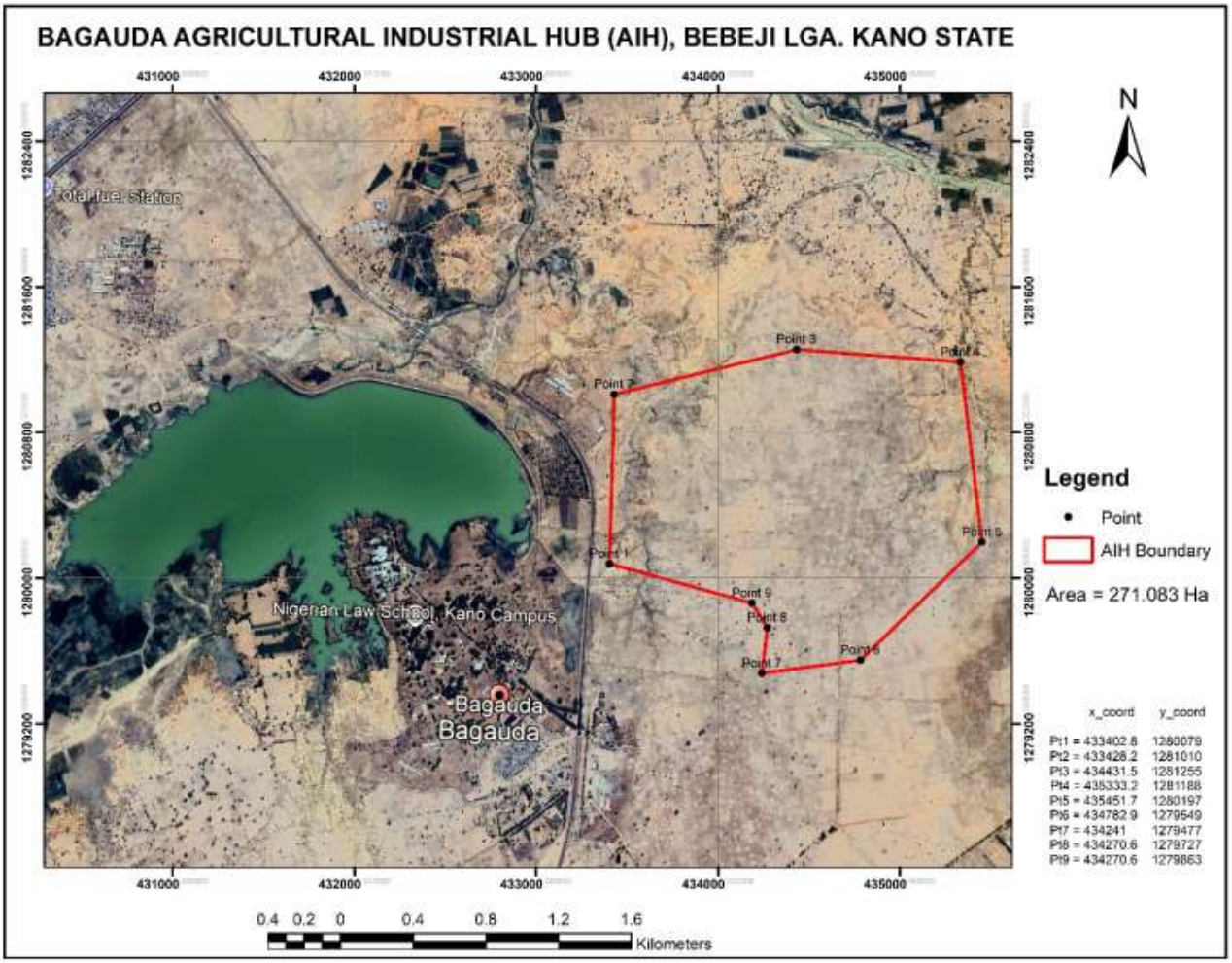


Figure 3.1: Satellite imagery of Bagauda project site

3.3 Project Components

Table 3.1 shows the SAPZ project categories which are a multi-sector intervention covering the various project components:

Table 3.1: Project Categories of SAPZ and Planned Activities

S/N	Building Blocks	SAPZ Categories	Activities
1.	Agricultural Transformation Centre	Rice Production	- Support farmers for the production of rice that will serve as rice flour, instant porridges, noodles, and other fortified products.
		Groundnut production	- Support farmers for the production plants of groundnut products such as groundnut oil, peanut butter, roasted peanuts, and groundnut cake for animal feed.
		Tomato production	- Support farmers for the production of tomatoes that will serve as paste, puree, juice, ketchup, and dried tomatoes.
		Sesame production	- Support farmers for value-added products like sesame oil, sesame paste, roasted sesame seeds, and sesame cake for animal feed.
2.	Aggregation Centre (AC)	Crop Storage Zone	- Warehouse for the storage of crops and silos for gram storage.
3.	Agro-Industrial Hub (AIH)	- Rice processing - Groundnut processing - Tomato processing - Sesame processing	- Construction of plant processing and storage facilities (cold rooms). - Processing of groundnut, tomato, sesame oil and other derivatives. - Construction of boreholes for water supply - Construction of wastewater treatment plants
		Infrastructure development	- Access roads - Storage facilities - Offices - Agro-input shops - Stores (feed, materials and equipment), etc - Buildings including vocational training centre, school, clinic - Truck parking area/car park - Solar farm

3.4 Project Phases and Activities

This section describes the activities associated with implementing the AIH project. These activities are divided into four broad categories, including:

1. Pre-construction Phase
2. Construction Phase
3. Operation and Maintenance Phase
4. Decommissioning Phase

3.4.1 Pre-construction Phase

This phase involves identifying and acquiring suitable land for the AIH. Detailed ESIA was conducted, and necessary permits are secured. Site preparation includes clearing vegetation, grading, and setting up drainage systems.

Major activities during this phase include:

1. **Feasibility Studies, Engineering Design:** The project begins with comprehensive feasibility studies to assess viability. This includes market analysis to identify demand for processed agricultural products, technical feasibility to evaluate infrastructure and equipment needs, financial feasibility to estimate costs and returns, and environmental and social feasibility to address potential impacts and stakeholder engagement
2. **ESIA Study**: Conduct thorough assessments to evaluate potential environmental and social impacts of the project, identify mitigation measures, and engage with stakeholders to ensure community acceptance.
3. **Site Clearing and Preparation:** Clear vegetation, grade the land, and prepare the site for construction activities while ensuring minimal environmental disruption.
4. **Site Yard Setup:** Install essential utilities such as temporary power, water supply, and sanitation facilities to support construction activities. Set up temporary camps for construction workers, ensuring they have adequate living conditions and access to necessary services.
5. **Material Procurement and Transportation:** Arranging for the procurement and transportation of construction materials, machinery, and equipment to the site,

ensuring minimal environmental impact.

6. **Access Road Development:** Constructing or upgrading access roads to facilitate the movement of materials and personnel to and from the site.

3.4.2 Construction Phase

This phase involves the physical development of the infrastructure required for the proposed AIH (Agro Industrial Hub). Major activities during this phase include:

1. **Foundation Works**: Laying the foundation for buildings and structures within the AIH, following the approved designs and engineering specifications.
2. **Building Construction:** Constructing the various facilities as per the plans, including office buildings, warehouses, pre-processing units within the AIH, and other required structures.
3. **Infrastructure Development:** Building the necessary infrastructure within the centre, such as roads, drainage systems, water supply networks, sewage systems, and power supply, to ensure proper functionality.
4. **Landscaping:** Building outdoor spaces to enhance their aesthetic appeal, functionality, and environmental sustainability. It includes activities such as planting trees, shrubs, and flowers; creating pathways; and constructing drainage channels.
5. **Equipment Installation:** Installing the specialised processing equipment and machinery within the AIH based on the designated functionalities for each zone (e.g., sorting and grading equipment, washing stations, storage facilities).

   This phase will also include: excavating and burrowing, land filing and compacting, culverts and drains constructing, bituminous road construction, fencing, pavements and surfacing works, clean up and waste management, QA/QC inspections and tests, etc

3.4.3 Operation and Maintenance Phase

Once construction is complete, the focus shifts to the ongoing management and maintenance of the facilities. Activities during the phase include:

1. Commissioning and testing of facilities and equipment.
2. Facilitating connections between processors and local farmers, and ensuring a steady supply of raw materials.
3. Business model planning
4. Workforce recruitments
5. Operating and maintaining the project infrastructure and facilities.
6. Managing daily operations (e.g., production processes, service delivery).
7. Implementing environmental monitoring and management plans.
8. Continuous engagement with local communities and stakeholders.
9. Conducting routine maintenance and repairs.
10. Managing operational waste and emissions.
11. Monitoring and ensuring compliance with regulatory requirements.

3.4.4 Decommissioning Phase

Following a period of successful operation, a decommissioning plan will be developed and implemented to ensure the safe, responsible dismantling of facilities and restoration of the site. This plan will consider environmental and social factors throughout the process to manage the impacts of the project. Activities to be carried out during the decommissioning phase include planning for the decommissioning activities, site preparation and mobilisation, destruction and removal of facility buildings, staff compensation and site restoration activities.

3.5 Surface Water (Bagauda Dam)

The Bagauda Dam is proposed to be harness for the proposed Agricultural Industrial Hub (AIH) Project. It is intended that the AIH will utilize the water supply for irrigation and agro-processing activities, including rice, tomato, groundnut, and sesame production and processing. The project will be designed to optimise the existing water infrastructure, reduce flood risks, improve dam safety, and support value-chain development while ensuring that environmental and social impacts are properly managed.

The Bagauda Dam is a strategic water infrastructure located in Bebeji LGA of Kano State and has historically supported irrigation, agricultural production, and flood regulation for Bebeji and neighboring communities (Plate 3.2-3.3). Over time, the operational efficiency of the dam has declined due to reservoir sedimentation, aging hydraulic and control structures, limited flow regulation capacity, and increased exposure to extreme rainfall events associated with climate variability.

These constraints have resulted in reduced effective storage capacity, unreliable dry-season water supply, and an increased risk of uncontrolled spill events and downstream flooding. At the same time, agricultural expansion, agro-processing activities, and population growth within Bebeji LGA have intensified the demand for reliable, well-managed water resources.

To address these challenges, the Bagauda Dam need to be rehabilitated to optimize its use through controlled water abstraction and conveyance to the proposed Agricultural Industrial Hub (AIH) located approximately 2km from the Dam. The intervention will enhance agricultural productivity, support agro-processing, improve water-use efficiency, and strengthen livelihoods while ensuring environmental sustainability and compliance with the Federal Ministry of Environment (FMEnv) requirements.

The proposed project will involve the rehabilitation of Bagauda Dam and the development of a controlled water supply system to support the Agricultural Industrial Hub (AIH). The AIH is conceived as an integrated hub for agricultural production, value addition, technology transfer, research, and extension services.

Water diverted from Bagauda Dam will be used to support irrigated agriculture and agro-processing operations at the AIH, with strict controls to maintain downstream environmental flows and protect existing water users.

Planned uses of water under the AIH include:

i. Irrigation of approximately 271 hectares of farmland.
ii. Tomato washing and processing.
iii. Rice farming and processing.
iv. Groundnut processing
v. Sesame seed processing.

Project Components

The proposed rehabilitation and AIH development will comprise the following components:

a. Bagauda Dam Rehabilitation

- Structural rehabilitation of the dam embankment and spillway.
- Repair or replacement of outlet works and flow control gates.
- Installation of flow monitoring and measurement systems.
- Safety improvements to enhance operational resilience.

b. Reservoir Dredging and Sediment Management

- Removal of accumulated sediments to restore reservoir capacity.
- Improvement of flood attenuation and dry-season water availability.
- Environmentally responsible management of dredged materials.

c. Water Diversion and Conveyance System

- Construction of a controlled intake structure at the dam.
- Development of a 2 km water conveyance route
- Use of a hybrid system combining lined canals and pipelines.
- Installation of valves, control chambers, and access structures.

d. Agricultural Industrial Hub (AIH) Infrastructure

- Irrigated farmland covering 271 hectares.
- Agro-processing facilities for tomato, rice, groundnut, and sesame.
- Water treatment and storage facilities for processing operations.
- Demonstration plots for modern irrigation and crop technologies.
- Farmer training, extension, and applied research facilities.

e. Drainage and Flood Management Systems

- Agricultural drainage systems to prevent waterlogging.
- Stormwater drainage for processing and built-up areas.
- Measures to safely manage runoff during heavy rainfall events.



Plate 3.2: Bagauda Dam



Plate 3.3: Bagauda Dam area and its surrounding

3.6 Waste Management

On this project, it is envisaged that different types of wastes shall be generated across the various stages of the project lifecycle. Some of these are detailed below:

- Organic wastes like stems, leaves, husks, straws, peels, seeds, and roots shall be generated in the operational life of this project. Though non-hazardous, these wastes shall be converted to other by-products like animal feeds and sold within the centre.
- Liquid wastes like effluent produced from cleaning, washing, and processing operations, containing organic matter, nutrients, pesticides, and other contaminants shall be generated in the operational phase of this project. To address this, effluent treatment will be done through a series of anaerobic and aerobic treatment processes in line with the National Effluent Limitation Regulation, S.1.8 of 1991 (No. 42, Vol. 78, August,1991). The treated effluent will meet the standard to be supplied back to the rice mills for boiler feed and for washing in other units.

  Furthermore, a sewage collection and treatments system consisting of an underground sewerage network shall be constructed to collect sewage from each plot and convey it to a sewage treatment plant (STP). There it will be treated to acceptable standards and recycled for irrigation purposes.

3.7 Sources of Power

On this project, it is estimated that the aggregate power demand of the AIH shall be about 33KVA for both industrial and domestic use. The centre shall install high grade transformers that will be capable of generating 33KVA of electricity or more. Also, solar street lighting shall be used for outdoor illumination to augment the electricity needs.

3.8 Project Schedule

The IsDB ATC/SAPZ- intervention has a completion period of three (3) years and within this period, the ATC is expected to be completed between the third quarter of 2027 and the fourth quarter of 2027. Table 3.2 below represents the project implementation schedule for the ATC centre in Bagauda community.

Table 3.2: Proposed Project Schedule

S/N	Activities	Q3 2025	Q4 2025	Q1 2026	Q2 2026	Q3 2026	Q4 2026	Q1 2027	Q2 2027	Q3 2027	Q4 2027	Q1 2028	Q2 2028	Q3 2028	Q4 2028
1.	Feasibility studies														
2.	ESIA														
3.	Financial Closure														
4.	Engineering & Construction														
5.	Interconnection & commissioning														
6.	Start operation														

3.9 Bagwai ATC Project Location

The ATC provide centralized processing, storage and packaging services thereby, acting as a bridge between smallholder farmers and larger market. The proposed ATC will be equipped with modern machinery to facilitate the processing of a wide range of crops such as rice, sorghum, onion, tomatoes, beans and maize into value-added products that command higher prices in both domestic and export markets. The rationale behind the proposed ATC in Bagwai LGA comes from the fact that the LGA has a vast potential for agricultural production, particularly the host community of Kiyawa where maize, sorghum, beans, rice, tomatoes and onion show a positive marketable surplus.

The Kano State Agricultural and Rural Development Authority (KNARDA) was established to support and improve agricultural production, food security, and rural livelihoods. It is saddled with the responsibility to collaborates closely with farmers, rural communities, and other parties to provide technical help, resources, and training to enhance agricultural practices and boost agricultural production. It services also provides extension services, and promotes modern farming techniques to enhance productivity in rural communities. At the time of the study, the KNARDA extension office which was proposed for the ATC Project has been abandoned for about 20yrs with no physical activities on site. The facility is over grown with weeds and old dilapidated structures and collapsed building. Some of the buildings are without roof mostly vacant except the Project Manager's office with little or no activities. The structures are old comprises of staff quarters (junior/senior), workshop, store, admin office and a laboratory. Most of the buildings are currently unused and some

are collapsed. Plate 3.2: depicted the project area facility while Figure 3.2 presents the satellite imagery showing the project location.



Figure 3.2: Satellite imagery of the proposed ATC in Bagwai LGA and its surrounding


Administrative block


Senior staff quarters


Abandoned vehicles and structure


Abandoned machinery


Junior staff quarters


old structure


Collapsed structure


Abandoned structure

Plate 3.2: Dilapidated and collapsed structures at the proposed KNARDA ATC Project Site

3.9.1 Project Components

The proposed Bagwai-ATC is designed to encompass a diverse array of facilities and services. The designed is to optimise agricultural processing and logistics within a total area of 20.18 hectares. Table 3.2 summarises the land use plan for the allocation of space across various key zones, including pre-processing facilities, specialised infrastructure, amenities, and centralised utilities. The largest portion (30%) is dedicated to the pre-processing area, which handles various agricultural products. The Demo Farm & Agri-Logistics zone utilises a significant area (20%) for research, education, and support services. Amenities and a Centre of Excellence with specialised infrastructure occupy a smaller portion but cater to essential needs and support activities. Finally, centralised infrastructure like utilities and roads account for the remaining area. Strategically organising these components will enhance the efficient handling of agricultural products, foster innovation, and promote operational effectiveness within the broader agricultural landscape.

Table 3.2: Summary of Land Use Plan for the proposed ATC

S/N	Area	Description	Percentage (%)
1.	**Agricultural Transformation Centre (ATC)**	**14.25 hectares**	**(75)**
		Pre-processing Area • Livestock Zone • Quarantine Advisory Cell • Inspection Area • Receiving Area • Livestock Pens, Feed Area & Weighing Area • Loading & Unloading, Circulation Space & Truck Parking	30
		Fruits, Vegetables & Tubers Zone • Receiving Warehouse • Grading & Sorting Shed • Washing & Drying • Controlled Atmospheric Storage • Loading & Unloading, Circulation Space & Truck Parking	6
		Cereals, Pulses & Oilseeds Zone • Receiving Warehouse • Grading & Sorting Shed • Washing & Drying • Bulk Storage	9

		• Loading & Unloading, Circulation Space & Truck Parking	
		Centre of Excellence & Specialised Infrastructure	5
		Amenities	5
		Demo Farm & Agri Logistics	20
2	**Centralised Infrastructure Zone**	**4.75 hectares**	**(25)**
		Utilities	10
		Roads	15
	Grand Total	**20.18 hectares**	**100**

Source: *Fahamu Field work, 2025*

The ATC will serve as collection and distribution points for agricultural products; thus, pivotal in linking local farmers with the processing units within the SAPZ AIH. The provision of the following infrastructure network as follows is required for the smooth operation of the ATC.

- **Administrative Block:** Offices for management and administration.
- **Storage Facilities:** Includes warehouses and cold storage to preserve produce.
- **Drying Yard:** For drying grains and other produce before storage or sale.
- **Auction Centre:** Venue for selling agricultural products.
- **Mechanised Agricultural Equipment:** For leasing or renting to farmers.
- **Fertilizer and Pesticide Storage:** Safe storage for agricultural inputs.
- **Soil Testing Facilities:** To analyse soil health and fertility.
- **Demonstration Farms:** Showcasing modern farming techniques and practices.
- **Centre of Excellence (CoE):** Hub for technology dissemination and capacity building.
- **Quality Control Lab:** Ensures the quality of incoming and outgoing produce.
- **Agri-Clinic:** Provides healthcare services for crops.
- **Certification Lab:** Certifies the quality and standards of agricultural products.
- **Training Centre:** Offers training programs for farmers and staff.

- **Health Centre:** Provides medical services to farmers and staff.
- **Nursing Mother Area and Crèche:** Supports working mothers.
- **Restrooms:** Basic sanitary facilities.
- **Women Self-Help Groups:** Empowerment and support groups for women.
- **Bank & ATM:** Financial services for farmers and staff.
- **Microfinance:** Providing financial support to small farmers.
- **Rural BPO:** Business process outsourcing services to support agribusinesses.
- **Food Court:** Catering services for workers and visitors.

3.9.2 Surface Water (Watari Dam)

Water is a vital input needed for the successful completion of the construction phase of this project as well as the smooth running of its operations. The project shall source for water for its construction and operations phases from surface water. After careful study of the project area, Watari Dam is the closest surface water to the proposed ATC project location approximately 2.5km (Plate 3.2). The Watari Dam is a strategic water infrastructure serving irrigation, domestic use, and flood regulation functions. Over time, the dam has experienced progressive sedimentation, ageing hydraulic structures, reduced storage capacity, and increased vulnerability to extreme rainfall events. These challenges have limited its ability to meet current and projected water demands and have heightened flood risks for downstream communities. Based on our study, the ATC project will therefore propose a comprehensive rehabilitation of the Watari Dam, including embankment stabilization, spillway and outlet works repairs, installation of modern flow control and monitoring devices, and reservoir dredging to recover an estimated 10–20 per cent loss in effective storage capacity.

The component of the project is the controlled diversion of water over an approximate distance of 2.5km from Watari Dam to the proposed ATC (Figure 3.1). The ATC is designed as a multi-functional agricultural hub, comprising 20.18 hectares of irrigated farmland, agro-processing facilities, research and demonstration plots, and farmer extension services. Water diverted from the dam will support irrigated production of tomato as well as

tomato washing and processing. Estimated annual irrigation water demand for the ATC farmland will be approximately 140,000–180,000 cubic meters, while agro-processing activities are projected to require 20–30 cubic meters per day during peak periods.

Two water conveyance options were evaluated. The first involves open canal or spillway-based diversion, which offers lower capital costs but is associated with higher evaporation losses and water quality risks. The second involves pipeline conveyance using HDPE or steel pipes, which minimizes losses, protects water quality, and is better, suited for agro-processing, though at a higher capital cost. Estimated costs range from ₦92.4–184.8 million for a 2.5km open canal system and ₦246.4–492.8 million for a 2.5km pipeline system. A hybrid approach, combining pipelines for processing water and lined canals for irrigation, is recommended to balance cost, efficiency, and operational reliability.

Given the dual use of water for irrigation and food processing, the project includes provisions for water treatment infrastructure, comprising sedimentation tanks, filtration units, and disinfection systems. This ensures that water used for processing meets basic hygiene and environmental standards, while irrigation water is supplied efficiently with minimal treatment requirements.

The project also addresses the impacts of heavy rainfall and flood risk, which have become more pronounced due to climate variability in Kano State. Reservoir dredging, spillway rehabilitation, and improved outlet control will enhance the dam's flood buffering capacity, reduce the frequency and severity of downstream flooding, and improve dry-season water availability. Complementary drainage systems will be developed within the ATC and surrounding farmlands, including surface drains, selective subsurface drainage, and engineered drainage for processing areas, to prevent waterlogging, soil salinity, and infrastructure damage.

From a socio-economic perspective, the project is expected to deliver significant benefits. These include increased crop yields, higher cropping intensity, reduced post-harvest losses, and job creation across farming, processing, and logistics, improved food security, and enhanced resilience of rural livelihoods. The ATC will function as a research and extension platform, facilitating the transfer of modern irrigation technologies, improved crop varieties, and best agricultural practices to farmers in Bagwai and surrounding communities.

Environmentally, the project promotes sustainable water resource management, controlled abstraction, maintenance of environmental flows, and reduced flood risks.

Potential adverse impacts are largely temporary and manageable, mainly associated with construction activities such as noise, dust, and localized disturbance. These will be mitigated through a comprehensive Environmental Management and Monitoring Plan, covering construction and operational phases, in compliance with FMEnv regulations.

In conclusion, the rehabilitation of Watari Dam and the development of a controlled water diversion system to the proposed Agricultural Transformation Centre represent a technically feasible, environmentally sustainable, and socially beneficial intervention. With proper implementation of mitigation measures, monitoring, and stakeholder engagement, the project will transform Watari Dam into a modern, multi-purpose water resource asset that supports agricultural innovation, value addition, flood control, and long-term community development in Kano State.



Plate 3.1: Watari Dam



Figure 3.2 Satellite view of Watari/Bagwai Dam

3.9.3 Sources of Inputs

The inputs required for the various phases of this project can be classified into manpower, materials and machinery. In all cases, inputs for the implementation of this project shall first be sourced locally in line with the Nigerian Local Content Act 2010. Where these inputs cannot be sourced from the community, the state, or the Nation (Nigeria) then they shall be sourced for internationally. Agricultural inputs that shall serve as raw materials for the ATC centre (including rice, maize, millet and many more) shall be sourced from neighboring farming communities like the Bagwai community, Shenga, Nigaski Rice and Maize Cluster.

3.9.4 Sources of Power

On this project, it is estimated that the aggregate power demand of the ATC shall be about 33KVA for both industrial and domestic use. The centre shall install high grade transformers that will be capable of generating 33KVA of electricity or more. Also, solar street lighting shall be used for outdoor illumination to augment the electricity needs.

3.10 Kakara, Gezawa ATC and Project Location

The proposed Agricultural Transformation Centre (ATC) in Gezawa Local Government Area (LGA), Kano State, will provide centralized processing, storage, and packaging services. It will serve as a vital bridge between smallholder farmers and larger markets, equipped with modern machinery to process diverse crops including guinea corn, sorghum, millet, white beans, maize, and sesame into high-value products for domestic and export markets. The proposed Kakara ATC site will focus on Sesame Processing and Storage.

The 16.12ha project site is located within the old Agricultural Development Programme (ADP) facility in Kakara community, Gezawa LGA. Established in the 1980s as one of Kano State's first ADPs, the facility originally provided technical support, resources, training, extension services, and modern farming techniques to boost productivity in rural communities.

Current site Conditions

The site has been abandoned for over two decades and is now overgrown with grasses, weeds, trees, and shrubs. It features dilapidated structures, including workshops, a filling station, warehouses, and abandoned machinery. There are no activities at the site. A single store holds agricultural inputs such as fertilizers, herbicides, pesticides, and insecticides, while security personnel guard the entrance gate to deter theft following past incidents of fertilizer pilferage. (see Plate 3.3 for site photos and Figure 3.3 for satellite imagery).

The site's expansive, accessible land surrounded by emerging industrial activities offers ideal conditions for infrastructure development, logistics, and mechanized farming support. Revitalizing this location will leverage its historical agricultural role while integrating it into modern value-chain initiatives.



Figure 3.3: Satellite imagery of the proposed ATC in Gezawa and its surrounding






Dilapidated structures at the proposed Kakara ATC Project site




Collapsed structures at the proposed Kakara ATC Project site




Farming activities at the proposed project site




ADP Warehouse at the project site

old generator house




Abandoned customized trolley for carrying loads





Access road within the facility site

Transmission line running over the project site

Plate 3.3: Facilities within the project site

3.10.1 Project Components

The proposed Kakara-ATC is designed to encompass a diverse array of facilities and services. The designed is to optimise agricultural processing and logistics within a total area of 16.12 hectares. Table 3.3 summarises the land use plan for the allocation of space across various key zones, including pre-processing facilities, specialised infrastructure, amenities, and centralised utilities. The largest portion (30%) is dedicated to the pre-processing area, which handles various agricultural products. The Demo Farm & Agri-Logistics zone utilises a significant area (20%) for research, education, and support services. Amenities and a Centre of Excellence with specialised infrastructure occupy a smaller portion but cater to essential needs and support activities. Finally, centralised infrastructure like utilities and roads account for the remaining area. Strategically organising these components will enhance the efficient handling of agricultural products, foster innovation, and promote operational effectiveness within the broader agricultural landscape.

Table 3.3: Summary of Land Use Plan for the proposed ATC

S/N	Area	Description	Percentage (%)
1.	**Agricultural Transformation Centre (ATC)**	**14.25 hectares**	**(75)**
		Pre-processing Area • Livestock Zone • Quarantine Advisory Cell • Inspection Area • Receiving Area • Livestock Pens, Feed Area & Weighing Area • Loading & Unloading, Circulation Space & Truck Parking	30
		Fruits, Vegetables & Tubers Zone • Receiving Warehouse • Grading & Sorting Shed • Washing & Drying • Controlled Atmospheric Storage • Loading & Unloading, Circulation Space & Truck Parking	6
		Cereals, Pulses & Oilseeds Zone • Receiving Warehouse • Grading & Sorting Shed • Washing & Drying • Bulk Storage • Loading & Unloading, Circulation	9

		Space & Truck Parking	
		Centre of Excellence & Specialised Infrastructure	5
		Amenities	5
		Demo Farm & Agri Logistics	20
2	**Centralised Infrastructure Zone**	**4.75 hectares**	**(25)**
		Utilities	10
		Roads	15
	Grand Total	**16.12 hectares**	**100**

Source: *Fahamu Field work, 2025*

The ATC will serve as collection and distribution points for agricultural products; thus, pivotal in linking local farmers with the processing units within the SAPZ AIH. The provision of the following infrastructure network as follows is required for the smooth operation of the ATC.

- **Administrative Block:** Offices for management and administration.
- **Storage Facilities:** Includes warehouses and cold storage to preserve produce.
- **Drying Yard:** For drying grains and other produce before storage or sale.
- **Auction Centre:** Venue for selling agricultural products.
- **Mechanised Agricultural Equipment:** For leasing or renting to farmers.
- **Fertilizer and Pesticide Storage:** Safe storage for agricultural inputs.
- **Soil Testing Facilities:** To analyse soil health and fertility.
- **Demonstration Farms:** Showcasing modern farming techniques and practices.
- **Centre of Excellence (CoE):** Hub for technology dissemination and capacity building.
- **Quality Control Lab:** Ensures the quality of incoming and outgoing produce.
- **Agri-Clinic:** Provides healthcare services for crops.
- **Certification Lab:** Certifies the quality and standards of agricultural products.
- **Training Centre:** Offers training programs for farmers and staff.
- **Health Centre:** Provides medical services to farmers and staff.

- **Nursing Mother Area and Crèche:** Supports working mothers.
- **Restrooms:** Basic sanitary facilities.
- **Women Self-Help Groups:** Empowerment and support groups for women.
- **Bank & ATM:** Financial services for farmers and staff.
- **Microfinance:** Providing financial support to small farmers.
- **Rural BPO:** Business process outsourcing services to support agribusinesses.
- **Food Court:** Catering services for workers and visitors.

3.11 Kura ATC and Project Location

The ATC provide centralized processing, storage and packaging services thereby, acting as a bridge between smallholder farmers and larger market. The proposed ATC will be equipped with modern machinery to facilitate the processing of a wide range of crops such rice into value-added products that command higher prices in both domestic and export markets. The rationale behind the proposed ATC in Kura LGA comes from the fact that the LGA has a vast potential for agricultural production, particularly the host community of Kura where rice show a positive marketable surplus. Agriculture is the primary economic driver in Kura, with significant production of staple crops like rice (which is basically planned to be processed in the ATC). Plate 3.4 shows photograph of the project site while Figure 3.4 presents satellite imagery showing Kura project area.



Figure 3.4: Satellite imagery of the proposed ATC in Kura LGA and its surrounding



Project location and its surrounding



Kura milk collection centre



Proposed project site



Water supply station at the project site



Water Board office (WASH Program)



Fire service office

Plate 3.4: Proposed project site and its surrounding

3.11.1 Project Components

The proposed Kura-ATC is designed to encompass a diverse array of facilities and services. The designed is to optimise agricultural processing and logistics within a total area of 10 hectares. Table 3.4 summarises the land use plan for the allocation of space across various key zones, including pre-processing facilities, specialised infrastructure, amenities, and centralised utilities. The largest portion (30%) is dedicated to the pre-processing area, which handles various agricultural products. The Demo Farm & Agri-Logistics zone utilises a significant area (20%) for research, education, and support services. Amenities and a Centre of Excellence with specialised infrastructure occupy a smaller portion but cater to essential needs and support activities. Finally, centralised infrastructure like utilities and roads account for the remaining area. Strategically organising these components will enhance the efficient handling of agricultural products, foster innovation, and promote operational effectiveness within the broader agricultural landscape.

Table 3.4: Summary of Land Use Plan for the proposed ATC

S/N	Area	Description	Percentage (%)
1.	**Agricultural Transformation Centre (ATC)**	**14.25 hectares**	**(75)**
		Pre-processing Area • Livestock Zone • Quarantine Advisory Cell • Inspection Area • Receiving Area • Livestock Pens, Feed Area & Weighing Area • Loading & Unloading, Circulation Space & Truck Parking	30
		Fruits, Vegetables & Tubers Zone • Receiving Warehouse • Grading & Sorting Shed • Washing & Drying • Controlled Atmospheric Storage • Loading & Unloading, Circulation Space & Truck Parking	6
		Cereals, Pulses & Oilseeds Zone • Receiving Warehouse • Grading & Sorting Shed • Washing & Drying • Bulk Storage • Loading & Unloading, Circulation	9

		Space & Truck Parking	
		Centre of Excellence & Specialised Infrastructure	5
		Amenities	5
		Demo Farm & Agri Logistics	20
2	**Centralised Infrastructure Zone**	**4.75 hectares**	**(25)**
		Utilities	10
		Roads	15
	Grand Total	**4.28 hectares**	**100**

Source: *Fahamu Field work, 2025*

The ATC will serve as collection and distribution points for agricultural products; thus, pivotal in linking local farmers with the processing units within the SAPZ AIH. The provision of the following infrastructure network as follows is required for the smooth operation of the ATC.

- **Administrative Block:** Offices for management and administration.
- **Storage Facilities:** Includes warehouses and cold storage to preserve produce.
- **Drying Yard:** For drying grains and other produce before storage or sale.
- **Auction Centre:** Venue for selling agricultural products.
- **Mechanised Agricultural Equipment:** For leasing or renting to farmers.
- **Fertilizer and Pesticide Storage:** Safe storage for agricultural inputs.
- **Soil Testing Facilities:** To analyse soil health and fertility.
- **Demonstration Farms:** Showcasing modern farming techniques and practices.
- **Centre of Excellence (CoE):** Hub for technology dissemination and capacity building.
- **Quality Control Lab:** Ensures the quality of incoming and outgoing produce.
- **Agri-Clinic:** Provides healthcare services for crops.
- **Certification Lab:** Certifies the quality and standards of agricultural products.
- **Training Centre:** Offers training programs for farmers and staff.
- **Health Centre:** Provides medical services to farmers and staff.

- **Nursing Mother Area and Crèche:** Supports working mothers.
- **Restrooms:** Basic sanitary facilities.
- **Women Self-Help Groups:** Empowerment and support groups for women.
- **Bank & ATM:** Financial services for farmers and staff.
- **Microfinance:** Providing financial support to small farmers.
- **Rural BPO:** Business process outsourcing services to support agribusinesses.
- **Food Court:** Catering services for workers and visitors.

3.12 Dawanau ATC and Project Location

The ATC provide centralized processing, storage and packaging services thereby, acting as a bridge between smallholder farmers and larger market. The proposed ATC will be equipped with modern machinery to facilitate the processing of a wide range of crops such as groundnut, rice, sorghum, onion, beans and maize into value-added products that command higher prices in both domestic and export markets. The rationale behind the proposed ATC in Dawakin-Tofa LGA comes from the fact that the LGA has a vast potential for agricultural production, particularly the host community of Dawanau where groundnut show a positive marketable surplus. There were no farming activities on the land only farm ridges and post-harvest. The proposed ATC project area houses an Entraco trucking company, an abandoned asphalt plant, dilapidated structures as shown in Plate 3.5: depicted the project area facility while Figure 3.5 presents the satellite imagery showing the project location.



Figure 3.5: Satellite imagery of the proposed ATC in Dawakin-Tofa LGA and its surrounding



Plate3.5 Entraco company (Kwakwaci Truck company)



Plate 3.6: Abandoned asphalt plant



Plate 3.7: Dilapidated Structure



Plate 3.8: Proposed earmarked ATC project site

3.12.1 Project Components

The proposed Dawakin-Tofa-ATC is designed to encompass a diverse array of facilities and services. The designed is to optimise agricultural processing and logistics within a total area of 40 hectares. Table 3.5 summarises the land use plan for the allocation of space across various key zones, including pre-processing facilities, specialised infrastructure, amenities, and centralised utilities. The largest portion (30%) is dedicated to the pre-processing area, which handles various agricultural products. The Demo Farm & Agri-Logistics zone utilises a significant area (20%) for research, education, and support services. Amenities and a Centre of Excellence with specialised infrastructure occupy a smaller portion but cater to essential needs and support activities. Finally, centralised infrastructure like utilities and roads account for the remaining area. Strategically organising these components will enhance the efficient handling of agricultural products, foster innovation, and promote operational effectiveness within the broader agricultural landscape.

Table 3.5: Summary of Land Use Plan for the proposed ATC

S/N	Area	Description	Percentage (%)
1.	**Agricultural Transformation Centre (ATC)**	**25.25 hectares**	**(75)**
		Pre-processing Area • Livestock Zone • Quarantine Advisory Cell • Inspection Area • Receiving Area • Livestock Pens, Feed Area & Weighing Area • Loading & Unloading, Circulation Space & Truck Parking	30
		Fruits, Vegetables & Tubers Zone • Receiving Warehouse • Grading & Sorting Shed • Washing & Drying • Controlled Atmospheric Storage • Loading & Unloading, Circulation Space & Truck Parking	6
		Cereals, Pulses & Oilseeds Zone • Receiving Warehouse	9

		• Grading & Sorting Shed • Washing & Drying • Bulk Storage • Loading & Unloading, Circulation Space & Truck Parking	
		Centre of Excellence & Specialised Infrastructure	5
		Amenities	5
		Demo Farm & Agri Logistics	20
2	**Centralised Infrastructure Zone**	**14.75 hectares**	**(25)**
		Utilities	10
		Roads	15
	Grand Total	**40 hectares**	**100**

Source: *Fahamu Field work, 2025*

The ATC will serve as collection and distribution points for agricultural products; thus, pivotal in linking local farmers with the processing units within the SAPZ AIH. The provision of the following infrastructure network as follows is required for the smooth operation of the ATC.

- **Administrative Block:** Offices for management and administration.
- **Storage Facilities:** Includes warehouses and cold storage to preserve produce.
- **Drying Yard:** For drying grains and other produce before storage or sale.
- **Auction Centre:** Venue for selling agricultural products.
- **Mechanised Agricultural Equipment:** For leasing or renting to farmers.
- **Fertilizer and Pesticide Storage:** Safe storage for agricultural inputs.
- **Soil Testing Facilities:** To analyse soil health and fertility.
- **Demonstration Farms:** Showcasing modern farming techniques and practices.
- **Centre of Excellence (CoE):** Hub for technology dissemination and capacity building.
- **Quality Control Lab:** Ensures the quality of incoming and outgoing produce.

- **Agri-Clinic:** Provides healthcare services for crops.
- **Certification Lab:** Certifies the quality and standards of agricultural products.
- **Training Centre:** Offers training programs for farmers and staff.
- **Health Centre:** Provides medical services to farmers and staff.
- **Nursing Mother Area and Crèche:** Supports working mothers.
- **Restrooms:** Basic sanitary facilities.
- **Women Self-Help Groups:** Empowerment and support groups for women.
- **Bank & ATM:** Financial services for farmers and staff.
- **Microfinance:** Providing financial support to small farmers.
- **Rural BPO:** Business process outsourcing services to support agribusinesses.
- **Food Court:** Catering services for workers and visitors.

CHAPTER FOUR

ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

4.1 Introduction

The environmental baseline study as presented in this chapter, provides a comprehensive understanding of the existing biophysical, social, and health conditions within and around the proposed Agro-Industrial Hub (AIH) project site located at Bagauda in Bebeji Local Government Area, Kano State, being executed by the Kano State Government (KNSG). Establishing the pre-project environmental status is essential for assessing potential impacts that may arise from project activities and for developing appropriate mitigation and management measures in line with the requirements of the Environmental Impact Assessment (EIA) Act Cap E12 LFN 2004 and the Federal Ministry of Environment (FMEnv) guidelines.

