



ENUGU STATE GOVERNMENT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED DEVELOPMENT OF SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE (SAPZ) AT OWO, NKANU EAST LGA, ENUGU STATE, NIGERIA

ESIA Report

Prepared by



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ABBREVIATIONS & ACRONYMS

AEA	Agricultural Extension Agents
AfDB	African Development Bank
ACHPR	African Charter on Human and Peoples' Rights
ACRWC	African Charter on the Rights and Welfare of the Child
ATCs	Agricultural Transformation Centres
AoI	Area of influence
BAT	Best Available Technology
BCS	Broad Community Support
BPT	Best Practical Technology
BOQ	Bill of Quantities
CAT	Convention against Torture
CBOs	Community Based Organisations
CCAC	Climate and Clean Air Coalition
CoC	Code of Conduct
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CEMPs	Construction Environmental Management Plans
C-ESMP	Contractors Environmental and Social Management Plan
CO	Carbon monoxide
CITES	Convention on International Trade and Traffic in Endangered Species
CRC	Convention on the Rights of the Child
CRPD	Convention on the Rights of Persons with Disabilities
CPGs	Consumer Packaged Goods
CSOs	Civil Society Organisations
Db	Noise-decibel
DFIs	Development Financial Institutions
EIA	Environmental Impact Assessment
EA	Environmental Assessment
ENSG	Enugu State Government
ESAP	Environmental and Social Action Plan
ESEU	Environmental Sanitation and Enforcement Unit
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESS	Environmental and Social Standards
E&S	Environmental and Social
ESMAAI	Enugu State Ministry of Agriculture and Agro Industrialization
ESMECC	Enugu State Ministry of Environment and Climate Change
ESMP	Environmental and Social Management Plan
ESMMP	Environmental and Social Management and Monitoring Plan
ESMWASD	Enugu State Ministry of Women Affairs and Social Development
ESWMA	Enugu State Waste Management Authority
FAO	Food and Agriculture Organisation
FEPA	Federal Environmental Protection Agency
FGD	Focus Group Discussions
FGN	Federal Government of Nigeria
FMARD	Federal Ministry of Agriculture and Rural Development
FMEnv	Federal Ministry of Environment
FMWASD	Federal Ministry of Women Affairs and Social Development
GBV	Gender Based Violence
GFSI	Global Food Safety Initiatives
GHGs	Green House Gases
GON	Government of Nigeria
GPS	Global Positioning System
GRM	Grievance Redress Mechanism
GRC	Grievance Redress Committee

Ha	Hectare
HIV/AIDS	Human Immune Deficiency/ Acquired Immune Deficiency Syndrome
HHQ	Household questionnaires
H ₂ S	Hydrogen sulphide
HSE	Health Safety and Environment
IEE	Initial Environmental Evaluation
IESIA	Integrated Environmental and Social Impact Assessment
ISS	Integrated Safeguards System
ICESCR -	International Covenant on Economic, Social and Cultural Rights
ICCPR -	International Covenant on Civil and Political Rights
IPF	Investment Project Financing
ISO	International Organization for Standardization
IRM	Independent Review Mechanism
KII	Key informant interviews
LEL	Lower Explosive Limit
LFN	Laws of the Federation of Nigeria
LGA	Local Government Area
MDA	Ministries, Departments and Agencies
MoU	Memorandum of Understanding
NAP	National Action Plan
NESREA	National Environmental Standards and Regulations Enforcement Agency
NH ₃	Ammonia
NEPAD	New Partnership for Africa's Development
NGOs	Non-governmental organizations
NIMET	Nigerian Meteorological Agency
NO ₂	Nitrogen dioxide
OS	Operational Safeguards
OHSP	Occupational Health and Safety Plan
PM	Particulate matter
PAPS	Project Affected Persons
PACs	Project Affected Communities
PPE	Personal Protective Equipment
RAM	Risk Assessment Matrix
RH	Relative Humidity
SAPZ	Special Agro-Processing Zones
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SME	Small and Medium Scale Enterprise
STDs/STIs	Sexually Transmitted Diseases/Sexually Transmitted Infections
SO ₂	Sulphur dioxide
SPM	Suspended Particulate Matter
SPV	Special Purpose Vehicle
TDS	Total Dissolved Solid
TOR	Terms of Reference
UES	Uniform Effluent Standards
UNFCCC	United Nations Framework Convention on Climate Change
UN SDG	United Nations Sustainable Development Goal
USEPA	United State Environmental Protection Agency
VOCs	Volatile Organic Compounds
WASH	Water, Sanitation and Hygiene
WEEE	Waste Electrical Electronic Equipment
WMP	Waste Management Plan

EXECUTIVE SUMMARY

ES1 Introduction

In collaboration with the African Development Bank (AfDB), important private investors, and the Federal Government of Nigeria (FGN), the Enugu State Government (ENSG) is developing a Special Agro-Industrial Processing Zone (SAPZ) project in three locations in the three senatorial zones of the State. The pilot phase is in Nkanu East Local Government Area (LGA), Enugu East Senatorial Zone of Enugu State.

The Special Agro-industrial Processing Zones (SAPZ) is a major investment program of the Federal Government of Nigeria (FGN), driven by the Federal Ministry of Agriculture and Rural Development (FMARD) in collaboration with the state governments, AfDB and other Development partners, relevant Federal Ministries, Departments and Agencies (MDAs) and private investors to develop agro-processing clusters in areas of high agricultural production across the country. It is aligned with the FGN's priority agenda and a flagship programme of the AfDB's Feed Africa Strategy.

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 overall objective of this ESIA is to identify and evaluate all potential adverse environmental and social impacts and effects that could arise from the activities associated with the construction and operation of the proposed Agro processing facilities and ancillary infrastructure. Once potential adverse environmental and social impacts are identified, appropriate mitigation measures will be developed to mitigate the identified negative impacts on the bio-physical and social environment.

ES2: Project Location

The proposed location for the SAPZ is within Owo community in Nkanu East LGA where Enugu State government have acquired 529.818 ha of land for the project. The land which has some agricultural activity has been voluntarily donated by the community and has been gazetted by the government of Enugu State. Consequently, the project will not involve any physical or economic displacement but rather provide opportunities for farmers and agro investors to come into the area and participate in the programme. Nkanu East has an area of 795 km² (307sqmi) and a population of 148,774 as at the 2006 census. Owo is a rural community situated in the south-eastern part of Enugu State with coordinates of 6.5076° N, 7.6932° E. Over 80% of the inhabitants are farmers. Owo population was estimated at 14,000 in 2022. Owo has rich agricultural land and many staple crops including yam, cassava, rice, maize, fruits and leafy vegetables such as *Telfaria*, *Amaranthus* among many others, are cultivated by famers in the community. The arable land facilitates the cultivation of many cash crops, for example, oil palm, cashew, oranges, and cocoa.

ES 3: Project Proponent and Partners

The project proponent is the ENSG with partnership with the FGN through the Federal Ministry of Agriculture and Food Security (FMAFS) and key private sector players. The AfDB is providing a loan to the state through the FGN.

ES 4: Institutional & Legal Framework

The project will be guided by applicable Federal and State policies and regulatory framework particularly the Environmental Impact Assessment Act No. 86, 1992 (as amended by EIA Act CAP E12 LFN 2004) as well as the AfDB's Integrated Safeguard System. Other relevant national laws and policies applicable to the project include the following:

- National Policy on the Environment (Revised 1999)
- National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991
- National Environmental (Sanitation and Wastes Control) Regulations, 2009
- National Environmental (Noise Standards and Control) Regulations, 2009
- National Environmental (Surface/Groundwater Quality Control) Regulations 2011
- Harmful Wastes (Special Criminal Provisions etc.) Act CAP HI LFN 2004.
- National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations, 1991
- National Environmental Protection (Effluent Limitation) Regulations, 1991
- Land Use Act CAP L5 LFN 2004

The Federal Ministry of Environment (FMEnv) is the statutory government institution mandated to coordinate environmental protection and natural resources conservation for sustainable development in Nigeria. The Federal Ministry of Agriculture and Food Security (FMAFS) is the lead implementing Ministry for the SAPZ in the country. The Enugu State State SAPZ programme is managed at the state level by the ESMARD.

ES 5: Project Description

The project has four broad mutually reinforcing components namely:

- (i) Support the development of enabling climate adapted infrastructure for Agro-Industrial Hubs (AIHs);
- (ii) Improve agricultural productivity and enterprise development to enhance agricultural value chains and job creation in the SAPZ Catchment Areas;
- (iii) Support Agro-Industrial Zone Policy and Institutional Development; and
- (iv) Program Coordination and Management.

The key Development Needs/SAPZ objectives include to increase food production capacity and efficiency; increase value addition to agricultural produce; promote local, regional and international trade; promote investment in agri-business; and increase the contribution of the agriculture sector to GDP, wealth and employment creation. The SAPZ project is a multi-sector intervention covering the following components:

Table ES1: Project Categories of SAPZ and Planned Activities

S/N	Building Blocks	SAPZ Categories	Activities
1	Agricultural Transformation Centre	Nursery bed	<ul style="list-style-type: none"> Develop Nursery beds for palm trees and Cocoa
		Oil palm production	<ul style="list-style-type: none"> Support to the farmers for transplanting and of oil palm seedlings and production of oil palm
		Cassava Production	<ul style="list-style-type: none"> Support farmers for the production of cassava that will serve as feedstock for the ethanol production plant
		Maize Production	<ul style="list-style-type: none"> Support farmers for the production of maize that will serve as feedstock for animal feed production.
		Fodder Production	<ul style="list-style-type: none"> Support farmers for the production fodder plants for animal grazing.
		Yam Production	<ul style="list-style-type: none"> Support farmers for the production of yam
		Cocoa Production	<ul style="list-style-type: none"> Support to the community for transplanting and of cocoa seedlings and production of cocoa
		Poultry Production	<ul style="list-style-type: none"> Construction of poultry houses-deep litter, and battery cage systems
		Livestock Production	<ul style="list-style-type: none"> Construction of pens for Cattle, sheep and goat production
		Breed Improvement Zone	<ul style="list-style-type: none"> Construction of breeding stations
Soybean production	<ul style="list-style-type: none"> Support farmers for the production of soybean that will serve as feedstock for animal (poultry) feed production. 		
2	Aggregation Centre (AC)	Crop Storage Zone	<ul style="list-style-type: none"> Warehouse for the storage of crops and silos for gram storage.
		Livestock Handling and storage Zone	<ul style="list-style-type: none"> Construction of animal handling and storage house.
			<ul style="list-style-type: none"> Breed Improvement Zone -Construction of breeding stations.
			<ul style="list-style-type: none"> Veterinary and Disease Control - Construction of veterinary and quarantine stations
3	Agro-Industrial Hub (AIZ)	Cassava Processing	<ul style="list-style-type: none"> Ethanol Production Plant
		Livestock Processing Zone	<ul style="list-style-type: none"> Construction of Abattoir/ slaughterhouse (cattle, sheep, goats, poultry) Construction of meat processing and storage facilities (cold rooms). Construction of leather curing facilities Construction of boreholes for water supply Construction of wastewater treatment plants