To achieve this, a combined approach involving both primary and secondary data collection was adopted. The primary data were obtained through field sampling, in-situ measurements, laboratory analyses, and stakeholder consultations, designed to capture the environmental and socio-economic attributes of the project area. The secondary data were sourced from relevant published literature, previous environmental studies, meteorological records, and existing datasets on Kano State, encompassing information from both the wet and dry seasons.

A focused field survey was carried out during the wet season between 25th and 28th August 2025 to obtain data on soil quality, surface and groundwater quality, air quality, and ambient noise levels. The field activities were conducted under the supervision and guidance of the Federal Ministry of Environment (FMEnv) and the Kano State Ministry of Environment and Climate Change (KNSMEv&CC) to ensure compliance with national environmental standards and best practices.

The environmental components assessed in the study include topography, geology, climate and meteorology, air quality, noise levels, wind speed and direction, soil quality, groundwater and surface water quality, vegetation and wildlife composition, and waste management practices. In addition, the study examined the socio-economic

characteristics, community structure, and public health status of settlements within the project's area of influence. The integration of these datasets provides a holistic representation of the environmental setting, forming a sound basis for subsequent impact prediction, evaluation, and mitigation planning for the proposed Agro-Industrial Hub development.

4.2 Study Methodology

This Environmental Impact Assessment (EIA) for the proposed project was undertaken in strict compliance with the provisions of the Federal Ministry of Environment (FMEnv) EIA Act, Cap E12, LFN 2004, which governs environmental assessment processes in the Nigeria as well as the Islamic Development Bank (IsDB) Environmental and Social Framework (ESF, 2020), which is the primary policy document governing environmental and social assessment for IsDB-funded projects. The assessment process adhered to the regulatory framework and procedural guidelines established by the FMEnv and IsDB's Environmental and Social Assessment (ESA) Procedures to ensure that potential environmental and social impacts of the project are properly identified, evaluated, and mitigated prior to project implementation. In alignment with the above procedural requirements, the study followed a systematic and participatory approach encompassing the following key steps:

Project Conceptualization and Screening:

The screening stage involved an initial review of the proposed project concept to determine its eligibility under the EIA Act and to categorize it according to its potential environmental and social impacts. Based on its nature, scale, and potential for significant environmental effects, the project proposal was reviewed and categorized requiring full ESIA study in accordance with the FMEnv EIA Sectoral Guidelines for Industrial and Agricultural Projects.

Scoping and Terms of Reference (ToR) Development:

A scoping exercise was conducted to identify key environmental and social issues relevant to the proposed project. Based on this, a detailed ToR outlining the scope, methodology, and extent of the ESIA study was developed and approved by the FMEnv.

Baseline Data Collection:

Reconnaissance survey and delineation of the study area were carried out on the 25th of August 2025, by the study team and the proponent (representative of KNSG). Visual observations within a 2km radius of the proposed project area were made to determine resources, population, landforms, features, ecological characteristics, drainages, and biological and human communities. Consequently, comprehensive baseline studies were carried out to establish the existing environmental, social, and health conditions of the project area. This involved the collection of both primary data (through field sampling, laboratory analysis, and community consultations) and secondary data (through literature reviews and available datasets). The project area was described by the extent to which the proposed project activities is expected to have influence on the receiving environment; thus, the boundary covered during this study stretched through 2km. while one-season (wet season) field data gathering was undertaken between 25th and 28th August, 2025 for the acquisition of baseline data by a multi-disciplinary EIA team for which different section of the natural and social environment was covered including the existing air quality, noise level, soil quality, water quality, vegetation and wildlife, land use, and socio-economic and health issues within the proposed project environment and host community. Secondary data was sourced for dry season from FMEnv approved EIA report within the study area (*ESIA for Priority Value Chains of Rice, Wheat and Tomato, Kano state. March, 2021*). A team of experts and a representative of the FMEnv fully participated in the field study. Field investigations, review of relevant literature, interviews and discussions with stakeholders as well as consultation were undertaken.

Impact Identification, Prediction, and Evaluation:

Potential interactions between project activities and environmental components were systematically analyzed to identify and predict possible adverse and beneficial impacts. The Leopold matrix approach and other recognized impact assessment tools were employed to evaluate the magnitude, extent, duration, and significance of the impacts.

Development of Mitigation and Enhancement Measures:

Appropriate mitigation measures were designed to prevent, minimize, or offset the identified negative impacts, while strategies to enhance potential positive effects were also proposed.

Environmental and Social Management Plan (ESMP):

An ESMP was formulated to provide a framework for implementing mitigation measures, monitoring performance indicators, and ensuring compliance with environmental standards during project construction, operation, and decommissioning phases.

Stakeholder Engagement and Public Participation:

Stakeholders, including local communities (Dakatsalle-Wak and Chiroma), regulatory agencies (FMEnv and KNSMEnv&CC), and other interested parties, were actively consulted about the Agro-Industrial Hub throughout the ESIA process to incorporate their views, concerns, and recommendations into project planning and decision-making.

Report Preparation, Submission, and Review:

The findings of the ESIA study were compiled into a comprehensive report submitted to the FMEnv and relevant state environmental authorities for review, public disclosure, and certification in line with national environmental assessment procedures.

Through these stages, the ESIA process ensured full compliance with the FMEnv Act and international best practices, providing a robust framework for environmental protection, sustainable project implementation, and informed decision-making by regulatory bodies and project stakeholders.

4.2.1 Quality assurance and quality control

Standard methods and procedures for data acquisition, collation, presentation and analysis were strictly adhered to in the course of this study. Quality assurance and quality control (QA/QC) measures were implemented during sample collection, labelling, analyses and data verification. These measures include, amongst others:

- In-situ measurements of parameters (such as temperature, pH, electrical conductivity and total dissolved solids) with short holding time in water samples were done immediately after collection.

- Proper calibration of all portable meters used for in-situ measurements.
- Separate samples were collected for parameters requiring different treatment/preservation before analysis.
- Only new containers that are thoroughly washed with water to be sampled (from source) were used.
- Field samples were adequately preserved and labelled.
- The chemical reagents used for sample preservation were adequately labelled to avoid mix-up.

Sample preservation was done according to the FMEnv recommended methods of sample preservation. This is done to avoid sample contamination and deterioration by pre-sterilizing sampling tools and containers, pre-treating and preserving samples in transit in ice-cooled chests to the laboratory and stored at that temperature in refrigerators pending subsequent analysis.

Sample handling, transportation, logging and cross-checking in the laboratory were also implemented. All analyses were carried out in Abuja Environmental Protection Board (AEPB) Laboratory located in Abuja. The methods of analyses used in this study were those specified in Federal Ministry of Environment Guidelines and other internationally accepted analytical procedures, in order to ensure the reliability and integrity of the data obtained.

4.2.2 Sampling design and strategy

Sampling strategy for this study was based on the report of the site verification exercise by FMEnv. The strategy consists of the approved number of samples, sampling locations and coordinates (Table 4.1). A total of eighteen (18) sampling points and two (2) control for air quality, noise level, wind speed and direction; ten (10) sampling points for soil and one (1) control points, three (3) sample of surface water and two (2) sample of groundwater within the study boundary for groundwater analysis.

Table 4.1: Sample Stations and Coordinates

Air Quality and Noise		Soil		Groundwater		Surface Water	
Code	Coordinate	Code	Coordinate	Code	Coordinate	Code	Coordinate

A/N 01	11.590144°N 8.380736°E	SS 01	11.590144°N 8.380736°E	GW 01	11.593360°N 8.379481°E	SW 01	11.605081°N 8.382807°E
A/N 02	11.592130°N 8.379104°E	SS 02	11.592130°N 8.379104°E			SW 02	11.596986°N 8.385853°E
A/N 03	11.593767°N 8.376871°E	SS 03	11.592945°N 8.376564°E			SW 03	11.587417°N 8.380480°E
A/N 04	11.595272°N 8.378625°E	SS 04	11.595272°N 8.378625°E				
A/N 05	11.593580°N 8.380002°E	SS 05	11.592916°N 8.382559°E				
A/N 06	11.592196°N 8.380577°E	SS 06	11.594686°N 8.385294°E				
A/N 07	11.592916°N 8.382559°E	SS 07	11.595007°N 8.382960°E				
A/N 08	11.593405°N 8.384399°E	SS 08	11.598191°N 8.381477°E				
A/N 09	11.595007°N 8.382960°E	SS 09	11.599921°N 8.384328°E				
A/N 10	11.595431°N 8.380789°E	SS 10	11.597173°N 8.386510°E				
A/N 11	11.597273°N 8.380007°E	SS Ctrl	11.594655°N 8.372781°E				
A/N 12	11.598191°N 8.381477°E						
A/N 13	11.597305°N 8.383206°E						
A/N 14	11.596450°N 8.385012°E						
A/N 15	11.598191°N 8.381477°E						
A/N 16	11.597173°N 8.386510°E						
A/N 17	11.598716°N 8.385143°E						
A/N 18	11.599921°N 8.384328°E						
A/N Ctrl 01	11.594655°N 8.372781°E						
A/N Ctrl 02	11.590209°N 8.385845°E						

Key: A/N – Air Quality and Noise, SS – Soil sample, GW – Ground Water, Ctrl -Control
Source: Field Study, 2025

- ***Climate and Meteorology***

Information on the climate and meteorology of the proposed area was obtained from the Nigerian Meteorological Agency (NiMet) of the Federal Ministry of Aviation, Abuja,

2023. Thirty-five (35) years data (1987-2022) was acquired for rainfall, relative humidity, temperature, wind speed and wind direction. These data were presented and analysed in this report.

- ***Air Quality and Noise Level***

Data on ambient air quality around the proposed project area were directly acquired by in-situ measurement. The measurement conducted was to determine the concentration of pollutant gases which includes sulphur dioxide ($SO_{2)}$, nitrogen dioxide (NO_2), carbon monoxide (CO), carbon dioxide (CO_2), hydrogen sulfide (H_2S), particulate matters (PM_1, $PM_{2.5}$ and PM_{10}), methane (CH_4) and volatile organic compounds (VOC), and analyse their impact on the environment.

- The oxides of nitrogen, carbon, sulphur was measured in parts per million (ppm) using hand-held portable *iBrid MX6 (its* calibration was done using a gas/air mixture forced from a gas cylinder at 1.0 psi*);*
- Particulate matters were measured in µg/m^3 using Konamx Handheld lacer Particle counter
- VOCs were measured using Mini Rae Lite
- Coordinates were taken using *etrex Legend* GPS
- To determine noise levels, TES Sound Level Meter was used. Measurement was recorded in dB(A).
- Wind speed was measured using an Anemometer vane probe
- Wind speed and direction were measured with the aid of Laser Tool 6903 meter, and the values were recorded in meter per second (m/s).
- At each sampling point, readings were taken between 9am and 5pm.
- Sampling points considered for air quality, noise level, wind speed and direction were geo-referenced (Figure 4.1).

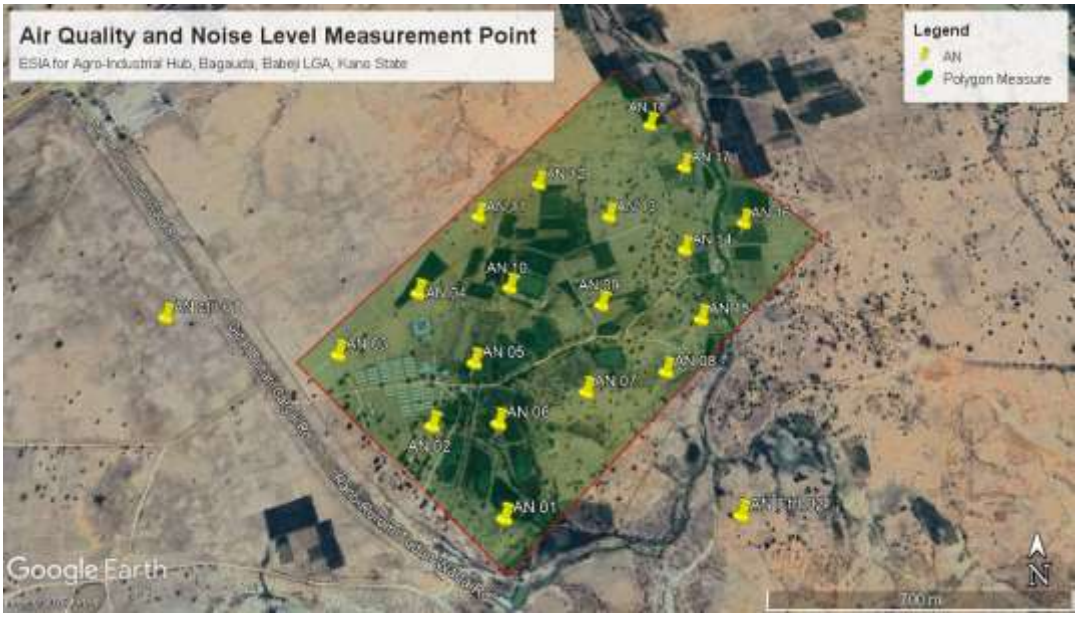


Figure 4.1: Satellite Imagery Showing Air Quality and Noise Level Sampling Points

Water Study (Physico-chemistry and Microbiology)

Groundwater sample was collected from the hand dug well within the proposed project area while surface water samples were collected from the stream that flows through the proposed project site using sterilised 1 litre polyethylene bottle. The sample was preserved and transported to laboratory for analysis on parameters that can only be determined in laboratory using the following procedures:

- General physico-chemical parameters: Sample was collected into 1 litre polyethylene bottle. The bottle was previously rinsed with distilled water and with some portion of the water sample prior to sampling.
- For heavy metals, sample was collected into 1 litre pre-cleaned polythene bottle and preserved by the addition of 2ml concentrated nitric acid.
- For oil, grease and total hydrocarbon content (THC), sample was collected into 1 litre pre-cleaned glass bottle and preserved by the addition of 2ml concentrated sulphuric acid.
- For chemical oxygen demand (COD), sample was collected into pre-cleaned 500ml glass bottle and fixed with sulfuric acid (H_2SO_4).
- For microbiology, sample was collected into 25ml sterilized glass bottle.

- For biochemical oxygen demand (BOD_5), sample was collected into 300ml amber-coloured BOD bottle.

Samples collected were stored at 4^0C on the field with the aid of ice pack before transportation to laboratory for further holding at same temperature. In-situ measurements were conducted for temperature, pH, Electrical Conductivity, Total Dissolved Solids (TDS), Colour, Turbidity, Dissolved Oxygen (DO).

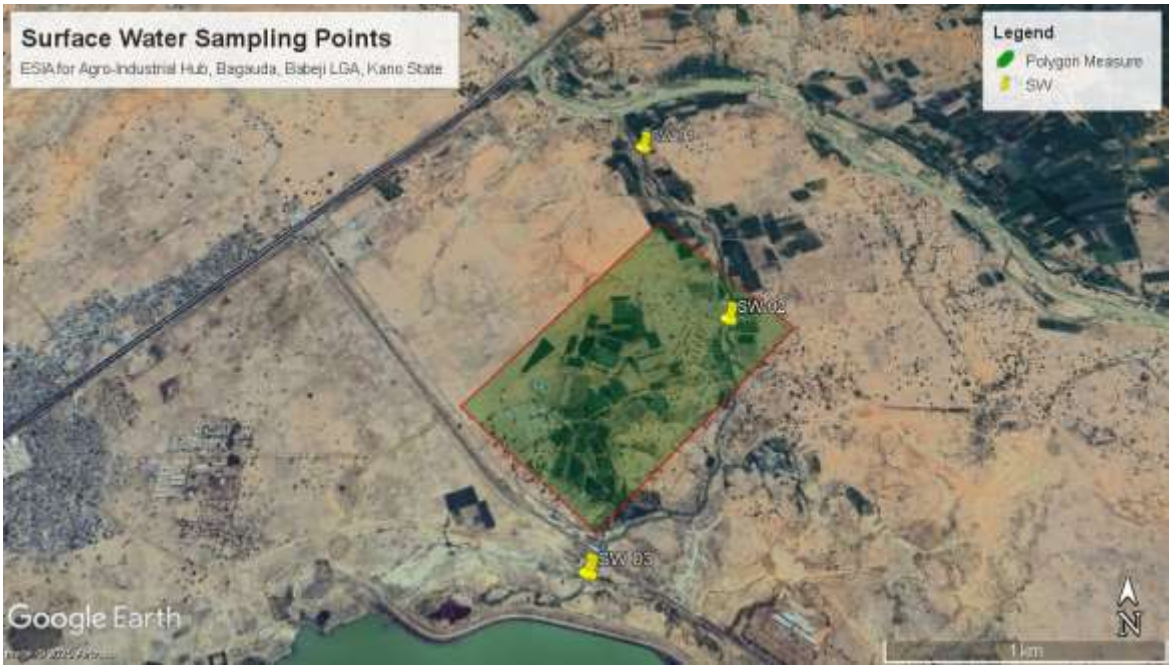


Figure 4.2a: Satellite Imagery Showing Surface water Sampling Point



Figure 4.2b: Satellite Imagery Showing Groundwater Sampling Point

Soil samples

Soil samples were collected at two depths: 0-15cm and 15 – 30cm from ten sampling points and one control (Figure 4.3) with the aid of dutch stainless steel hand auger. A total of 22 soil samples (2 samples at each sampling location from 11 sampling points) were collected at intervals within and outside the proposed project boundary. The soil samples were collected in duplicate. Those for physical and chemical analysis were packed in black polythene bags, and those for microbial and oil and grease/hydrocarbon analysis wrapped in aluminium foil. The samples were neatly labeled, preserved and taken to the laboratory for analysis. All in-situ observations for colour, presence of roots and lives were recorded in a field note book.

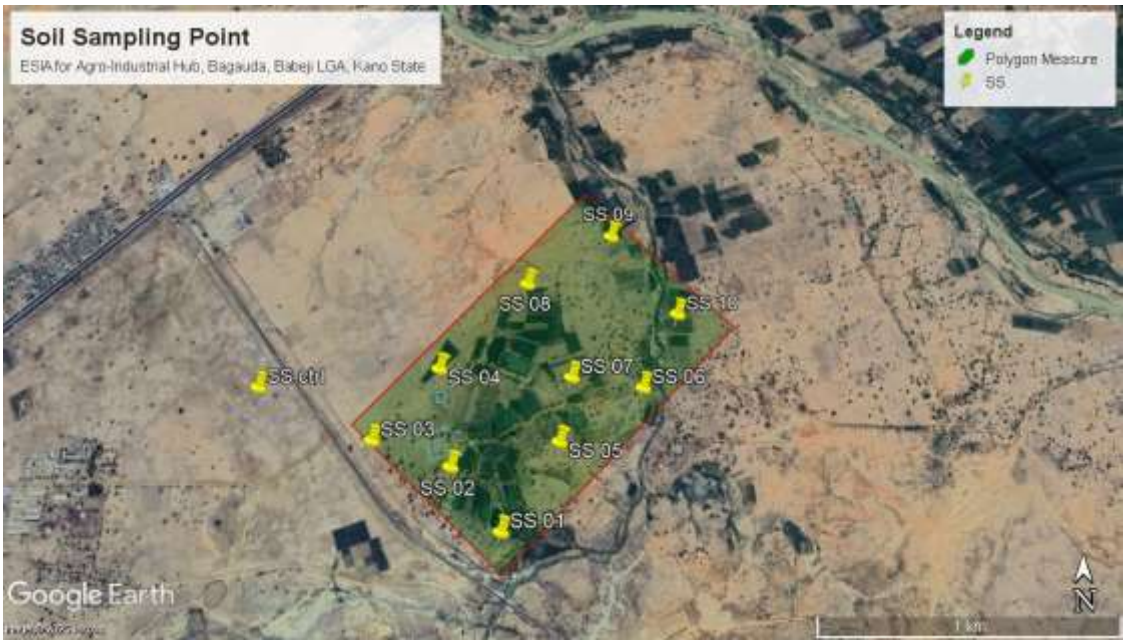


Figure 4.3: Satellite Imagery Showing Soil Sampling Points

Microbiological Analysis

Heterotrophic bacteria and total *coliform* were enumerated by adopting the most probable technique for water samples, while standard spread plate technique was used for soil sample. Appropriate dilutions (three-fold) of samples were plated out on nutrient agar plates for bacteria and macconkey agar plates for total *coliform*. The plates were made in duplicate and incubated aerobically at 37^0c for 24hours (bacteria) while that of *coliform*

were incubated aerobically at 37^0c, 48hours. At the end of the incubation periods, the number of colonies on the agar plates were counted and enumerated after screening. The relative abundance (i.e., the population density estimate) of the organism were obtained by multiplying the plate count per ml for each organism by the dilution factor used. The growth on the agar plates were noted with regards to the following characteristics: form, pigmentation or colour, texture and elevation. Each bacterial culture was identified based on its morphological characteristics using gram reaction as well as confirmatory test.

Flora Study

The flora study of the proposed AIH project area was conducted by observation within study boundary/environment and using transects. Plants within each transects were identified, and those that could not be identified on site were collected and pressed for herbarium. The knowledge of the economic importance of the common plant around the project was obtained from the locals.

Fauna Study

Information on the fauna biodiversity of the project area was obtained from residents using interviews, and identification of species from a photograph catalogue. Thus, Coloured photographs of West African wildlife species were shown to the locals for easy identification of the wild. Information on frequency and when last the species were sighted was provided.

Socio-Economic and health

Baseline socio-economic information of Dakatsalle-waks community around the project area were acquired during a consultation with the leadership/members of the communities and a community survey. Group consultation, interviews and questionnaire administration were employed to acquire information such as traditional governance, demography, education, business activities, social amenities, security situations, and waste management. These information/data were used to analyse the social/socio-economic characteristics of the communities around the proposed AIH project area.

Community health status and presence of healthcare centres were determined by interviews and questionnaire administration to locals.

4.3 Climate and Meteorology over Study Area

In Kano, the wet season is muggy and mostly cloudy, the dry season is partly cloudy, and it is hot year round. Over the course of the year, the temperature typically varies from 53°F to 102°F and is rarely below 48°F or above 106°F. Figure 4.4 below shows climate of Kano state study area.

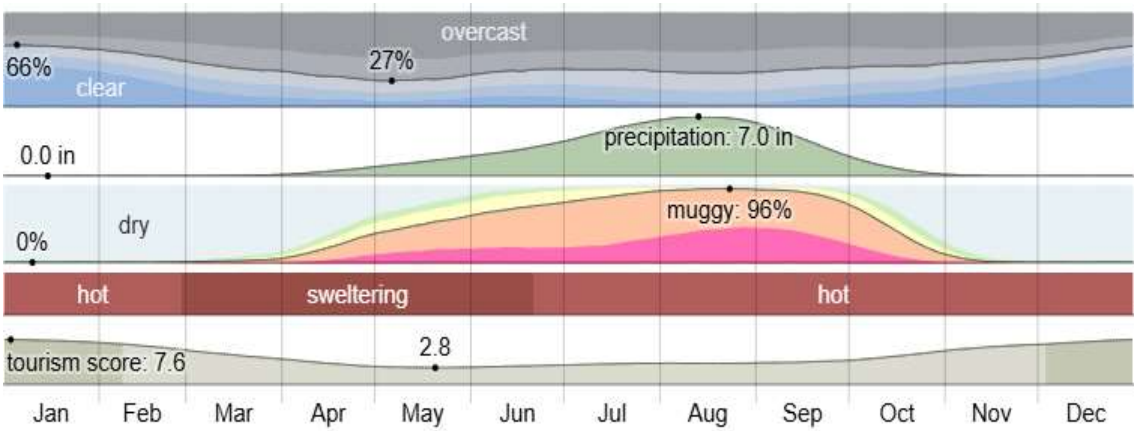


Figure 4.4: Climate of Kano study area
Source: NiMeT

Clouds

Average percentage of the sky covered by clouds experiences significant seasonal variation over the course of the year. The clearer part of the year in Kano begins around November 6 and lasts for 3.9 months, ending around March 3. The clearest month of the year in Kano is January, during which on average the sky is clear, mostly clear, or partly cloudy 64% of the time. The cloudier part of the year begins around March 3 and lasts for 8.1 months, ending around November 6. The cloudiest month of the year in Kano is May, during which on average the sky is overcast or mostly cloudy 70% of the time.

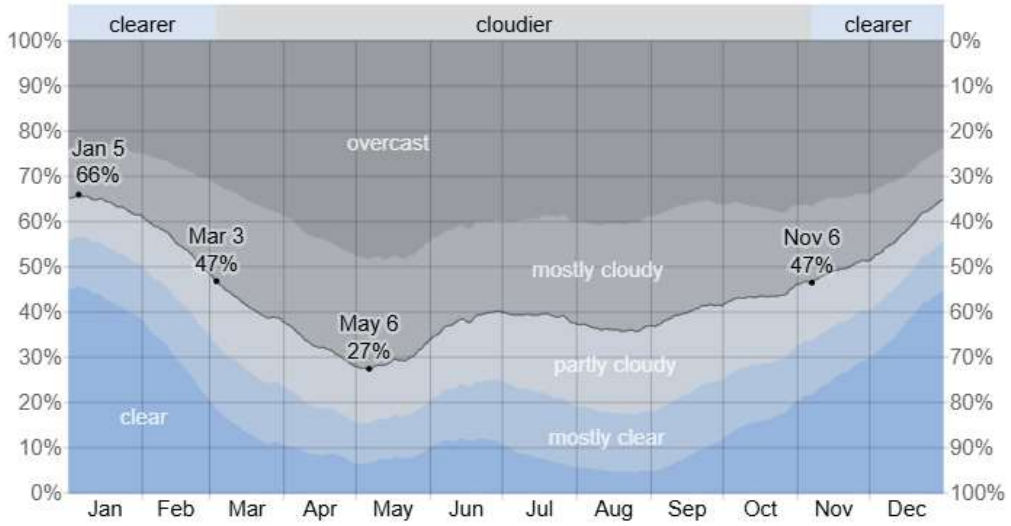


Figure 4.5: Showing cloud cover categories of Kano
Source: NiMeT

Rainfall

Kano experiences extreme seasonal variation in monthly rainfall. The rainy period of the year lasts for 6.3 months, from April 14 to October 23, with a sliding 31-day rainfall of at least 0.5 inches. The month with the most rain in Kano is August, with an average rainfall of 7.0 inches. The rainless period of the year lasts for 5.7 months, from October 23 to April 14. The month with the least rain in Kano is January, with an average rainfall of 0.0 inches.

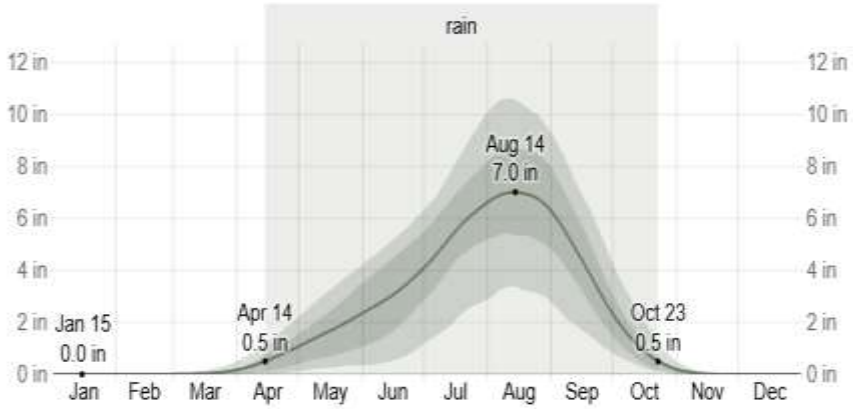


Figure 4.6: Annual monthly Rainfall of Kano study area
Source: NiMeT

Relative Humidity

Lower dew points feel drier and higher dew points feel more humid. Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night. Kano experiences extreme seasonal variation in the perceived humidity. The muggier period of the year lasts for 6.1 months, from April 20 to October 23, during which time the comfort level is muggy, oppressive, or miserable at least 24% of the time. The month with the most muggy days in Kano is August, with 29.7 days that are muggy or worse. The month with the fewest muggy days in Kano is January, with 0.0 days that are muggy or worse.

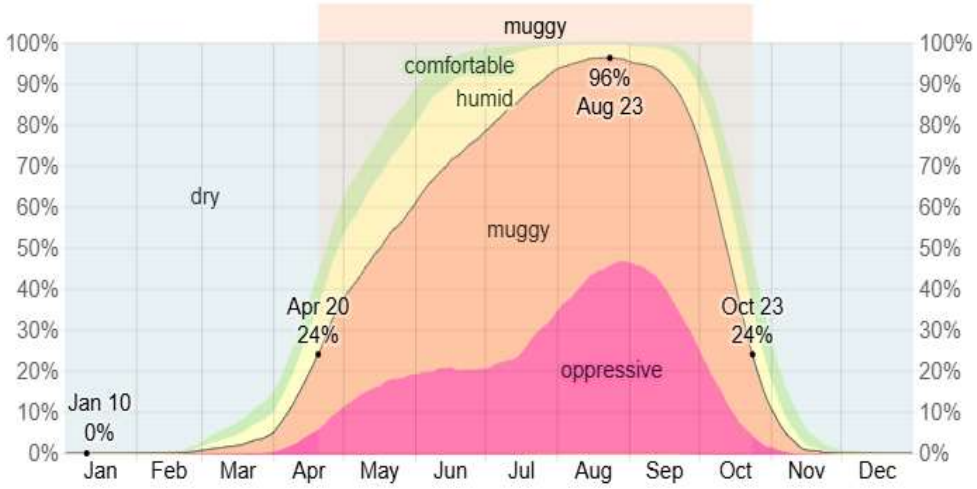


Figure: 4.7: Humidity comfort level of Kano state study area
Source: NiMeT

Wind Speed and Direction

The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages. The average hourly wind speed in Kano experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 7.7 months, from November 17 to July 6, with average wind speeds of more than 5.3 miles per hour. The windiest month of the year in Kano is February, with an average hourly wind speed of 6.9 miles per hour. The calmer time of year lasts for 4.3 months, from July 6 to

November 17. The calmest month of the year in Kano is September, with an average hourly wind speed of 3.6 miles per hour. The wind speed of the study area is presented in Figure 4.8 shows the wind speed.

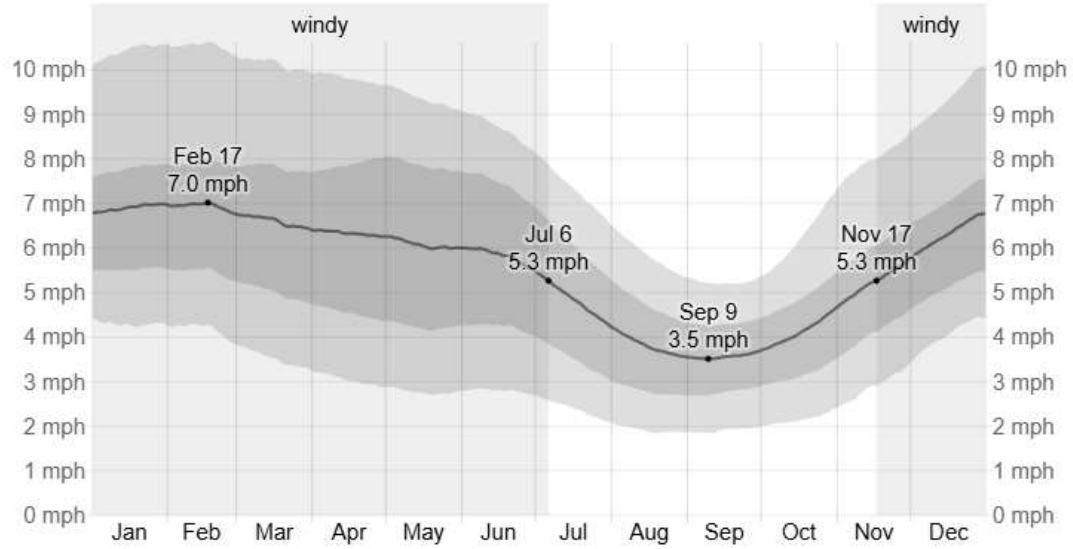


Figure 4.8: Average Wind Speed of Kano state study area
Source: NiMeT

The predominant average hourly wind direction in Kano varies throughout the year. The wind is most often from the west for 5.3 months, from April 19 to September 29, with a peak percentage of 60% on July 4. The wind is most often from the south for 2.0 days, from September 29 to October 1, with a peak percentage of 31% on September 29. The wind is most often from the east for 6.6 months, from October 1 to April 19, with a peak percentage of 76% on January 1.

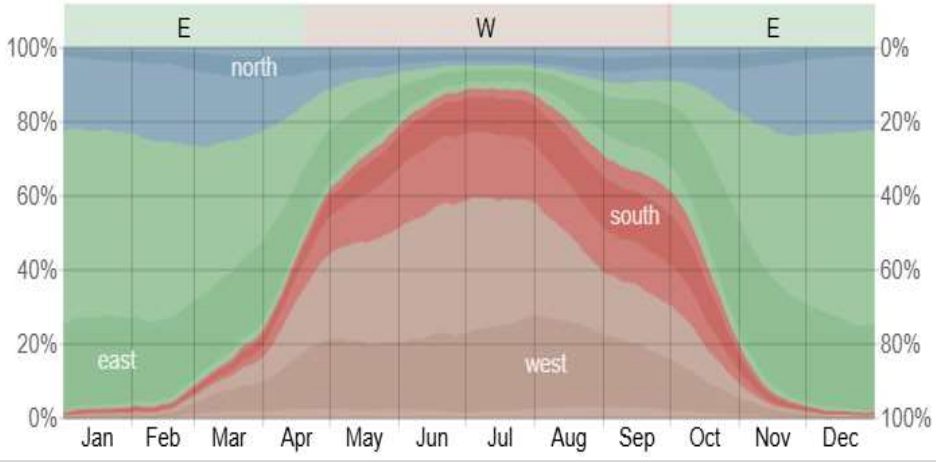


Figure 4.9: Showing wind direction of Kano state study area
Source: NiMeT

Sunshine

The length of the day in Kano does not vary substantially over the course of the year, staying within 49 minutes of 12 hours throughout. In 2025, the shortest day is December 21, with 11 hours, 25 minutes of daylight; the longest day is June 21, with 12 hours, 50 minutes of daylight.

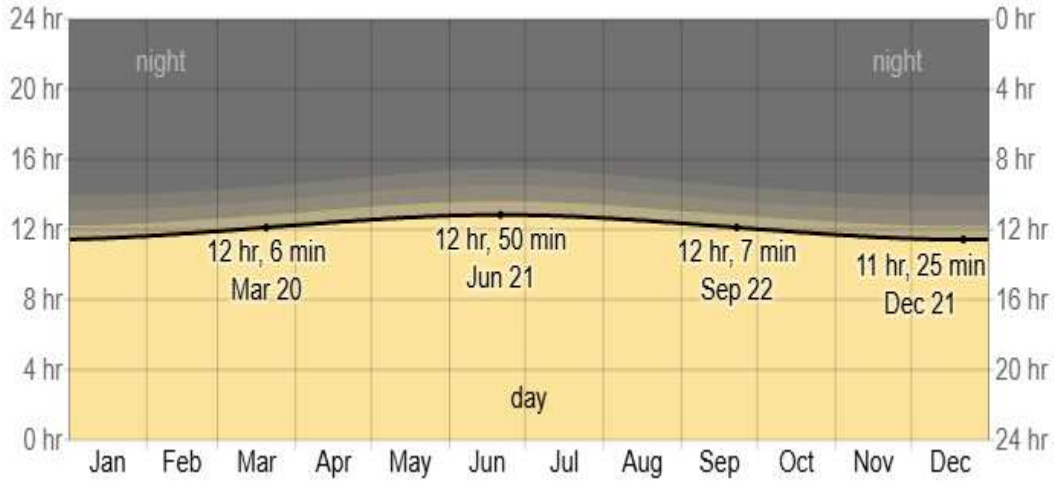


Figure 4.10: Showing hours of daylight and twilight in Kano state study area
Source: NiMeT

The earliest sunrise is at 6:00 AM on May 30, and the latest sunrise is 51 minutes later at 6:51 AM on January 25. The earliest sunset is at 5:57 PM on November 18, and the latest sunset is 57 minutes later at 6:54 PM on July 9.

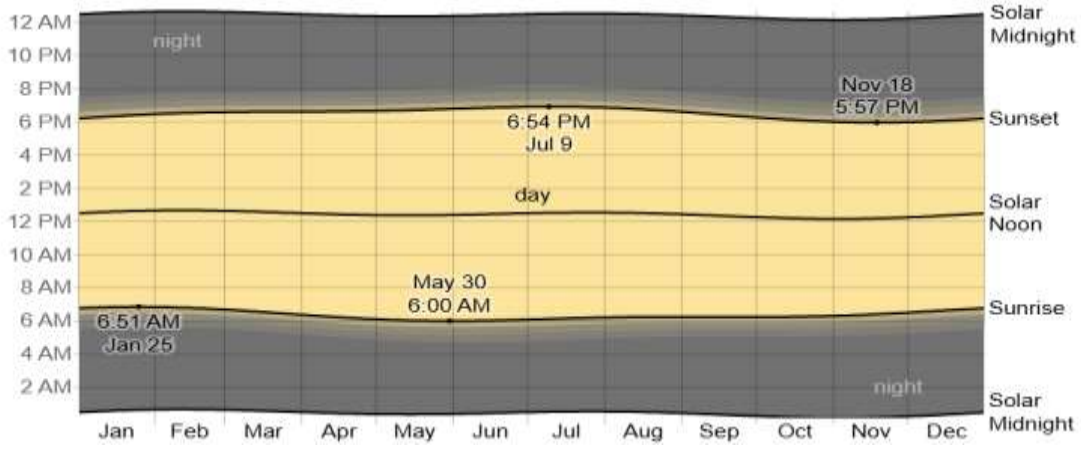


Figure 4.11: Showing sunrise, and sunset with twilight in Kano study area
Source: NiMeT

Moon

The figure below presents a compact representation of key lunar data for 2025. The horizontal axis is the day, the vertical axis is the hour of the day, and the colored areas indicate when the moon is above the horizon. The vertical gray bars (new Moons) and blue bars (full Moons) indicate key Moon phases.

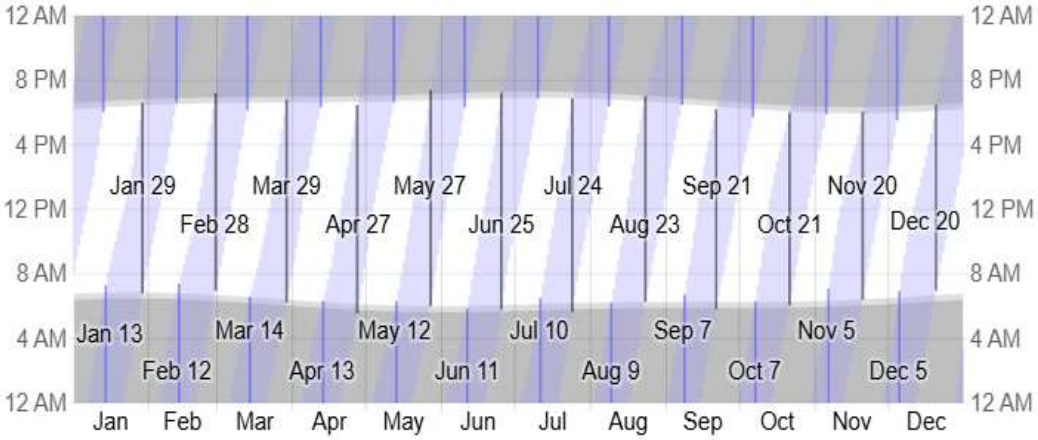


Figure 4.12: Showing Moon rise, set and phases in Kano state study area
Source: NiMeT

Temperature

The hot season lasts for 2.3 months, from March 17 to May 26, with an average daily high temperature above 98°F. The hottest month of the year in Kano is May, with an average high of 99°F and low of 75°F. The cool season lasts for 1.7 months, from December 4 to January 28, with an average daily high temperature below 89°F. The coldest month of the year in Kano is January, with an average low of 54°F and high of 87°F.