	Animal feed (poultry and, aquaculture)	<ul style="list-style-type: none"> • Animal feed production plant
	Oil palm Processing	<ul style="list-style-type: none"> • Processing of oil palm – palm oil, palm kernel oil and other derivatives.
	Fodder plant	<ul style="list-style-type: none"> • Fodder plant for the processing of feeds for livestock
	Infrastructure development	<ul style="list-style-type: none"> • Access roads, bridges and drainages • Livestock Market • Facilities for managing waste including wastewater, manure and dead animals. • Buildings for workers and storage facilities including Farmhouses, Offices, Agro-input shops, Stores (for feed, materials and equipment) etc. • Other Buildings including Vocational Training Centre, Primary School and Clinic • Truck parking area/car park • Solar Farm
		<ul style="list-style-type: none"> •

ES6: Environmental and Social Baseline

The study team undertook a detailed baseline survey to determine the baseline physical, biological and socio-economic conditions of the project environment based on identified sensitive receptors within the project area of influence. Field surveys were carried out from Thursday September 28 to Friday October 6 2023, by a multidisciplinary team of experts to collect baseline data on the physical, biophysical and human environment. The project’s area of influence was delineated to cover the entire 528.818 ha of land earmarked for the project and sections of the immediate environment up to 5 km radius around the site.

Physical Environment

The results indicate that the values of the noise levels (ranged from 42 dB(A) to 48 dB(A)) and air quality parameters (CO, NH₃, NO₂, SO₂, H₂S, PM_{2.5} and PM₁₀) fall below the Federal Ministry of Environment maximum allowable limits. This indicates that the air quality and noise levels around the project area are quite healthy without any form of pollution. It therefore follows that any pollution after project implementation would most likely be attributed to the operational activities of the project.

The soils of this site are generally free of gravel and outcrops. The land is fairly flat with a slope of less than 2%, and with minor undulation as the major micro-topographic feature. The soil is deep and liable to flooding at the lowland area and, frequently, it is covered by flood waters for weeks at peak flood periods. The soils vary from well drained (in the upland areas) to somewhat poorly or imperfectly drained (in the lowland areas). The soil pH in water is expectedly higher than the pH values in KCl, indicating that the soil is not extremely weathered and the colloidal surfaces are predominantly negatively charged and has the potential to attract and retain nutrients released by fertilizer application and other sources. The nutrient elements of nitrogen, phosphorus and potassium (NPK) are very low for nitrogen, generally low for phosphorus and very low for potassium. The fertility status of the soil is generally low to

medium. The concentration of the heavy metals in the soil of the study area is far below the background values of soils in Nigeria.

Regarding surface water, all the measured physico-chemistry parameters had values within the permissible limits of the FMEnv. The concentration values of the heavy metals also did not exceed FMEnv permissible limits. However, the concentration of lead was at par with the permissible limits indicating that this heavy metal needs to be monitored closely.

The concentration values of the heavy metals in the sediments of the surface water are far lower than background values indicating that there may not be any pollution of the sediments arising from anthropogenic activities.

Biological Environment

The vegetation consists of derived savannah featuring tree species like *Pterocarpus* spp. Some common economic trees in the project area include; oil palm, coconut, cashew, and herbal trees like bitterleaf. Diverse tree species such as *Daniellia oliveri*, *Lophira lanceolata*, *Piliostigma thonningii*, *Cochlospermum planchoni* are found in the area. Others include herbs such as *Aspilia africana*, *Cleome viscosa*, *Calopogonium sp*, *Centrosema pubescens* while major grasses include *Andropogon gayanus*, *Brachiaria lata*, *Imperata cylindrica*, and *Hyparrhenia involucrate*.

Animal species in the project area include mammals (*Cricetomys gambianus*, *Canis catus*, *Capra aegagrus hircus*) reptiles (*Varanus niloticus*, *Naja melanoleuca*, *Agama agama*). Other fauna species encountered include amphibians, birds and invertebrates.

Socio-economic environment

The project host/affected community is Owo, a town in Nkanu East Local Government Area (LGA) of Enugu state, Nigeria. The residents are largely agrarians, artisans, traders and very few skilled professionals who work in schools and health institutions located in the community. Many of its population are Christians, while the rest are African Traditional worshippers. As of the field visit, most residents said they had unreliable access to the national electricity grid, which did not meet household energy demand. Therefore, a small proportion of the residents make up their home lightening, cooking and other demands by generating their electricity with petrol generators, leaving the vast majority to depend on firewood, hurricane lanterns and other local alternatives. Furthermore, except for the rainy season and few household boreholes and wells, more households rely on a local stream (Idodo) to supply their demand for water as the community has no access to public pipe-borne water. Owo community has seven (7) nursery schools, seven (7) primary schools and four (4) secondary schools. It can also boast of a hospital, a health centre, about four (4) maternity homes, three (3) traditional healing homes, and seven (7) patent medicine stores. Regarding sanitation and environmental waste management, the community has no public waste management infrastructure. On security issues, Owo has a police station and a vigilante group that works under Police supervision to secure the community. Apart from the availability of amenities in the community, a sample of a few residents' opinions shows that it takes most households about one hour of walk time to access the only public water source (Idodo stream), public transportation pack and the public secondary schools. It was also estimated that an average household spends about 30 minutes walking time to access food markets, healthcare facilities and a public primary school.

ES 7: Environmental and Social Impacts and Mitigation Measures

A summary of key identified impacts for all development phases is presented in Table ES2 below.

Table ES2: Summary of key impacts and mitigation for all development phases

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
PRE-CONSTRUCTION PHASE		
<p>Site Preparation and Clearing for Access/ Internal Road, Forage development, Crop production and other SAPZ Infrastructure.</p> <p>Mobilization and storage of equipment, materials on site</p> <p>Installation of Site Offices & Workers Camp Site</p>	Air quality deterioration from release of dusts and gaseous emissions from exposed soil surfaces and vehicles may affect motorist plying the Enugu-Abakaliki expressway and other roads around the SAPZ.	<ul style="list-style-type: none"> • Use spraying devices such as water tanker to sprinkle water on exposed soil surfaces to limit dusts. • Ensure all vehicles and machines are serviced and meet appropriate emissions standards before being brought to site. • Train drivers/ workers on proper operation of vehicles & equipment to include fuel efficiency and anti-idling techniques. • Tarpaulins should be used to cover trucks transporting earth materials or spoil on public roads
	Noise and vibration from the use of machineries and motorized equipment	<ul style="list-style-type: none"> • Ensure equipment not in use are turned off. • Ensure construction work is limited to daytime hours to limit impact of noise. • Provide appropriate PPE for hearing protection and enforce usage. • Ensure use of low-noise machineries and equipment or fit with exhaust mufflers/silencers to minimize noise.
	Loss of vegetation cover due to clearing for crop production and construction	<ul style="list-style-type: none"> • Schedule vegetation clearing to occur in phases so that the entire area is not cleared at once. • Avoid Land clearing by bush burning to reduce the amount of CO2 released in the course of establishing the hub • Where possible, ensure site clearing is done during the dry season to protect work areas from erosion. • Restrict removal of vegetation and trees to ONLY areas of need within the Agri hub • Protect all vegetation not required to be removed against damage particularly riparian vegetation along the watercourses to act as buffer zone and sediment trap. • Ensure early installation of temporary drainage and diversion structures to include silt traps. • Re-vegetate cleared unused areas and ensure site landscaping plan include green areas where indigenous plant species and tolerant grasses and shrubs are planted. • Use vegetal waste as compost to aid rapid vegetal propagation.
	Reduction in carbon sequestration in the project area due to removal of trees	
	Removal of vegetation and trees leading to habitat destruction and fauna loss	
	Depletion of Soil fauna due to removal of vegetation	
	Soil erosion and loss of soil quality from exposure of soil to weather elements	
	Movement of equipment, vehicles and workforce into project area, could introduce invasive species which adversely impact fauna, flora, ecosystems, and crops.	<ul style="list-style-type: none"> • Training and awareness-raising amongst workers, farmers and communities on potential impacts of invasive species. • No introduction of exotic species (e.g., for site rehabilitation) without specialist vetting and approval by ESMARD. • Ensure clearance of invasive species upon completion of construction and periodically during SAPZ operations.
	Soil contamination from spillages of oil and other petroleum products from leakages and/or improper handling during maintenance of vehicles and equipment	<ul style="list-style-type: none"> • Ensure all vehicles and machines are serviced before being brought to site to avoid leaks of oil. • Install impermeable surface and bund walls at fuel storage areas, vehicle servicing & limit zone to contain potential leakages. • Prevent unregulated dumping of fuel waste by ensuring that spent oil drained from equipment during maintenance are properly collected and sent to recycling facility.
	Soil compaction and predisposition to erosion due to movement of vehicles on site and stacking of heavy-duty equipment	<ul style="list-style-type: none"> • Limit zone of vehicle and equipment weight impacts by designating an area for parking and stacking equipment

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
	Generation of vegetal wastes from de-vegetation and site clearing activities	<ul style="list-style-type: none"> • Prepare and Implement Waste Management Plan (WMP). • Waste to be disposed should be evacuated by ESWAMA or ESWAMA approved private sector providers. • To the extent possible, woody debris and slash generated from vegetation clearance should be given to locals for use as fuel wood for cooking or mulched for use in farms or site restoration.
	<p>Contamination/pollution of sources of water, food and fodder for animals during clearing</p> <p>Eutrophication/nutrient-enrichment due to Siltation of streams around the site as a result of sediment runoffs from exposed soils during clearing</p> <p>Alteration of aquatic habitat as a result of pollution and sedimentation may lead to depletion of aquatic biota</p>	<ul style="list-style-type: none"> • Schedule vegetation clearing to occur in phases so that the entire area is not cleared at once. • Where possible, ensure site clearing is done during the dry season to protect work areas from erosion. • Restrict removal of vegetation and trees to ONLY areas of need within the Reserve. • Protect all vegetation not required to be removed against damage particularly riparian vegetation along the watercourses to act as buffer zone and sediment trap. • Ensure early installation of temporary drainage and diversion structures to include silt traps. • Re-vegetate cleared unused areas and ensure site landscaping plan include green areas where indigenous plant species and tolerant grasses and shrubs are planted. • Use vegetal waste as compost to aid rapid vegetal propagation.
	Traffic congestion/travel delay along the access road into the project site will occur as a result of mobilization of workers, equipment and other materials to the site	<ul style="list-style-type: none"> • Implement Traffic Management Plan (TMP) prepared for the project, including the following: • Hire drivers with appropriate driver's license, train drivers and enforce speed limit. • Mobilization of equipment and machinery should be done at off-peak period (10am – 4pm). • Ensure trucks and other vehicles are parked at the designated parking area within the project site and prohibited from parking along major high way, for example, the Enugu-Abakaliki expressway to prevent obstruction of traffic. • Ensure Traffic/caution signs at strategic locations in English and Igbo and engage personnel to manage traffic flow during peak periods. • Cover truck conveying materials to site to prevent materials falling and causing injuries to pedestrians & motorists.
	Storage of materials and equipment on site may attract theft and security breaches and threat to lives and properties.	<ul style="list-style-type: none"> • Ensure deployment of 24-hour security guards and distribution of suitable security light. • Ensure consultation and collaboration with local Police
	There could be increased exposure to health risks from fugitive dusts and exhausts fumes.	<ul style="list-style-type: none"> • Use spraying devices such as water tanker to sprinkle water on exposed soil surfaces to limit dusts. • Ensure provision of appropriate PPE for eye/respiratory protection and enforce usage.
	Site clearing and mobilization of workers, equipment and other materials to the site may cause an upsurge in noise, fugitive dust and exhaust fumes nuisance in the area which can have adverse health impacts	<ul style="list-style-type: none"> • Ensure use of low-noise machineries and equipment or retrofit with exhaust mufflers/ silencers to minimize noise. • Ensure equipment not in use are turned off. • Ensure construction work is limited to daytime hours to limit impact of noise. • Provide appropriate PPE for hearing, eyes and respiratory protection and enforce usage by workers and visitors. • Restrict access of non-project personnel to work areas where dusts and emissions exist/persist from project works.
	Occupational accidents and injuries from use of heavy machineries and equipment as well as struck by injuries from falling of trees, insect bites and exposure to dangerous animals etc.	<ul style="list-style-type: none"> • Develop a project specific Occupational Health and Safety Plan (OHSP) commensurate to construction activities. OHSP to include: • Prohibition of drug and alcohol use by workers while on the job. • Provision of adequate first aid, first aiders, PPE, signage (English and Igbo), engineering barriers e.g., fencing.