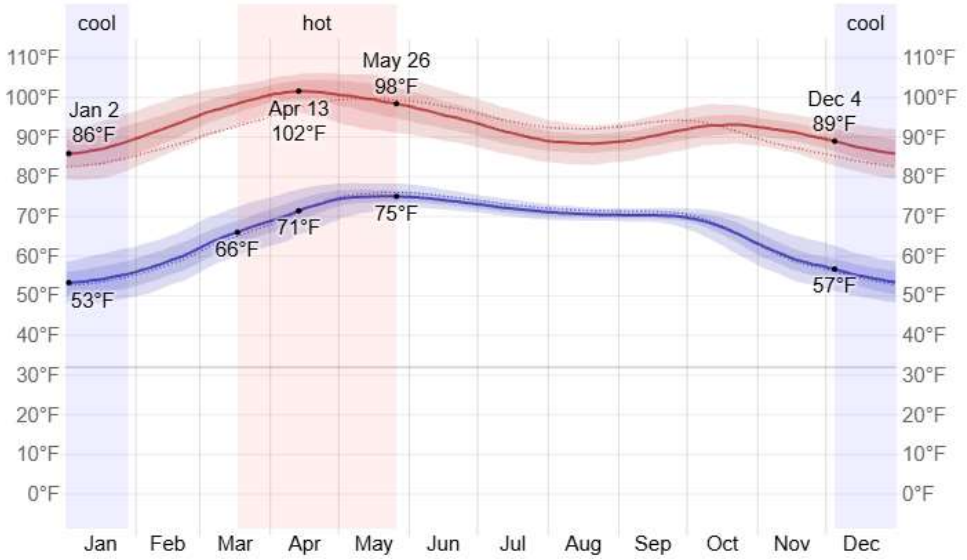
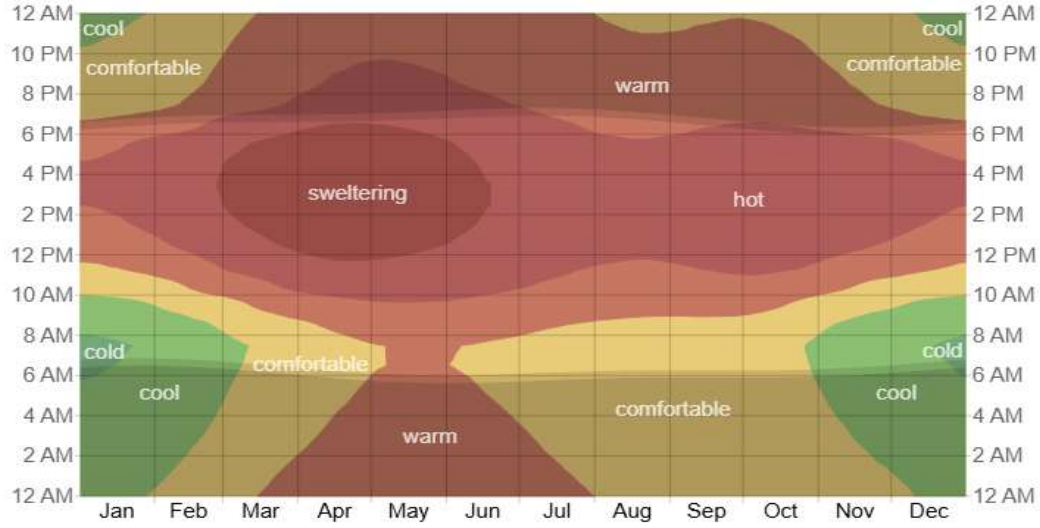


Figure 4.13: Average maximum and minimum temperature of Kano state study area
Source: NiMeT

The figure below shows you a compact characterization of the entire year of hourly average temperatures. The horizontal axis is the day of the year, the vertical axis is the hour of the day, and the color is the average temperature for that hour and day.



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Figure 4.14: Average hourly temperature of Kano state study area

4.4 Air Quality and Noise Level Assessment

4.4.1 Air Quality

Assessment of atmospheric air quality was conducted in the course of this study. Pollutant gases and suspended particles capable of impacting natural air quality, ecosystems and their biotic components and human health are measured. These pollutants such as CO_2, CO, NO_2, SO_2, H_2S, CH_4 and particulate matter are found to be within the FMEnv and NESREA permissible limit for industrial land use.

These pollutants, when present above the permissible levels, are known to affect man and his environment in a number of ways and this will increase over the years.

Table 4.2: Regulatory Standards for Ambient Air Quality

S/N	Air Pollutants	Exposure Time	Maximum Concentration (µg/m^3)	
			WHO	FMENV[a]
1.	CO	1 – Hr		
		8 – Hr		22,800 (20ppm)
		24 – Hr		11,400 (10ppm)
2.	NOX	24 – Hr	200	75 – 113 (0.04-0.06ppm)
3	SO2	1 – Hr	125	260(0.1ppm)
		24 – Hr		26(0.01ppm)
4	O3	24 – Hr	100-120	
5.	PM2.5	24 – Hr	25	
6.	PM10	24 – Hr		
7	VOC			160
8.	TSP	1 – Hr		600
		24 – Hr		250

Source: *FMENV (1991)*

4.4.2 Noise Level

Noise level of the area was measured (Table 4.3). Noise within the proposed project area is determined by natural and human activities, notable vehicular movement as a result of the road construction in the area which necessitates movement of heavy-duty vehicles delivering construction materials to the area and can impact on human health and also unbalance the ecosystem, causing migration of wildlife species.

Table 4.3: Permissible Noise Levels

Environment / Habitat	***Permissible Noise Levels (Decibels)***	
	Day time (6am -10pm)	Night time (10pm - 6am)
Residential areas	50	35
Hospitals and Schools	45	35
Mixed Residential (with some commercial and entertainment) area	55	45
Residential + industry or small scale production + commerce	60	50
Industrial (outside perimeter fence)	70	60

Source: *NESREA*



Plate 4.1: In-situ measurements of air quality, Noise Level and Wind Speed

Table 4.4: Result of Ambient Air Quality and Noise Level Measurements within the Project area (Rainy Season)

Sample Code	Time	COORDINATES		PARTICULATE MATTERS (µg/m^3)			TVOC (ug/M^3)	AIR POLLUTANTS (PPM)							Noise Level dB(A)	CLIMATE AND METEOROLOGY		
		Latitude (^{0}N)	Longitude (^{0}E)	$PM_{1.0}$	$PM_{2.5}$	PM_{10}		CO	CO_2	SO_2	NO_2	NH_3	CH_4	H_2S		Relative Humidity (%)	Wind Speed (m/s)	Temperature (^{0}C)
A/N 01	08:20am	11.590144	8.380736	6	8	9	0.051	4	423	BDL	BDL	BDL	BDL	BDL	52.3	43	1.2	35
A/N 02	08:56am	11.592130	8.379104	9	12	14	0.057	3	420	BDL	BDL	BDL	BDL	BDL	54.0	45	1.4	34
A/N 03	09:21am	11.593767	8.376871	6	9	12	0.053	5	418	BDL	BDL	BDL	BDL	BDL	50.3	42	1.8	33
A/N 04	09:40am	11.595272	8.378625	5	8	12	0.121	4	448	BDL	BDL	BDL	BDL	BDL	53.5	49	2.0	35
A/N 05	09:51am	11.593580	8.380002	7	9	11	0.136	2	423	BDL	BDL	BDL	BDL	BDL	51.7	51	1.2	36
A/N 06	10:00am	11.592196	8.380577	6	8	10	0.058	3	427	BDL	BDL	BDL	BDL	BDL	50.9	44	2.2	35
A/N 07	10:15am	11.592916	8.382559	6	9	12	0.058	3	431	BDL	BDL	BDL	BDL	BDL	48.3	44	2.0	35
A/N 08	10:43am	11.593405	8.384399	5	8	11	0.123	4	442	BDL	BDL	BDL	BDL	BDL	54.0	47	2.1	37
A/N 09	11:02am	11.595007	8.382960	8	11	14	0.210	4	427	BDL	BDL	BDL	BDL	BDL	52.1	45	2.4	38
A/N 10	11:29am	11.595431	8.380789	5	8	10	0.231	4	419	BDL	BDL	BDL	BDL	BDL	53.5	43	1.8	37
A/N 11	11:52am	11.597273	8.380007	7	10	13	0.086	5	418	BDL	BDL	BDL	BDL	BDL	50.9	42	1.9	39
A/N 12	12:10pm	11.598191	8.381477	6	9	12	0.210	2	434	BDL	BDL	BDL	BDL	BDL	52.4	43	2.1	37
A/N 13	12:34pm	11.597305	8.383206	7	10	13	0.236	3	427	BDL	BDL	BDL	BDL	BDL	50.5	42	1.7	35
A/N 14	12:47pm	11.596450	8.385012	5	8	10	0.201	4	438	BDL	BDL	BDL	BDL	BDL	51.6	45	1.8	33
A/N 15	01:06pm	11.598191	8.381477	7	9	11	0.093	4	434	BDL	BDL	BDL	BDL	BDL	51.5	41	1.6	37
A/N 16	01:26pm	11.597173	8.386510	6	8	11	0.167	5	424	BDL	BDL	BDL	BDL	BDL	52.3	43	2.0	35
A/N 17	01:47pm	11.598716	8.385143	6	9	11	0.162	5	432	BDL	BDL	BDL	BDL	BDL	52.8	45	1.2	38
A/N 18	02:04pm	11.599921	8.384328	7	11	14	0.012	3	432	BDL	BDL	BDL	BDL	BDL	51.6	46	1.5	39
A/N Ctrl 1	02:38pm	11.594655	8.372781	5	8	10	0.176	2	428	BDL	BDL	BDL	BDL	BDL	50.8	44	1.8	38
A/N Ctrl 2	03:12pm	11.590209	8.385845	5	8	9	0.217	3	421	BDL	BDL	BDL	BDL	BDL	50.9	47	1.8	37
Equipment Detection limit				**0.01**	**0.01**	**0.01**	**0.001**	**0.1**	**-**	**0.001**	**0.01**	**0.01**	**0.01**	**0.01**	**30**	**10**	**0.1**	**10**
Secondary Data (Dry Season)				0.19 to 2.31	0.16 to 8.81	0.2 to 4.54	125 to 149	1 to 3.6	-	-	22.52 to 161.08	-	-	-	40.9 to 61.52	-	-	30.9 to 35
Minimum value				5	8	9	0.051	2	418	-	0.02	-	-	-	50.3	41	1.2	33
Maximum value				9	12	14	0.236	5	448	-	0.03	-	0.02	-	54.0	47	2.4	39
NESREA/FMEnv Limits				**-**	**250**	**-**	**-**	**10**	**-**	**0.01**	**0.03**	**0.01**	**-**	**0.01**	**55**	**-**	**-**	**<40**

Key - BDL: Below Detection Limit; AN: Air Quality and Noise Level.

Source: *Field Study, 2025*

Secondary Data Source: *ESIA for Priority Value Chains of Rice, Wheat and Tomato, Kano state. March, 2021.*

Discussions

Pollutant Gases

Nitrogen dioxide (NO_2): Nitrogen dioxide is one of several nitrogen oxides collectively represented by the formula NO_x, which are a group of highly reactive gases containing nitrogen and oxygen. Among these, NO_2 is particularly important due to its significant environmental and health impacts. It appears as a reddish-brown gas with a sharp, biting odor that is easily noticeable even at low concentrations. NO_2 is primarily produced during high-temperature combustion processes, such as those occurring in vehicle engines, industrial facilities, and power plants. Based on the air quality measurements conducted in this study, the concentration of NO_2 was not detected in all sample locations. The Federal Ministry of Environment (FMEnv) permissible limit is 0.06 ppm, indicating that the ambient air quality in terms of NO_2 is within safe and acceptable standards. Its absence suggests minimal contribution from combustion-related pollution sources in the area during the period of this study and implies a lower risk of adverse health effects typically associated with NO_2 exposure, such as respiratory irritation, reduced lung function, and aggravation of asthma.

Carbon monoxide (CO): Carbon monoxide (CO) is a colorless, odorless, and non-irritating yet highly toxic gas. It is primarily produced as a result of incomplete combustion of carbon-containing fuels such as natural gas, coal, wood, gasoline, and other fossil fuels. CO poses serious health risks when inhaled in significant amounts, as it binds with hemoglobin in the blood more readily than oxygen, thereby reducing the blood's oxygen-carrying capacity. Prolonged exposure to elevated CO levels can lead to symptoms ranging from headaches and dizziness to unconsciousness and even death in extreme cases. Carbon monoxide concentrations recorded in this study ranged from 2 to 5 parts per million (ppm). These values fall below the Federal Ministry of Environment (FMEnv) permissible limit of 10 ppm, indicating that CO levels are within acceptable safety thresholds based on national environmental standards.

Carbon dioxide (CO_2), a greenhouse gas present naturally in the atmosphere and vital to living organisms, is also generated naturally human and animals that exhales it as waste

product, and human activities which primarily are energy production, including burning coal, oil, or natural gas, as well as agricultural activities which includes farm clearing. This gas, when in excess concentration in the atmosphere impact on the greenhouse effect causing Global Warming and Climate Change which further affect the health and wellbeing of all living things, destroys ecosystem and human civilization, and reduce food production through excess heat and flood. This gas occurred between the range of 418 and 448ppm which is within the excellent region of the CO_2 scale.

Oxides of sulfur especially sulfur dioxide, a chemical compound with the formula SO_2 is produced by various industrial processes. Since petroleum often contain sulfur compounds, their combustion generates sulfur dioxide. Further oxidation of SO_2, usually in the presence of a catalyst such as NO_2, forms H_2SO_4, and thus acid rain. This is one of the causes for concern over the environmental impact of the use of these fuels as power sources. In this study, however, SO_2 concentration was not detected.

Volatile Organic Compounds (VOCs):

Volatile Organic Compounds (VOCs) were detected in concentrations ranging from 0.051ppm to 0.236ppm within the proposed industrial hub project area. VOCs are a group of organic chemicals characterized by their high vapor pressure at standard atmospheric conditions, which causes them to readily evaporate into the air. These compounds are significant air pollutants and may originate from both natural sources and human activities, including fuel combustion, industrial processes, and the use of solvents. The presence of VOCs in the environment is a matter of concern because many of them are hazardous to human health, potentially causing short- and long-term health effects such as respiratory irritation, headaches, and even damage to the liver, kidneys, or central nervous system. In addition to their impact on human health, VOCs also contribute to environmental issues such as the formation of ground-level ozone and smog, which can degrade air quality and harm ecosystems. Therefore, the detection of VOCs within the project site underscores the need for effective monitoring and mitigation measures to minimize both human exposure and environmental impact.

Particulate Matter

Particulate matter across the proposed industrial hub project area is relatively low, ranging between 5 and 9µg/m^3 for $PM_{1.0}$, 8 to 12µg/m^3 for $PM_{2.5}$ while PM_{10} ranged from 9 to 14µg/m^3 as against FMEnv permissible limit of 250µg/m^3. Sources of PM within the project area includes farming activities and vehicular movement along the approach road. Increased levels of fine particles in the air are linked to health hazards such as heart disease, malfunctioning of the lung and lung cancer.

Noise Level

Noise level measurements conducted within and around the project site ranged between 50.3dB(A) and 54.0dB(A). These values are below the 55 dB(A) limit stipulated by the National Environmental Standards and Regulations Enforcement Agency (NESREA) for residential areas, and also far less than the Federal Ministry of Environment (FMEnv) permissible hourly exposure limit of 90 dB(A). This indicates that the proposed project environment is generally quiet and does not pose any immediate environmental or public health concern.

4.5 Geology and Hydrogeology of the Project Environment

The main geological formation underlying Kano State is the Nigerian Basement Complex. This Basement Complex rock formation predominates in the southern and western parts of the state while the Chad Formation occurs in the northern part. The Basement Complex rock characteristics of the area is similar to that of Kaduna State described previously in this study. The Chad Formation is found on top of the other formations within its sphere of occurrence. This sedimentary sector of the Chad Formation consists of three layers of loose sandy sediments. These layers of sand are separated by thick bodies of clay originating largely from alluvial deposits from rivers and floodplains. The segregated layers of sand and clay are of variable colors of brown, yellow, white and grey, and contain quartz and diatomite. In their natural states, the soils of the State can be categorized into four main groups. The ferruginous tropical soils formed on crystalline acid rocks occupy about two-fifth of the State to the south, south-

west and south-east; the brown and reddish brown soils and latosols occur in the northern half; the brown and reddish soils are in the northeastern corner; while the juvenile and hydromorphic soils occur along the alluvial channel complexes. The soils largely reflect the influence of parent materials. Intensive use of the soils and addition of manure and chemical fertilisers have altered their character, profile, texture, structure and chemical characteristics.

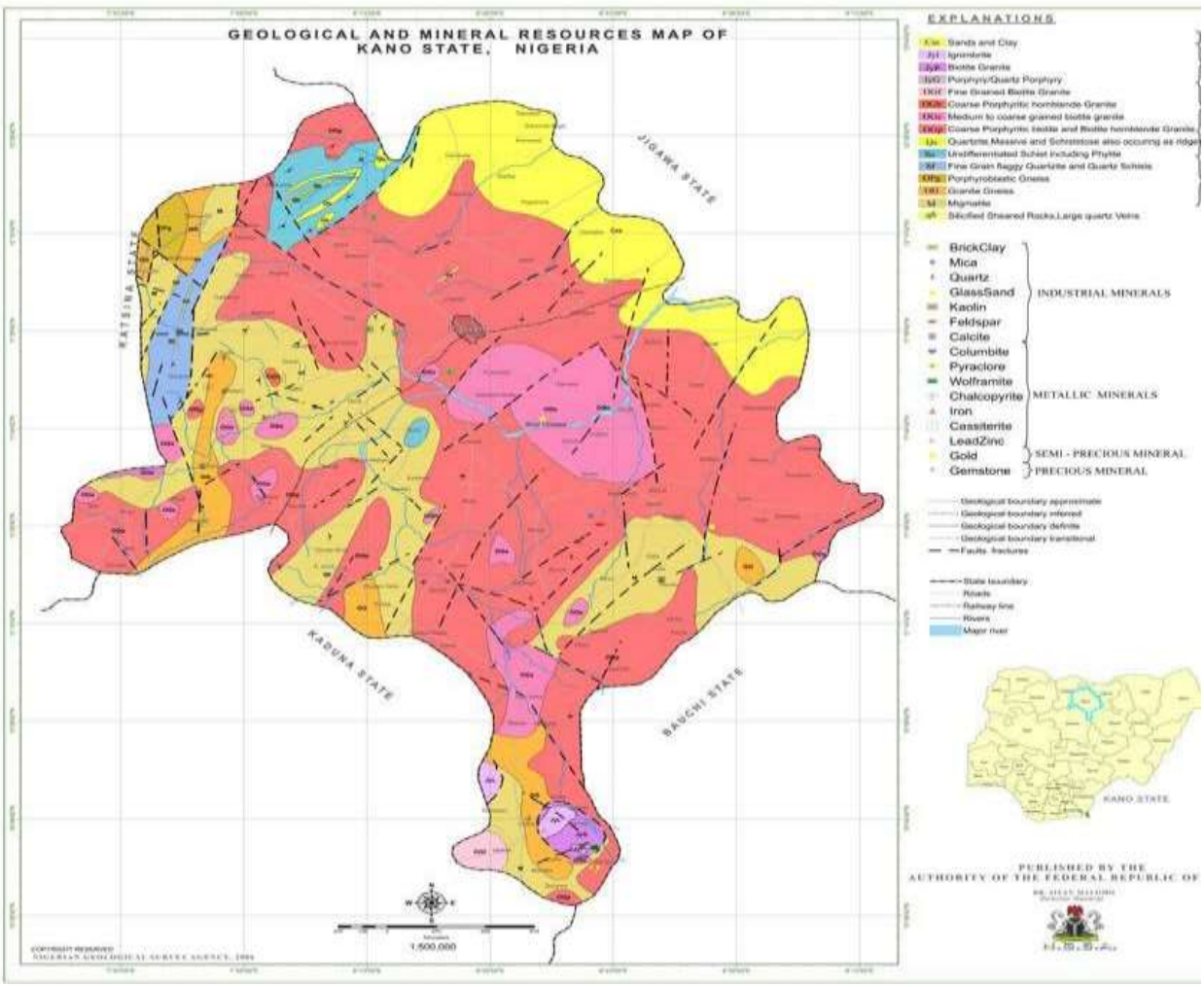


Fig. 4.11: Geology map of Kano state Project Area

4.6 Soil of the project area

The soils of the study area are generally light texture, typically classified as sandy loam or loamy sand, characterized by a high sand content (often over 70%) and a low clay percentage. This texture leads to several distinct physical properties: the soil is generally well-drained, which prevents waterlogging but results in a low water-holding capacity, making it prone to moisture stress during dry periods. The structure is often described as weak or physically fragile, with low aggregate stability and generally low bulk density values in undisturbed areas, though bulk density can be higher (up to 1.7 g/cm^3) in cultivated or grazing lands due to compaction and low organic matter content. The minimal clay and organic matter content mean the soil has poor nutrient retention capabilities, further impacting its inherent fertility.



Plate 4.2: Showing Photograph of Soil Sampling within the proposed project environment

Table 4.5: Physico-chemical Properties of Soil Samples within the Study Area

S/N	PARAMETERS	SAMPLE											
		SS 01		SS 02		SS 03		SS 04		SS 05		SS 06	
		0-15 cm	15-30cm	0-15 cm	15-30cm	0-15 cm	15-30cm	0-15 cm	15-30cm	0-15 cm	15-30cm	0-15 cm	15-30cm
1	pH	5.94	5.96	5.99	6.0	6.01	6.04	5.98	6.12	5.94	5.99	5.98	6.04
3	E/Conductivity (µSc/m)	134	147	121	129	132	148	127	142	126	132	125	141
4	Moisture Content (%) dried soil	16.23	17.47	17.2	18.9	20.80	16.23	17.47	17.2	20.80	17.2	18.9	20.80
5	Bulk density (g/cm^3)	1.015	1.155	1.12	1.05	1.045	1.015	1.155	1.12	1.045	1.12	1.05	1.045
6	Porosity (%)	25.1	11.7	27.7	20.3	24.6	25.1	11.7	27.7	24.6	17.2	18.9	20.80
7	**Particle Grain Size (%)**												
	% Sand	33.06	39.4	39.4	40.2	45.66	33.06	39.4	40.2	42.9	33.06	39.4	39.4
	% Silt	41.41	40	40	38.2	29.82	41.41	40	38.2	38.5	41.41	40	40
	% Clay	15.51	12.5	12.5	13.2	11.15	15.51	12.5	13.2	9.48	15.51	12.5	12.5
9	CEC (meq/100g)	0.541	0.693	0.693	0.258	2.600	0.541	0.693	0.172	0.709	0.541	0.693	0.693
10	Sulphate (mg/Kg)	68.93	58.7	58.7	57.9	75.05	68.93	58.7	59.25	72.54	68.93	58.7	58.7
11	Total Nitrogen (mg/Kg)	0.014	0.21	0.21	0.021	0.26	0.014	0.21	0.015	0.026	0.014	0.21	0.21
12	Ammonium (mg/Kg)	0.300	0.120	0.120	0.306	0.052	0.300	0.120	0.270	0.274	0.300	0.120	0.120
13	Nitrate (mg/Kg)	36.64	36.72	38.17	20.39	37.12	36.64	23.45	16.20	38.70	36.64	34.12	32.91
14	Phosphate (mg/Kg)	2.205	1.99	1.99	1.97	2.413	2.205	1.99	2.205	2.001	2.205	1.99	1.99
15	Calcium (mg/Kg)	33.06	39.4	7.21	4.361	4.004	8.008	39.4	4.004	4.004	8.008	39.4	7.21
16	Magnesium (mg/Kg)	6.23	7.25	5.34	8.21	4.12	3.65	5.34	8.21	6.78	8.649	3.65	8.649
17	Sodium (mg/Kg)	29.0	39.39	17.6	19.09	19.9	36.4	17.6	19.09	17.6	28.48	17.6	39.39
18	Potassium (mg/Kg)	7.224	0.400	2.911	0.415	4.068	1.524	2.911	0.415	1.355	0.428	0.400	7.224
19	Oil & Grease (mg/Kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
20	Iron (mg/Kg)	2.500	2.005	2.43	2.37	2.803	1.971	2.630	2.994	2.630	2.994	2.005	2.994
21	Lead (mg/Kg)	0.105	0.082	0.093	0.092	0.077	ND	0.068	0.095	0.068	0.095	-	0.105
22	Zinc (mg/Kg)	3.180	3.543	3.45	3.37	4.002	4.050	3.180	3.543	3.256	4.221	3.180	4.211
23	Cadmium (mg/Kg)	1.650	1.885	1.76	1.782	2.350	2.658	1.650	1.885	1.012	1.005	1.005	2.658
24	Copper (mg/Kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
25	Chromium (mg/Kg)	0.486	0.490	0.487	0.488	0.488	0.472	0.251	0.256	0.251	0.256	0.251	0.490
26	Nickel (mg/Kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
27	Manganese (mg/Kg)	0.715	1.262	0.98	1.14	1.441	1.007	0.505	0.519	0.505	0.519	0.505	1.441
28	Chloride (mg/Kg)	48.2	49.26	59.26	48.9	48.9	55.7	48.9	55.7	57.0	48.9	48.2	57.0
30	Total Organic Carbon (mg/Kg)	0.82	1.20	0.93	0.89	3.20	2.41	3.20	2.41	1.20	0.81	0.82	3.20
31	THBC (cfu/g)	2.0×10^5	2.6×10^4	8.0×10^4	1.8×10^5	1.7×10^5	5.9×10^5	7.5×10^4	6.0×10^5	7.5×10^4	6.0×10^5	2.6×10^4	6.0×10^5
32	THFC (cfu/g)	2.0×10^4	4.0×10^4	6.0×10^4	5.2×10^4	4.0×10^4	2.0×10^4	6.0×10^4	5.2×10^4	5.0×10^4	1.0×10^4	1.0×10^4	5.2×10^4
33	Coliform (cfu/100g)	3.3×10^5	5.0×10^4	1.3×10^5	2.0×10^4	1.6×10^5	2.2×10^5	3.3×10^5	5.0×10^4	2.2×10^5	8.0×10^4	2.0×10^4	3.3×10^5
34	Escherichia Coli (cfu/g)	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present

Abbreviations

mg/kg = Milligram per Kilogram **cfu/g** = Coliform-forming Unit per gram **ND** = Not Detected **NG** = No Growth
THBC = Total Heterotrophic Bacteria Count **THFC** = Total Heterotrophic Fungi Count **CEC** = Cation exchange capacity

Source: *EIA Field Study/lab analysis, September, 2025*

S/N	PARAMETERS	SAMPLE										RANGE		Secondary Data (Dry Season)
		SS 07		SS 08		SS 09		SS 10		SS Ctrl		Min	Max	
		0-15 cm	15-30cm	0-15 cm	15-30cm	0-15 cm	15-30cm	0-15 cm	15-30cm	0-15 cm	15-30cm			
1	pH	5.98	6.02	5.95	6.0	6.01	6.04	6.10	6.12	5.97	6.09	5.94	6.12	5.15 – 7.0
3	E/Conductivity (µSc/m)	140	147	129	137	132	143	127	142	126	132	121	148	77.15 – 193.0
4	Moisture Content (%) dried soil	17.2	18.9	20.80	19.15	17.03	17.07	17.2	20.80	19.15	17.03	16.23	20.80	17.08 – 24.9
5	Bulk density (g/cm^3)	1.12	1.05	1.045	1.05	1.110	1.025	1.12	1.045	1.05	1.110	1.015	1.155	-
6	Porosity (%)	17.2	18.9	20.80	20.3	21.8	17.9	27.7	20.80	20.3	21.8	11.7	27.7	-
7	**Particle Grain Size (%)**													
	% Sand	42.9	33.06	39.4	40.2	45.66	39.83	39.4	40.2	33.06	39.4	33.06	45.66	49.2 – 91.8
	% Silt	38.5	41.41	40	38.2	29.82	37.86	40	38.2	41.41	40	29.82	41.41	4.7 – 33.6
	% Clay	9.48	15.51	12.5	13.2	11.15	13.3	12.5	13.2	15.51	12.5	9.19	15.51	1.0 – 21.0
9	CEC (meq/100g)	0.709	0.541	0.693	0.258	2.600	1.052	8.793	0.172	0.541	0.693	0.172	8.793	-
10	Sulphate (mg/Kg)	72.54	68.93	58.7	57.9	75.05	79.47	56.98	59.25	68.93	58.7	56.98	79.47	2.30 – 24.94
11	Total Nitrogen (mg/Kg)	0.026	0.014	0.21	0.021	0.26	0.024	1.034	0.015	0.014	0.21	0.014	1.034	-
12	Ammonium (mg/Kg)	0.274	0.300	0.120	0.306	0.052	0.252	0.030	0.270	0.300	0.120	0.030	0.306	-
13	Nitrate (mg/Kg)	38.7	36.64	35.4	16.2	37.12	19.0	37.12	21.05	36.64	37.44	16.2	38.7	23.27 – 36.16
14	Phosphate (mg/Kg)	2.001	2.205	1.99	1.97	2.413	2.205	2.413	2.205	2.205	1.99	1.908	2.413	7.14 – 10.8
15	Calcium (mg/Kg)	4.004	8.008	7.21	4.361	4.004	4.004	4.004	4.004	33.06	39.4	4.004	9.37	3.85 – 6.36
16	Magnesium (mg/Kg)	6.23	7.25	5.34	8.21	4.12	3.65	5.34	8.21	6.78	8.649	3.65	8.649	0.52 – 1.0
17	Sodium (mg/Kg)	29.0	39.39	17.6	19.09	19.9	36.4	17.6	19.09	17.6	28.48	17.6	39.39	-
18	Potassium (mg/Kg)	7.224	0.400	2.911	0.415	4.068	1.524	2.911	0.415	1.355	0.428	0.400	7.224	0.06 – 1.05
19	Oil & Grease (mg/Kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-
20	Iron (mg/Kg)	2.500	2.005	2.43	2.37	2.803	1.971	2.630	2.994	2.630	2.994	2.005	2.994	76.74 – 119.2
21	Lead (mg/Kg)	0.105	0.082	0.093	0.092	0.077	ND	0.068	0.095	0.068	0.095	-	0.105	0.11 – 0.24
22	Zinc (mg/Kg)	3.180	3.543	3.45	3.37	4.002	4.050	3.180	3.543	3.256	4.221	3.180	4.211	0.74 – 1.64
23	Cadmium (mg/Kg)	1.650	1.885	1.76	1.782	2.350	2.658	1.650	1.885	1.012	1.005	1.005	2.658	0.31 – 0.86
24	Copper (mg/Kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	4.12 – 9.42
25	Chromium (mg/Kg)	0.486	0.490	0.487	0.488	0.488	0.472	0.251	0.256	0.251	0.256	0.251	0.490	0.59 – 1.43
26	Nickel (mg/Kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	0.59 – 1.19
27	Manganese (mg/Kg)	0.715	1.262	0.98	1.14	1.441	1.007	0.505	0.519	0.505	0.519	0.505	1.441	4.67 – 8.69
28	Chloride (mg/Kg)	48.2	49.26	59.26	48.9	48.9	55.7	48.9	55.7	57.0	48.9	48.2	57.0	-
30	Total Organic Carbon (mg/Kg)	0.82	1.20	0.93	0.89	3.20	2.41	3.20	2.41	1.20	0.81	0.82	3.20	-

31	THBC (cfu/g)	2.0×10^5	2.6×10^4	8.0×10^4	1.8×10^5	1.7×10^5	5.9×10^5	7.5×10^4	6.0×10^5	7.5×10^4	6.0×10^5	2.6×10^4	6.0×10^5	$4.4x10^4 – 8.48x10^6$
32	THFC (cfu/g)	2.0×10^4	4.0×10^4	6.0×10^4	5.2×10^4	4.0×10^4	2.0×10^4	6.0×10^4	5.2×10^4	5.0×10^4	1.0×10^4	1.0×10^4	5.2×10^4	$1.15x10^3 – 5.0x10^4$
33	Coliform (cfu/100g)	3.3×10^5	5.0×10^4	1.3×10^5	2.0×10^4	1.6×10^5	2.2×10^5	3.3×10^5	5.0×10^4	2.2×10^5	8.0×10^4	2.0×10^4	3.3×10^5	-
34	Escherichia Coli (cfu/g)	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present	-

Table 4.5 contd.: Physico-chemical Properties of Soil Samples within the Study Area

Abbreviations

mg/kg = Milligram per Kilogram **cfu/g** = Coliform-forming Unit per gram **ND** = Not Detected **NG** = No Growth

THBC = Total Heterotrophic Bacteria Count **THFC** = Total Heterotrophic Fungi Count **CEC** = Cation exchange capacity

Source: *EIA Field Study/lab analysis, 2025*

Secondary Data Source: *ESIA for Priority Value Chains of Rice, Wheat and Tomato, Kano state. March, 2021.*

Discussions

Depth: The soil samples at different sampling locations were taken from top soil at a depth of 0 -15cm and 15 – 30cm in each of the sampling points.

pH: The result of physical and chemical parameters of soil from the project area is shown in Table 4.6. The soil pH values recorded from the samples show that pH decreases with an increase in soil depth all within the range of 5.94 and 6.12. These values show characteristics acidic tending towards neutrality.

Texture: The textural composite of the soil is mostly sandy loam to sandy clay loam (Sand: 33–46%, Silt: 29–41%, Clay: 9–15%). The soil has moderate texture with good drainage but may have moderate nutrient retention.

Nitrate (NO_3^-): Nitrate from the sampling points vary between 16.20 to 38.70mg/kg and decreases with increasing soil sampling depth. Nitrates are highly soluble compounds and as such move readily and are available to plant roots at the topsoil. The value of nitrate from study area may be attributed to the use of Nitrate fertilizers by the local farmers in the area. Nitrates are also subject to leaching if they move out of the root zone and can eventually cause contamination of groundwater if present in excess. Nitrate is a byproduct of biological decay from the plant and animal matter. High concentrations can be found in rural, farming areas where fertilizers are regularly used.

Soluble Anions

Sulphate (SO_4^{2-}): The concentrations of sulphate ion in the area are in the range of 5.0 to 35.0mg/Kg. Sulphate is one of the ingredients required for the formation of acid sulphate soil which may affect key environmental values or uses such as aquatic ecosystem, drinking water, recreation and aesthetics.

Phosphate (PO_4^{2-}): Phosphate contents are within the range of 1.480 to 27.68mg/Kg. Just like any other soil nutrient, its concentration decreases with an increase in soil sampling depth. Phosphorus-containing compounds are essential for photosynthesis by plants for energy transformations and for the activity of some hormones in both plants and animals.

Exchangeable Cations: These are abundant elements in the earth's crust and are very important nutrients required to ensure plants growth and development.

Phosphate values reads 1.908mg/kg which is below the permissible standard 2.413mg/kg for the soil to support plant growth and development.

Sulphate values reads 56.98 – 79.47mg/kg. Samples shows values within normal range which can supports plant nutrition.

Nitrite value reads from 7.908 to 9.888mg/kg. Results obtained are relatively high and could indicate recent organic decomposition or contamination from fertilizers/sewage.

Heavy Metals: Manganese from the soil samples reads 0.505 – 1.441mg/kg which are below standards 2000mg/kg. Hence the content of Manganese in the soil samples are safe because they are far below toxicity thresholds. Iron is essential and these are low values 2.0 – 2.994mg/kg. Zinc value reads (3.180 – 4.211mg/kg) are considered low but safe because they below hazard level (300mg/kg). Cadmium value reads 1.005 – 2.658mg/kg are considered low but safe because they below hazard level 3mg/kg. Though, elevated but within safe limit. However, Cd is toxic even at low levels and should be monitored. Lead value reads 0.0 – 0.105mg/kg are considered low but safe because they below hazard level 85mg/kg. There is no contamination concern. Chromium value reads 0.251 – 0.490mg/kg are considered low but safe because they below hazard level 100mg/kg. There is no heavy contamination detected.

Total Organic Carbon: The range at which Total Organic Carbon was measured is 0.81 – 3.20(%). Soil samples shows that Point 1 soils have low organic matter (0.8–1.2%), while Point 3 topsoil is much higher (3.2%), indicating better fertility there.

Soil Micro-organisms

The microorganisms and macro-fauna work together as a team in organic matter decomposition. The microorganisms of concern in this study were fungi and bacteria and these play important roles in the transformation of soil nutrients. The pre-dominant heterotrophic bacterial isolates were *Serratia* sp, *Bacillus* sp, *Escherichia* sp, *Pseudomonas* sp, *Vibro* sp, *Flavobacterium* sp and *Alkalegene* sp. Their populations varied from 2.6 x 10^4 to 6.0 x 10^5 cfu/g. The low percentage of HUB is indicative of low

levels of utilization of petroleum products in the study area. The fungi population ranged from 1.0 x 10^4 – 5.2 x 10^4cfu/g. The major fungal isolates are *Pseudomonas* sp, *Candida sp, Aspergillus sp* and *Mucor sp*.

4.7 Water Study

4.7.1 Groundwater Study within the Proposed Project Area

The proposed project area is supplied by borehole. Sample of groundwater was sourced from one (1) borehole at the Fishery Institute. Parameters investigated for groundwater in the proposed industrial hub environment are levels of heavy metals: Lead (Pb), Mercury (Hg), Arsenic (as), Fe (iron). Other parameters include pH, Electrical Conductivity, Nephelometric Turbidity Unit (NTU), Alkalinity, Hardness, Chlorine, Total Dissolved Solids (TDS), Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Sulphate (So_4^{2-}), Nitrate (No_3^-) and oil contamination where relevant. Also, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Temperature were analyzed. Microbiology analysis of water samples was also carried out. Table 4.7 presents analysis for groundwater.