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
		<ul style="list-style-type: none"> • Restrict unauthorized access to all areas of high-risk activities. • Training of personnel on worksite OHS management, induction/ daily toolbox and refresher program. • Adequate safety signage and barriers at construction sites, staging areas, pits, equipment parking areas etc should be installed to alert workers, community members, drivers and pedestrians. • Lighting and reflective tapes and signage should be made available in all worksites for safety at night.
CONSTRUCTION PHASE		
Construction of SAPZ Infrastructure such as Internal Roads, Buildings, Ethanol Processing facilities, Oil palm processing facilities, Livestock Containments, Impoundment and Boreholes	Air Quality deterioration from dusts generated during excavation, filling, backfilling and compaction activities	<ul style="list-style-type: none"> • Use spraying devices such as water tanker to sprinkle water on exposed soil surfaces to limit dusts. • Ensure all vehicles and machines are serviced and meet appropriate emissions standards before being brought to site. • Train drivers/ workers on proper operation of vehicles & equipment to include fuel efficiency and anti-idling techniques. • Tarpaulins should be used to cover trucks transporting earth materials or spoil on public roads
	Noise and vibration from the use of machineries and vehicles during excavation, burrowing, backfilling and compaction activities	<ul style="list-style-type: none"> • Ensure equipment not in use are turned off. • Ensure construction work is limited to daytime hours to limit impact of noise. • Provide appropriate PPE for hearing protection and enforce usage. • Ensure use of low-noise machineries and equipment or fit with exhaust mufflers/silencers to minimize noise.
	Introduction of air pollutants into the atmosphere from asphalt laying on internal roads.	<ul style="list-style-type: none"> • Use dust control and suppression measures such as wetting, dampening. • Use modern equipment that meet appropriate and ensure regular preventive maintenance.
	Predisposition of soil to erosion during excavation and earth movement	<ul style="list-style-type: none"> • Use erosion protection structures such as sediment traps, riprap, gabions etc. as additional measures to control erosion and run-off to waterbodies. • If possible, schedule construction to take place in dry season to prevent run-off to waterbodies. • Ensure stockpile and disposal areas are stable and protected against erosion and not interfere with run off or subsequent construction activities. Stockpile to be covered and stored in a sealed and bonded area in order to divert storm water away. • Reuse stockpile as fill materials for reclamation of river channel. • Establish vegetation buffers and green belts between project area and waterbodies.
	Loss, damage or disruption of soil/sediments during construction works.	
	Siltation of streams due to runoff of spoils and topsoil from exposed soils	
	Release of hazardous substances associated with construction activities or with transport of goods (e.g., accidental spills & leaks), leading to soil, surface or groundwater contamination.	<ul style="list-style-type: none"> • Ensure all vehicles and machines are serviced before being brought to site. • to avoid leaks of oil. • Install impermeable surface at fuel storage areas, vehicle servicing & limit zone to contain potential leakages. • Ensure that equipment maintenance on site is done at the designated site where the surface is impervious. • Prevent unregulated dumping of fuel waste by ensuring that spent oil drained from equipment during maintenance are properly collected and sent to recycling facility.
	Generation of construction waste including spoils, debris and concrete wastes.	<ul style="list-style-type: none"> • Prepare Waste Management Plan following the waste hierarchy, supported by training and awareness-raising

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
	<p>Generation of scrap wastes from mechanical and electrical works such as pieces of electric cables, timbers, metals cuttings, nails and packaging materials</p> <p>Inefficient waste management during construction leading to excess consumption of materials, generation of wastes/emissions, pollution of soils and water.</p>	<p>around topic of waste for workforce and for local community.</p> <ul style="list-style-type: none"> • Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. • Unsuitable soils can be used for reclamation. • Ensure recycling of scraps and other recyclables through approved recycling facilities to conserve resources. • Storage of hazardous waste onsite should be done in closed/labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. • Ensure no waste is left behind at project site after construction.
	<p>Construction activities will likely intercept or terminate the flow of the existing surface water bodies and Wells; and cause lack of water for human and livestock drinking as well as water for irrigation.</p>	<ul style="list-style-type: none"> • Proper channelization of surface water flow should be undertaken as part of measures to preserve water availability to the settlement and livestock during construction works. • An impoundment should be created as part of the SAPZ to accommodate varieties of water needs for irrigation, livestock production and value chain processing.
	<p>Abstraction of large volume of water from ground or surface water sources may affect supply for other water users downstream of the hub resulting in conflicts over water use.</p>	<ul style="list-style-type: none"> • Ensure water for construction is sourced from multiple sources including rainwater harvesting, waterbodies, borehole and water tankers to prevent overreliance on a single source. • Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. • Water for construction SHOULD not be sourced from perennial streams during the dry season.
	<p>Traffic congestion and increased road traffic accident along Enugu-Abakaliki expressway and site access road due to movement of heavy-duty vehicles in and out of the construction site.</p>	<ul style="list-style-type: none"> • Implement Traffic Management Plan (TMP) prepared for the project, including the following: • Hire drivers with appropriate driver's license, train drivers and enforce speed limit. • Mobilization of equipment and machinery should be done at off-peak period (10am – 4pm). • Ensure trucks and other vehicles are parked at the designated parking area within the project site and prohibited from parking along the Enugu-Abakaliki expressway and the Agri hub access road to prevent obstruction of traffic. • Ensure Traffic/caution signs at strategic locations in English and Igbo and engage personnel to manage traffic flow during peak periods. • Cover truck conveying materials to site to prevent materials falling and causing injuries to pedestrians & motorists.
	<p>The project has no safeguard officers and is likely not able to implement the ESMP prepared for the project</p>	<ul style="list-style-type: none"> • Employ or train personnel on environmental and social safeguards best practices. • Work closely with the Ministry of Environment and Mineral Resources to achieve success in environmental management including waste management
	<p>Risk of health problems from exposures to noise, fugitive dust and exhaust emissions from the use of machineries & motorized equipment for construction</p>	<ul style="list-style-type: none"> • Ensure use of low-noise machineries and equipment or retrofit with exhaust mufflers/ silencers to minimize noise. • Ensure equipment not in use are turned off. • Ensure construction work is limited to daytime hours to limit impact of noise. • Provide appropriate PPE for hearing, eyes and respiratory protection and enforce usage by workers and visitors. • Restrict access of non-project personnel to work areas where dusts and emissions exist/persist from project works.
	<p>Poor management of occupational health and safety leading to accidents, injuries and illnesses among workers; mental health issues due to remote or enclosed living</p>	<ul style="list-style-type: none"> • Implement the Occupational Health and Safety Plan (OHSP) developed for this project. • Prohibition of drug and alcohol use by workers while on the job. • Provision of adequate first aid, first aiders, PPE, signages (English and Yoruba), engineering barriers e.g., fencing.

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
		<ul style="list-style-type: none"> • Restrict unauthorized access to all areas of high-risk activities. • Training of personnel on worksite OHS management, induction/ daily toolbox and refresher program. • Adequate safety signage and barriers at construction sites, staging areas, pits, equipment parking areas etc should be installed to alert workers, community members, drivers and pedestrians. • Lighting and reflective tapes and signage should be made available in all worksites for safety at night. • Rest and recreational facilities and time should be provided, and rules on alcohol and drugs defined and clearly communicated to workers. • The basis for differences in the standard of accommodation should be non-discriminatory; it should be documented and communicated transparently to the workforce.
Creation of borrow pits.	<p>Unsustainable excavation and non-reclamation of borrow pits may lead to land degradation and increased susceptibility to erosion and flooding</p> <p>Borrow-pit may become inundated with water and pose possible risk of accident and drowning to human and animals.</p> <p>Community health & safety risks associated with creation and poor management of borrow pits and staging areas.</p>	<ul style="list-style-type: none"> • Avoid the production of excess spoil material and reduce the need for borrow pit materials. • Where burrowing becomes unavoidable, develop and implement Borrow pit Reclamation Plan to ensure that site is rehabilitated and restored to a safe and stable state. Plan should include measures to: <ul style="list-style-type: none"> • Re-contour/grade site to blend with natural topography. • Reuse excess stockpile to back fill pits during grading. • Revegetate with appropriate plant species. • Avoid material borrowing or restrict borrowing to approve quarry and ensure rehabilitation before the onset of wet season.
Presence of Migrant Workers & Business Opportunists	<p>Direct employment of local population in workforce, and stimulation of local economy through export of and demand for goods and services will enhance livelihoods and economic activity in local communities; potential for adverse effects if expectations not met and community relations are not well managed.</p> <p>Real or perceived disruption to normal community life, through the physical presence of a non-local workforce.</p> <p>Risk of illicit behaviour and crime (including prostitution, theft, robbery and substance abuse)</p> <p>Potential increased prevalence of GBV & SEA resulting from interaction among</p>	<ul style="list-style-type: none"> • Employment practices and working conditions should conform to International Labour Organization (ILO) Standards and national regulations. • Ensure priority engagement of workers from local communities. • Rest and recreational facilities and time should be provided, and rules on alcohol and drugs defined and clearly communicated to workers. • The basis for differences in the standard of accommodation should be non-discriminatory; it should be documented and communicated transparently to the workforce. • Adopt a Stakeholder Engagement Plan, as a framework for early and ongoing community consultation. • Ensure priority engagement of workers from local communities. • Implement the Grievance Redress Mechanism designed for this project. • Define works procedure and Code of Appropriate Conduct for all workers, including acceptable behaviour with respect to community interactions. • Ensure payment of adequate salaries for workers to reduce incentive for theft. • Pay salaries into workers' bank accounts rather than in cash. • Partner with the existing local vigilante and seek cooperation with the Police to curb the activities of theft and robbery. • Ensure priority engagement of workers from local communities. • Ensure creation of supervised leisure areas in workers' camp. • Introduce sanctions (e.g., dismissal) for workers involved in criminal activities. • Prohibit the use of illicit drugs by workers. • Mandatory and regular training for workers on required lawful conduct in host community and legal consequences for failure to comply with laws.