Plate 4.3: Showing groundwater sample collection and in-situ measurement

Table 4.6: Result of Physico-chemical Analysis of Groundwater samples collected from boreholes (Wet Season)

S/N	Parameters	Unit	FMEnv Maximum Permissible Limits	WHO Maximum Permissible Limit	GW001	Secondary Data (Dry Season)
PHYSICOCHEMICAL PARAMETERS					**11.593360°N 8.379481°E**	
1	General Appearance		Clear	Clear	Clear	Clear
2	Temperature	^{O}C	40	40	32.0	23.6 – 27.2
3	Electrical Conductivity	µS/cm	1000.00	NS	43	1006 – 1567
4	pH		6.0-9.0	6.5-9.0	6.81	6.7 – 7.2
5	Turbidity	NTU	10.00	5.00	0.0	1.12 – 1.92
7	Total Dissolved solid	mg/l	2000.00	500.00	25	25.3 – 33.1
8	Total Suspended Solid	mg/l	NS	NS	0.08	89 – 142
9	Total Solid	mg/l	NS	NS	1.250	-
10	Total Hardness	mg/l	NS	NS	26.0	7.48 – 10.3
11	Magnesium Hardness	mg/l	NS	NS	10.52	-
12	Calcium Hardness	mg/l	NS	NS	3.76	-
13	Total Alkalinity	mg/l	NS	150.00	-	-
14	Salinity	mg/l	NS	NS	0.00	-
15	Ammonia	mg/l	NS	1.00	0.12	<0.02
ORGANICS						
16	Dissolved Oxygen (DO)	mg/l	NS	NS	12.0	-
17	Chemical oxygen demand (COD)	mg/l	40.00	60-90	ND	-
18	Biological oxygen demand (BOD)	mg/l	30.00	30-50	ND	-
ANIONS						
19	Carbonate	mg/l	NS	NS	0.09	-
20	Bicarbonate	mg/l	NS	NS	28.8	-
21	Chloride	mg/l	600.00	350.00	18.0	120 – 189
22	Nitrite	mg/l	<1.0	0.08	0.24	-
23	Nitrate	mg/l	10.00	10.00	12.13	1.63 – 1.92
24	Phosphate	mg/l	5.00	3.50	2.01	0.24 – 0.29
25	Sulphate	mg/l	500.00	500.00	25.3	0.22 – 0.29
METALS						
26	Calcium	mg/l	200.00	180.00	4.62	75 – 88
27	Magnesium	mg/l	200.00	40.00	5.49	0.22 – 1.5
28	Lead	mg/l	<1.0	0.10	0.217	
30	Iron	mg/l	0.3	0.5	1.002	0.15 – 0.28
31	Chromium	mg/l	0.20	0.20	0.1133	-
32	Copper	mg/l	2.00	1.00	ND	-
33	Manganese	mg/l	0.05	0.05	ND	-
34	Arsenic	mg/l	0.05	0.01	ND	-
35	Mercury	mg/l	0.0003	0.0003	ND	-
MICROBIAL PARAMETERS						
40	Total Heterotrophic Bacterial (THB)	cfu/ml	10	10	ND	-
41	Total Heterotrophic Fungi (THF)	cfu/ml	0	0	ND	-

42	Total coliform (TC)	cfu/ml	30	30	12	-
43	Feacal coliform (FC)	cfu/ml	0	0	ND	-

Key:
mg/Kg = milligram per kilogram
µS/cm = micro-Siemens per centimetre
cfu/g = colony forming unit per gram
ND = Not Detected
Source: EIA Field Study/lab analysis, 2025
Secondary Data Source: *ESIA for Priority Value Chains of Rice, Wheat and Tomato, Kano state. March, 2021.*

Discussion

pH: The pH value of the groundwater is 6.81. Neutral to slightly acidic, acceptable. This value falls within the recommended value compared to the Federal Ministry of Environment (FMEnv) limits of 6-9, during the sampling periods.

Total Dissolved Solids (TDS)/Electrical Conductivity: The TDS and conductivity of the ground water were found to be 21mg/l and 43µS/cm respectively which are very low compared to FMEnv standard, 500mg/l and 1000µS/cm respectively. This indicates water is fresh with low mineral/salt content. Although, these values are within the FMEv permissible limits for groundwater.

Turbidity: The concentration of turbidity detected is 0 NTU. Turbidity describes the cloudiness of water caused by suspended particles such as clay and silts, chemical precipitates such as manganese and iron, and organic particles such as plant debris and organisms (APHA/AWWA/WEF, 2012; Health Canada, 2012).

The sources of turbidity are diverse, and many of the constituent particles (e.g. clays, soils and natural organic matter) are harmless. However, turbidity can also indicate the presence of hazardous chemical and microbial contaminants and have significant implications for water quality. The implications will vary depending on the characteristics of the turbidity. In addition, the point of detection is important in considering potential impacts. Elevated turbidity in source waters can signal pollution events in the catchment (e.g. heavy rain, spills or contamination of groundwater), and can challenge the effectiveness of coagulation and clarification, filtration and disinfection. Failure to meet turbidity targets for filtered water can indicate the possible presence of pathogens in drinking water, and increased turbidity in distribution systems can represent

detachment of biofilms and oxide scales or entry of external sources of contamination. Each source needs to be considered in context because the treatment and management implications will vary (WHO, 2017).

Total Hardness

The total hardness of the ground water was found to be 26.00mg/l. Very low when compared to the FMEnv standard, 200mg/l during the time of analysis. Indicating that the water is soft.

Magnesium Hardness/Magnesium Ion

Magnesium hardness and ions levels in the ground water analysed within the study area was found to be 10.52mg/l and 3.76mg/l which below threshold, 50mg/l and 50mg/l respectively. This is a safe level.

Calcium Hardness/Calcium Ion

The Calcium Hardness/Calcium Ion ground water values were found to be 3.76mg/l and 4.25mg/l which are below FMEnv recommended standards.

Nitrate as Nitrogen

The nitrate value of the ground water sample analysed was found to be 12.13mg/l. This is within the FMEnv acceptable limit of 10mg/l for surface. However, it is close to the benchmark, high nitrates indicates agricultural runoff or sewage influence.

Chemical Oxygen Demand COD/ Biochemical Oxygen Demand BOD

The COD and BOD of the water analysed were not detected. This indicates low organic input and oxygenation.

Heavy Metals

Metal tested for the ground water and surface water within the study area is discussed below.

Manganese

The Manganese levels in the ground water is below detection limit.

Iron

The concentration of Iron in the ground water samples analysed was found to be 1.002mg/l. This value is within the permissible limit of 1.5mg/l. It is safe.

Lead

The groundwater analysed has high content of Lead (0.217) as at the period of analysis, which exceed FMEnv permissible limit (0.05). Lead is highly toxic and it is linked to developmental and neurological damage.

Chromium

As at the period of analysis, the groundwater has chromium levels (0.1133mg/g) that exceeds FMEnv permissible limit (0.05mg/l). Chromium is a potential carcinogenic element. Hence its pollution makes this water unsafe for human consumption.

Bacteriological

Water samples for microbiological studies were collected in 100ml plastic containers which were covered with aluminium foil and kept in ice-cool box prior to culturing in the laboratory. The water was then analysed for coliforms using the multiple tube fermentation technique.

The water sample analysed revealed that the total Coliform Number of bacteria is above the recommended values of 1.8 and 400 for ground water and surface water. While Escherichia Coli (Too Few To Count), salmonella (Too Few To Count), shigella (Too Few To Count) were all present in groundwater. No positive Oxidase bacteria was detected.

4.7.2 Surface Water Study within the proposed Project area

Surface water samples were sourced from a stream (that runs through the proposed project site) at three different locations representing upstream, midstream and downstream. Parameters investigated for surface water are levels of heavy metals: Lead (Pb), Mercury (Hg), Arsenic (as), Fe (iron). Other parameters include pH, Electrical Conductivity, Nephelometric Turbidity Unit (NTU), Alkalinity, Hardness, Chlorine, Total Dissolved Solids (TDS), Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Sulphate (So_4^{2-}), Nitrate (No_3^-) and oil contamination where relevant. Also, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and

Temperature were analyzed. Microbiology analysis of water samples was also carried out. Table 4.8 presents analysis for surface water.



Plate 4.4: Showing surface water sample collection and in-situ measurement

Table 4.7: Result of Physico-chemical Analysis of surface water sample collected from Bagauda stream (Wet Season)

S/N	Parameters	Unit	FMEnv Maximum Permissible Limits	WHO Maximum Permissible Limit	SW001 (Upstream)	SW002 (Midstream)	SW003 (Downstream	Secondary Data (Dry Season)
PHYSICOCHEMICAL PARAMETERS					**11.605081°N 8.382807°E**	**11.596986°N 8.385853°E**	**11.587417°N 8.380480°E**	
1	General Appearance		Clear	Clear	Turbid	Turbid	Turbid	Clear
2	Temperature	^{O}C	40	40	33.1	32.4	31.2	23.6 – 27.2
3	Electrical Conductivity	µS/cm	1000.00	NS	26	34	31	1006 – 1567
4	pH		6.0-9.0	6.5-9.0	7.9	8.2	8.1	6.7 – 7.2
5	Turbidity	NTU	10.00	5.00	3.0	4.0	4.0	1.12 – 1.92
7	Total Dissolved solid	mg/l	2000.00	500.00	13	17	15	25.3 – 33.1
8	Total Suspended Solid	mg/l	NS	NS	0.12	0.14	0.42	89 – 142
9	Total Solid	mg/l	NS	NS	1.250	1.32	1.521	-
10	Total Hardness	mg/l	NS	NS	32.1	31.0	31.5	7.48 – 10.3
11	Magnesium Hardness	mg/l	NS	NS	21.2	18.9	17.2	-
12	Calcium Hardness	mg/l	NS	NS	10.9	12.1	14.3	-
13	Total Alkalinity	mg/l	NS	150.00	-	-	-	-
14	Salinity	mg/l	NS	NS	0.01	0.01	0.01	-
15	Ammonia	mg/l	NS	1.00	0.32	0.41	0.31	<0.02
ORGANICS								
16	Dissolved Oxygen (DO)	mg/l	NS	NS	8.0	9.1	8.5	-
17	Chemical oxygen demand (COD)	mg/l	40.00	60-90	9.4	10.2	9.8	-
18	Biological oxygen demand (BOD)	mg/l	30.00	30-50	8.9	8.2	9.1	-
ANIONS								
19	Carbonate	mg/l	NS	NS	0.12	0.13	0.10	-
20	Bicarbonate	mg/l	NS	NS	12.8	11.4	12.1	-
21	Chloride	mg/l	600.00	350.00	14.0	13.6	12.5	120 – 189
22	Nitrite	mg/l	<1.0	0.08	0.19	0.19	0.17	-
23	Nitrate	mg/l	10.00	10.00	6.01	5.92	6.12	1.63 – 1.92
24	Phosphate	mg/l	5.00	3.50	2.03	2.10	2.01	0.24 – 0.29
25	Sulphate	mg/l	500.00	500.00	11.3	10.3	10.5	0.22 – 0.29
METALS								

26	Calcium	mg/l	200.00	180.00	2.25	1.81	1.90	75 – 88
27	Magnesium	mg/l	200.00	40.00	1.76	1.75	1.68	0.22 – 1.5
28	Lead	mg/l	<1.0	0.10	0.124	0.132	0.123	
30	Iron	mg/l	0.3	0.5	1.4	1.3	1.3	0.15 – 0.28
31	Chromium	mg/l	0.20	0.20	0.1133	0.121	0.114	-
32	Copper	mg/l	2.00	1.00	ND	ND	ND	-
33	Manganese	mg/l	0.05	0.05	ND	ND	ND	-
34	Arsenic	mg/l	0.05	0.01	ND	ND	ND	-
35	Mercury	mg/l	0.0003	0.0003	ND	ND	ND	-
MICROBIAL PARAMETERS								
40	Total Heterotrophic Bacterial (THB)	cfu/ml	10	10	ND	ND	ND	-
41	Total Heterotrophic Fungi (THF)	cfu/ml	0	0	ND	ND	ND	-
42	Total coliform (TC)	cfu/ml	30	30	23	22	20	-
43	Feacal coliform (FC)	cfu/ml	0	0	12	11	13	-

Key:

mg/Kg = milligram per kilogram

µS/cm = micro-Siemens per centimetre

cfu/g = colony forming unit per gram

ND = Not Detected

Source: EIA Field Study/lab analysis, 2025

Secondary Data Source: *ESIA for Priority Value Chains of Rice, Wheat and Tomato, Kano state. March, 2021.*

Discussion

pH: The pH value of the surface water is ranges from 7.9 to 8.2. Slightly basic, acceptable. These values fall within the recommended value compared to the Federal Ministry of Environment (FMEnv) limits of 6-9, during the sampling periods.

Total Dissolved Solids (TDS)/Electrical Conductivity: The TDS and conductivity of the surface water were found to range from 13 to 17mg/l and 26 to 34µS/cm respectively which are very low compared to FMEnv standard, 500mg/l and 1000µS/cm respectively. This indicates water is fresh with low mineral/salt content. Although, this value are within the FMEv permissible limits for groundwater.

Turbidity: The concentration of turbidity detected ranged between 3.0 and 4.0 NTU. Turbidity describes the cloudiness of water caused by suspended particles such as clay and silts, chemical precipitates such as manganese and iron, and organic particles such as plant debris and organisms (APHA/AWWA/WEF, 2012; Health Canada, 2012).

The sources of turbidity are diverse, and many of the constituent particles (e.g. clays, soils and natural organic matter) are harmless. However, turbidity can also indicate the presence of hazardous chemical and microbial contaminants and have significant implications for water quality. The implications will vary depending on the characteristics of the turbidity. In addition, the point of detection is important in considering potential impacts. Elevated turbidity in source waters can signal pollution events in the catchment (e.g. heavy rain, spills or contamination of groundwater), and can challenge the effectiveness of coagulation and clarification, filtration and disinfection. Failure to meet turbidity targets for filtered water can indicate the possible presence of pathogens in drinking water, and increased turbidity in distribution systems can represent detachment of biofilms and oxide scales or entry of external sources of contamination. Each source needs to be considered in context because the treatment and management implications will vary (WHO, 2017).

Total Hardness

The total hardness of the surface water was found to range from 31.0 to 32.1mg/l. Very low when compared to the FMEnv standard, 200mg/l during the time of analysis. Indicating that the water is soft.

Magnesium Hardness/Magnesium Ion

Magnesium hardness and ions levels in the surface water analysed within the study area was found to be 17.2 – 21.2mg/l and 1.68 – 1.76mg/l which is below threshold, 50mg/l and 50mg/l respectively. This is a safe level.

Calcium Hardness/Calcium Ion

The Calcium Hardness/Calcium Ion surface water values were found to be 10.9 – 14.3mg/l and 1.81 – 2.25mg/l which are below FMEnv recommended standards.

Nitrate as Nitrogen

The nitrate value of the surface water sample analysed was found to be between 5.92 to 6.12mg/l. This is within the FMEnv acceptable limit of 10mg/l for surface. However, it is close to the benchmark, high nitrates indicates agricultural runoff or sewage influence.

Chemical Oxygen Demand COD/ Biochemical Oxygen Demand BOD

The COD and BOD of the water analysed were 9.4 – 10.2mg/l and 8.2 – 9.1mg/l respectively. This indicates low organic input and oxygenation.

Heavy Metals

Metal tested for the surface water within the study area is discussed below.

Manganese

The Manganese levels in the surface water is below detection limit of the equipment. This is below the permissible limit (0.2mg/l).

Iron

The concentration of Iron in the surface water samples analysed was found to be between 1.3 and 1.4mg/l. This value is within the permissible limit of 1.5mg/l. It is safe.

Lead

The surface water analysed has high content of Lead (0.123 – 0.132) as at the period of analysis, which exceed FMEnv permissible limit (0.05). Lead is highly toxic and it is linked to developmental and neurological damage.

Chromium

As at the period of analysis, the surface water has chromium levels (0.1133 – 0.121mg/g) that exceeds FMEnv permissible limit (0.05mg/l). Chromium is a potential carcinogenic element. Hence its polution makes this water unsafe for human consumption.

Bacteriological

The water sample analysed revealed that the total Coliform Number of bacteria is below the recommended values of 1.8 and 400 for ground water and surface water. While Feacal coliform ranged between 20 and 23cfu/ml indicating feacal contamination of the surface water.

4.8 Biodiversity of the Study Area

The biodiversity assessment established baseline ecological conditions of the project area, examining both vegetation and animal life. The plant survey identified species composition, abundance, distribution, and community structure, with attention to dominant, indicator, rare, threatened, and endemic species following IUCN (2023) criteria. The faunal inventory covered terrestrial and avifaunal species, including invertebrate.

4.8.1 Vegetation

Nigeria lies within the tropical region, characterized by a climate that is alternately moist and highly humid. The country's natural vegetation zones are shaped by the interplay of temperature, humidity, and rainfall especially the fluctuations in rainfall patterns. These factors strongly determine the types of native plants that thrive across different areas of the nation.

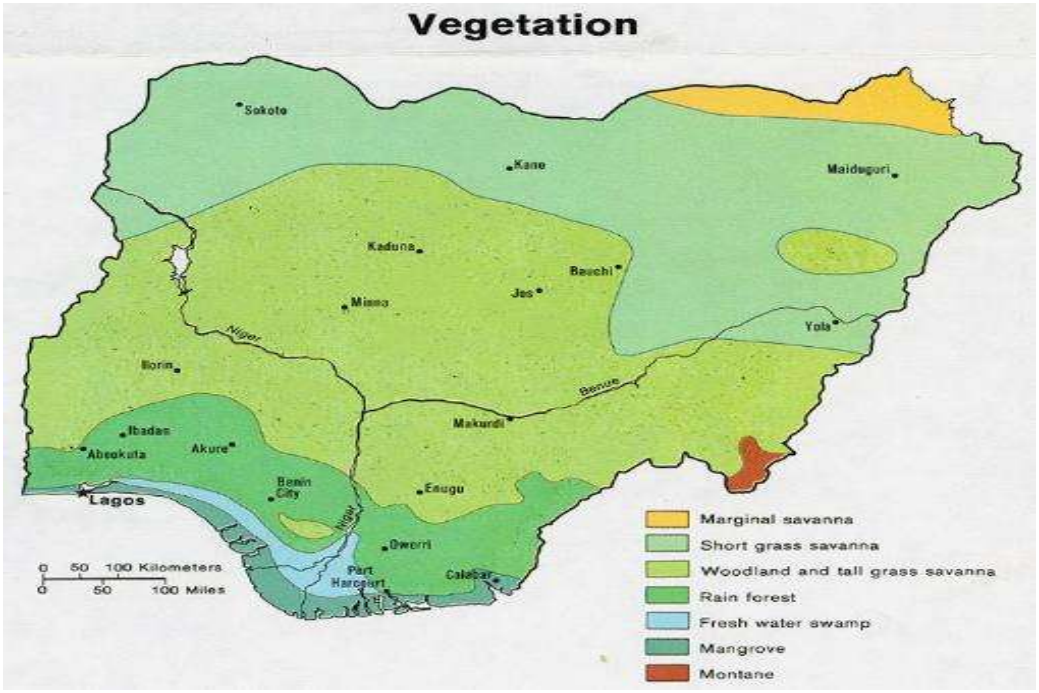


Figure 4.12: Showing Map of Nigeria highlighting various distribution of Vegetation
Source: https://www.globalsecurity.org/

The humid tropical forest zone of the South that has longer rains is capable of supporting a number of plantation crops such as cocoa, oil palm, rubber, coffee, cotton and staple crops like, yam, cassava, cocoyam, sweet potatoes, melon, groundnut, rice maize and cowpeas; however, in some parts of the East and many areas near the coast, the high rainfall has led to badly leached soils and severe erosion in some places.

The Northern part of the country representing about 80% of the vegetative zones experiences lower rainfall and shorter rainy season and they make up the Savannah land. The Savannah land forms an excellent natural habitat for a large number of grazing livestock such as cattle, goats, horses, sheep, camels, and donkeys.

The natural vegetative zones resulted from the interaction of climate, humidity, rainfall and soils. These factors have been modified by human activities and man's pattern of land use. Based on the above, Nigeria's agro-ecological zones can be classified into:

- The Mangrove forest and coastal vegetation – naturally found in the Niger Delta
- The Freshwater swamp forest – naturally found in Ogun, Benin, Imo and Niger Delta

- The tropical high forest zone – vegetation belt which stretches from the western border of Nigeria, through a narrow stretch on the Niger-Benue river system into the extensive area in the South-East of the country.
- The derived Guinea Savannah – which is a transition between the tropical rainforest and guinea savannah zones is found immediately after the tropical rainforest zone.
- The Guinea Savannah zone – the most is the most extensive ecological zone, covering nearly half of Nigeria is located in the middle of the country, extending from Ondo, Edo, Anambra and Enugu States in the South, through Oyo State to beyond Zaria in Kaduna State.
- The Sudan savannah (Short grass savanna) – found in the Northwest stretches from Sokoto plains in the West, Northern sections of the Central highland and spans almost the entire Northern States.
- The Sahel savannah (Marginal Savanna) – fast-encroaching Sahara desert, occupies about 18,130km^2 of the extreme Northeast corner of Nigeria
- The Montane vegetation – located in the high altitude areas of the country like Jos Plateau, Mandara, Adamawa Mountain and Obudu Plateau.

4.8.2 Vegetation of the Study Area

Kano state is characterized by Sudano-Sahelian ecological zone, where rainfall is seasonal, temperatures are high, and soils are often sandy or lateritic. This climate dictates the dominance of drought-resistant trees such as baobab (*Adansonia digitata*), neem (*Azadirachta indica*), and shea butter tree (*Vitellaria paradoxa*). These trees not only provide shade and stabilize soils against erosion but also serve as critical reservoirs of food, medicine, and cultural identity. Their deep root systems allow them to survive long dry seasons, while their canopies create microhabitats that support smaller shrubs and herbs.

Shrubs such as henna (*Lawsonia inermis*), and castor oil plant (*Ricinus communis*) contribute to the ecological diversity by offering medicinal, cultural, and economic benefits. They often occupy transitional zones between cultivated fields and natural

savanna, acting as buffers that reduce wind erosion and provide fodder for livestock. Herbs like cowpea (*Vigna unguiculata*), and Sorghum (*Sorghum bicolor*) dominate agricultural landscapes, reflecting the strong human influence on vegetation patterns. These annual crops are highly dependent on rainfall, and their abundance fluctuates with seasonal water availability.

The plant species identified in the study area are presented in Table 4.8.

Table 4.8: Checklist of plant species present in the study area

S/N	Botanical Name	Family	Common Name	Habit	Uses	Abundance	IUCN Status
1	*Abelmoschus esculentus*	Malvaceae	Okra	Herb	Food	+	NE
2	*Mangifera indica*	Anacardiaceae	Mango	Tree	Fruit, shade	++	LC
3	*Azadirachta indica*	Meliaceae	Neem	Tree	Medicine, shade, timber	+++	LC
4	*Parkia biglobosa*	Fabaceae	African locust bean	Tree	Food, medicine	+	LC
5	*Vitellaria paradoxa*	Sapotaceae	Shea butter tree	Tree	Oil, food, cosmetics	+	LC
6	*Hibiscus sabdariffa*	Malvaceae	Roselle	Shrub	Beverage, medicine	+	NE
7	*Senna siamea*	Fabaceae	Cassia	Tree	Timber, ornamental	+	LC
8	*Tamarindus indica*	Fabaceae	Tamarind	Tree	Food, medicine	+	LC
9	*Ficus sycomorus*	Moraceae	Sycamore fig	Tree	Shade, cultural	+	LC
10	*Adansonia digitata*	Malvaceae	Baobab	Tree	Food, medicine, fiber	+++	LC
11	*Khaya senegalensis*	Meliaceae	African mahogany	Tree	Timber, medicine	+	LC
12	*Ziziphus mauritiana*	Rhamnaceae	Jujube	Tree	Fruit, fodder	++	LC
13	*Anogeissus leiocarpa*	Combretaceae	African birch	Tree	Timber, medicine	+	LC
14	*Balanites aegyptiaca*	Zygophyllaceae	Desert date	Tree	Food, medicine, oil	+	LC
15	*Acacia nilotica*	Fabaceae	Gum arabic tree	Tree	Gum, fodder, medicine	++	LC
16	*Acacia Senegal*	Fabaceae	Gum arabic	Tree	Gum, fodder	+	LC
17	*Euphorbia hirta*	Euphorbiaceae	Asthma weed	Herb	Medicine	+	NE
18	*Vernonia amygdalina*	Asteraceae	Bitter leaf	Shrub	Medicine, food	+	NE
19	*Corchorus olitorius*	Malvaceae	Jute mallow	Herb	Food, fiber	+	NE
20	*Sorghum bicolor*	Poaceae	Sorghum	Herb	Food, fodder	+++	NE
21	*Zea mays*	Poaceae	Maize	Herb	Food, fodder	++	NE
22	*Oryza sativa*	Poaceae	Rice	Herb	Food	++	NE
23	*Vigna unguiculata*	Fabaceae	Cowpea	Herb	Food	++	NE
24	*Capsicum annuum*	Solanaceae	Pepper	Herb	Food	++	NE
25	*Solanum melongena*	Solanaceae	Eggplant	Herb	Food	+	NE
26	*Solanum tuberosum*	Solanaceae	Potato	Herb	Food	+	NE
27	*Ipomoea batatas*	Convolvulaceae	Sweet potato	Herb	Food	+	NE
28	*Musa paradisiaca*	Musaceae	Plantain	Herb	Food	+	NE
29	*Citrus sinensis*	Rutaceae	Orange	Tree	Fruit	+	LC
30	*Citrus limon*	Rutaceae	Lemon	Tree	Fruit, medicine	+	LC

S/N	Botanical Name	Family	Common Name	Habit	Uses	Abundance	IUCN Status
31	*Carica papaya*	Caricaceae	Pawpaw	Tree	Fruit, medicine	+	LC
32	*Gossypium hirsutum*	Malvaceae	Cotton	Shrub	Fiber	+	NE
33	*Ricinus communis*	Euphorbiaceae	Castor oil plant	Shrub	Oil, medicine	+	LC
34	*Jatropha curcas*	Euphorbiaceae	Physic nut	Shrub	Biofuel, medicine	+	LC
35	*Moringa oleifera*	Moringaceae	Moringa	Tree	Food, medicine	++	LC
36	*Cajanus cajan*	Fabaceae	Pigeon pea	Shrub	Food, fodder	+	NE
37	*Cucumis sativus*	Cucurbitaceae	Cucumber	Herb	Food	+	NE
38	*Citrullus lanatus*	Cucurbitaceae	Watermelon	Herb	Food	++	NE
39	*Phaseolus vulgaris*	Fabaceae	Common bean	Herb	Food	+	NE
40	*Allium cepa*	Amaryllidaceae	Onion	Herb	Food, medicine	++	NE
41	*Capsicum frutescens*	Solanaceae	Chili pepper	Herb	Food, spice	++	NE
42	*Sesamum indicum*	Pedaliaceae	Sesame	Herb	Oilseed, food	+	NE
43	*Arachis hypogaea*	Fabaceae	Groundnut	Herb	Food, oil	++	NE
44	*Cucurbita pepo*	Cucurbitaceae	Pumpkin	Herb	Food, fodder	+	NE
45	*Hibiscus cannabinus*	Malvaceae	Kenaf	Shrub	Fiber, fodder	+	NE
46	*Lawsonia inermis*	Lythraceae	Henna	Shrub	Dye, cultural	+	LC
47	*Nicotiana tabacum*	Solanaceae	Tobacco	Herb	Cultural, economic	+	LC

Key:

+ = present ++ = Abundant +++ = Very Abundant

NE = Not Evaluated S = Secure VU = Vulnerable DD = Data deficient

LC = Least Concern En = Endangered NT = Nearly threatened

Source: EIA Field Study, September 2025



Plate 4.5: Showing some of the plants around the study area

4.8.3 Fauna study

Footprints and sounds were used to identified Fauna species; also locals, hunters, meat traders were interviewed to determine the type of Fauna species in the study area. The study area is endowed with abundant Fauna species.

The fauna of Kano State reflects the ecological diversity of the Sudan–Sahelian zone, where savanna woodlands, grasslands, and wetlands support a wide range of species. Mammals such as the olive baboon (*Papio anubis*), tantalus monkey (*Chlorocebus tantalus*), and African golden wolf (*Canis anthus*) are relatively common, while larger carnivores like the spotted hyena (*Crocuta crocuta*) persist in lower numbers. Historically, species such as the lion (*Panthera leo*) and scimitar-horned oryx (*Oryx dammah*) roamed the region, but today they are rare or locally extinct, reflecting the pressures of habitat loss and hunting. Birdlife is abundant, with species like the helmeted guineafowl (*Numida meleagris*), laughing dove (*Streptopelia senegalensis*), and black kite (*Milvus migrans*) thriving in both rural and urban landscapes. Raptors such as the tawny eagle (*Aquila rapax*) and wetland specialists like the goliath heron (*Ardea goliath*) highlight the importance of Kano's wetlands and open savanna habitats. Reptiles are well represented, ranging from the ubiquitous agama lizard (*Agama agama*) to larger predators like the Nile monitor (*Varanus niloticus*) and African rock python (*Python sebae*), alongside venomous snakes such as the puff adder (*Bitis arietans*) and black-necked spitting cobra (*Naja nigricollis*). Amphibians, including the African common toad (*Amietophrynus regularis*) and reed frogs (*Hyperolius viridiflavus*), are widespread, especially in agricultural and wetland areas. Invertebrates dominate the landscape, with termites (*Macrotermes bellicosus*), honeybees (*Apis mellifera adansonii*), and locusts (*Schistocerca gregaria*) playing critical ecological and economic roles, while mosquitoes (*Anopheles gambiae*) represent a major public health concern.

Major threats to wildlife in the area include uncontrolled poaching and clearance of land for farming including bush burning. However, based on the IUCN conservation status, none of the fauna species are considered threatened. A list of some Fauna species is presented in Table 4.9.

Table 4.9: List of Fauna Species Sighted or Reported in within the study area

S/N	Scientific Name	Family	Common Name	Abundance	IUCN Status
1	*Papio Anubis*	Olive Baboon	Cercopithecidae	Common	Least Concern
2	*Chlorocebus tantalus*	Tantalus Monkey	Cercopithecidae	Common	Least Concern

S/N	Scientific Name	Family	Common Name	Abundance	IUCN Status
3	*Crocuta crocuta*	Spotted Hyena	Hyaenidae	Uncommon	Least Concern
4	*Canis anthus*	African Golden Wolf	Canidae	Uncommon	Least Concern
5	*Panthera leo*	Lion	Felidae	Rare (historical)	Vulnerable
6	*Felis lybica*	African Wildcat	Felidae	Uncommon	Least Concern
7	*Kobus kob*	Kob Antelope	Bovidae	Uncommon	Least Concern
8	*Tragelaphus scriptus*	Bushbuck	Bovidae	Uncommon	Least Concern
9	*Numida meleagris*	Helmeted Guineafowl	Numididae	Common	Least Concern
10	*Francolinus bicalcaratus*	Double-spurred Francolin	Phasianidae	Common	Least Concern
11	*Ardea cinerea*	Grey Heron	Ardeidae	Common	Least Concern
12	*Ardea goliath*	Goliath Heron	Ardeidae	Uncommon	Least Concern
13	*Milvus migrans*	Black Kite	Accipitridae	Common	Least Concern
14	*Ptilopachus petrosus*	Stone Partridge	Odontophoridae	Common	Least Concern
15	*Streptopelia senegalensis*	Laughing Dove	Columbidae	Very Common	Least Concern
16	*Psittacula krameri*	Rose-ringed Parakeet	Psittaculidae	Common	Least Concern
17	*Agama agama*	Common Agama Lizard	Agamidae	Very Common	Least Concern
18	*Varanus niloticus*	Nile Monitor Lizard	Varanidae	Common	Least Concern
19	*Python sebae*	African Rock Python	Pythonidae	Uncommon	Least Concern
20	*Bitis arietans*	Puff Adder	Viperidae	Common	Least Concern
21	*Naja nigricollis*	Black-necked Spitting Cobra	Elapidae	Common	Least Concern
22	*Amietophrynus regularis*	African Common Toad	Bufonidae	Very Common	Least Concern
23	*Hyperolius viridiflavus*	Banded Reed Frog	Hyperoliidae	Common	Least Concern
24	*Ptychadena mascareniensis*	Mascarene Grass Frog	Ptychadenidae	Common	Least Concern
25	*Schistocerca gregaria*	Desert Locust	Acrididae	Common (seasonal)	Least Concern
26	*Anopheles gambiae*	Malaria Mosquito	Culicidae	Very Common	Not Evaluated
27	*Apis mellifera adansonii*	African Honeybee	Apidae	Very Common	Not Evaluated
28	*Macrotermes bellicosus*	Termite	Termitidae	Very Common	Not Evaluated
29	*Periplaneta americana*	American Cockroach	Blattidae	Common	Not Evaluated
30	*Acheta domesticus*	House Cricket	Gryllidae	Common	Not Evaluated

S/N	Scientific Name	Family	Common Name	Abundance	IUCN Status
31	*Helix aspersa*	Garden Snail	Helicidae	Common	Not Evaluated
32	*Scorpio maurus*	Sahara Scorpion	Scorpionidae	Common	Not Evaluated

IUCN Key: EN: Endangered; LC: Least Concern; NT: Near Threatened; NE: Not Evaluated

Source: *Field survey, 2025*

4.9 Socio-Economics

4.9.1 Methodology

The proposed project host community is Dakatsalle-Wak, Bebeji LGA of Kano state. Purposive random sampling was adopted to distribute questionnaires to members of the communities, oral Interview sessions and participatory random walk activities were the primary data collection sources.

The study community (Dakatsalle-Wak) has an estimated population of 9,000 people and 750 households (an average of 12 persons per household). While national-level surveys such as the Living Standards Survey records ~5.06 persons per household (National Bureau of Statistics; Nigeria Living Standard Survey, 2020), the field reconnaissance and oral interviews in Dakatsalle-Wak suggest a larger local household structure. This higher value (≈12 persons per household) may reflect polygamous marriage practice in Northern Nigeria.

In rural settings typical of developing countries such as Nigeria, the household is frequently adopted as the basic unit of socioeconomic analysis. This approach is informed by both practical and cultural considerations. Practically, households serve as the primary unit of production, consumption, and resource allocation, particularly in subsistence and small-scale farming systems where decisions on land use, labour distribution, and income generation are collectively made. Culturally, rural communities are structured around extended family systems, with households functioning as the central unit of social organization, inheritance, land tenure, and mutual support. Consequently, adopting the household as the unit of analysis provides a more accurate

reflection of livelihood strategies, decision-making processes, and socio-economic dynamics within the study area.

The Yamane (1973) formula was used to determine the statistically valid sample size for the household survey:

$$n=\frac{N}{1+N(e^2)}$$

Where:

- n = Sample size
- N = Total number of households (750)
- e = Acceptable margin of error (set at 7% or 0.07)

$$n=\frac{750}{1+750(0.07^2)} \approx 160$$

Therefore total of 160 questionnaires were administered while 156 questionnaires were retrieved representing 97.5% retrieval. Table 4.11 presents the number of questionnaire distributed in each community within the project area. A field test of the data collection instruments was conducted one day prior to the main survey. This pre-testing exercise was essential to refine the instruments and to ensure the accuracy, reliability, and validity of the data to be collected.

Relevant published documents from National Bureau of Statistics and National Population Commission acted as secondary data collection sources.

Data were analysed using descriptive statistics. Microsoft Excel and the Statistical Package for the Social Sciences (SPSS) were the primary tools used in the analysis. SPSS was employed to compute mean scores and perform statistical tests, while Microsoft Excel was mainly used for generating graphs and visual representations of the data.

Table 4.11: Number of the questionnaires administered and retrieved

S/N	Local Government Area	Community	Estimated Population	No of Household	No. of questionnaire administered	No. of questionnaire retrieved
1	Bebeji	Dakatsalle	9,000	750	160	156

Source: *Field survey (2025)*

4.9.2 Traditional Administrative Structure

In Kano State, governance at the community level has long been shaped by the Hausa

emirate system, a deeply rooted institution that blends cultural heritage with administrative authority. At the apex of this system stands the Emir of Kano, regarded not only as the highest traditional authority but also as a custodian of history, religion, and cultural identity. His role extends beyond ceremonial duties, as he appoints District Heads (Hakimi) to oversee larger territories, ensuring that governance reaches every corner of the emirate.

Beneath the District Heads are Village Heads (Dagachi) and Ward Heads (Mai-Unguwa), who manage smaller settlements and neighborhoods. Their responsibilities include maintaining order, resolving disputes, and safeguarding traditions within their communities. This layered hierarchy ensures that authority flows from the Emir down to the grassroots, creating a system where leadership is both centralized and locally responsive.

Importantly, this emirate structure has been adapted to coexist with modern local government administration. While elected officials handle statutory governance, Emirs and District Heads continue to serve as advisers on cultural and religious matters, bridging the gap between tradition and modernity. Their influence provides legitimacy to government policies and fosters community acceptance, especially in matters touching on faith and customs.

At the most intimate level of authority lies the extended family compound, typically led by the eldest male. Here, decisions affecting family members are made collectively, reflecting the consultative ethos that permeates the entire system. Whether at the compound, village, or district level, decisions are rarely unilateral; they are reached through dialogue and only finalized with the approval of the relevant authority, the Emir at the top, or the Dagachi within the village.

This intricate blend of tradition and modern governance highlights the resilience of the Hausa emirate system. It continues to function not merely as an administrative framework but as a cultural anchor, ensuring that leadership remains deeply connected to the values and identity of the people of Kano.

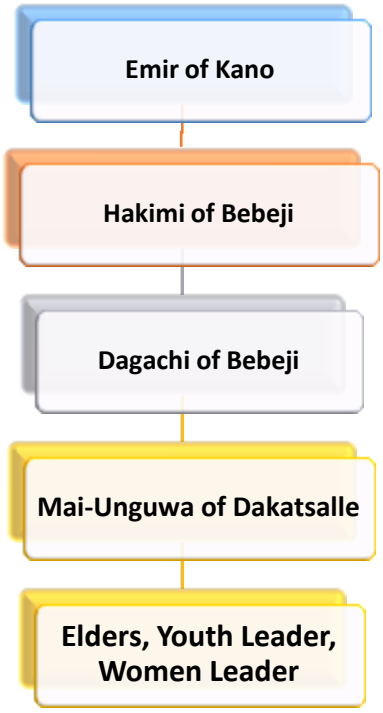


Figure 4.13: Showing Traditional Administrative Structure of Host Community
Source: *Field survey, 2025*

4.9.3 Ethnicity and Cultural Heritage

The people of Kano State are homogeneous in ethnic and cultural identity, with the Hausa and Fulani forming the dominant ethnic groups and Islam is the predominant religion, deeply woven into the social, political, and cultural fabric of the state. Kano has historically been one of the most important centers of Islamic scholarship in West Africa, with its embrace of Islam dating back to the 11th century through trans-Saharan trade and the influence of scholars and merchants. Today, mosques, Islamic schools, and clerical institutions remain central to community life, reinforcing the religious cohesion of the population.

Within the Dakatsalle-Wak study area, and by extension the entire Bebeji Local Government Area (LGA), Hausa, Fulfulde (Fufunde), and Fulani languages are widely spoken. Bebeji LGA itself is home to over 179,000 people, the majority of whom are Hausa-Fulani Muslims. The area is characterized by traditional settlements, extended family compounds, and a strong adherence to cultural practices that emphasize communal

living and respect for elders.

One of the most iconic cultural expressions in Kano is the Durbar festival, hosted by the Emir of Kano. The Durbar is a spectacular procession of horsemen, drummers, and traditional guards, symbolizing centuries of royal authority and military heritage. It is held to mark the two major Muslim festivals: Eid al-Fitir, which celebrates the end of Ramadan, and Eid al-Adha, which commemorates the willingness of Prophet Ibrahim to sacrifice his son in obedience to God. During the Durbar, district heads, village chiefs, and other dignitaries pay homage to the Emir, while the public gathers to witness the colorful displays of horsemanship, music, and pageantry.

Beyond its religious significance, the Durbar serves as a cultural showcase, reinforcing the Emirate's role as custodian of tradition and unifier of the people. It attracts visitors from across Nigeria and beyond, highlighting Kano's reputation as a hub of Hausa-Fulani culture. Although recent years have seen occasional cancellations due to security concerns, the Durbar remains a defining feature of Kano's identity, symbolizing continuity between the emirate system and modern governance.

Cultural do's and Don'ts of the proposed project areas include but not limited to the following:

- Religious grounds must be respect by anyone coming into the communities
- During prayer time no one is allowed to stand or cross the vicinity of the persons observing prayer
- People are not allowed to enter another person's house without permission
- Visitors must not interact with young women until giving permission from the parents
- Smoking, Drinking or playing of loud music is not allowed

4.9.4 Demographic Characteristics of the Study Area

The demographic characteristics of the study area is presented with the aid of descriptive method of analysis such as mean, percentages, and frequencies to reveal their effect on the occupational livelihood of the host community. The socio-economic characteristics of the sample household's variables in the study area include; sex, age, religion, marital status, education level, family size and labour.

Population

According to the 2006 population census, Kano state has a population of 9,401,288 people. Table 4.12 presents the population of the study area. The population projection was calculated based on annual population growth of 3.2%.

Table 4.12: Population of the study area

S/No	Study Area	2006 Census			2025 Projection		
		Male	**Female**	**Total**	**Male**	**Female**	**Total**
1	Kano State	4,945,077	4,456,211	9,401,288	8,549,366	7,704,183	16,253,549
2	Bebeji LGA	100,947	90,969	191,916	168,740	152,060	320,800
3	Dakatsalle-Wak Community (estimation)				9,000		

Source: *https://citypopulation.de/en/nigeria/admin/NGA018__kano/*

Gender of Respondents

An analysis of the gender distribution of respondents, as illustrated in Figure 4.14, shows that 73% were male while only 27% were female. This imbalance highlights the predominance of men over women in the study area. The higher proportion of male respondents reflects broader social realities in Kano State, which is largely a conservative Hausa Muslim society. Within this cultural context, men are traditionally recognized as heads of households and are more likely to engage in public interactions, including participation in surveys and interviews. Women, on the other hand, are less frequently represented in such roles due to cultural norms that limit their involvement in household leadership and discourage direct interaction with strangers outside the family circle.

This pattern is consistent with the patriarchal structure of Hausa-Fulani communities, where authority and decision-making are typically vested in male figures. It also

underscores how cultural and religious traditions shape social participation, influencing not only household leadership but also the visibility of women in community-level activities and research engagements. In order to compensate for such imbalance, a Focus Group Discussion was held for women in the community.

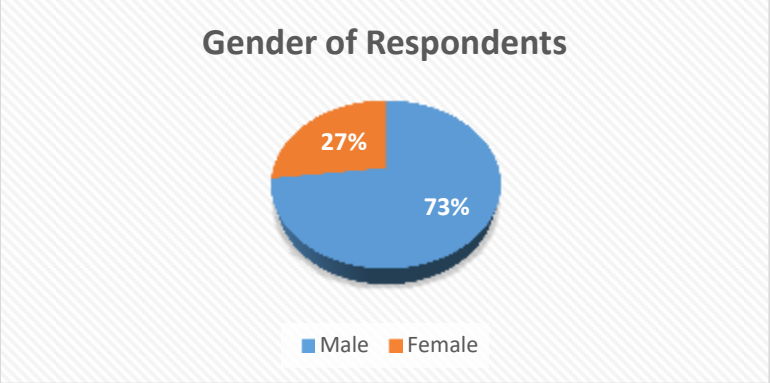


Figure 4.14: Gender distribution of Respondents
Source: *Field survey (2025)*

Age Distribution of Respondents

An assessment of the age distribution of respondents reveals that the largest proportion falls within the 19–40 years category, accounting for 46% of the total sample. Respondents aged between 41–60 years represent 31%, while those above 60 years constitute 18%. The least represented group comprises individuals below 18 years of age, who make up only 5% of the sample. This distribution indicates that household heads in the study area are predominantly young adults, many of whom are within the economically active and employable age bracket. The presence of a significant proportion of respondents in the 41–60 years and above 60 years categories further reflects the generational continuity of household leadership, though the dominance of younger age groups underscores the potential for active participation in livelihood activities, community development, and environmental decision-making processes.

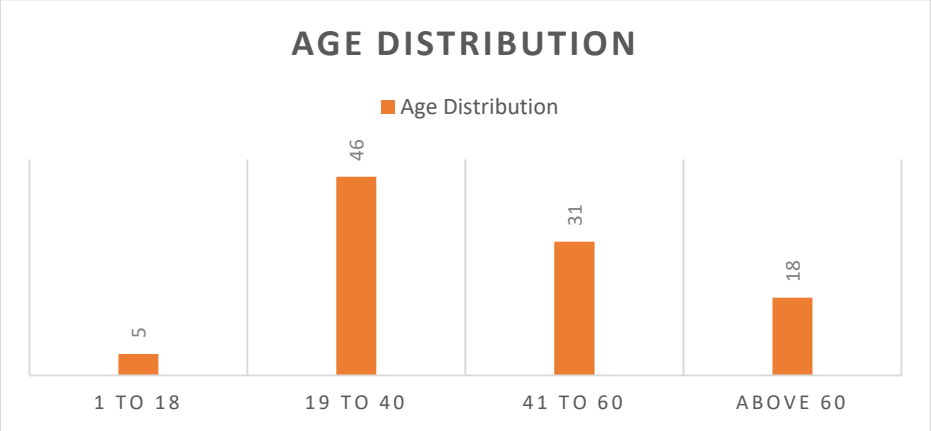


Figure 4.15: Age distribution of Respondents
Source: *field survey, 2025*

Religion of Respondents

Culture and religion have a firm grip on many human activities as it's greatly influence in the adoption of jobs and decision making in Africa, as social norms and beliefs taught during upbringing, modified and stimulate by environmental context which influence people's choices of jobs and practices. A survey of the project area revealed the religious affiliation of the respondents across the communities as predominantly Muslims and only a fraction of Christian faithful. Muslims accounted for about 98% of the respondents while only 2% of the respondents are Christians. None of the respondents practice African Traditional Religion or any other religions.

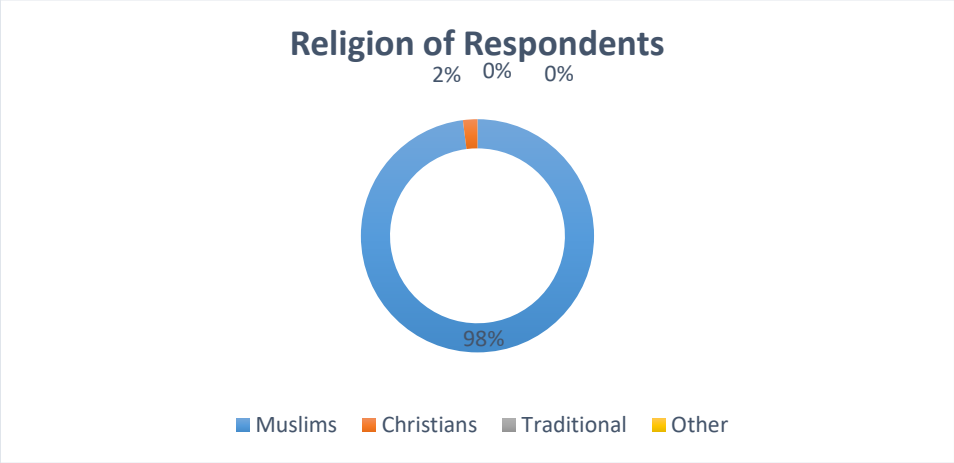


Figure 4.16: Religion of Respondents
Source: *field survey, 2025*

Marital Status of Respondents

The study showed that only 12% of the respondents are single, about 72% are married and some of the married men practice polygamy. 7% are divorced or separated and 9% are widowed. The high proportion of married individuals gives an insight into the household type, the consumption of power and the infrastructure needs of the people. Marriage measures the level of responsibility as well as amount of risk an individual can take. It may perhaps curtail issues relating violence in an area.

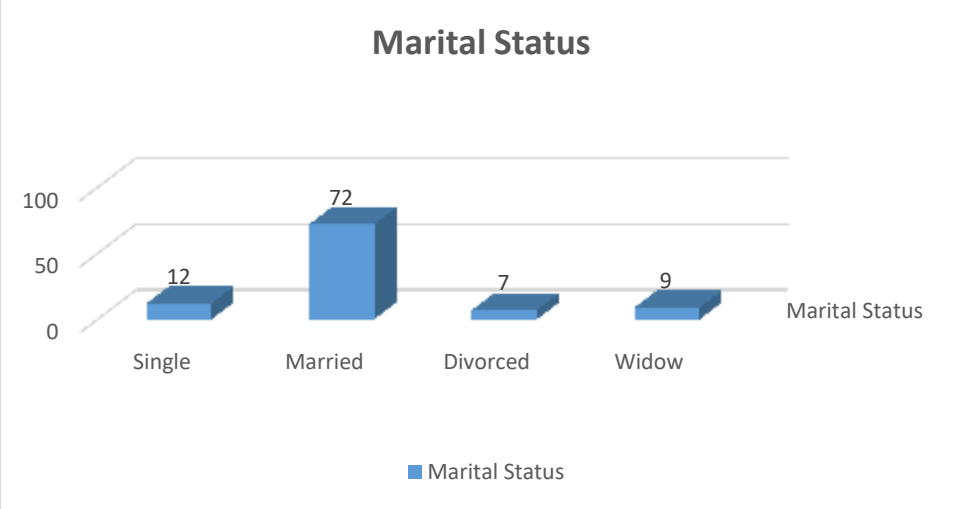


Figure 4.17: Marital status of Respondents
Source: *field survey, 2025*

4.9.5 Economy and Occupation

The community under study possess a long-standing artisanal tradition, with notable skills in pottery, cotton weaving, indigo dyeing, and mat making. These crafts serve not only as expressions of cultural identity but also as supplementary sources of household income, particularly for women and older artisans who play a central role in sustaining these practices. Despite the importance of artisanal activities, the dominant economic base of the area remains agriculture and the extraction of natural resources, which constitute the primary means of livelihood. Farming is largely focused on staple grains and root crops, reflecting subsistence and small-scale commercial production. Fuelwood collection also plays a critical role, serving both domestic energy needs and providing a commodity for trade within local markets.

Local markets are vibrant centers of exchange, facilitating the distribution of agricultural produce and fuelwood while supporting informal economic activities. In addition to these traditional sectors, the emergence of small-scale enterprises such as phone accessory shops, vulcanizing services, and auto-mechanics demonstrates a gradual diversification of the local economy. This diversification reflects adaptive responses to changing socioeconomic conditions and provides alternative livelihood opportunities beyond agriculture and resource extraction.



Plate 4.6: Depicting economic activities in the study area.

Household Size of Respondents

Baseline socioeconomic findings from the project area show that the average household size is approximately 10 members. The largest proportion of households falls within the 11–16 members, representing 47% of respondents, which indicates the predominance of large family size in the community. Households with more than 16 members accounted for the smallest share at 12%, while smaller households of 1–5 members and medium-sized households of 6–10 members comprised 14% and 27% respectively. Family composition is predominantly nuclear, with relatively fewer extended family arrangements observed. Nonetheless, the tendency toward large household sizes is strongly associated with the polygamous nature of marital practices in the area. This demographic pattern contributes to high dependency ratios, with implications for household welfare, resource distribution, and demand for social services.

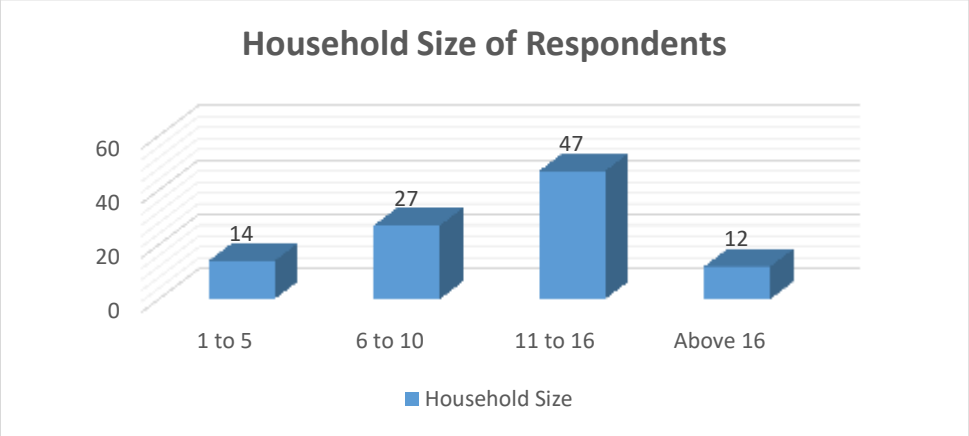


Figure 4.18: Household size of Respondents
Source: *field survey, 2025*

Means of livelihood

Respondents in the project area are engaged in a diverse range of formal and informal livelihood activities, reflecting the mixed economic structure of the community. The survey identified farming, trading, civil service, and artisanal work as the most common occupations, alongside other informal engagements such as driving and motorcycle transport services (Okada). Agriculture remains the dominant source of livelihood, with 53% of respondents identifying as farmers, engaged in both crop cultivation and animal rearing. Trading constitutes the second most common activity, accounting for 18% of respondents, while 17% are artisans, involved in skilled manual work such as carpentry, tailoring, and related crafts. Civil service employment is relatively limited, representing only 5% of respondents. The remaining proportion of households reported participation in other informal activities, including commercial driving and motorcycle transport, which provide supplementary income opportunities.

This occupational distribution indicates the community's heavy reliance on agriculture and informal economic activities, with limited representation in formal employment. Such a structure suggests a high vulnerability to seasonal variations in agricultural productivity, market fluctuations, and broader economic shocks.

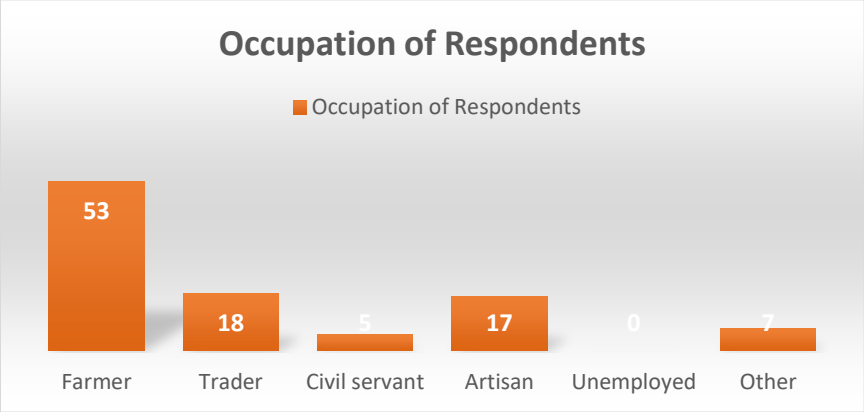


Figure 4.19: Occupation of Respondents
Source: *field survey, 2025*

Household Income per month

Survey shows the average monthly income of individuals to be between N10, 000.00 and over N120,000.00. The result of the distribution of respondents by monthly income earnings revealed the rural nature of the study area, where more than half of the respondents earned below N90,000.00 (68%) which is below national poverty level benchmark of USD 2 (approx. N3,150) per day. About 17% of the respondents earn between N91,000.00 and N120,000.00 as their monthly income. About 35% of the people earn between N61,000.00 and N90,000.00. Only about 5% of the respondents earn between N10,000.00 and N30,000.00 while 28% of the respondents earn between N31,000.00 to N60,000.00. Only 15% of the respondents earn above N120,000.00 per month.

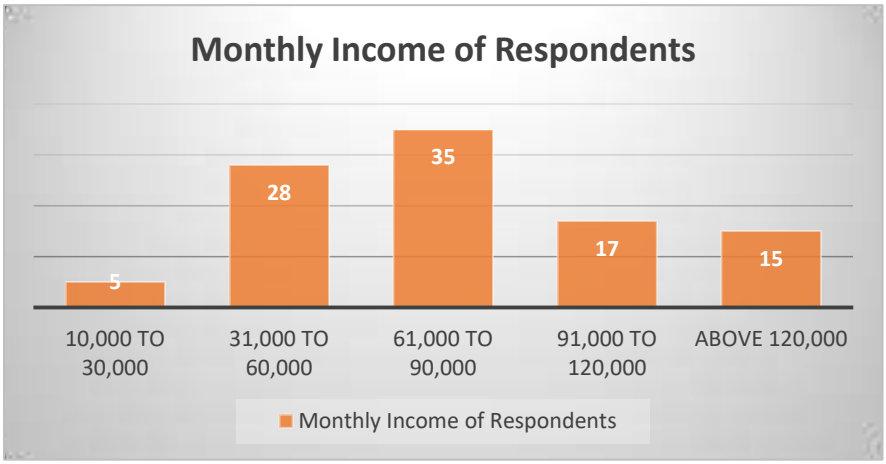


Figure 4.20: Monthly Income of Respondents
Source: *field survey, 2025*

Household Expenditure

Respondents were asked to rank six major categories of monthly household expenditure in order of priority. The results show that food ranked highest, with 39% of responses, underscoring its centrality to household survival and welfare. Transportation followed as the second priority, representing 27%, Healthcare, clothing, education, and household maintenance were ranked 3rd, 4th, 5th, and 6th, respectively. Education and household maintenance were therefore identified as the least prioritized items within the household expenditure profile.

The prioritization of food highlights the issue of food security, particularly in communities where agriculture is predominantly subsistence-based and household income levels are modest. Any disruption to local agricultural productivity or access to markets could therefore significantly affect household welfare. This expenditure profile indicates communities that are economically constrained but forward-looking, with immediate needs centered on food security.

4.9.6 Literacy Level

Educational Institution

Education plays a critical role in shaping the socioeconomic conditions of any society. Households headed by individuals with formal education are generally better equipped to manage family affairs compared to those led by individuals without such educational attainment. Within the Dakatsalle-wak community, educational facilities are available at the primary and secondary levels, comprising both public and private schools. However, the area lacks tertiary institutions, only the Nigerian Law School is present. For higher education, residents rely on institutions located in Kano city, approximately 50 kilometers from the study area. Kano hosts several reputable tertiary institutions, including Bayero University, Kano, which serves as a major center for advanced learning in the region.



Plate 4.7: Depicting Educational Institution in the study area.

Respondents' Highest Qualification

The study shows that educational attainment in the Dakatsalle-Wak community is relatively low, with 38% of respondents reporting primary education as their highest level, 29% having completed secondary education, and only 22% attaining tertiary education. About 11% of respondents have no formal education. This pattern reflects limited access to higher education and highlights socioeconomic challenges, as households with lower educational levels often face restricted employment opportunities and reduced resilience to economic pressures. Expanding access to tertiary education could strengthen human capital and improve overall community development.

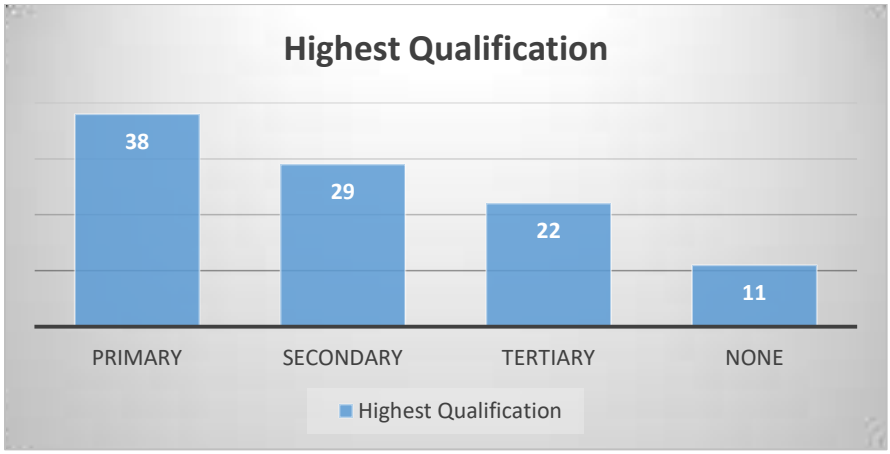


Figure 4.21: Educational Qualification of Respondents

Source: *field survey, 2025*

4.9.7 Social Infrastructure

Housing Type and Settlement Pattern

The structure design and location of the housing and population density within it can influence health both physical and mental. The housing type in the study community varies depending on the individual household. A typical house consists of two or more men and their families grouped in a mud- or stalk-walled enclosure of some 1,000 square feet containing small round or rectangular huts with thatched roofs and a larger rectangular hut in the centre for the headman of the compound in some household. While there is low-quality grade houses, there are also relatively good houses. They are house type that are built with mud blocks without proper foundation. Some others build their houses with mold block, cement. They are small, poorly ventilated with an average of about 2 to 20 persons per house. These houses were built without modern engineering infrastructures and social amenities, most of the houses in the community are locally built with either bricks or mud blocks.



Plate 4.8: Showing Housing types in the study area.

Housing and Land Tenure

Survey results show that 39% of respondents in the studied communities own their houses, 12% live in rented apartments, while 49% occupy rent-free housing. Regarding land, 77% reported ownership, 14% had no land, and 9% hired land for farming activities. These findings indicate that land ownership is common within the SAPZ project community, and disputes over land are generally resolved through negotiations among the parties involved.

Electricity Supply

Electricity is needed and it is crucial for commercial activities prosperity. It was observed during the field work that the study area is connected to the national grid through Kano Electricity Distribution Company (KEDCO). However, constant power supply from the grid is very challenging. The inadequate power supply from the national grid has prompted individuals and businesses, particularly within the study area to source electricity from various means such as solar and through fuel (PMS/Diesel) powered generators.



Plate 4.9: Showing electricity supply in the study area

Source of Water

The major sources of water observed in the study area are borehole, hand dug well and rain harvesting. There is adequate water supply from the well and boreholes for home chores like cooking, washing and other domestic work during dry season.



Plate 4.10: Showing sources of water in the study area.

A greater number of the inhabitants at the study area depend on borehole as their major source of water. This is evidenced in the respondent's view of 57% on borehole as sources of water. Those that depend on rain harvesting as their major source of water account for 5% of the respondent whereas those that account for other sources are 21%.

Means of Transportation

Transportation within the study area is mainly land. These include; cars, motorcycle, tricycle etc.



Plate 4.11: Showing the means of transportation in the study area.

The commonest means of transportation in the community are cars, motorcycle/tricycle and foot. Transportation by motorcycle/tricycle account for 68% of the respondents while transportation by cars accounted for 21% of the respondents. Other means of transportation such as bicycle and animal accounted for 11% of the respondents.

4.9.8 Quality of social services

The level of infrastructure and amenities available and functional in any area or community has direct implications on the quality of life and poverty level in that area, and therefore the willingness of people to live and remain there. It also influences other socio-cultural and economic variables in the area. The study area have quality social services such as communication, road, health and education.

Table 4.13: Quality of Social Services

Community	Quality of Social Services					Total
	Road	Communication	Health	Education	Security	
Dakatsalle-Wak	32	21	14	17	16	**100**

Source: *field survey, 2025*

4.9.9 Security Information

Security infrastructure is an essential component of community stability and project sustainability, as it directly influences residents' sense of safety, investment decisions, and the overall operational environment. Within the study area, there are no formal security posts or permanent law enforcement facilities located inside the host community. The nearest established security presence is found within Bebeji Town, which hosts police and other paramilitary formations providing centralized law enforcement services. The community-level security is largely dependent on informal vigilance groups, community leaders, and periodic patrols. In situations requiring rapid response, residents may experience delays due to the distance from formal security outposts.

Security /crime rate

Crime is a threat to the economic, political, and social security of a nation and a significant factor associated with underdevelopment because it discourages both local and foreign investments, thus reducing the quality of life. Based on the questionnaire administration and focus group discussion held in the study area, the assessment of crime rate is low as most of the respondents are of the opinion that the study area is safe and secure. However, some of the major causes of insecurity according to some of the respondents include but are not limited to robbery, cattle rustling, inter-communal crisis and kidnapping.

Conflict resolution method/mechanism in the study area

There were good and cordial relationships among the various groups- youth, elders, and the women organization in the study area. Conflicts and contentious issues are resolved in the communities and settlement is by collaboration among the village heads, the youth and women wing. In most cases or more often than not cases/disputes were amicably

settled without resort to the police or court proceedings. Various forms of conflict were identified as common in the community. These conflicts include land related conflicts, family conflicts and value- based conflicts, among others. All these conflicts are managed by the council of elders and traditional rulers when issues are reported to these groups of persons.

4.9.10 Perception about the Project

All the respondents in the project area indicated their support for the proposed Industrial Hub project. Asked about their main reason for supporting the project, the respondents indicated reasons, such as availability of food, improvement in economic activities, and improvement in social infrastructure (through corporate social responsibility), along with providing employment opportunities.

4.9.11 Sanitation and Waste Management

An effective and sustainable waste management system is fundamental for protecting human health, safeguarding environmental quality, and ensuring long-term community well-being. Poorly managed waste can lead to soil and water contamination, proliferation of disease vectors, degradation of air quality, and overall decline in environmental aesthetics, all of which directly impact public health and socioeconomic activities. In the study area, no formal or organized waste management structure exists. There are no designated solid waste collection points, transfer stations, or municipal waste disposal services available to residents. Consequently, households resort to informal and unsustainable disposal practices. It is a common sight to observe litter and scattered refuse around residential premises, along access roads, and in open community spaces, reflecting the absence of structured waste handling.

The dominant methods of solid waste disposal identified in the area are open dumping and open burning. Liquid waste is mainly disposed by open drainage and disposal into surface environment. Many people also discharge their liquid waste through piping into septic tank. Open dumping, typically carried out in vacant plots, nearby bushes, or roadside spaces, contributes to environmental pollution, attracts pests and rodents, and

contaminates both surface and groundwater resources, particularly during rainfall events when leachates infiltrate into soils and drainage systems. Open burning, while reducing waste volume, poses significant health risks as it releases particulate matter, carbon monoxide, and other toxic compounds into the atmosphere, thereby contributing to respiratory illnesses and poor air quality.



Plate 4.12: Showing waste management in the study area.

4.10 Health Study

Health Care Centre

Health facilities that are owned and operated by the government are usually the most affordable healthcare services, particularly, to low-mid income earners. The existing health facility around the study area is a government owned primary health centre, Dakatsalle.

Prevalent ailment

Most commonly reported diseases according to the community sources in the study area are malaria/typhoid fever, diarrhea and communicable diseases which are reflected by 66%, 19% and 12% respectively. There were no reported cases of cardiac problem or sexually transmitted disease. The problem above occurs very commonly in all parts of Nigeria.

Frequency of hospital visit

Respondents were asked on their frequency of hospital visit, their response shows that visit to hospitals for treatment is very low. 7% of the respondents say they visit the

hospital on a weekly basis and 34% of the respondents visit the hospital on monthly bases while about 53% visits hospitals once in a year. 6% goes to hospitals always.

4.11 Stakeholders Engagement

Stakeholder consultation and participation are integral part of an EIA process. Without their involvement, the EIA cannot be considered complete. Engagement activities began at the earliest stage of the assessment and are intended to continue throughout the project's lifecycle. The Stakeholder Engagement framework has been structured to meet the regulatory standards outlined in Nigerian environmental legislation while also incorporating, where possible, international best practices. This process ensures that stakeholders have the opportunity to review the proposed project, provide feedback, and contribute to maximizing its benefits while reducing potential negative impacts.

4.11.1 Objectives of the Consultation

The objective of the consultation for the proposed industrial hub project are summarized as:

- Creating public awareness and understanding of the proposed project
- Informing the stakeholders on the proposed project activities and ensuring its acceptance
- Develop and maintain medium of communication channels between the project proponent and stakeholder's opinion about the Socio-Environmental risks and potential benefit associated with the project and the measures and actions put in place to mitigate any anticipated impact of the project
- Discussing the nature and scale of any adverse impact that the proposed project might cause and laying down the mitigating measures in a direct and transparent manner.
- Getting feedback from the stakeholders on issues of concern and expectation about the proposed project in order to optimize the project
- Creating a strong social and institutional dialogue in order to assess the strength and perception on the proposed project social acceptability
- Document all the views and opinion raised by the stakeholders about the proposed project and sensitize the community members from cluster level to state level about the project activities and intervening opportunities.

4.11.2 Stakeholders Identification

Key relevant stakeholders was duly consulted. The approach use in the consultation exercise are as follows; issuance of notice of intent to carry out an EIA for the proposed industrial hub project; terms of reference to regulatory Agencies and potential stakeholders; transparent method of compensation payment to all affected parties; consultation with stakeholders with explanations on key issues as they arise and affect the people. The primary stakeholders identified for the proposed project are; Immediate community (Dakatsalle), Local Government, Traditional councils in the project area, Kano State Government. Also, the regulatory bodies identified are; Federal Ministry of Environment Abuja (FMEnv) and Kano State Ministry of Environment and Climate Change. Also, community based organization present within and around the proposed project environment were consulted.

The consultation team has sought to ensure that all identified stakeholders, including the project impacted communities, are aware of the proposed project and the EIA process through extensive community consultation. The stakeholder engagement strategy was designed to attain meaningful participation and involvement that enabled stakeholders and the community to actively contribute to the development of new ideas and options as the Project is planned and developed.

Community Consultation Exercise

The community consultation exercise of the proposed project was done on the 4th October, 2025 at proposed hub site. The objectives of the exercise covers; identification of stakeholders, formal announcement of the project, provision of project and EIA details and identification of potential project risks. While the medium used for the scoping were background information of the project, information and presentation of the project, key stakeholder meetings, site verification and feedbacks. Also, the minutes of the consultation exercise is presented in Annexure I

General Concerns of the Host Communities

- Dust emission during construction activities
- Increased noise level

- Contamination of water bodies within the study area
- Vibration from equipment and machinery
- CSR from project proponent in line with the communities needs

Response to concerns that were raised during consultations with host communities

- The communities were assured that the project proponent will execute the project in line with best environmental practices as provided in the EIA, hence, noise and dust shall be managed efficiently to avoid as much as possible adverse effects on the environment. More so, mitigation measures shall be put in place to avoid contamination of water bodies in the study area.
- The community members were advised to report any negative issue arising from the proposed project to the project CLOs who are from the community for speedy redress in line with the proponents Grievance Redress Policy.

Plates 4.13 below present Group Photographs with community members during Consultation. Appendix 2 and 3 captures the stakeholder's meeting and pictorial evidence during the consultation meeting.







Plate 4.13: Showing evidence of stakeholder engagement in the study area

CHAPTER FIVE

POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACT IDENTIFICATION AND EVALUATION

5.1 Introduction

The objectives of Environmental and Social Impact Assessment (ESIA) are to identify and describe the potential environmental and social impacts associated with the proposed project activities, predict the likelihood and magnitudes of such impacts, evaluate the significance of changes likely to result from them, and thereafter proffer measures that will be taken to mitigate the predicted impacts. This chapter therefore, presents the associated and social impacts of the proposed implementation of the Agricultural Transformation Centre (ATC), Bagauda, Bebeji LGA of Kano State, Nigeria.

5.2 Impact Assessment Methodology

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

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

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

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

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

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

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

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

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

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

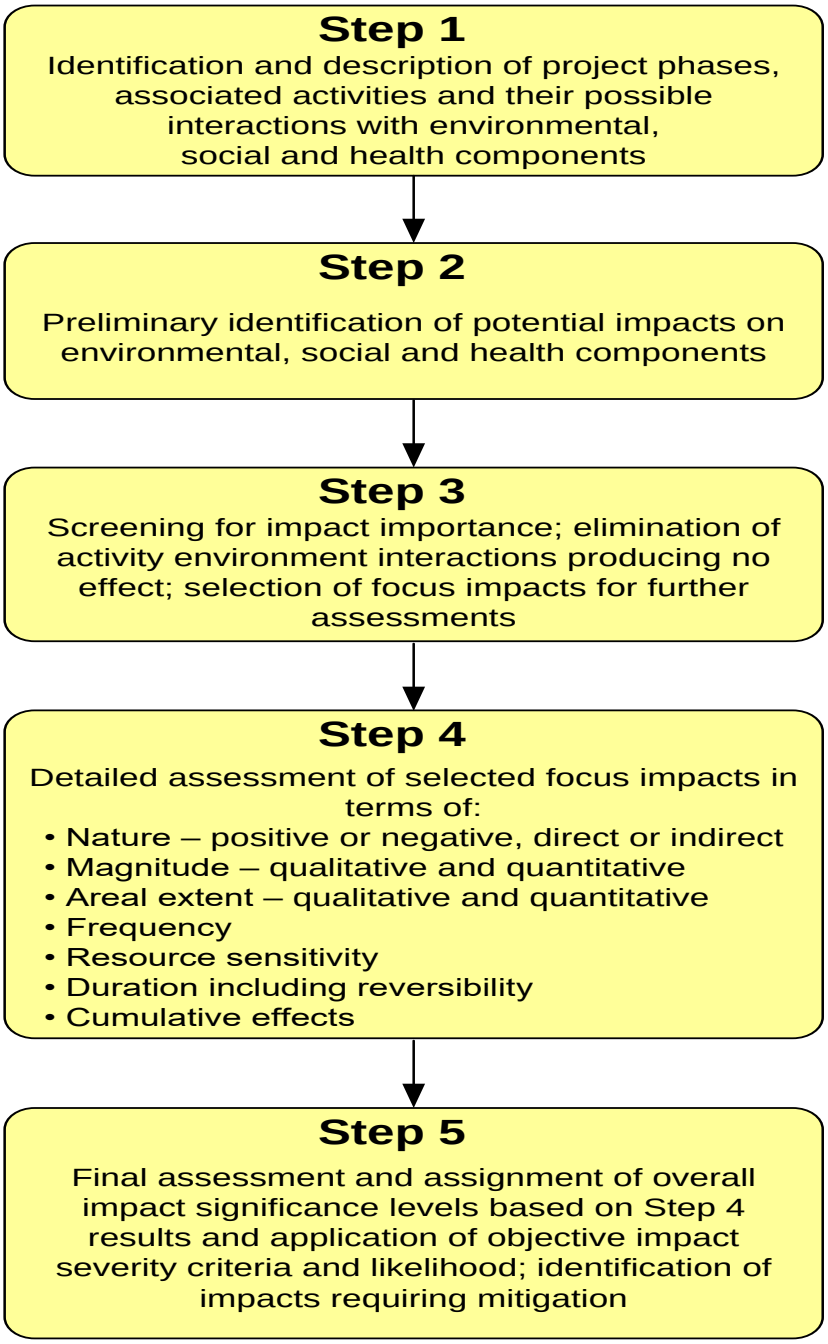


Figure 5.1: Schematic of the Impact Assessment Methodology

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

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

1. **Pre-construction:** This will include feasibility studies, engineering design, ESIA study, site clearing and preparation, site yard setup, material procurement and transportation etc.

   From an environmental and social impact perspective, key considerations in this phase includes:

   - Suitability of the selected site for the ATC Project
   - Likely impacts of the ATC project on the environment and host community and mitigation planning
   - Stakeholders' engagement, grievance redresser
   - Inclusivity in project design and planning
   - Baseline environmental and socio-economic reporting
   - Environmental and social management planning
   - Compensation of project affected persons

2. **Construction/Installation:** excavating and burrowing, land filing and compacting, culverts and drains constructing, bituminous road construction, fencing, pavements and surfacing works, clean up and waste management, QA/QC inspections and tests, etc. From an environmental and social impact perspective, key considerations in this phase shall include:

   - Compliance with the Environmental and Social Impact Assessment
   - Involvement of the locals in construction works for knowledge transfer and project learning
   - Proper waste management

3. **Operation and maintenance:** Operations such as business model planning, workforce recruitment, transportation of raw materials from ATCs to the Hub and subsequent maintenance activities.

   From an environmental and social impact perspective, key considerations in this phase shall include:

   - Compliance with ESIA guidelines
   - Periodic environmental and social audits
   - Proper waste management
   - Maintenance of environmental and ecosystem balance
   - CSR and engagements with local communities

4. **Decommissioning:** Disusing/abandoning of project. Major activities include removal of facility buildings, staff compensation and site restoration activities.

   From an environmental and social impact perspective, key considerations in this phase shall include:

   - Proper waste management and evacuation
   - Compensation of the local community and Staff members
   - Restoration of the environment
   - Proper evacuation of the facility construction materials from the site

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

Table 5.1: Environmental Components and their Impact Indicators

Aspect	Environmental Component	Project Phase	Impact Indicators
Biophysical	Climate	All project phases	Humidity, Temperature, Rainfall, Wind Speed and Direction
	Air quality	All project phases	Gaseous emissions (like: NO_x, SO_x PM, CO, VOC) that contaminates ambient air.
	Noise levels	All project phases	Day and night disturbance, hearing loss communication impairment.
	Water Quality (Surface water and Ground water)	Construction, Operation and Maintenance phases	Changes in the baseline physico-chemical and biological properties of surface water; Changes in the Physico-chemical properties of sediment; Changes in community composition and abundance of aquatic biota including; microbes, plankton, macrobenthos, fishes, mammals, reptiles, amphibians, bird species, etc.
	Geology	Pre-construction phase	Changes in geology structure
	Soil	Pre-construction, operation and maintenance phases	Changes in physico-chemical and biological properties of soil
	Topography	Pre-construction phase	Changes in land terrain and topography
	Vegetation	Pre-construction phase	Changes to vegetation population, health, species abundance and diversity and impact on endangered and economic species
	Wildlife	Pre-construction phase	Changes in wildlife distribution and abundance
Human, Socio-economic and Cultural	Land-use pattern	Pre-Construction and Construction phases	Changes in land-use patterns such as agriculture, fishing, logging, hunting, etc,
	Local Population level	All project phases	Immigration and in-migration of workers and other people
	Socio-economic system	All project phases	Changes in employment opportunities, income differentials, inflation, difference in per capita income, inequality of benefits to local population, etc.
	Socio-cultural system	Operation and Maintenance	Changes in social structure, organisation and cultural heritage, practices and beliefs, natural resources, rights of access, changes in value system influenced by foreigners, etc.
	Basic Amenities and Infrastructure	All project phases	Access to goods and services such as housing, education, healthcare, water, fuel, electricity, sewage and waste disposal, consumer goods brought into the region, etc.
	Transportation System	All project phases	Changes in transport systems and associated effects such as noise, accidents risk, changes in existing facilities, etc.
	Aesthetics	Construction phase	Presence of unsightly structures.