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
	construction workers, community members and camp followers	<ul style="list-style-type: none"> • Training program for project personnel to include GBV and SEA issues. • Contractor to engage locals from the communities as labour force where possible. • All workers must be trained and retrained on the provisions of the Code of Conducts and have it signed. Training can be done in local language to ensure that it is understood by all. • Ensure cross gender participation in project implementation. • Provision of gender-based awareness campaign within the communities. • Commitment to cooperate with law enforcement agencies investigating perpetrators of GBV
	Interaction between non-local workforce and local communities may increase occurrence of communicable diseases, including HIV/AIDS and sexually transmitted diseases (STDs).	<ul style="list-style-type: none"> • Institute HIV prevention programs (peer education, condom distribution etc.) • Liaise with appropriate health focused NGOs to undertake health awareness and education initiatives on STDs amongst workers and in the host community. • Provide opportunities for workers to regularly return to their families. • Implement community-based Grievance Redress Mechanism (GRM).
	Threat to community culture, safety and security due to presence of workers and business opportunists.	<ul style="list-style-type: none"> • Develop an induction program including a code of appropriate conduct for all workers. Code of conduct to address the following: Respect for local residents; No hunting or unauthorized taking of products or livestock; Zero tolerance of illegal activities such as child sexual exploitation and underage sex, prostitution, harassment of women, 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. • Provide cultural sensitization training to improve awareness of and sensitivity of workers to local cultures, traditions, and lifestyles. • Implement GRM and Labour Influx Management Plan prepared for this project. • Limit the number of migrant workers by engaging local workers.
	Increased social vices/crimes and dilution of indigenous culture, norms and traditions in surrounding communities, due to influx of migrant workers and business opportunists	
	Child labour and school drop out in nearby communities of Ore due to availability of construction work	<ul style="list-style-type: none"> • Ensure children and minors are not employed directly or indirectly on the project. • Communication on hiring criteria, minimum age, and applicable laws should be ensured. • Enforcement of legislations that prohibits child labour. • Ensure CoCs contains texts that speak on zero tolerance on child labour and all forms of SEA/SH/VAC.
	Individuals are likely to migrate into the project area from the local/regional area, which may cause conflict with residents, and put pressure on resources and infrastructure.	<ul style="list-style-type: none"> • Implement the Labour Influx Management Plan prepared for this project in consultation with Enugu East LGA • Limit the number of migrant workers by engaging local workers.
	Increase demand on community health and sanitation infrastructure due to influx of workers and camp followers.	<ul style="list-style-type: none"> • Provide basic amenities (water, sanitation etc to workers according to WHO standards). • Provide separate toilets for male and female workers.
	Pollution of streams from open defaecation of construction workers may lead to increased risk of water borne diseases in nearby communities.	<ul style="list-style-type: none"> • Provide water and sanitation amenities at the construction site and camp site so that workers will not use nearby bushes. • Provide separate toilets for male and female workers.
	Assault of workers, kidnapping and vandalizing of equipment by local youths over local jobs	<ul style="list-style-type: none"> • Adopt a Stakeholder Engagement Plan, as a framework for early and ongoing community consultation.

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
	Conflicts between contractors and community members over labour intake	<ul style="list-style-type: none"> • Ensure priority engagement of workers from local communities. • Implement the GRM and Labour Influx Management Plan prepared for this project. • Engage competent security to protect workers and assets 24/7 in collaboration with the Police
	Loss of employment for temporary construction workers	<ul style="list-style-type: none"> • Ensure compliance with all legal and contractual agreement with workers. • Ensure all workers receive notice of dismissal and severance payments mandated by law and collective agreements in a timely manner. • Provide a grievance mechanism for workers to raise workplace concerns.
OPERATIONAL PHASE		
Operation and Maintenance of SAPZ and Ancillary Infrastructure	Increase ambient noise from machineries and equipment including haulage trucks	<ul style="list-style-type: none"> • Ensure installation of modern processing equipment fitted with noise abatement technology such as silencers to exhaust systems. • Ensure installation of enclosure and cladding of processing plants. • Ensure installation of proper sound barriers and / or noise containments, with enclosures and curtains at or near the source equipment. • Ensure regular maintenance of processing plants to ensure noise is minimal. • Ensure provision of appropriate hearing PPE (earmuffs) for workers and enforce usage. • Ensure installation of processing plants on anti-vibration mountings. • 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
	Odour associated with livestock and waste can constitute nuisance for nearby receptors.	<ul style="list-style-type: none"> • Ensure all processing facilities are installed in an enclosed plant and processing activities are taking place within an enclosed system to prevent odour. • Ensure provision of appropriate PPE (respiratory protection) for workers and enforce usage. • Ensure waste storage areas are covered including waste pond and effluent treatment plants. • Ensure proper sanitary conditions in livestock pens or ranches
	Abstraction of large volumes of water from surface or groundwater sources for ethanol and oil palm processing, irrigation and watering livestock may affect water availability and ecosystems.	<ul style="list-style-type: none"> • Ensure water for SAPZ operation is sourced from multiple sources including rainwater harvesting, waterbodies, borehole and water tankers to prevent overreliance on a single source. • Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. • The existing impoundments within the project site should be rehabilitated as part of the SAPZ to accommodate varieties of water needs for irrigation, value chain processing and livestock production
	Inefficient waste management during operation and maintenance leading to excess consumption of materials, generation of wastes/emissions, pollution of soils and water.	<ul style="list-style-type: none"> • Implement the general and Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. • Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. • Encourage manure recovery for use as fertiliser and reapplication of by-products of cocoa and oil palm processing • Ensure treatment of effluents through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEnv Effluent Standards.