5.4 Preliminary Identification of Potential Impacts on the Environment

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

Table 5.2: Checklist of Associated and Potential Impacts

Project Phase/Activity	Associated and Potential Impacts
PRE-CONSTRUCTION • Feasibility studies • Land Acquisition • Engineering design • Permitting • Mobilisation of materials and personnel • Recruitment • Site Preparation	Economic loss arising from clearing of farm lands
	Uncertainty and misunderstanding due to a lack of information and communication.
	Acquisition/Displacement of people
	Employment opportunities arising from recruitment of skilled and unskilled workers
	Business opportunities for local contractors through sub-contracting activities
	Local support services from road side supply markets and shops etc.
	Skill acquisition and enhancements to local indigenes and workforce.
	Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure
	Increase of communicable diseases due to influx of people
	Increase in social vices (like theft, prostitution etc.) resulting from increased number of people
	Community agitation over unidentified stakeholder, leadership tussles etc.
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset
	Conflicts/community agitations over employment issues (quota and methods)
	Nuisance (noise and vibrations) due to movement from heavy duty equipment and vehicles affecting site workers and wildlife
	Increase of dust particles and vehicular emissions
	Disturbance of the vegetative cover due to site clearing and preparation
	Waste Disposal • Paper, domestic waste • Waste from laydown area and camp site (material and wood) • Scrap metal, wood, sand, concrete, iron rods, paper • Used oil and replace/obsolete equipment parts that may contaminate soil/ground water

	Contamination of surface water as a result of siltation caused by increased erosion during site preparation
CONSTRUCTION PHASE Civil work, Mechanical and Electrical work which include: • Culverts and drains • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc. • Bituminous road construction Commissioning /Testing • pavements and surfacing works • Waste management • QA/QC inspections and tests	Visual intrusion and aesthetic quality resulting from the construction of the road
	Work place accidents/ incidents (falling from height, injury from falling objects, etc.)
	Littering of site with packaging materials and unused construction material.
	Respiratory disorder from inhalation of cement dust.
	Respiratory / health hazards to onsite personnel due to the release of fumes from construction equipment (bulldozers, excavators)
	Injuries to on-site workers from fall or dislodgement of earth, rock or other materials.
	Localised increase (above baseline values) in ambient concentrations of air pollutants (NOx, SOx, COx, CxHy, H2S, & SPM) from fuel combustion engines (e.g. cement mixing machine) used for construction and cement dust
	Influx of predominantly male population) job seekers) into host community and neighboring communities leading to increased extramarital sexual activity, and introduction of commercial sex workers
	Gender-based violence (GBV)
	Child abuse
	Increase in the ambient noise level of the area above baseline values due to noise generated from construction activities
	Increased pressure on social amenities (housing, water supply, roads) due to influx of workers and job seekers into the community
	Decrease in groundwater aquifer as a result of groundwater abstraction for construction activities e.g. concrete mixing, equipment washing, etc.
	Increased erosion potential as a result of construction activities such as excavation and reduction in structural stability and percolative ability of soil resulting from compaction during civil works and installation activities.
	Damage to ecological resources and environmental degradation by minor spillages during fuelling of construction trucks and equipment
	Risk of electrocution and burns (to onsite workers) during electrical installation processes
	Job creation/ Business opportunity/Economic enhancement
	Accidents due to collapse of structure under construction
	Kidnapping of personnel
DEMOBILISATION • Demobilization after construction phase.	Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)
	Traffic congestion during transportation of demobilized equipment and personnel
	Generation of dust and automobile/heavy duty equipment emissions
	Waste disposal (scrap metal, wood, sand, concrete, paper)

	Reclamation and restriction of access roads to prevent unauthorized uses
	Loss of employment and business opportunities due to completion of construction phase
	Illegal access to building site leading to accident, sabotage, asset damage and loss
	Surface runoff and erosion resulting in sedimentation problems
OPERATIONS AND MAINTENANCE: • Building inspection and checks • Power generation/ servicing • Transportation of raw materials and finished product • Plant maintenance • industrial waste discharges • Emergence of small-scale enterprises • Green Buffer development around the ATC. • Recruitment of workers	Risk of injury from fall from height/trip or being hit by object
	Air pollution by gaseous emission (CO, SO_2, NO_2) and particulates from power generator and other processing plants
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator and plant servicing (diesel, spent oil etc.)
	Generation of dust and gaseous pollutants from automobile emissions
	Increase in noise level nuisance from vehicles plying the access roads
	Gender-based violence (GBV)
	Child abuse
	Traffic congestion along as a result of transportation of raw materials and processed agro-products
	Metallic materials generation from plant parts, retrofitting/upgrade of parts during plant servicing
	Potential for land contamination from industrial waste disposal
	Pollution of surface water bodies by wastewater generated from industrial waste discharges
	Change in Land Use of nearby areas
	Recreational facility
	Acquisition of skills by individuals to be employed
	Increase in income for workers.
DECOMMISSIONING / ABANDONMENT: • Removal of electrical cables and wires • Demolition of buildings for facilities retrieval • Waste generation • Transportation of Plant components for sale/ another site	Risk of accident and injury to workers during demolition of structures
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles
	Increased sedimentation process close to river banks and floodplains along the building sites
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages
	Traffic obstruction from transportation of decommissioned structures and equipment
	Availability of land for alternative uses such as community hall
	Improved Ecology, Air Quality and Aesthetics

5.5 Screening of Impact Importance

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

- Knowledge of the Project activities as summarized in Table 5.1.
- Detailed information on the environmental and socio-economic setting of the Project's area of influence as documented in Chapter 3 and Chapter 4. The potential environmental and social receptors/resources that could be affected by the proposed Project are summarized in Table 5.1.
- Consultation with relevant stakeholders including potentially affected community
- Review of other ESIA reports on similar projects/environments.
- Series of experts group discussions, meetings and experience on similar projects.

A modified Leopold matrix (Leopold, 1971) was used for the screening. The matrix arrays project activities against environmental (biophysical and socio-economic) components, and supports a methodical comprehensive and objective identification of impacts each activity could have on the environmental components. The matrix consists of a horizontal list of biophysical and socio-economic environmental components that could be affected by the proposed activities versus a vertical list of project activities, which represent environmental aspects, or sources of impacts associated with each project phase.

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

Table 5.3: Impact Ranking Matrix

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

The impact ranking categories are defined as follows:

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

Ranking of negative impacts are discussed below:

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

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

Moderate Impact: This affects a portion of an area, system, aspect (physical), population or species (biological) and at sufficient magnitude to cause a measurable numerical increase in measured concentrations when compared with national or international limits and standards specific to the receptors) and may bring about a change in species abundance, but does not threaten the integrity of that population or any population dependent on it.

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

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

Table 5.4: Activity-Receptor Interaction for Impact Screening

Summary of ProjectActivities at various Phases	Receptors														
	Physical					Biological		Socio-economic					Others (Health and Safety)		
	Air Quality	Ambient Noise	Soil	Groundwaterand Aquifers	Landscape/ Topography	Terrestrial Flora	Terrestrial Fauna	Land Use	Population	Utilities	Infrastructure	Employment/ Income	Construction workers	Workplace health & safety	General Public
Pre-construction Phase															
Site selection	0	0	0	0	0	0	0	2	1	1	0	1	0	0	1
Site clearing and preparation	2	1	1	0	0	3	3	3	1	1	1	+	2	2	1
Mobilization of constructionequipment and materials to site	2	2	1	0	0	1	1	2	2	2	1	+	2	2	1
Construction of access road, drainages and erosion control	2	2	3	2	2	2	2	2	1	1	1	+	2	3	2
Construction Phase															
Civil work activities including excavation, trenching, cable laying, foundation, construction of buildings	3	2	2	2	3	1	1	3	2	2	2	+	3	3	2
Installation of machinery and other facilities	1	2	0	1	0	0	0	0	1	1	1	+	2	3	1
Waste generation anddisposal	2	0	3	0	2	0	0	2	0	0	0	+	0	2	2
Commissioning															
Testing of machinery and associated infrastructure.	2	2	0	0	0	0	0	0	0	0	0	0	2	2	0
Commissioning of the Agricultural Transformation Centre (ATC).	0	2	0	0	0	0	0	0	2	2	1	0	0	0	2
Operation and Maintenance															
Power generation	3	3	0	0	0	0	0	0	0	0	2	+	2	3	2
Operation and maintenance of machinery	3	3	2	2	0	1	1	0	2	2	2	+	3	3	2
Movement of Agro-products from ATCs to AIH for storage and exportation	2	1	1	0	0	1	1	0	0	0	2	+	2	3	2

Summary of ProjectActivities at various Phases	Receptors														
	Physical					Biological		Socio-economic					Others (Health and Safety)		
	Air Quality	Ambient Noise	Soil	Groundwaterand Aquifers	Landscape/ Topography	Terrestrial Flora	Terrestrial Fauna	Land Use	Population	Utilities	Infrastructure	Employment/ Income	Construction workers	Workplace health & safety	General Public
Routine maintenance; wastegeneration and disposal	2	1	2	0	2	1	1	2	0	0	0	0	2	2	2
Decommissioning	2	2	2	0	2	+	+	+	2	1	1	2	2	2	2

5.6 Detailed Assessment of Selected Focus Impact

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

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

Table 5.5: Impact Characterization

Impact Characterization	Definition
Beneficial Impacts	Impacts that would produce an overall positive effect on the well-being of the people as well as the environment.

Adverse Impacts	Impacts that may result in: • irreversible and undesirable change(s) in the biophysical environment; • decrease in the quality of the biophysical environment; • limitation, restriction or denial of access to or use of any component of the environment to others, including future generations; and • sacrifice of long term environmental viability or integrity for short term economic goals
Direct Impacts	Impacts resulting directly (direct cause-effect consequence) from a project activity
Indirect Impacts	Impacts that are at least one step removed from a project activity. They do not follow directly from a project activity.
Normal Impacts	Impacts that will normally be expected to follow a particular project activity
Abnormal Impacts	An impact is considered to be abnormal when it follows a project activity as against sound predictions based on experience
Short-term Impacts	Impacts that will last only within the period of a specific project activity.
Long-term Impacts	Impacts whose effects remain even after a specific project activity.
Reversible Impacts	Impacts whose effects can be addressed on application of adequate mitigation measures
Irreversible Impacts	Impacts whose effects are such that the subject (impacted component) cannot be returned to its original state even after adequate mitigation measures are applied
Cumulative Impacts	Impacts resulting from interaction between ongoing project activities with other activities, taking place simultaneously
Incremental Impacts	Impacts that progress with time or as the project activity proceeds.
Residual Impacts	Impacts that would still remain after mitigation measures have been applied

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

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

Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset		√	√			√			√
	Disturbance of the vegetative cover due to site clearing and preparation	√		√			√		√	
	Littering of the environment due to waste from wood, sand paper; domestic waste from laydown area and camp site (material and wood)	√		√		√			√	
	Contamination of surface water as a result of siltation caused by increased erosion during site preparation	√		√		√				√
Construction / installation Civil work, Mechanical and Electrical work which include; • Culverts and drains • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc. • Bituminous road construction Commissioning /Testing • pavements and surfacing works • Waste management • QA/QC inspections and tests	Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.	√		√			√			√
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities	√			√		√			√
	Gender-based violence (GBV)		√			√				√
	Child abuse		√			√				√
	Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	√			√		√			√
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers		√		√		√		√	
	Generation of dust and automobile / heavy duty equipment emissions from construction earthworks.	√		√		√		√		√
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and building sites.	√		√			√	√	√	
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	√		√			√		√	
	Soil/groundwater contamination resulting from accidental		√	√		√		√		√

Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
	leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)									
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites		√	√			√	√		√
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	√		√			√			√
	Traffic congestion during haulage of plant components to site for installation		√	√		√				√
	Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	√		√			√			√
	Reduction in wildlife population as a result of poaching due to easier access created by access roads		√	√			√	√	√	
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	√		√			√			√
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	√		√		√				√
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	√		√		√				√
	Waste Disposal • Scrap metal, wood, sand, concrete, paper • Spent-oil and replaced /obsolete equipment parts that may contaminate soil/ground water • Waste from laydown area and building sites causing unsightliness	√		√		√		√		√
Demobilization	Workplace accidents from burns, cuts, bruises, trips and falls,	√		√			√			√

Project Phase/Activity	**Associated and Potential Impacts**	**Impact Characterization**								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
-Demobilization after construction phase	object at height leading to injury of fatalities.									
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)		√	√			√			√
	Traffic congestion during transportation of demobilized equipment and personnel		√	√		√				√
	Generation of dust and automobile/heavy duty equipment emissions		√	√		√		√		√
	Waste disposal (scrap metal, wood, sand, concrete, paper)	√		√		√				√
	Reclamation and restriction of access roads to prevent unauthorized uses		√		√			√	√	
	Loss of employment and business opportunities due to completion of construction phase	√		√		√			√	
	Illegal access to building site leading to accident, asset damage and loss		√	√		√				√
Operation and Maintenance • Building inspection and checks	Risk of injury from fall from height/trip or being hit by an object	√		√			√			√
• Power generation/ servicing	Security threat such as kidnapping and banditry attack		√	√			√		√	
• Transportation of raw materials and finished product	Gender-based violence (GBV)		√			√				√
	Child abuse		√			√				√
• Plant maintenance • industrial waste discharges	Air pollution by gaseous emission (CO, SO_2, NO_2) and particulates from power generator		√	√			√	√	√	
• Emergence of small-scale enterprises	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator servicing (diesel, spent oil etc.)		√	√			√			√
• Green Buffer development around the ATC.	Generation of dust and gaseous pollutants from heavy duty equipment, agro processing plant, automobile emissions	√		√			√		√	

Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
• Recruitment of workers	Increase in noise level nuisance from operation machines and from vehicles plying the access roads		√	√			√	√	√	
	Traffic congestion along agro-products transportation route		√	√		√		√	√	
	Reduction of water tables and source of water for production processes	√		√		√			√	
	Metallic materials generation from plant parts, retrofitting/upgrade of parts during plant servicing	√		√			√			√
	Potential for land contamination from industrial waste disposal	√		√		√			√	
	Pollution of surface water bodies by wastewater generated from industrial waste discharges	√		√			√		√	
	Change in Land Use of nearby areas	√		√		√		√	√	
	Recreational facility from lawns/parks/ green areas		√		√		√	√	√	
	Acquisition of skills by individuals to be employed as operators	√			√		√	√	√	
Decommissioning / Abandonment • Removal of electrical cables and wires, water and sewage treatment plant pipelines. • Demolition of buildings for facilities retrieval • Waste generation • Transportation of Plant components for sale/another site • Re-vegetation of site	Risk of accident and injury to workers during demolition of structures	√		√			√			√
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	√		√			√			√
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages		√	√		√		√		√
	Traffic obstruction from transportation of decommissioned structures and equipment		√	√		√		√		√
	Abandoned structures possibly taken-over by miscreants/criminals		√	√		√				√
	Availability of land for alternative uses such as community hall, farmland, etc	√			√		√		√	
	Improved Ecology, Air Quality and Aesthetics	√			√	√			√	

5.7 Final Assessment and Assignment of Overall Impact Significance Levels

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

Legal/Regulatory Requirements (L)

Here, the proposed project activities that resulted in impacts were weighed against existing legal / regulatory provisions to determine the requirement or otherwise for permits prior to the execution of such activities. Such legal/regulatory requirements were identified from the laws/guidelines, which have been reviewed in chapter one of this report. The weighting scale used was as follows:

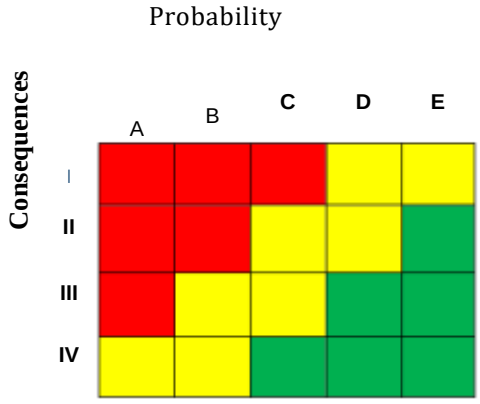
Table 5.7: Legal/Regulatory Requirements Criterion

Condition	Rating
No legal / regulatory requirement for carrying out project activity	**Low =1**
Legal / regulatory requirement exist for carrying out activity	**Medium =3**
A permit is required prior to carrying out project activity which may result in impact on the environment	**High =5**

Risk Posed by Impact (R)

The health, safety and environmental risks associated with each impact were assessed and ranked as “low”, “medium” or “high”, using the Risk Assessment Matrix (RAM). Reference was also made to the source references listed in the previous sections. Three criteria (consequence, probability of occurrence and severity) were used as basis for ranking the risks of the impacts. These were determined using the RAM as shown in Table 5.8.

Table 5.8: Risk Assessment Matrix (RAM)



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

Consequence Category	Considerations			
	Safety / Health	**Public Disruption**	**Environmental Aspects**	**Financial Aspects**
I	Fatalities / Serious Impact on Public	Large Community	Major/Extended Duration/Full Scale Response	**High =5**
II	Serious Injury to Personnel / Limited Impact on Public	Small Community	Serious / Significant Resource Commitment	**Medium =3**
III	Medical Treatment for Personnel / No Impact on Public	Minor	Moderate / Limited Response of Short Duration	**Low =1**
IV	Minor Impact on Personnel	Minimal to None	Minor / Little or No Response Needed	**None**

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

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

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

Table 5.9: Risk Criterion

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

Frequency of Impacts Occurrence (F)

Evaluation of the frequency of occurrence of each impact was also carried out. Frequency of occurrence was rated as "high", "medium" or "low" based on the historical records of accidents/incidents, consultation with experts and professional judgment. The frequency criterion is summarized below.

Table 5.10: Frequency Criterion

Frequency	Attribute – Environmental, Human Health and Safety
High = 5	• Major degradation in quality in terms of scale (>1% of study area or habitat within the study area), appearance, duration (beyond duration of project) • Irreversible or only slowly recoverable (change lasting more than 1 year) degradation of environmental ecosystem level (population, abundance, diversity, productivity) • High frequency of impact (occur continuously and almost throughout the project execution period (< 4months) • Geographic extent of impact (e.g. encompassing areas beyond study area)
Medium =3	• Degradation in quality in terms of scale (>0.1% of study area, habitat), appearance, duration (a few months) • Effect beyond naturally occurring impacts variability • Slow reversibility (change lasting a few months before recovery), lasting residual impact • Potential for cumulative impact • Intermittent frequency of impact (occur in only a few occasions during the project execution period) • Limited geographic extent of impact (large area within study Area)
Low = 1	• Minor degradation in quality in terms of scale (<0.1% of study area, habitat, very localized), appearance, duration (a few days to a month) • Effect within range of naturally occurring impacts, changes, dynamics • Rapid reversibility (change lasting only a few weeks before recovery), no lasting residual impact of significance • No potential for significant cumulative impact • Low frequency of impact (occur in just about one occasion during the project execution period)

	• Only very localized geographic extent of impact (e.g. not more than a few meters from impact source point)

Importance of Impact (I)

The importance of target environmental component in respect of identified potential impact was also determined and rated as "high", "medium" or "low". The ratings were based on consensus of opinions among consulted experts including project engineers and other stakeholders in the proposed project. The importance criterion is summarized below.

Table 5.11: Importance Criterion

Importance	Attribute – Environmental, Human Health and Safety
High = 5	• Highly undesirable outcome (e.g., impairment of endangered, protected habitat, species) • Detrimental, extended flora and fauna behavioral change (breeding, spawning, molting) • Major reduction or disruption in value, function or service of impacted resource • Impact during environmentally sensitive period • Continuous non-compliance with international best practices
Medium = 3	• Negative outcome • Measurable reduction or disruption in value, function or service of impacted resource • Potential for non-compliance with international best practices
Low =1	• Imperceptible outcome • Insignificant alteration in value, function or service of impacted resource • Within compliance, no controls required

Public Interest/Perception (P)

Here, the interest/perception of the public on the proposed project and the identified potential/ associated impacts were determined through consultation with proposed project stakeholders. The ratings of high, medium‖ or low‖ were assigned based on consensus of opinions among consulted stakeholders. The public perception/interest criterion is summarized below in Table 5.12.

Table 5.12: Public perception /interest criterion

Public Perception	Attribute – Environmental and Human Health
High (5)	• Elevated incremental risk to human health, acute and/or chronic • Possibility of life endangerment for community inhabitants and site personnel • Major reduction in social, cultural, economic value • Continuous non-compliance with international best practices • Any major public concern among population in the project region
Medium (3)	• Limited incremental risk to human health, acute and/or chronic • Unlikely life endangerment for community inhabitants and site personnel • Some reduction in social, cultural, economic value • Possibility of adverse perception among population • Potential for non-compliance
Low (1)	• No known risk to human health, acute and/or chronic • No known risk of life endangered for community inhabitants and site personnel • Minor reduction in social, cultural, economic value • Unlikely adverse perception among population

Result of Impact Assessment

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

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

Medium = (L+R+F+I+P) ≥ 9 but < 15

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

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

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

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
Construction / Installation: Civil work, Mechanical and Electrical work which include; • Culverts and drains • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc. • Bituminous road construction Commissioning /Testing • pavements and surfacing works • Waste management • QA/QC inspections and tests	Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.	3	3	1	3	3	**13**	**4**	Medium
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities	-	-	-	-	-	-	-	Beneficial
	Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	-	-	-	-	-	-	-	Beneficial
	Gender-based violence (GBV)	3	3	1	3	3	**12**	**4**	Medium
	Child abuse	3	3	1	3	3	**12**	**4**	Medium
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers	-	-	-	-	-	-	-	Beneficial
	Generation of dust and automobile/ heavy duty equipment emissions from construction earthworks.	3	3	3	3	1	**13**	**6**	High
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and building sites.	3	3	1	3	1	**11**	**4**	Medium
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	3	3	1	3	1	**11**	**4**	Medium
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	3	3	1	3	1	**11**	**4**	Medium
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites	3	3	1	5	3	**15**	**6**	High
	Traffic congestion during haulage of plant components to site for installation	3	3	1	3	3	**13**	**4**	Medium
	Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	1	3	1	3	3	**11**	**4**	Medium
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	1	3	1	3	3	**11**	**4**	Medium

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
	Reduction in wildlife population as a result of poaching due to easier access created by access roads	5	1	3	3	1	**13**	**6**	High
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	1	3	3	3	1	**11**	**6**	High
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	3	3	3	3	1	**13**	**6**	High
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	1	3	1	3	3	**11**	**4**	Medium
	Waste Disposal • Scrap metal, wood, sand, concrete, paper • Spent-oil and replaced /obsolete equipment parts that may contaminate soil/ground water • Waste from laydown area and building sites causing unsightliness	3	3	3	3	3	**15**	**6**	High
Demobilization -Demobilization after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.	1	3	1	3	1	**9**	**4**	Medium
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	3	3	1	3	3	**13**	**4**	Medium
	Traffic congestion during transportation of demobilized equipment and personnel	3	3	3	5	3	**17**	**8**	High
	Generation of dust and automobile/heavy duty equipment emissions	3	3	1	3	1	**11**	**4**	Medium
	Waste disposal (scrap metal, wood, sand, concrete, paper)	3	3	1	3	3	**13**	**4**	Medium
	Reclamation and restriction of access roads to prevent unauthorized uses	-	-	-	-	-	-	-	Beneficial
	Loss of employment and business opportunities due to completion of construction phase	3	3	1	3	3	**13**	**4**	Medium
	Illegal access to building site leading to accident, asset damage and loss	1	3	1	3	3	**11**	**4**	Medium
Operation and Maintenance	Risk of injury from fall from height/trip or being hit by an object	3	3	1	3	1	**11**	**4**	Medium

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
• Building inspection and checks • Power generation/ servicing • Transportation of raw materials and finished product • Plant maintenance • industrial waste discharges • Emergence of small-scale enterprises • Green Buffer development around the ATC. • Recruitment of workers	Security threat such as kidnapping and banditry attack	3	5	1	5	3	**17**	**6**	High
	Gender-based violence (GBV)	3	3	1	3	3	**12**	**4**	Medium
	Child abuse	3	3	1	3	3	**12**	**4**	Medium
	Air pollution by gaseous emission (CO, SO_2, NO_2) and particulates from power generator	3	3	3	3	1	**13**	**6**	High
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator servicing (diesel, spent oil etc.)	3	3	1	3	1	**11**	**4**	Medium
	Generation of dust and gaseous pollutants from automobile emissions	3	3	3	3	1	**13**	**6**	High
	Increase in noise level nuisance from operation machines and from vehicles plying the access roads	3	1	3	3	1	**11**	**6**	High
	Traffic congestion along agro-products transportation route	3	3	1	3	3	**13**	**4**	Medium
	Threat to community culture, safety and security due to presence of workers and business opportunists	1	3	1	3	3	**11**	**4**	
	Reduction of water tables and source of water for production processes	3	1	3	3	3	**13**	**6**	High
	Metallic materials generation from plant parts, retrofitting/upgrade of parts during plant servicing	1	3	1	3	1	**9**	**4**	Medium
	Potential for land contamination from industrial waste disposal	3	3	1	3	3	**13**	**4**	Medium
	Pollution of surface water bodies by wastewater generated from industrial waste discharges	3	3	3	3	3	**15**	**6**	High
	Change in Land Use of nearby areas	1	3	1	3	3	**11**	**4**	Medium
	Recreational facility from lawns/parks/green areas	-	-	-	-	-	**-**	**-**	Beneficial
	Acquisition of skills by individuals to be employed as operators	-	-	-	-	-	**-**	**-**	Beneficial
Decommissioning /Abandonment • Removal of electrical cables and wires, water and sewage	Risk of accident and injury to workers during demolition of structures	3	3	1	3	1	**11**	**4**	Medium
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	3	3	1	3	3	**13**	**4**	Medium

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
treatment plant pipelines. • Demolition of buildings for facilities retrieval • Waste generation • Transportation of Plant components for sale/another site • Re-vegetation of site	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages	3	3	1	3	1	**11**	**4**	Medium
	Traffic obstruction from transportation of decommissioned structures and equipment	3	3	1	3	3	**13**	**4**	Medium
	Abandoned structures possibly taken-over by miscreants/criminals	1	3	3	3	3	**13**	**6**	High
	Availability of land for alternative uses such as community hall, farmland etc	-	-	-	-	-	-	-	Beneficial
	Improved Ecology, Air Quality and Aesthetics	-	-	-	-	-	-	-	Beneficial

5.8 Discussion of Impacts

5.8.1 Positive Environmental and Social Impacts of the Proposed Project

Reduction of post-harvest losses and wastages

Agricultural Transformation Centre (ATC) provide the facilities for storages which help to reduce post-harvest wastages and losses from the cultivation year. The usual experience of post-harvest losses will become a thing of the historic accounts for the farmers, particularly for perishables such as tomato whose lifespan is short.

Employment Opportunities

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

Provision of Market for Supply of Construction Materials

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

Improved Drainage

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

Gains in the Local and National Economy

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

Improved produce price at demand-driven rate

Lack of storage encourages immediate farm-gate sales and reduces profit; presenting a huge difficulty for produce marketability with good pricing. When external storages such as warehouses are employed, they increase the cost outlay. Thus an ATC helps in price stabilisation especially during the periods of glut and possible seasonal scarcity of produce like tomato and wheat. Thus economies of scale become enlarged and the smallholder farmer can scaled-up to become a medium-size farmer.

Informal Sectors Benefits

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

Skills Transfer and Training

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

5.8.2 Anticipated Negative Impacts of the Proposed Project

Dust Emissions Impact

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

Noise and Vibration Impact

The construction works, delivery of materials by heavy trucks and the use of machinery/equipment including bulldozers, generators, graders and compactors shall contribute high levels of noise and vibration within the construction site and the surrounding area. Elevated noise levels within the site shall affect project workers, the residents, passers-by, domestic animals, wildlife and other persons within the vicinity of the project area.

Increased Soil Erosion Impact

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

Impact on Vegetation clearance

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

Extraction and Use of Materials Impacts

Construction materials such as hard core, rough stone, sharp sand gravel, laterite and water shall be required for the construction activities and will be obtained from quarries, bore holes and land. Sharp sand shall be extracted from rivers. Since substantial quantities of these materials will be required for construction of the proposed development project, the availability and sustainability of such resources at the extraction sites will be negatively affected, as they are not renewable in the short term. In addition,

the sites from which the materials will be extracted shall be significantly affected in several ways including landscape changes, displacement of wildlife, intrusion into animal's breeding ground, and destruction of vegetation, poor visual quality and opening of depressions on the surface leading to pond creation thereby serving as a breeding ground for vector organisms, as well as other human and animal health impacts.

Exhaust Emissions Impact

Trucks and other vehicles that will be used to transport various materials from their sources to the project area will contribute to the increase in emissions of oxides of carbon, oxides of nitrogen, oxides of sulphur amongst other harmful gases and fine particulates along the way as a result of fossil fuel combustion. Such emissions can lead to several environmental and health impacts including global warming. The impacts of such emissions shall be greater in areas where the materials are sourced and at the construction site as a result of frequent combustion by vehicle engines, frequent vehicle turning and slow vehicle movement in the loading and offloading areas.

Risks of Accidents and Injuries to Workers

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

Impacts on Soil

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

Waste Generation Impact

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

by the fact that some of the waste materials contain hazardous substances such as waste oil, solvents, while some of the waste materials including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment.

Energy Consumption Impact

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

Contamination of Environment

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

Impact on Sanitary Facilities

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

Water supply impact

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

Impact on Storm Water Flow and Demand for Sanitation

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

Impact on Interference of Traffic Flow

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

Social Infrastructural Impact

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

Impact on Health / Aesthetics

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

5.9 Cumulative Impacts

Cumulative impacts arise from the impact of the project interacting with other relevant past, present, and reasonably foreseeable developments to create an additional impact and effect. This includes unplanned but predictable activities that may occur later or at different locations due to the project's influence. Cumulative impacts can arise from individually minor but collectively significant activities over time, and they must be

considered in an ESIA based on scientific concerns and/or the concerns of project-affected parties (AfDB ISS, 2023).

Cumulative impacts often result from the interaction of multiple activities affecting the same resources or receptors. These impacts can sometimes be more significant when combined, although, in some cases, they may simply be the sum of individual impacts. The complexity of effectively designing and implementing a Cumulative Impact Assessment (CIA) typically exceeds the technical and financial capacity of a single proponent, especially given the need for coordination with other developers and authorities in the region.

A CIA is a multi-stakeholder, iterative process that requires the involvement of multi-disciplinary teams and a robust governance structure. It is also time- and data-intensive, necessitating collaboration across different sectors to accurately assess and manage cumulative impacts.

In addition to the direct impacts assessed, the project may experience cumulative impacts resulting from interactions with existing and planned third-party projects and activities within the project area. Identifying and understanding these projects are essential for a comprehensive assessment of potential cumulative effects. For this project location, there are no other projects that have the potential to cumulatively impact on the environment.

CHAPTER SIX

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) / MITIGATION MEASURES

6.1 Introduction

This chapter presents the Environmental and Social Management Plan (ESMP) developed for the proposed Construction of Agricultural Transformation Centre (ATC), Bagauda, Bebeji LGA of Kano State, Nigeria. An environmental and social management plan is essentially a management tool and standalone component of an Environmental study that provides the assurance that the mitigation measures developed for the significant impacts of a proposed project are implemented and maintained throughout the project lifecycle. It outlines management strategies for safety, health and environment stewardship in the proposed project implementation. It states in specific terms how the project proponent's commitments will be implemented to ensure sound environmental practice.

The ESIA for the proposed project shall be a "life document" which shall be reviewed periodically with the incorporation of various mitigation measures for potential impacts and shall form the basis for the actual project implementation.

Compliance with the legal standards on safety and environment is regarded as the minimum requirement, and must be satisfied during all phases of the Project development. In order to reduce the risk of an adverse effect on the environment to the lowest level that is reasonably practicable, an objective of the engineering design will be to apply the ALARP principle. Figure 6.1 illustrates this principle graphically.

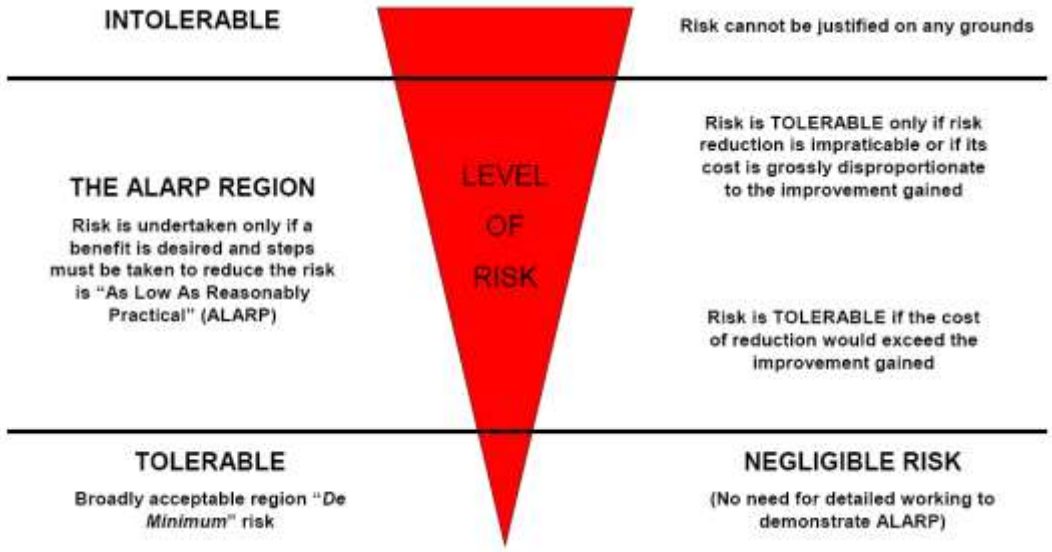


Figure 6.1: Level of Risk and ALARP

6.2 ESMP Objectives

The ESMP is essential for successfully implementing the Project's environmental performance throughout the life of the Project. Having this framework in place ensures a systematic approach to bringing environmental and social considerations into decision making and day-to-day operations. It establishes a framework for tracking, evaluating and communicating environmental performance and helps ensure that environmental risks and liabilities are identified, minimised and managed. The ESMP will be a living document and will continue to develop during the design and construction phase to enable continuous improvement of the Project's environmental performance.

Specifically, the ESMP is designed to:

- ensure that all mitigation measures prescribed in this report for eliminating, minimizing, and enhancing the project adverse and beneficial impacts are fully implemented; and
- provide part of the basis and standards needed for overall planning, monitoring, auditing and review of environmental and socio-economic performance throughout the project activities.

This has been developed to manage negative impacts/effects, enhance benefits and ensure good standards of practice are used throughout the project. These objectives shall be achieved by:

- ensuring compliance with all stipulated legislation on protection of the biophysical and socio-economic environment and Kano State Government HSE policy;
- integrating environmental and socio-economic issues fully into the project development and operational philosophies;
- promoting awareness on the management of the biophysical and socio-economic environment among workers;
- rationalizing and streamlining existing environmental activities to add value to efficiency and effectiveness;
- ensuring that only environmentally and socially sound procedures are employed during the project implementation; and
- continuous consultations with the relevant regulatory bodies, community leaders (local heads/chiefs, clan heads, landlords, etc), youth leaders, community based organizations (CBOs), and other stakeholders throughout the project lifecycle.

6.3 Core Elements of the EMP

In line with the objectives summarized in section 6.2 above, the main elements of this ESMP are:

- Overall project organizational chart (including HSE) organogram;
- Preliminary ESMP guidelines;
- Guidelines for waste management;
- Guideline for Consultation;
- Noise Minimization Guideline;
- Overall safety philosophy/guidelines;
- Emergency/Contingency plan;
- Communication plan;
- Security plan;

- Plan for Training and Awareness;
- Environmental monitoring plan;
- Guidelines for audit and review;
- Guidelines on maintenance and facility management; and
- Guidelines for decommissioning and abandonment.

6.4 Structure and Responsibility

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

Resident Engineer

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

Assistant Project Manager(s)

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

HSE Advisor

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

Environmental Lead

- Provide specialist environmental advice

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

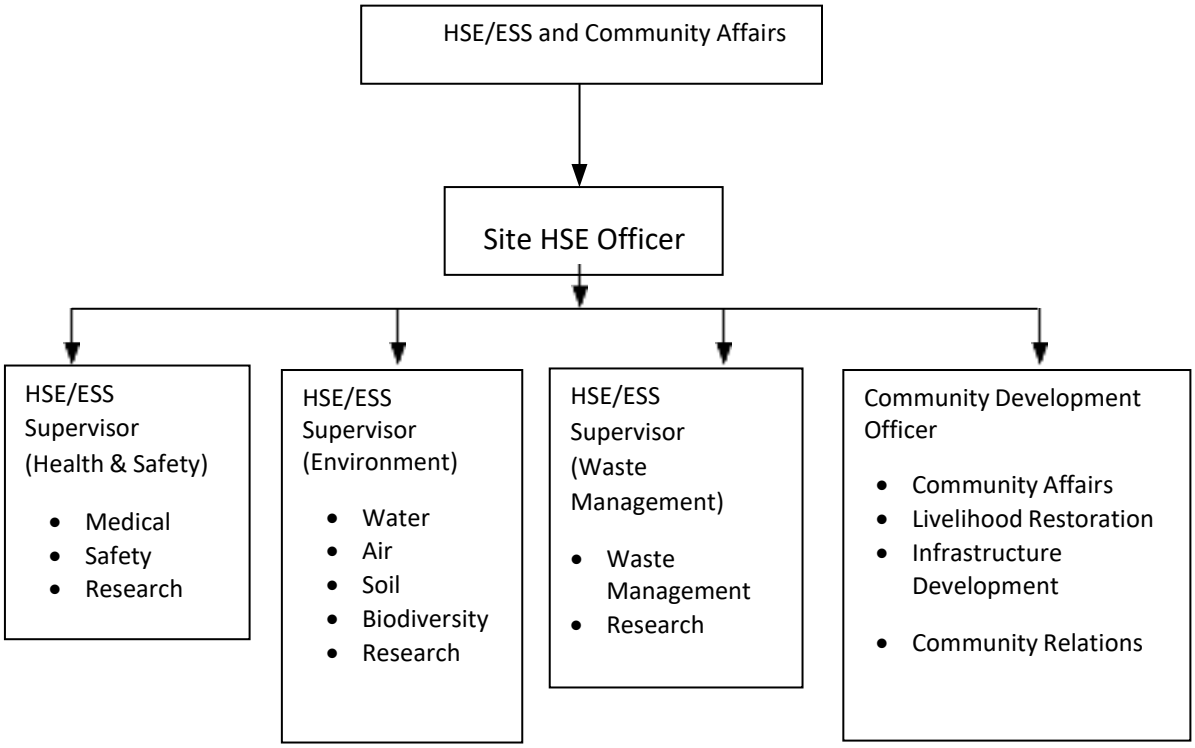


Figure 6.2: KNSG Proposed Organogram HSE/ESS

6.4.1 Institutional Responsibility

The responsibilities of all incorporated institutions in the implementation of this ESIA are presented in Table 6.1 below:

Table 6.1: Roles and Responsibilities of Relevant Institution

S/N	Category	Roles & Responsibilities
1.	IsDB	• Inclusion of relevant provisions in the Legal Agreement. • Provision of advice on expected or likely issues based on Bank experience. • Project supervision and implementation support to verify compliance with the ESMP
2.	Federal Ministry of Environment	• Provision of advice on screening, scoping, review of draft ESMP report (in liaison with State Ministry of Environment), receiving comments from stakeholders, public hearing of the project proposals, and convening a technical decision-making panel, environmental and social liability investigations, monitoring and evaluation process and criteria.
3	Kano State Ministry of Environment and climate change	• Oversee all environmental compliance at the State level • Review of draft ESMP report (in liaison with Federal Ministry of Environment) • Site assessment and monitoring of ESMP implementation.
4.	Kano SPIU	• Monitoring of project/contractor performance and taking appropriate action to ensure ESMP provisions are met. • Inclusion of relevant provisions in the SPMU contract. • Safeguards due diligence • Implementation of request for environmental and social protection.
5.	Safeguards Unit	**Environmental Safeguards** • Analyze potential environmental impacts; • Ensure that project activities that are implemented will in accordance to best practices and guidelines • Identify and liaise with all stakeholders involved in environment related issues in the project; and be responsible for the overall monitoring of mitigation measures and the impacts of the project during implementation. **Social Safeguards** • Develop, coordinate and ensures the implementation of the social aspects of the proposed project. • Identify and liaise with all stakeholders involved in social related issues during the proposed road rehabilitation; • Ensure that project activities that are implemented will be in accordance with best practices and guidelines; • Ensure that GBV mitigation and response measures are in place & working correctly.
6.	State Government MDAs (Ministry of Physical Planning, Urban Development, Bureau of Lands etc.	• Compliance overseer at State Level, on matters of land acquisition and compensation and other resettlement issues, • Other MDAs come in as and when relevant areas or resources under their jurisdiction or management are likely to be affected by or implicated projects. • They participate in the EA processes and in project decision-making that helps prevent or minimize impacts and to mitigate them. • Issuance of consent or approval for an aspect of a project; allow an area to be included in a project; or allow impact to a certain extent or impose restrictions or conditions, monitoring responsibility or supervisory oversight.

7.	KASEPPA	• Inspection of project premises in order to ensure strict compliance with sanitation and waste management standards in the state. • Collaboration with other MDAs at the State and Federal level, NGOs and Donor Agencies in environmental protection and management especially in areas of waste recycling etc.
8.	Local Government	• Provision of oversight function across subproject in LGAs for ESMP compliance. • Monitoring of activities related to public health, sanitation, waste management amongst others.
9.	Affected Community	• Promote environmental awareness. • Review environmental and social performance report made available by KNSG • Provide comments, advice and/or complaints on issues of nonconformity. • Attend public meetings organized by KNSG to disseminate information and receive feedback.
10	CDA	• Ensure community participation by mobilizing and sensitizing community members.
11	NGOs/CSOs	• Assisting in their respective ways to ensure effective response actions, conducting scientific researches alongside government groups to devise sustainable environmental strategies and techniques.
12	Others/General Public	• Identify issues that could disrupt the project and support project impacts and mitigation measures and awareness campaigns.

6.5 Framework for Implementing the ESMP

The framework for the implementation of this ESMP is strongly based on a repeated process of continuous improvement which comprises of eleven (11) elements, each with underlying principle and set expectations.

Overview of each of the eleven primary elements is presented as follows.

- Management Leadership, Commitment, and Accountability: Ensures that the workers understand the goals and management commitment to excellence in safety, health, environment, and operational integrity.
- Risk Assessment and Management: Ensures that risks involved in operations are recognized so that they can be appropriately addressed through facility design and/or operating practices.
- Facilities Design and Construction: Ensures elements for the protection of people and the environment are incorporated into the design of facilities and the plans for installation and operation.
- Process and Facilities Information/Documentation: Ensures that the systems designed to protect people and the environments are appropriately documented.

- Personnel and Training: Ensures that personnel understand the systems that are in place and are appropriately trained to perform required roles with respect to their functions.
- Operations and Maintenance: Ensures that facilities are maintained and operated in ways that ensure the protection of people and the environment.
- Management of Change: Ensures that new personnel are informed of existing systems that all affected personnel are informed of changes in the systems, and that safety and environmental aspects are considered when making changes.
- Third Party Services: Through contract, oversight and other mechanisms, third party contractors are held to the same standards as Kano State Government.
- Incident Investigation and Analysis: Seeks to understand the causes of any incidents so that effective controls or systems can be implemented to prevent recurrence.
- Community Awareness and Emergency Preparedness: Though not highly applicable in offshore project far removed from Community, ensures appropriate outreach and awareness programmes are implemented to establish effective emergency procedures and to allay concerns.
- Operations Integrity Assessment and Improvement: Ensures that the safety and environmental performance is monitored against targets to ensure Kano State Government meeting its goals to protect people and the environment and seeks the means to improve the systems and processes, particularly when goals are not being met.

6.6 ESMP Guidelines

Preliminary ESMP guidelines have been developed to cover the entire project activities. These include: waste management, consultation, noise minimization, overall safety philosophy, emergency/Contingency plan, communication plan, security plan, training and awareness, environmental monitoring etc.

6.7 Impact Mitigation Methodology

The framework for determining the form of mitigation measures to be applied for the significant impacts identified for the project is shown in Figure 6.3 below. The frequency, severity, sensitivity, scale, magnitude and nature of the impacts were taken into consideration in the assessment.

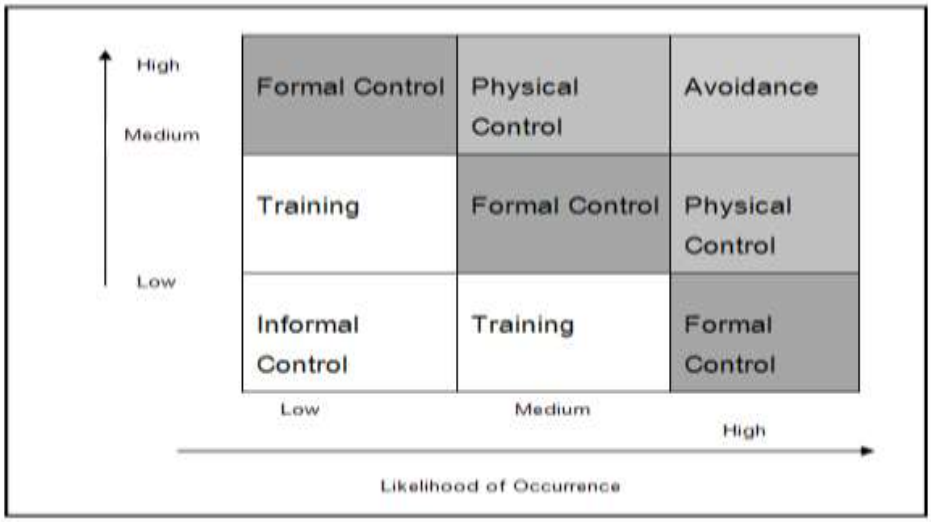


Figure 6.3: Matrix for Determination of Mitigation measures

The approaches to the mitigation measures include enhancement (for the positive impacts), prevention, reduction, avoidance and compensation (for the significant negative impacts). The mitigation measures for each (significant and adverse) impact of the proposed project activities were generally identified based on the associated effect to the environment and human health/safety.

The definitions of the various approaches to impact mitigation considered are presented below.

Enhancement: These are measures proffered to ensure that significant beneficial impacts of the existing facilities and proposed project are encouraged.

Prevention: These are measures proffered to ensure that significant and adverse potential impacts and risks do not occur.

Reduction: These are measures proffered to ensure that the effects or consequences of those significant associated and potential impacts that cannot be prevented are reduced to a level as low as reasonably practicable.

Formal control: This involves the application of documented policy, process or procedure in mitigating the impacts of the project activities.

Informal Control: This involves the application of sound judgment and best practice in mitigating the impacts of project activities.

Physical control: This involves the application of physical processes or instruments (pegs, flags, sign post etc), not necessarily requiring any special technology, in order to mitigate the impacts of a project or impacts.

Avoidance: This involves the modification of plans, designs or schedules in order to prevent the occurrence of an impact or impacts.

Training: This involves personnel awareness in specific / specialized areas.

6.8 Management Procedure for Mitigation Measures

The management procedures employed for the establishment of mitigation measures for the identified impacts is presented in Figure 6.4. Mitigation measures were subsequently proffered for adverse significant potential impacts. These measures (prevention, reduction, control strategies) were developed for the adverse impacts through review of industry experience (past project experience), consultations and expert discussions with multi-disciplinary team of engineers and scientists.

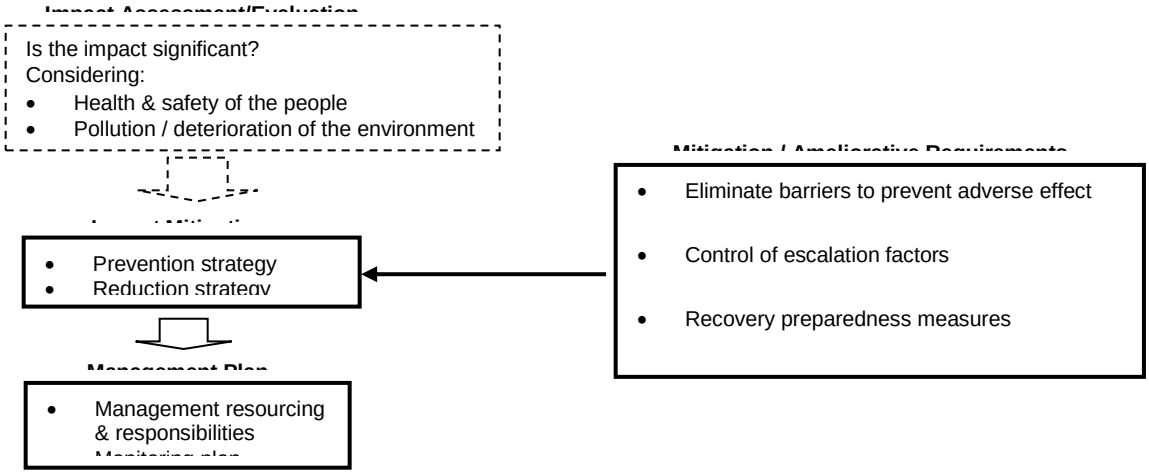


Figure 6.4: Management Procedure for Mitigation Measures

6.9 Proffered Mitigation Measures

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

Based on the impact assessment matrix in the previous section, the overall ratings of impact significance **High** or **Medium** or **Low** was established for each identified impact. The proffered mitigation measures and the expected final residual impact rating for the identified potential significant impacts are presented in the Table 6.2. A residual impact is the impact that is predicted to remain after mitigation measures have been designed into the intended activity. Impact prediction takes into account any mitigation, control and operational management measures that are part of the project design and project plan. The residual impacts are described in terms of their significance in accordance with the categories identified in chapter 5.

6.10 Environmental and Social Management Plan

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase of the proposed project are outlined in Table 6.2 below.

Table 6.2: Environmental and Social Management Plan (ESMP)

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
Pre-Construction -Permitting -Mobilization -Recruitment -Site Preparation	Economic loss arising from loss of farm lands	KNARDA shall ensure: • That due diligence is carried out prior to land acquisition. • To carry out census of affected farmers for compensation. • That all relevant stakeholders and issues are identified, discussed, and resolved properly prior to mobilization. • To implement regular consultations with the local community and other stakeholders (government, community, NGOs, CBOs, etc.) for effective communication and social license; support traditional conflict resolution structures in the project communities. • The activation of Grievance Redress Mechanism. • To compensate and resettle displaced farmers prior to mobilization.	Contractor	5,000,000	Livelihood Restoration Plan(LRP)	Once before project commencement	Kano State Agricultural and Rural Development Authority (KNARDA)	-
	Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure Increase of communicable diseases due to influx of people	KNARDA shall ensure: • To embark on community development programmes in line with the desires and needs of the people. • The provision of accommodation for workers. • Employment of indigenes. • To coordinate with medical posts and emergency services to prepare for water supply, waste management and incidents. • To install proper and independent facilities at construction site for water supply, sanitation, solid and liquid waste, so that pressure on community infrastructure is limited. • Areal fumigation and use of Insecticide Treated Net should be promoted in the Workers camp • Sex education in protected sex, risk of casual sex and counselling services should be provided.	Contractor	1,000,000	Employment Record, HSE Record Training	Monthly	KNARDA	1,500,000
	Increase in social vices (like theft, prostitution etc.) resulting from increased number of people a	KNARDA shall: • Make security plan and emergency response and contacts with security forces. • Engage professional security outfit in protecting lives and properties within the project area and the community. This must be registered with the Nigerian Police/NSCDC etc. • Prepare a Local Content Plan to facilitate involvement of locals in the security network.	Contractor/ KSG	-	Security Report	Monthly	Police/ NSCDC	-

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
		• Develop a code of behaviours for workers. All workers to receive training on community relations and code of behaviour. • Ensure that the workers are properly cautioned to respect the culture and place of worship of the people.						
	Community agitation over unidentified stakeholder, leadership tussles etc. Conflicts/community agitations over employment issues (quota and methods)	KNARDA shall: • Inform communities about details of construction activities (e.g., employment opportunities, schedule, timing of noise activities, traffic including movements of oversized loads) by billboards, posters and community meeting. • Set-up and effectively monitor project grievance redress mechanism • Engage communities in the monitoring activities to enhance transparency and involvement. • Enhance ongoing consultations with local communities (with good representation) to create continuous dialogue, trust and planning of community development activities. • Proper consultation with the host communities and youth organizations on the recruitment of labour and work at height. • To liaise with local community head and relevant local organizations to work out formula for recruitment from the host communities. • To be transparent in working out the formula for recruitment	Contractor		Stakeholder Engagement Report	Monthly	KNARDA	5,000,000.00
	Noise and vibrations due to movement from heavy duty equipment and vehicles affecting site workers, residents and wildlife	KNARDA shall ensure: • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses.	Contractor	1,500,000	Air quality parameters (PM2.5, PM10, CH4, CO, NO2, SO2, CO2) Maintenance records Driver's training records	Weekly (during pre-construction phase)	KSMEnv	500,000.00

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
		• Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration.						
	Increase of dust particles and vehicular emissions such as SO_X, NO_X, CO_X, etc	KNARDA shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.	Contractor	1,000,000	SO_X, NO_X, CO_X, VOC, SPM	Weekly (during pre-construction phase)	KSMEnv	500,000
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset	KNARDA shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management	Contractor	-	Traffic Record	Daily during pre-construction	KNARDA	FRSC/ Police
	Disturbance of the vegetative cover due to site clearing and preparation	KNARDA shall ensure: • That vegetation clearing will be limited to the surveyed area • That plants of economic value are transplanted • To limit vegetation clearing to approved widths and, as practicable, to minimum required; and • for disturbed areas that are no longer required for project operations, monitor regrowth and, if necessary, initiate actions to enhance regrowth or revegetation with appropriate species consistent with operation requirement	Contractor	-	Flora species record	Once before Mobilization	KNARDA	N/A
	Littering of the environment due to waste from wood, sand, paper; domestic waste from laydown area and camp site (material and	KNARDA shall ensure: • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically			Waste Management Record	Weekly	KASEPPA	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
	wood)	possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws.	Contractor	1,000,000				1,000,000
Construction/ Installation Civil work, Mechanical and Electrical work which include; • Drainage • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc. • Commissioning /Testing • Waste management • Livestock containment	Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.	KNARDA shall ensure: • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties. • Unregistered labourers and touts shall not be employed. • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence • workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire- fighting shall be included in the induction programme for workers.	Contractor	1,000,000	Incident/ accident rate record	Weekly	KASEPPA	
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	KNARDA shall ensure: • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term employees for future call-ups when required • Adopt procurement practices that favour local merchants and service providers where practicable consultation with the locals shall be carried out in terms of provision of jobs. • Prepare a Local Content Plan and strictly adhered to it in	Contractor	1,000,000	Stakeholder Engagement Report, Evidences of workers payment	Monthly	KASEPPA	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers	order to facilitate involvement of local labour.						
	Generation of dust and automobile/heavy duty equipment emissions from construction earthworks.	KNARDA shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.	Contractor	500,000	SO_X, NO_X, CO_X SPM	Weekly	KASEPPA	1,000,000.00
	Flora/habitat loss and disturbance through vegetation clearing and earthworks.	KNARDA shall ensure: • Ensure that vegetation clearing will be limited to the surveyed area • Ensure that plants of economic value are transplanted • for disturbed areas that are no longer required for project operations, monitor regrowth and, if necessary, initiate actions to enhance regrowth or revegetation with appropriate species consistent with operation requirement	Contractor	1,000,000	Biodiversity Record	Once	FMEnv	
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	KNARDA shall ensure: • Workers are warned not to kill fauna species but allow them to move back to the forest • Work force are provided with and use appropriate PPE (cover all, safety boots, hard hats, hand gloves and safety goggles) before venturing into the bush; • Work force are provided assistants/experienced guides from the local communities to look out for signs of wild animals (including bees and wasps) in the bush; and trips into the work in inclement weather e.g., periods of low visibility, are avoided	Contractor	1,000,000	Fauna Species Record	Once before Construction	FMEnv	
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill	KNARDA shall ensure: • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g			Soil & Water Quality and Waste	Monthly	KSMEnv,	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
	of hazardous substances (diesel, lubricants, hydraulic oil etc.)	fuel, waste areas). • An inventory of waste is developed and maintained • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Waste bins shall be provided at designated locations on site for temporary storage of different waste streams. • General waste that cannot be reused or recycled shall be disposed of at an approved dumpsite. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite.	Contractor	1,500,000	evacuation/disposal rate			500,000
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites	KNARDA shall: • use standard warning notice (e.g. signal lights and horn) to other road users; • ensure a practicable journey management programme is developed and adhered to; • maintain speed limits for road vehicles • ensure that mobilization is carried out after due consultation with relevant road authorities and other stakeholders to minimize interference along the road ways	Contractor		Incident/ accident rate record	Daily	KASEPPA	
	Traffic congestion during haulage of plant components to site for installation	KNARDA shall ensure: • the creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • compliance with journey management policy • to minimize movement at the peak hours of the day • that all traffic rules are obeyed by the drivers	Contractor		Traffic Record	Daily	KASEPPA	
	Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	KNARDA shall ensure: • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties. • Unregistered labourers and touts shall not be employed. • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and			Result of geotechnical survey	At Foundation	KASEPPA	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
		investigating accidents and near misses, and developing measures to prevent recurrence • workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire- fighting shall be included in the induction programme for workers. • Test structures for integrity prior to undertaking work. • Implement a fall protection program that includes training in climbing techniques and the use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others. • Provide an adequate work-positioning device system for workers.	Contractor	1,500,000				
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	KNARDA shall ensure: • Appropriate PPE shall be provided for workers. • Workers shall imbibe the workplace safety rules via proper sensitization procedures. • Strict compliance to the SOPs shall be ensured. • A conduit type of wiring shall be adopted instead of a surface to prevent shock. • Only allowing trained and certified workers to install, maintain, or repair electrical equipment; • Deactivating and properly grounding live power distribution lines before work is performed on, or close to, the lines; • ensuring that live-wire work is conducted by trained workers with strict adherence to specific safety and insulation standards. • Prior to excavation works, all existing underground cable installations should be identified and marked. Drawings and plans should indicate such installations.	Contractor	1,500,000	HSE record	Throughout construction phase	KASEPPA	
	Reduction in wildlife population as a result of poaching due to easier access created by access roads	KNARDA shall ensure: • Workers are warned not to kill fauna species but allow them to move back to the forest. • Poachers are not allowed access to the site • Work force are provided with and use appropriate PPE (cover all, safety boots, hard hats, hand gloves and safety	Contractor		Biodiversity record	Once before construction	KASEPPA	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
		goggles) before venturing into the bush; • Work force are provided assistants/experienced guides from the local communities to look out for signs of wild animals (including bees and wasps) in the bush; and trips into the work in inclement weather e.g., periods of low visibility, are avoided						
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	KNARDA shall: • Cover properly loose materials and keep top layers moist • Use binder material for erosion and dust control for long term exposed surfaces. • Regular cleaning of equipment, drains and roads to avoid excessive buildup of dirt. Spray surfaces prior to excavation • Use covered trucks for the transportation of materials that release dust emissions. • Speed limits on-site of 15 k/h should be recommended and enforced	Contractor		Air Quality, HSE Record	Throughout Construction Phase	KASEPPA	
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	KNARDA shall ensure that: • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise‘ equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration.	Contractor		Noise Level	Daily	KASEPPA	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	KNARDA shall: • Maintain construction site in orderly condition and do not distribute material over many sites before usage.	Contractor		Visual Inspection, Incident/Accident record	Monthly	KASEPPA	
Operation and Maintenance • Building inspection and checks • Power generation/ servicing • Transportation of raw materials and finished product • Agro-products processing for export. • Plant maintenance • Industrial waste discharges • Emergence of small-scale enterprises • Green Buffer development around each industrial plot. • Recruitment of workers	Risk of injury from fall from height/trip or being hit by an object	KNARDA shall ensure that: • A comprehensive HSE Policy must be displace openly, and enforced through monitoring within the site; • All staff must be trained and retrained on regular basis for HSE compliance; • Develop a training program including a code of conduct for all workers; • Well-equipped Clinic should be put up for emergence attention, while referral system should be arranged with a Secondary Hospital	Contractor		Incident/Accident Record	Daily	KNARDA	
	Security threat such as kidnapping and banditry attack	KNARDA shall: • Engage trained security personnel • Avoid lone working • Avoid working at nights • Avoid night journeys	Contractor		HSE Record	Weekly	KNARDA	
	Air pollution by gaseous emission (CO, SO_2, NO_2) and particulates from power generator	KNARDA shall ensure: • Generator to comply with international standards for exhaust gases; • Maintenance of generator and exhaust gas check; • Use of the cleanest fuel economically available shall be adopted	Contractor		SO_X, NO_X, CO_X, VOC, SPM	Monthly	KNARDA, KSMEnv	
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator servicing (diesel, spent oil etc.)	KNARDA shall ensure: • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be	Contractor		Soil Quality, Waste Management Record	Daily	KNARDA, KSMEnv, KASEPPA	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
		available onsite. • Conduct bioremediation of polluted soil immediately to inhibit further spread						
	Generation of dust and gaseous pollutants from automobile emissions	KNARDA shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Preference for usage of clean fuel like LPG, low sulphur diesel should be explored; • Energy conservation should be adopted by opting the alternate energy options like solar power; • Power Generators and equipment should be provided with stacks of adequate height (higher than nearest building) to allow enough dispersion of emission; • Enclosure of dust producing equipment, • Use of local exhaust ventilation; • Use of dust extraction and recycling systems to remove dust from work areas; • Regular checking and maintenance of all plant and equipment to minimize the risk gas leakage	Contractor		SO_X, NO_X, CO_X, VOC, SPM	Weekly	KNARDA, KSMEnv	
	Odour disturbances from the processing of Rice, edible oil etc	KNARDA shall • Ensure all processing equipment are installed in an enclosed plant and processing activities are taking place within an enclosed system. • Ensure provision of appropriate PPE (respiratory protection) for workers and enforce usage. • Ensure that project staff are not exposed to more than nine hours at a go on any equipment generating noise level of more than 90 dBA	Contractor		SO_X, NO_X, CO_X, VOC, SPM	Daily	KNARDA, KSMEnv	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
	Increase in noise level nuisance from operation machines and from vehicles plying the access roads	KNARDA shall ensure that: • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration. • Machineries to be used should comply with the noise standards prescribed by FMEnv. • Workers shall be given PPE (ear plugs) and enforce compliance;	Contractor		Noise level	Daily	KNARDA, KSMEnv	
	Traffic congestion along agro-products transportation route	KNARDA shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management	Contractor		Traffic Record	Weekly	KNARDA, FRSC	
	Threat to community culture, safety and security due to presence of workers and business opportunists	KNARDA shall: • Develop an induction program including a code of conduct for all workers. Code of conduct to address the following: ○ Respect for local residents;			HSE training report	Monthly	KNARDA	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
		○ unauthorized taking of products; ○ Zero tolerance of illegal activities such as child sexual exploitation and underage sex, prostitution, harassment of women, Gender Based Violence (GBV,) purchase or use of illegal drugs, ○ Disciplinary measures and sanctions (e.g. dismissal) for infringement of the code of conduct and/or company rules; ○ Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of GBV. • Limit the number of migrant workers by engaging local workers.	Contractor					
	Reduction of water tables and source of water for production processes	KNARDA shall ensure: • Water conservation measures should be practiced • Waste water should be recycled for reuse. • Rain water harvesting. • Adoption of continuous horizontal washers and vertical spray washers or vertical, double-laced washers. • Adoption of counter current washing (e.g. reuse the least contaminated water from the final wash for the next-to last wash). • Use of water flow–control devices to ensure that water only flows to a process when needed.	Contractor		Water Quality	Monthly	KNARDA, KSMEnv	
	Metallic materials generation from plant parts, retrofitting / upgrade of parts during plant servicing	KNARDA shall ensure: • Recyclable materials should be sorted and sold to scrap metal converters • Regular checking and maintenance of all plant and equipment to minimize the risk of fuel or lubricant leakages.	Contractor		Waste Management Record	Daily	KNARDA, KASEPPA	
	Potential for land contamination from industrial waste disposal	KNARDA shall ensure: • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws.	Contractor		Waste Management Record	Daily	KNARDA, KSMEnv, KASEPPA	
	Pollution of surface water bodies by wastewater generated from industrial waste discharges							

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
	Creation of job and acquisition of skills by individuals to be employed as operators	KNARDA shall ensure: • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term employees for future call-ups when required • Adopt procurement practices that favour local merchants and service providers where practicable consultation with the locals shall be carried out in terms of provision of jobs. • Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour.	Contractor		Stakeholder Engagement Record	Monthly	KNARDA	
	Presence of livestock and humans may displace animals and disturb their habitats, by direct disturbance during operation (e.g., livestock rearing and movements, increased human and vehicle presence, noise, light disturbance at night, construction of associated facilities).	• Demarcation and avoidance of areas of conservation interest (high value species, feeding or breeding sites, migration routes, etc.) where possible, and wildlife rescue and translocation where appropriate, under expert supervision. • Establish compensatory wildlife refuges, as needed.	Contractor		Visual observation	Monthly	KNARDA, KSMEnv	
Decommissioning /Abandonment • Removal of \electrical cables and wires, water and sewage treatment plant pipelines. • Demolition of buildings for facilities retrieval • Waste generation • Transportation of Plant components for sale/another site	Risk of accident and injury to workers during demolition of structures	KNARDA shall ensure that: • A comprehensive HSE Policy must be displace openly, and enforced through monitoring within the site; • All staff must be trained and retrained on regular basis for HSE compliance; • Develop a training program including a code of conduct for all workers; • Well-equipped Clinic should be put up for emergence attention, while referral system should be arranged with a Secondary Hospital	Contractor	1,500,000	Incident/Accident Record	Daily	FMEnv.	
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	KNARDA shall ensure: • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site	Contractor		SO_X, NO_X, CO_X, VOC, SPM	Daily	KSMEnv	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
• Re-vegetation of site		• Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases.						
	Risk of soil contamination from accidental oil and hazardous substance leakages	KNARDA shall ensure: • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite.	Contractor		Waste Management Record	Daily	KSMEnv,	
	Traffic obstruction from transportation of decommissioned structures and equipment	KNARDA shall ensure: • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management	Contractor		Traffic Record	Daily	Project Contractor	
	Abandoned structures possibly taken-over by miscreants/ criminals	KNARDA shall: • Make security plan and emergency response and contacts with security forces. • Re-vegetate the site with local plant species	Contractor		Visual inspection	Once at decommissioning	Project Contractor	
	Availability of land for alternative uses such as community hall, farmland e.t.c	KNARDA shall ensure: Use local plant species to re-vegetate the abandoned site	Contractor		Visual inspection	Once at decommissioning	Project Contractor	
	Improved Ecology, Air Quality and Aesthetics							

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Mitigation Measures	Responsibility for Mitigation	Estimated cost of Mitigation (₦)	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated Cost of Monitoring (₦)
Total Estimated ESMP Cost				**22,500,000.00**				**8,000,000.00**

6.10.1 Training and Awareness – Site Induction

Training and the establishment of Safeguard Unit is essential for ensuring that the proposed ATC project is implemented efficiently and effectively. It is therefore imperative that the Kano State Ministry of Agriculture and other institutions and persons that have roles to play in the implementation of the ATC project are competent with appropriate education, training or experience. This study recommends that competent E&S Safeguard persons should be recruited for the ATC project and the contractors shall be required to undertake general HSE awareness for their project workforce and specific training for those whose work may significantly have impact on the environment. This is to ensure that they are fully aware of the relevant aspects of the ESMP and are able to fulfil their roles and functions. The training program has been proposed to enhance the capacities of those that will be involved in the ATC project implementation as shown in Table 6.3.

Table 6.3: Proposed Training Program for the Implementation of the ATC project

Capacity Building Activity	Proposed Topics	Objectives	Target Audience	Duration	Cost ₦
Module 1: Training on Environmental and Social Management Plan Implementation	• Overview of Environmental and Social Impact Assessment • Overview of Potential Impacts of Project • Environmental Pollution & Control • Environmental and Social Management Plan • Basic Environmental and Social Management • Environmental Performance Monitoring – Monitoring Mitigation Measures in ESMP • Environmental Reporting	To enhance competence in environmental sustainability and regulatory practice	KNSG Rep., relevant staff of FMEnv (EA Dept), KSMEnv, KNARDA, SPIU other relevant MDAs, LGA departments, Project Contractors, NGOs.	2 days	2m

Module 2: Training on Construction HSE/ESS	• Introduction to Construction HSE/ESS • Overview of Health and Safety Hazards in Construction • Incidents: Causation, Investigation & Reporting • Excavation Safety • Construction Site Inspection • Personal Protective Equipment	To promote safe & healthy working conditions as well as the health of workers and regulators who may be involved in monitoring during project implementation	KNSG Rep., relevant staff of FMEnv (EA Dept), KSMEnv, KNARDA, SPIU and other relevant MDAs, LGA departments, Project Contractors, NGOs.	1 day	1m
Module 3: Training on Social and Community Engagement	• Listening to & understanding the opinions and perspectives of a diversity of stakeholders; • Negotiation and partnership contracting; • Interpersonal communication; • Relationship-building; • Facilitation; • Principles of cross-cultural awareness and cross-cultural communication; • Equity and diversity principles; and • Public sector values and codes of conduct.	To ensure effective engagement with communities around the project area, public officials and public relation team. To facilitate relationships with communities for continuous stakeholder engagement and peaceful co- existence with the project host communities.	KNSG Rep., KSMEnv, KNARDA, SPIU and other relevant MDAs, Project contractors	1 day	1m
Training on GRM, Code of Conduct, OHS, HSE, etc	• Public sector values and codes of conduct.	Reporting and feedback mechanism	SPIU, Supervision Consultants, Contractors /workers, GRCs	2 days	1.5m
Total					**4m**

6.10.2 Communications

Environmental issues will be communicated to the workforce on a regular basis. Daily project meetings, which follow a set agenda incorporating Health, Safety and Environmental issues will be held on-site and a daily report will be generated and distributed. All staff and sub-contractors involved in all phases of the project will be encouraged to report environmental issues.

Environmental Reporting: The contractor will report the status of project environmental activities to Kano State Ministry of Agriculture on a regular basis. These reports will summarize the key environmental issues in the period and identify any non-conformances and the status of corrective actions.

Communication of Initiatives and Project Information: Communication of initiatives and project information will be developed as the project progresses. Typically, these will include campaigns to raise environmental awareness, circulars to inform staff of key environmental issues such as lessons learnt from incidents or accidents and the impact of any new legislation.

Subcontractor Environmental Reporting: All external communications with local interest groups, external agencies and also the response to any complaints will be conducted by Kano State Ministry of Agriculture. Contractors shall notify the onsite Kano State Ministry of Agriculture representative if any communications are received from external stakeholders.

6.10.3 Environmental Audit and Review

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

- compliance with all necessary codes, standards and procedures;
- examine line management systems, plant operations, monitoring practices etc.;
- identify current and potential environmental problems especially during the operational phase of the project;
- check the predictions in ESIA and assure implementations and application of recommended practices and procedures; and
- make recommendation for the improvement of the management system of the operation.

After every audit exercise, the environmental auditor shall produce an Environmental Audit Report (EAR) which shall be submitted to Kano State Ministry of Agriculture for review.

6.10.4 Environmental Monitoring Programme

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

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

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

Kano State Ministry of Agriculture and Regulators shall monitor the project from mobilisation through operation stages to keep track of the entire project development life cycle. The monitoring plans for the project including the environmental components, parameters and frequency of monitoring as well as responsibilities are presented in Table 6.4.

Table 6.4: Monitoring Plan for the Project

Environmental Components	Indicator Parameters	Frequency	Location	Responsibility
Air Quality	• NO_x, SO_x, CO_2, CH_4, SPM • Noise level	Monthly during construction and operation	Project site	FMEnv, KSMEnv, SPIU
Surface Water Quality	• Turbidity • TSS • pH • Biological Oxygen Demand (BOD) • Coliform analysis	Once every month during construction and 3 months after construction	Water bodies around the site	FMEnv, KMEnv, SPIU
Biodiversity (vegetation/forest resources and wildlife)	• Diversity and abundance • Pressure on species	6 months interval from beginning to end of project	Project site	FMEnv, KSMEnv, SPIU
Socio-economic	• Population • Health status • Infrastructure	At the project peak and before commissioning	Identified host community of the Project	KNSG

6.10.5 Waste Management Plan

The provision of adequate waste management guideline and disposal facility is vital to the implementation of the proposed project. Table 6.5 presents overview of waste stream in all phases of the project and specifies proactive management approach to prevent environmental pollution and degradation. Waste shall be managed in accordance with Kano State Ministry of Agriculture Waste Management Plan. The principle of waste reduction, recycling, recovery and reusing shall be practiced.

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

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

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

- Segregate components such as wood, plastic and paper, for recycling or reuse.

- Reduce packaging wastes such as paper and plastic by the use of bulk handling systems.
- Dispose all wastes at government designated dump sites.
- Refilling and reusing of containers.

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

(b) Sanitary Waste

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

Waste Handling Guidelines

Wastes handling and disposal procedures shall be well defined at source and a waste inventory register kept. The waste contractor shall define, and document appropriately, all wastes generated and transferred in the course of his work. The general information required, as a minimum, for adequate definition of wastes include: Waste stream identification; Proper waste categorization; Waste segregation; Appropriate handling and disposal practice; and Recommended Management practices.

Waste Minimization Guidelines

The four principles of waste minimization process; recycle, reduce, reuse and recovery shall be adopted as applicable, to ensure reduction to the possible extent, of the volume or relative toxicity of liquid or solid wastes.

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

Waste Segregation Guidelines

All wastes to be generated from the proposed project shall be segregated at source, into clearly designated bins at strategic locations.

Waste Disposal Guidelines

All debris, spoil materials, rubbish and other waste, except excavated soil, shall be cleared regularly from the site and disposed of accordingly at government designated sites for such wastes. Instructions on material safety handling sheet (MSDS) shall be strictly adhered to and shall form the basis for the disposal of wastes related to such products. Adequate treatment measures shall be undertaken, where applicable, in line with applicable guidelines, for all waste before final disposal. All wastes in transit shall be tracked by waste consignment note. The waste consignment note records shall be kept and should include as a minimum the following information: Date of dispatch, Description of waste, Waste quantity/container type, designated disposal site and method, Consignee /driver name and means of transportation, and Confirmation of actual disposal (time and date).

Table 6.5: Waste Streams and Management

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

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

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

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

6.10.6 Emergency Response Plan

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

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

If an emergency develops, all persons on site will be notified immediately and efforts will be coordinated with others in the vicinity surrounding the project area in order to reduce impacts, if applicable. The military personnel and police officials, and all necessary authorities will be immediately notified. If an emergency is imminent, but has not yet begun, steps will be initiated to immediately advise person in the vicinity of the

emergency to evacuate and notifications will be made to military personnel and police officials and all other authorities which have responsibility regarding the emergency.

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

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

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

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

6.10.7 Project Traffic Management Plan

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

General Site Access

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

Traffic Management

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

- Private employee off-road vehicles or private transport buses will be prohibited from entry into the site.
- Signage will be posted near all construction sites.

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

Employee Transportation

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

Speed Limits

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

Communications and Notification Protocols

It is anticipated that the intervention project will require only single-lane temporary closures. Signage warnings of construction activities on the roads will be placed at appropriate distances from the construction site, in consultation with SPIU, Ministry of

Transports, department of Highways & Public Works. For significant work activity (those requiring more than one day to complete), written notification will be distributed to residents and the SPIU, Ministry of Transport, department of highways & public works will be notified. A public notice would be posted at multiple locations in the metropolis to communicate to residents any new activities that may be occurring or scheduled. Contact information for the Contractors senior management will be included in this notice and any concerns regarding the intervention work/project or traffic management can be forwarded through this notification system.

Traffic Routing and Volumes

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

Reporting

Records on traffic management and implementation of this plan should be kept and updated by the contractor as evidence of ongoing mitigation compliance, which will be submitted to Kano State Government (KNSG) as part of routine reports on progress of work.

6.10.8 Environmental Health and Safety Plan

A Health and Safety Plan will be prepared for the construction, operation and decommissioning phases of the project to ensure compliance with the Ministry of Health Guidelines for Occupational Health and Safety and IsDB guidelines. To ensure its employees' health and safety plan will address the following topics:

- Safety device to protect employees from injuries or hazardous conditions;
- Safe drinking water;

- Immunizations, as applicable;
- Clean eating area;
- First aid facilities;
- Sanitary conditions;
- Waste management, including bathrooms, and proper disposal procedures;
- Appropriate signage;
- Fire prevention facilities, training, and awareness; and
- Personal Protective Equipment (PPE).

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

6.10.9 Spill Contingency Management Plan

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

- Keeping equipment maintained.
- Inspecting equipment and containers for spill and leaks, corrosion, or other signs of deterioration
- Maintaining spill response equipment near material storage areas and on heavy equipment.

- Training employees on material storage, transfer, and transportation procedures, spill response procedures, and reporting requirements.

If a fuel spill occurs at the project sites, prompt action will be taken to contain the leakage or spillage in the event of a spill of leak, all combustible, flammable, and ignition sources (such as running engines) likely to result in a fire will be removed from the vicinity of the spill and anyone in the area will be advised to stay upwind. Spill kits will be kept at the project sites and the transport vehicles to readily clean up small spills.

6.10.10 Contractor Management

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

6.10.11 Air Quality: Generation of Air Emissions from Disturbance

Control techniques for minimizing temporary particulate matter (PM) emission during construction will involve watering of surfaces, chemical stabilization, or surface wind speed with windbreak or source enclosures. Furthermore, surface improvements offer long-term control techniques. These includes covering the road surface with a new material of lower site content, such as covering a dirt road with gravel or slag. Also, regular maintenance practices, such as grading of gravel roads, help to retain larger aggregate size on the traveled portion of the road and thus help reduce emissions. The amount of emissions reduction is tied directly to the reduction in surface site content.

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

- Proper site enclosure through appropriate hoarding and screening
- On-site mixing and unloading operations.
- Proper handling of cement material.
- Maintain minimal traffic speed on-site and on access roads to the construction sites.

- Covering all vehicles hauling materials likely to give off excessive dust emissions.
- Ensure adequate maintenance and repair of construction machinery and vehicle
- Avoid burring of material resulting from site clearance
- Cover any excavated dusty materials or stockpile of dusty materials entirely by impervious sheeting.
- Proper water spraying when necessary.

6.10.12 Generation of Air Emission from Vehicles and Equipment Engines

In addition to PM generation, emissions will consist of combustion emission from diesel engine-driven electrical generators and vehicles and diesel-driven mobile construction equipment (such as, concrete trucks, dump trucks, excavators, and backhoes). The engines emit primarily CO_2, Co, NO_2, Sox, and HC. Measures to reduce combustion emissions include proper truck and engine maintenance, adoption of a traffic management plan while avoiding congested routes, proper maintenance of construction equipment, and the quality of diesel fuel used. In addition, equipment will be turned off when not in use, while would reduce power needs as well as emissions of pollutants. The supervising consultant will have the responsibility of ensuring the implementation of these measures by the contractor.

6.10.13 Noise Management

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

- Effectively utilizing material stockpiles and other structures, where feasible; to reduce noise from on-site construction activities
- Choosing inherently quiet equipment
- Operating only well-maintained mechanical equipment on-site
- Keeping equipment speed as low as possible
- Shutting down or throttling down to minimum equipment that may be intermittent in use, between work periods

- Utilizing and properly maintaining silencer or mufflers that reduce vibration on construction equipment during construction works
- Restricting access to the site for truck traffic outside of normal working hours
- Utilizing proper site logistics and planning
- Limiting site working hours the morning hour
- Scheduling noisy activities strictly during the morning hours
- Consulting with local communities and informing the locals when noisy activities are planned
- Enforcing noise monitoring
- Enforce the use of hearing protection actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140dB(C), or the average maximum sound level reaches 110db(A)
- Installing warning signs in area high noise levels
- Consider the use of acoustic insulating materials, isolation of the noise source, and other engineering controls to minimize noise impact.

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

6.10.14 Hazardous Materials Management

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

- Storing oil and hazardous materials within secondary containment structures in designated area.
- Using portable oil collection pans during refueling operations.
- Storing pesticides and herbicides in designated areas according to FAO Guideline standards any pesticides to be used will be manufactured, packaged, labeled,

handled, stored, disposed of, and applied according to standards such as the minimum standards of FAO's Guidelines for packaging and storage of pesticides, Guidelines on Good labeling practice for pesticides.

- Ensuring that no storage of oil and hazardous materials occurs within 30m of a surface waste body
- Keeping equipment maintained
- Inspecting equipment and containers for spill and leaks, corrosion, or other signs of deterioration
- Maintaining spill response equipment near material storage areas and on heavy equipment
- Ensuring all working dealing with such substances are adequately informed about the risks
- Training employees on material storage, transfer, and transportation procedures, spill response procedures, and reporting requirements.

An accurate inventory of all oil, hazardous material, and waste stored on site and material safety Data sheets will be available for these material.

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

6.10.15 Recurring Environmental and Social Issues

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

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

- **Labour Management Plan**
  - Workers admitted as labourers must be of age 18 years and above.
  - Community members who possess the required skills and are ready to work shall be given preferential treatment during recruitment.
  - Payment of wages shall be made as and when due.
  - The Contractor shall be responsible for the safety and Health of its employees at the work place.
  - He shall provide PPE, train and inform all workers of any known hazards on the site.

- Workers shall not be allowed to form labour unions in the site.
- Labour Grievance Redress Desk shall be instituted.
- If a labourer is dismissed, he shall be given reasons for dismissal and the right to lodge complaints to Grievance Redress Desk.
- No worker shall be stigmatized due to his or her social status in the communities.
- Physically impaired workers shall be given due considerations.
- Severance allowance should be paid to casual workers during decommissioning.

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

CHAPTER SEVEN

REMEDIATION PLANS AFTER DECOMMISSIONING/CLOSURE

7.1 Introduction

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

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

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

- Identification of components of the project that will be removed;
- The choice of environmentally sound methods for removal, re-use, recycling or disposal of special wastes that may arise from the decommissioning process.
- Expressly outline the time frame/schedule for the decommissioning and post-decommissioning process, and communicate the same to FMEnv and other relevant regulatory agencies as well as the affected or concerned persons and groups;
- Proper rehabilitation and decommissioning process;
- Appropriate site rehabilitation, remediation and enhancement techniques and technologies; and

- There shall be post-decommissioning assessments to compare ameliorated project-related impacts, relative to the baseline conditions.

7.2 Consultation

The project decommissioning and abandonment plan will include consultation with various stakeholders including employees from various departments. The decommissioning team will include competent personnel from the KNSG as well as the regulatory authorities.

7.3 Reporting

As required by regulations, a post-decommissioning report will be prepared and submitted to FMEnv. The report will include the following details:

- Overview of decommissioned facilities
- Details of methods used for decommissioning
- Nature of decommissioning (partial or whole)
- Record of consultation meetings
- Details of recyclable / reusable materials / facility components
- Decontaminated facilities
- State of the surrounding environment
- Waste Management Plan
- Plans for restoration and remediation where necessary.

7.4 Decommissioning Activities

At the end of the facilities utility, all equipment and structures will be decommissioned. All installed facilities on project site will be adequately dismantled and removed to allow for proper remediation of the project site. In general, the activities to be carried out during the decommissioning phase shall include the following:

- Dismantling of all surface equipment and structures
- Dismantling of buildings including excavation
- Removal of foundations

- Removal of decommissioning waste

KNSG will ensure safety of personnel and the public during decommissioning as well as minimize negative environmental and social impacts. Particular attention will be paid to the following:

- Protection from air pollutant emissions;
- Protection from noise; and
- Waste handling

All the components that can be used or recycled will be identified and quantified. Cleared locations will be re-vegetated using fast growing native plant species, which can either be purchased from a nursery plantations/farms or nursery of these seedlings will be developed by capable agronomists. Disturbed areas on the facility will be identified and restored using native species.

7.5 Decommissioning and Abandonment Plans

Decommissioning of the houses is not foreseen, however, decommissioning of other facilities especially project site offices and workshops are inevitable. KNSG will prepare a written abandonment plan within 30 days of determining decommissioning. The Plan will detail how the decommissioning will be carried out. The abandonment plan will be subject to approval by KSMEnv, FMEnv / NESREA. An Environment Project Report (EPR) will be prepared prior to implementation of this plan, to assess and minimize potential environmental and social impacts arising from the abandonment of operations. This abandonment EPR Study will be submitted to FMEnv. / NESREA for consideration. Upon completion of the abandonment operations, an assessment of contaminated land will be prepared recording the final contamination status of the location of the project facilities. This assessment will be subjected to FMEnv./NESREA for approval.

7.6 Recommended Mitigation Measures for Decommissioning Phase

Some basic mitigation measures will be required to be undertaken once all operational activities of the project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames, prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in Table 7.1

7.7 Decommissioning phase

In addition to the mitigation measures provided in chapter 6 of this report, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the proposed project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in the Table 7.1.

Table 7.1: Decommissioning phase

Impact	Mitigation Measures	Responsible Persons	Frequency
Demolition waste	• Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Reuse • All buildings, machinery, equipment, that will not be used for other purposes Shall be removed and recycled/reused as far as possible • All foundations shall be removed and recycled, reused or disposed of at an approved disposal site • Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials shall be taken to an approved waste disposal site • Reusable demolition waste shall be donated to charitable organizations, individuals and institutions	KNSG	Throughout the demolition period
Noise and Vibration	• Sensitization of workforce including drivers of construction vehicles shall be undertaken • Installation of portable barriers to shield compressors and other small stationary equipment where necessary shall be in place • Proper maintenance of all equipment shall be carried out • Workers in the vicinity of high-level noise shall wear	KNSG	Throughout demolition period

	safety and protective ear mug		
Dust	KNSG shall; • Spray demolished piles of earth with water • Avoid pouring dust materials from elevated areas to ground • Cover all trucks hauling soil, sand and other loose materials • Provide dust screen where necessary	KNSG	Throughout demolition period
Site degradation	KNSG shall • Implement an appropriate re-vegetation programme to restore the site to its original status as much as possible. • Consider use of indigenous plant species in re-vegetation	KNSG	Throughout the demolition period

Source: Field study, 2025

7.8 Remediation Plans after Decommissioning

The incorporation of remediation plans into the overall project planning is essential because it allows proponents to understand the need for restoring the environment into its original, or near its original status when abandonment plans are being conceptualized. Operating projects beyond the designed lifespan makes it economically unproductive as returns from such investment become unattractive. The useful life of any project is determined by a number of factors, among which are:

- Specifications of materials,
- Durability of equipment and machinery,
- Profitability of the proposed project and
- Importance of the end product.

The activities to be carried out during the decommissioning phase shall include the following:

- Dismantling of the facility and other ancillary equipment and
- Removal of all structures.

The potential impacts that might result from the decommissioning phase of the proposed project have been earlier identified and discussed in Chapter 5.

The strategy to be adopted for site remediation shall depend on the prevailing biophysical and social environmental attributes and the attendant impacts that may result from such an action.

CHAPTER EIGHT

STAKEHOLDER CONSULTATION AND GRIEVANCE REDRESS MECHANISM (GRM)

8.1 Introduction

8.1.1 Stakeholder Consultation

This section describes consultation and disclosure program undertaken during the ESIA process. It is important to note that the consultation and disclosure are not one-off activities, and shall continue up to the project commences and during the various phases of its implementation. In the bid to fathom the perceptions, thoughts and concerns of the host community on the project, a consultation forum was held on the 19th of November 2025, with the village executives, Kano State Ministry of Agriculture and Natural Resources and the ESIA consultant. The Stakeholders participations during project planning, design and implementation is widely recognized as an integral part of the environmental and social impact assessment for projects. It is a two-way flow of information and dialogue between project proponents and stakeholders, which is specifically aimed at developing ideas that can help shape project design, resolve conflicts at an early stage, assist in implementing solutions and monitor ongoing activities.

This process was developed to ensure a consistent and coordinated approach, serving to provide timely information to stakeholders about the proposed project and its potential impacts on the affected communities and other stakeholders. The process was also designed to provide opportunities for stakeholders to voice their opinions and concerns in a way most appropriate to their circumstances and also to provide the proponent an opportunity to provide feedback to the community about their concerns.

8.1.2 Objectives of Consultation

The objective of consultation is to identify and address legislation, community and environmental consciousness, to proffer solutions for negative impacts. The focus of this consultation is as follows:

- Enhance awareness to remove apprehensions about the environmental and health impacts following the processes of the project.
- Foster healthy relationship between project proponent and the host communities.
- Prevent conflict with stakeholders' particularly principal stakeholders by addressing issues promptly.
- Integrate stakeholder views on the operations processes for the proposed project.
- Foster further understanding between the project proponent and principal stakeholders in order to obtain early warning of any changes in the environment that is due to the operation of the proposed project.
- Sensitize, intimate, and mobilize host communities to maintain and sustain beneficial impacts.

8.1.3 Processes and Stages of Consultation

Extensive consultations were held with host community and stakeholders to determine people's reaction to the propose project and its social benefits or otherwise. Consultations were also held to ascertain public understanding or knowledge about the health implications if any, and gauge reaction. The process is summarized in Table 8.1 below.

- Obtain copies of, or determine the methods for obtaining, any further relevant information that might be available to assist with the ESIA.
- Determine the nature and characteristics of facilities of the proposed project.
- Identify issues that the regulatory bodies consider to be of greatest concern.
- Discuss the level and nature of information that the regulatory authorities require to be included in the ESIA.
- Identify, define and review the relevant regulatory and legislative framework with which the proposed project will be required to comply.

Table 8.1: Process and Stages of Consultation

Stages /procedure	Goals	Objectives
Project Scoping and design	• Letter of Intent to FMEnv/KSMEnv • Discuss project design • Ensure compliance with KSMEnv and FMEnv regulations and guidelines	• Adequate consultation with Authorities • Reduce conflict areas
Field Consultations	• Consult host communities on Socio-economic aspects • Consult on the impact of the development project generally	Ensure that the public being the primary stakeholder understands the project and its benefits
Environmental reviews analysis, report	• Present results of field study • Discuss the potential impact / mitigation measures with the project proponent	• Seek approval of methodologies, results and Environment Management Plan from FMEnv.
Final report	Bridge the gaps observed at Review	Implement mechanism to ensure continuous consultation
Implement EMP	Disclose result of monitoring Implement public complaints process.	• Implement audit of the project • Evaluate lessons that could enhance the proponent's services to public
Final evaluation	• Assess effectiveness of consultation process • Consult stakeholders for their assessment	Any lessons learned that might be transferred to other projects.

8.1.4 Stakeholder Identification

ESIA stakeholders are those constituencies, organized groups, or individuals that have a direct or indirect interest in the outcome of the project because they are affected or (as is the case with governmental agencies) have authority. Stakeholders were identified through a combination of desktop studies, local knowledge, prior experience, community discussions, meetings and interviews with state, local and traditional governments.

Community and Traditional Leaders

Traditional leader (Hakimi), his traditional council, and leaders of other social groups in the community (such as women and youth), were all engaged on a continuous basis in a discussion of all aspects of the project that may impact on their community, lands and other assets. Meetings with these groups were followed by local practices and norms and were held prior to any wider communication in the villages in order to respect traditional structures. The project-affected community identified during the scoping phase is Bagauda community located few meters from the project area.

Non-Governmental Organisations (NGOs)

NGOs are organisations with direct interest in the project and that are able to influence the project directly or through public opinion. Such organisations may also have useful data and insight and may be able to become partners to the project in areas of common interest.

The Project identified the Bagauda Youth Association (TYA) as a key stakeholder. The main mechanism for engagement with TYA and any other relevant NGOs will be through face-to-face meetings at key stages of project development (e.g. during the ESIA and at the onset of construction) as shown in Table 8.2.

Table 8.2: List of Stakeholders specifically engaged during the ESIA

Stakeholder Type	Stakeholder Name	Objective	Method	Timing	Organiser
Regulator	FMEnv	To register ESIA, site visit, scoping, procedure, and to discuss salient issues	Direct and formal	As required	Consultant
Kano state Regulator	Kano State Ministry of Environment (KSMEnv)	Participating in the ESIA procedure Inform about the project	• Periodic face-to-face meetings • Involve in impact identification • Involve in impact mitigation	As required	Consultant
Community and settlements who are primary stakeholders	Bagauda Traditional Leadership and Youth Organisations of community	• Inform leadership about the project, its progress, and about potential hazards related to project activities • Get feedback on the project plans • Ensure grievances (if any) are addressed and resolved	Purpose-convened community meetings	On-going	ESIA team

Stakeholder Type	Stakeholder Name	Objective	Method	Timing	Organiser
	General Public	• Inform public about the project, its progress, through interview and interaction; • Raise general awareness on project related likely disturbances, hazards and community safety issues • Get feedback on the project plans • Ensure grievances (if any) are addressed and resolved	Direct through purpose-convened information meetings Disseminate information and get feedback through Traditional Leadership and through community leadership	On-going	ESIA Team
Non-Governmental Organization (NGO)	Local NGO – Youth Organization	Inform about the project, elicit input on the project-environment interactions and impacts, partner on local skills and capacity building for the project.	Direct through purpose-convened information meetings Direct access to project information through e-mails and reports.	November, 2025	ESIA Team

8.1.5 Summary of Consultations

ESIA team conducted a series of meetings with stakeholders with the aim of informing them of the proposed development, opening a communication channel for those interested in project developments and ensuring a two-way communication on the project-environment (including social) interactions (Table 8.3). Attendance sheets and minutes of meetings are in Appendix 2.

Table 8.3: Summary of Consultation Meetings

Meeting/Date	Stakeholder Description	Location	Issues Discussed
November, 2025	Kano state regulatory bodies	Ministry of environment	• Project overview and milestones • Status of our Environmental and Social Management Plan • Employment opportunities for youths & Women • Positive & Negative Impact of the Project • Need to partner with NGO and other local groups to enhance positive impacts & help mitigate the negative impacts • Enterprise Development Program
November, 2025	Bagauda Community	Kano State	• Project Overview – Community perception • Status of our Environmental and Social Management Plan

			• Employment opportunities for youths • Constant need to consult with the local government • Proponent's Corporate Social Responsibility

8.1.6 Issues of Concerns

Summary of Issues Identified

Detailed minutes of various consultation meetings are annexed in this report. The following is a summary of issues and observations raised by the public during various meetings and interactions. The list is based on a qualitative review of meeting notes and is not presented in order of importance or frequency. Many of these issues were raised by the public during field studies and/or observed by the study team; particularly the community members were concerned with the following:

- Compensation for temporary users of the proposed site.
- Will they be considered during employment of skilled and unskilled labour at the construction and function stages of the project?

How Concerns were addressed

- Qualified members of the community will be given employment opportunity in both skilled and unskilled labour.
- The ESIA will recommend mitigation measures for addressing specific adverse impacts so that all significant impacts are avoided, reduced to barest minimum or mitigated. He cited examples, that where the project will result in surface water pollution and depleting of the available surface water in the community, there will be need to rehabilitate existing water sources in the project location as a veritable alternative.
- The project proponent will compensate farmers whose livelihood are affected and may lose their crops due to the project. However, it is hoped that the farmers must have harvested their crops before the start of the project.
- The project will mainstream the participation of women farmers and workers, in various employment opportunities created by the project.

- The consultant requested for the improvement of security situations within the community through the community chief and Bebeji LGA Chairman and various leadership at all levels. He also stated that the investment company would be responsible for maintaining security during operations.
- The consultant assured them that their concerns are well noted and will be mainstreamed into the decision framework of the project to ensure project sustainability. All relevant issues were exhausted, and the meeting ended with a closing prayer by a member of the community.

8.2 Grievance Redress Mechanism

The grievance mechanism is a process that enables stakeholders to make a complaint or a suggestion regarding the way a project is being implemented. This includes ensuring that all grievances that are received are acknowledged, logged and tracked. It also enables complainants to know what to expect in terms of response and when. Generally, grievances may take the form of specific complaints for damages/injury, concerns about routine project activities, perceived incidents or impacts or requests for more information / clarity on project activities. In relation to resettlement, complaints may be related to compensation, land issues, resettlement assistance or housing, or other relevant issues.

The primary objectives of a grievance mechanism are to:

- enhance trust and positive relationships with stakeholders, particularly as resettlement is a sensitive and complex process;
- prevent the negative consequences of failure to adequately address grievances; and
- identify and manage stakeholder concerns and thus support effective risk management in relation to resettlement and the Project overall.

The grievance mechanism allows stakeholders to submit complaints and comments at no cost, without retribution and with the assurance of a timely response. The key principles and overview of an effective grievance mechanism are:

- *Culturally appropriate:* Tailored to the local language.

- *Accessible:* Accessible to all settlements and stakeholder groups within the project area.
- *Inclusive of vulnerable groups:* Available to those less likely to have the means to voice their concerns or opinions within the Nigerian context (e.g., women, elderly, Fulani).
- *Reliable:* The developer will respond to grievances within an agreed timeframe in order to manage expectations.
- *Publicized:* The developer will publicize the grievance mechanism through engagement activities and advertisements to ensure that stakeholders are aware and understand the process.
- *Logged:* Grievances will be logged and tracked, and
- *Confidential:* Grievances will remain confidential and anonymous

8.2.1 Roles and Responsibilities in Grievance Management

This outlines the key bodies that are involved in the Grievance Mechanism process. These include the following:

• **Project Staff:** The Project Community Liaison Officer (CLO) and Resettlement Coordinators (RC) will likely be the first point of contact for complainants and is responsible for receiving, recording and communicating the grievance to the Grievance Officer (GO), or equivalent. The GO is responsible for processing and resolving the grievance with relevant departments and stakeholders, including the complainant, Community Resettlement Committee (CRC) and Land Use and Allocation Committee (LUAC). All resettlement related grievances will be signed off by the Resettlement Manager (RM). Level 3 grievances will also require sign off by the Country Manager (CM).

• **Community Resettlement Committee (CRC):** If needed, the CRC particularly Community Leaders, will assist community members in accessing the grievance mechanism and ensure the Project is aware of the grievance. Additionally, depending on the type and priority level of the grievance, the CRC will play an active role in resolving the grievance. All the members of the CRC have been trained on their responsibilities,

including grievance management responsibilities, which includes where required by PAPs and the Developer:

- reporting grievances raised by PAPs if needed to the Project CLO;
- keeping the aggrieved parties updated on the progress with respect to addressing their grievance; and
- supporting the development of solutions to the grievance if the grievance is not resolved.

• **Resettlement Steering Committee (RSC):** As with the CRC, if needed, the RSC or individual members will play an advisory role in grievance resolution at the highest level, and will intervene in the case that it is not resolved.

• **Land Use and Allocation Committee (LUAC):** The LUAC is a key stakeholder regarding the management of land. They will be required to assist with the resolution of grievances related to replacement land allocation.

All bodies will work closely together to ensure that grievances are dealt with fairly and transparently.

Under the PIU, there will be an established Safeguard Unit. This unit will work with the Grievance Redress committee that would be established for this specific purpose comprising administrative heads or an appointed representative of Kano local governments, community and/or village Heads/Mai Anguwa's, Sarki, NGOs/CBOs and other relevant Government organs that will be set up to address complaints. For this reason, handling grievances will begin with the Local Government. A grievance log will be established by the project and copies of the records kept with all the relevant authorities.

The existence, location, purpose and composition of this committee will be publicized, so that complainants are knowledgeable about the availability of this committee for resolving any grievance.

8.2.2 Expectations when Grievances Arise

When people present their grievances, they expect to receive one or more of the following: acknowledgement of their problem, an honest response to questions/issues

brought forward, an apology, adequate compensation, modification of the conduct that caused the grievance and some other fair remedies. In voicing their concerns, they also expect to be heard and taken seriously. The company, contractors, or government officials must therefore convince people that they can voice grievances and work to resolve them without retaliation.

8.2.3 Setting up a Grievance Redress Mechanism

During the time of implementing of the ESIA, the PIU shall establish a Grievance Redress Mechanism that incorporates the use of existing local grievance redress mechanism available in the community. It will be effective and result oriented to work with existing and functional local structures of dispute resolution than to design an entirely new one, which may be alien to the people.

8.2.4 Membership of the Grievance Redress Committee

Membership of the GRC for the 3 levels of grievance uptakes shall comprise as follow:

<u>GRC at the Site/community Level:</u>

- The traditional Ruler/Hakimi of communities or a person appointed by them from the council;
- The village heads of Bagauda community;
- The Woman leader in the communities or her secretary;
- A woman leader of an affinity association;
- 2 Representatives of PAPs including at least a woman;
- 2 members of the site committee including at least a woman.

<u>GRC at the PIU Level:</u>

It is recommended that the state project coordinator shall constitute a team within the PIU to receive, hear and address complaints arising from the project. The State Project Coordinator Officer/Safeguards Officer will head the team. Membership of the team shall be as follow:

- Social and Livelihood Officer;
- Communication officer/ Public relations officer;
- Environmental officer
- Monitoring and Evaluation officer, and
- The project engineer

GRC at the State Steering Committee Level:

The committee at this level shall be headed by the Permanent Secretary/Commissioner, Kano State Ministry of Agriculture, while the Project Coordinator shall serve as the secretary of the committee.

Membership of the GRC at this level shall constitute as follows:

- The Permanent Secretary Kano State Ministry of Agriculture;
- Director Ministry of Land & Survey
- Director Ministry of Agriculture;
- Director Ministry of Environment
- The State Project Coordinator

8.2.5 Grievance Redress Process Procedure

The GRM Process would comprise:

Registration

It may be less depending on the severity of the matter under consideration. The first step is the presentation of a grievance at the uptake point at any level. The social contact person or secretary of the committee will receive grievance from the complainant, register and acknowledge receipt of grievance to the grievant within 2 days. The registration will capture the following data: name of the complainant, date of the grievance, category of the grievance, persons involved, and impacts on complainant life, proofs and witnesses. A registration form will have all these bits of information.

Verification

The verification determines among other things whether the matter has relationship with the project activities, and whether the matter can be handled/resolved at the level where it is presented. This will determine if the matter should be referred to the next level or not. Part of the investigations may also be to assess the cost of lost or risk involved in the grievance.

Processing

The processing step is when options for the approach to resolving the case are weighed and determined. Parties involved in the case are brought together for the first attempt at resolution with suggestions from the parties on practical steps to be taken which may also involve site visit for physical inspection and determination of the claim.

Feed back

All responses to the complainant in a grievance redress process that moves beyond a unit level must be communicated in writing and/or by verbal presentation to the complainant. This will include a follow up on the corresponding authority where cases are referred, to ascertain the status of reported cases. Feedback on outcome of each case should get to the complainant through the secretary of committee or social contact/safeguard person as the case may be. It is expected that reported complaints at each level will be resolved and determined within 21 days from date of receipt of the complaint.

CHAPTER NINE

CONCLUSION

9.1 Introduction

The conduct of this ESIA for the proposed SAPZ project in Kano State was executed in strict compliance with acceptable National and International regulatory requirements. The study sought the views and concerns of the host communities on essential aspects of the proposed project through special interaction and incorporated in the impact assessment process.

This ESIA has identified and assessed both positive and negative impacts of the proposed project and accordingly evaluated the associated and potential negative effects on the environment (biophysical), socio-economic and health characteristics of the project area in detail and mitigation measures have also been prescribed for significant negative impacts. For effective implementation of the recommended mitigation measures, an Environmental and Social Management Plan (ESMP) has been developed to ensure environmental sustainability during the construction and operation phases of the proposed SAPZ project.

The ESIA also revealed that the project will have significant transformative impacts on the socio-economic life of the host communities and Kano State in particular as well as the national economy in general.

The proposed SAPZ would pose limited environmental and social risks, taken into account the proposed mitigation measures. It is recommended that environmental performance should be regularly monitored to ensure compliance and that corrective measures be taken if necessary. In addition, it is very necessary that this information should be made available to the host communities on a regular basis.

The Environmental and Social Management Plan (ESMP) should be used as an on-site reference document during all phases (Planning, Construction and Operation) of the proposed SAPZ project.

Environmental auditing should be regularly undertaken, in order to determine compliance with the proposed EMP, and parties responsible for the implementation of the EMP should be held responsible for any inadequacy during the implementation process.

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APPENDIX 1

DEMOGRAPHIC INFORMATION

1. Educational qualification: No formal education_____

   Primary _____ Secondary_____ Tertiary_____

2. Marital status: Married …… Single …… Divorced……Separated……Widowed……

3. Marital Pattern: Polygamy……. Monogamy……

4. Number of children: Male:_____ Female:_____

5. Total No. of people in household: Male:_____ Female:_____

6. Age _____ _____ Sex

7. Are you aware of this project? Yes _____ No_____

(B) ECONOMIC INFORMATION

8. What is your occupation?

9. What types of domestic and wild animals do you have around?

10. What is your estimated monthly income: less than N10,000 ___ N10,000 to N50,000 _____

    N51,000 to N100,000 ____ N101,000 to N150,000 More than N200,000_____

(C) SOCIAL INFRASTRUCTURE

11. Do you have markets?_____ (names and the days of function)

12. What recreational facilities do you have in this community? _____

13. What communication network is in use here? _____

14. From which of the following sources is your water supply? Rain____ River_____ Stored run-off _____

    Pipe borne_____ borehole_____ well___ Spring_____

15. How is water from each of these sources treated before use?_____

16. How is solid waste disposed-off: Burning_____ Burying Dumping_____ Others_

17. How is human waste disposed-off? Defecation in bushes _____ pail systems_____ pit toilet _____ Water System (WC) ___ Any other (specify)____

(D) CULTURE AND RELIGION

18. Is there any sacred object in the community? (stream, animal, deity, stones, trees etc)
Mention them and location_____

19. Do you have any historic or archeological site/monuments in your community? If yes, mention their names and the location_____

20. Mention the kinds of festivals celebrated in your community and when

_____

_____

What are the Dos and Don'ts (taboos) in this community? _____

_____

21. (E) ENVIRONMENTAL PROBLEMS

22. List the main environmental problems in this community (e.g. deforestation; erosion; dust storm)

S/No.	Environmental problems	Causes

23. How seriously do these problems affect your occupations/jobs?
Little effect__ Serious _____ has forced us to stop some activities____

Further information on any serious effect_____

29. Has the government or any other group embarked on any activity to help reduce environmental problems in your community? Yes:_____ No:_____

30. If yes what type of development programmes; which organization; and what has been the impact?

_____

31. How do you think this project will benefit this community?

_____

HEALTH IMPACT ASSESSMENT

1. What type of health care facility do you use?

S/No.	Type	Name	Address
1	General Hospital		
2	Primary Health Care		
3	Private Clinic		
4	Maternity		
5	Pharmacy		
6	Patent Medicine Store		
7	Traditional Healing Homes		
8	Faith Based		

2. How many children were born in your household in the past 1 year _____ 3. _____

Which sicknesses affected your household in the past 1 year? _____

4. Have you been to a healthcare facility for medical check or counseling in the past 2 years?

Yes……/No……..

5. If No, why? 6.
If yes, where? _____

_____

COMMUNITY HEALTH NEEDS

7. What in your opinion is the most important health needs of your community (score in order of priority)

- Safe Drinking Water
- Health Services/Clinic
- Electricity
- Others

PROJECT RELATED

8. Do you have any concern about the effect the proposed project may have on the people of the community?

_____

9. What benefits do you expect the project will have on the people in the area in order of importance?

a. Economic Boom (increased commercial activity)

b. Employment Benefit

c. Infrastructural Development

e. Housing

f. Others. Please specify …….

10. What are your fears about the proposed project in order of importance? a. Loss of land

b. Damage to farmland

c. Pollution of Air

d. Noise Pollution

e. Water Pollution

f. Health Problems

g. Socio-cultural Interference

h. High cost of living

i. Increased population

j. Disruption of business activities

k. Disruption of traffic

Others – specify……

Explain your fears in detail

……

……

……

……

11. What causes death in this community most?

…….

12. What are the important needs of the community in order of preference?

.....

.....

Name and position Telephone number

QUESTIONNAIRE: COMMUNITY PROFILE

IDENTIFICATION

Town/Village/Settlement……..……

Location…… GPS Reading……..……

LGA……..

BRIEF HISTORY OF ORIGIN OF COMMUNITY (Describe in a separate sheet)

Field worker……

S/N	Description	Remarks
1.	**Leader:** 1. What is the name of the leader in this community? 2. What is the predominant tribe and languages spoken? 3. What is the average number of household size? 4. Are you aware of this project? (probe for baseline knowledge)	
2.	**Ethnic Group** a. Major ethnic group b. Minority ethnic group	
3.	**Culture and Religion** 1. What religions are practiced here? 2. Are there any sacred plants, water, animal, artefact or forest? 3. What are the festivals celebrated and month of celebration? 4.What is regarded as a taboo in this community?	
4.	**Economic** 1. What are the means of livelihood? 2. What are the common crops farmed here? 3. What livestock do you keep around here? 4. What is the average monthly income?	
5.	**Social Infrastructure** 1. What types of transportation services are available? 2. Are there markets in this community? 3. Are there financial institutions around here? 4. How does the community manage her waste? 5. What toilet types are available here?	
6.	**Number of Houses: (Use census approach)** a. Huts b. Bungalows c. Storey Buildings	
7.	**Housing characteristics:**	
	Bricks, mold, zinc, thatch	

8.	**Political structure:** 1. Is the community leadership by election, appointment or is it hereditary? ……. 2. Organogram (indicating leadership and hierarchy in community level decisions)	
9.	**Groups and Leaders:** a. Community Head (Title and Name) b. Chiefs-in-Council c. Men's Group d. Women's Group e. Youth Group	
10.	**Social Environment** 1. Are there any social groups in this community? 2. What common foods are eaten here?	
11.	**Demography:** a. Total population b. Number of houses c. Average household size d. Adults…… Youths Males……. Females Infants (0 - 5) Children……. Mortality	
12.	**Education:** a. Government nursery school b. Private nursery school c. Government primary school d. Private school e. Government secondary school f. Private secondary school g. Tertiary institutions h. Net enrolment rate i. Gender disparity	
13.	**Roads:** a. Tarred roads entering community b. Untarred roads entering community	
14.	**Source of domestic water** a. River b. Rain c. Well d. Borehole e. Pipe bone (Tap)	
15.	**Available social facilities:** a. Petrol station within 5km radius b. GSM	

	c. Electricity d. Public toilets e. Police stations f. Fire stations g. Markets h. Banks i. Pharmacy j. Chemist/patent medicine store k. Recreational facilities l. Archaeological sites	
16.	**Health Facilities: Government Facility:** a. Hospital b. Comprehensive health centres c. Maternity/PHC d. Dispensaries Private health facility: a. Hospital/clinics b. TBAs c. Traditional/spiritual homes d. Faith based e. NGOs	
17.	**Morbidity:** Communicable a. b. c. d. Non communicable a. b. c. d.	
18.	**Economic Activity:** Men a. b. c. Women a. b. c. Youth a. b. c.	
19.	**Waste/Refuse Disposal:** a. Bush a. Open space within homestead b. Rivers/streams c. Incinerators d. Others	

20.	**Major transport in the community:** a. Roads b. Water c. Rail	
21.	**Special features:** a. Sacred areas b. Shrines c. Forest reserves d. Common taboos	
22.	**Properties owned by members of the community:** 1. Farmland 2. Poultry 3. Plantation 4. Houses 5. Others	
23.	**Pattern of land ownership:** 1. Inheritance 2. Tenant/Lease 3. Family 4. Outright purchase 5. Communal	
24.	**Farming Methods** 1. Garden 2. Fallow 3. Shifting cultivation 4. Rotational bush fallow 5. Others	
25.	**Power Source:** 1. Electricity 2. Generator 3. Lantern 4. Candle	

APPENDIX 2

Minutes of Stakeholders' Meeting

Date	5th October 2025
Attendance	Representatives of Kano State Ministry of Agricultural and Natural Resources, Kano State Agricultural and Rural Development Authority (KNARDA), community leaders from Bebeji, men and women groups, Project Affected Persons (PAPs), Environmental and Social Consultants (Fahamu Consultants), youth representatives, and other stakeholders.
Language	Hausa and English
Venue	Bagauda Project location
Introduction	The meeting commenced at approximately 10:00am with an introductory session led by Prof. Nasiru Medugu Idris, who welcomed all participants and appreciated their presence. He proceeded to explain the purpose of the meeting, emphasizing that the gathering was organized to engage the community on the proposed Agricultural Transformation Centre situated within the Bagauda premises. Prof. Idris highlighted that the LRP process is a critical component of project preparation and is essential to identifying, assessing, and addressing potential impacts on PAPs. Speaking both in Hausa and English for clarity, he emphasized that irrespective of the land being government-owned, the IsDB policy makes it compulsory to compensate individuals whose livelihoods may be affected by the project. He stressed that farmers currently cultivating on the land would receive appropriate compensation and support to ensure that the project does not adversely affect their welfare.
Meeting Objectives	The consultant from Fahamu outlined the objectives of the engagement as follows: - To discuss the project overview and expected outcomes - To identify potential environmental and social impacts on the community - To explore appropriate resettlement and compensation strategies - To strengthen community participation and involvement in the project - To outline next steps, timelines, and provide clarity on SAPZ procedures Prof. Idris encouraged all stakeholders to support the project, stressing that the establishment of the ATC would bring enormous socio-economic benefits to Bebeji community including improved income opportunities, infrastructural development, and enhanced agricultural productivity.
Livelihood Restoration Plan (LRP)	A detailed overview of the SAPZ Project was presented by the consultant team. They explained the purpose of the LRP, noting that it provides a framework for identifying PAPs, assessing potential impacts, and designing appropriate compensation, livelihood restoration support, and mitigation measures. The consultant further stated that the LRP process prioritizes transparency, fairness, and accountability in accordance with IsDB and national guidelines. They emphasized that the active participation of PAPs in the process is essential to ensuring equitable treatment and community acceptance of project outcomes.
Remarks	The affected persons mentioned that the project would be beneficial in the development of community, business and job opportunities. Feedback obtained during the meeting and through the questionnaires will be used to refine the LRP and ensure that the concerns of PAPs and other stakeholders are addressed adequately. The meeting was recognised as a significant step toward ensuring inclusive project planning and strengthening trust between the project proponents and the host community.

Key Takeaways	The following key points emerged during the discussions: - Prof. Nasiru welcomed participants and explained the meeting objectives clearly in both Hausa and English to enhance understanding. - The LRP seeks to assess potential project impacts and design appropriate compensation and resettlement measures. - Stakeholders were actively engaged through the questionnaire and open discussion session. - The community unanimously acknowledged and accepted that the land belongs to the government. - Stakeholders emphasised the need for continuous engagement and transparency throughout the project lifecycle. - The approach of the consultant and the proponents demonstrated commitment to ensuring community needs are considered. - IsDB/IFAD policy prioritises the concerns and welfare of PAPs. - Compensation modalities for farmers and affected persons were discussed and clarified. - The meeting reinforced the need for sustained community participation as the project progresses.
Conclusion	The Stakeholders' Consultative Meeting was successful, with active participation from community members and PAPs. The session demonstrated the commitment of the project proponents to ensure that the voices of the community are heard and that their concerns are incorporated into the Livelihood Restoration Plan. The insights gathered will guide the preparation of a robust LRP that protects the rights and interests of affected persons and supports the sustainable implementation of the Agricultural Transformation Centre at Bagauda.

APPENDIX 3

Pictures from the Stakeholders' Meetings



Strategy meeting with the Kano SAPZ team and the Kano State Ministry of Agriculture officials



Formal engagement meeting with PAPs/Stakeholders at Bagauda



Fahamu team addressing the PAPs/Stakeholders

Cross session of participants filling questionnaires

APPENDIX 4

LIST OF ATTENDANCE

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES (SAPZ) PROGRAM. BAGAUDA COMMUNITY, KANO STATE

Project location _____ Date _____

ATTENDANCE LIST

S/No	Names	Position/title	Phone No.	Signature
1	Lawan Garba	Farmer	07036943121	
2	MUNTAZI HALADU	FARMER	08135911[illegible]	
3	MAMA ADO	FARMER		
4	SHAMSIYA LAWAN	FARMER	09020239747	
5	ABDULKADIR ILIYASU	FARMER	07068899140	
6	Sani Lawan	FARMER	08113[illegible]	
7	SALIS LAWAN	FARMER	08073 [illegible]	
8	KASIRU	FARMER	09067037[illegible]	
9	Sani Isah	farmer	08034718[illegible]	
10	Hargana Hassan	farmer	09012069435	
11	Awaisu Abubakar	farmer	08065025604	
12	Fatima mustapha	farmer	07130603613	
13	Rabiatu Abubakar	FARMER		
14	Hafsa Sani Ibrahim	FARMER	09066479144	
15	Ms. Yam Hassan	FARMER	08081356616	
16	Hassana Abubakar	FARMER	08082023271	
17	FatiMa Mustapha	FARMER	09029471044	
18	Zainab Mustapha	FARMER	08021944019	
19	Safiyya Abubakar	FARMER	09068010416	
20	Khadija Abubakar	FARMER	08168174379	
21	Safiyya Abubakar	FARMER	09056405282	
22	HAFSA Salisu	FARMER	07044[illegible]2072	
23	Rukaiya Mannan	FARMER		
24	Hadiza Yakubu	FARMER	09112066736	
25	AISHA Aliyu	FARMER	08168217797	
26	AISHA Yali	FARMER	08022675056	
27	Shamsiya Hassan	FARMER	09120667[illegible]36	
28	Hama Ahmed	FARMER	07025303321	
29	USAINI Lawan	FARMER	07065[illegible]	
30	Abulaka Lawan	FARMER	09025661171	
31	ZAINABU [illegible] ALIYU	FARMER	08065765716	
32	[illegible] ADAM	FARMER	08063134872	
33	ANIMLE LAWAN	FARMER	07014817[illegible]	
34	ABDULMUMINI KAMILU	FARMERS	08082547220	
35	MUNTARI HALADU	FARMER	08135911[illegible]	

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES (SAPZ) PROGRAM.

BABBAN DA [redacted] COMMUNITY, KANO STATE

Project location _____ Date _____

ATTENDANCE LIST

S/No	Names	Position/title	Phone No.	Signature
1	Sallau Musa	Sec.	07037855578	
2	ALIYU MUSTAPHA ALHASSAN	MEMBER	09033409191	
3	NASIRU BALA	MEMBER	07163666911	
4	MIFTAHU SHUAIBU MUHAMMAD	MEMBER	08104207456	
5	NAZIFU MURTAZA IDRIS	SEC.	08145285781	
6	YUSUF TIJJANI WANKI	MEMBER	08061513133	
7	ADINOU ADAMA	MEMBER	08033172902	
8	LAWAN GARBA	CHAIRMAN	07036963121	
9	SHUKURA ASHAABU	MEMBER	09069749286	
10	IBRAHIM ALIYU SHEHU	MEMBER	07[illegible]6825	
11	ZAILANI KUYA ALIYU	MEMBER	08065785766	
12	ALIYU UMAR	Member	08100822709	
13	Fatima Muhammad	Member	09060746833	
14	IBRAHIM YUNUSA KOFA	MEMBER	08058671552	
15	BA'AREE GARBA	"	08055504206	
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