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
		<ul style="list-style-type: none"> Storage of hazardous waste onsite should be done in closed/labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage.
	Generation of normal and hazardous waste during maintenance including obsolete parts (batteries, WEEE, solar panels etc)	<ul style="list-style-type: none"> Liaise with contractor/ manufacturer to take back obsolete parts including batteries, spent oils during maintenance and repair. Alternatively, use waste vendor licensed by ESWAMA to evacuate and process hazardous waste. Storage of hazardous waste onsite should be done in closed/labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage.
	Pollution of soil and watercourses due to run-off of untreated effluents and improper management of hazardous waste from the processing complexes	<ul style="list-style-type: none"> Storage of hazardous waste onsite should be done in closed/labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. Ensure treatment of effluents through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEnv Effluent Standards. use waste vendor licensed by ESWAMA to evacuate and process hazardous waste. Establish vegetation buffers and green belts between project area and waterbodies.
	Loss, damage or disruption of soil/sediments from livestock presence (e.g., trampling).	<ul style="list-style-type: none"> Establish clearly defined grazing areas within the zone (ranching) Restrict livestock access to fragile/unstable soil; adapt the type and number of animals to the land carrying capacity.
	Development of the Agri-hub and its ancillary infrastructure in its proposed remote or undeveloped area can lead to further development, increased disturbance and pressure on natural resources through bushmeat hunting, logging, fire, etc.	<ul style="list-style-type: none"> Where possible, instate access controls on roads leading to livestock containment areas or associated facilities in otherwise undeveloped or remote areas. Develop an induction program including a code of appropriate conduct for all workers. Code of conduct to prohibit hunting for bushmeat or unauthorized taking of products or livestock. Sensitisation and public awareness campaigns against hunting and bushmeat trade amongst livestock project workers and local communities.
	Presence of livestock and humans may displace animals and disturb their habitats, by direct disturbance during operation (e.g, increased human and vehicle presence, noise, light disturbance at night, construction of associated facilities).	<ul style="list-style-type: none"> 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.
	Pollution of watercourses from open defaecation of construction workers may lead to increased risk of water borne diseases in nearby communities.	<ul style="list-style-type: none"> Provide and maintain water and sanitation amenities at the construction site and camp site to prevent open defecation Provide separate toilets for male and female workers.
	Fear of sustainability of the project amidst change of political leadership	<ul style="list-style-type: none"> Create a Special Purpose Vehicle (SPV) to manage the SAPZ in order to encourage private sector involvement and participation. SPV will manage critical aspects of the project such as the dam/water supply and other necessary infrastructure, solar farm, coca/oil palm processing, etc
	Marginalization of the vulnerable groups and minority tribes in employment opportunities	<ul style="list-style-type: none"> As much as possible, groups should be encouraged to organize themselves as cooperatives with structures and be trained/sensitized for meaningful participation in the SAPZ. Ensure gender inclusivity in employment opportunities Develop compensation measures for affected parties (e.g., excluded farmers, downstream water users).
	Conflict between farmers and Employees over wage related issues	<ul style="list-style-type: none"> Develop and in-house conflict resolution mechanism Each farmer or worker employed should be engaged under written down terms and conditions and benefits that they are entitled to

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
	Risk of illicit behavior and crime (including prostitution, theft and robbery)	<ul style="list-style-type: none"> • Ensure payment of adequate salaries for workers to reduce incentive for theft. • Pay salaries into workers' bank accounts rather than in cash. • Partner with the existing local vigilante and seek cooperation with the Police to curb the activities of theft and robbery. • Ensure priority engagement of workers from local communities. • Ensure creation of supervised leisure areas in workers' camp. • Introduce sanctions (e.g., dismissal) for workers involved in criminal activities. • Prohibit the use of illicit drugs by workers.
	Threat to community culture, safety and security due to presence of workers and business opportunists.	<ul style="list-style-type: none"> • Develop an induction program including a code of appropriate conduct for all workers. Code of conduct to address the following: Respect for local residents; No hunting or unauthorized taking of products or livestock; Zero tolerance of illegal activities such as child sexual exploitation and underage sex, prostitution, harassment of women, 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. • Provide cultural sensitization training to improve awareness of and sensitivity of workers to local cultures, traditions, and lifestyles. • Implement GRM and Labour Influx Management Plan prepared for this project. • Limit the number of migrant workers by engaging local workers.
	Individuals are likely to migrate into the project area from the local/regional area, which may cause conflict with residents, and put pressure on resources and infrastructure.	<ul style="list-style-type: none"> • Implement the Labour Influx Management Plan prepared for this project in consultation with Nkanu East LGA • Limit the number of migrant workers by engaging local workers.
	Labour Influx which could lead to increase in sexual activities and potential spread of STDs/STIs including HIV/AIDS in the project location	<ul style="list-style-type: none"> • Institute HIV prevention programs (peer education, condom distribution etc.) • Liaise with appropriate health focused NGOs to undertake health awareness and education initiatives on STDs amongst workers and in the host community. • Provide opportunities for workers to regularly return to their families. • Implement community-based Grievance Redress Mechanism (GRM).
	Potential increased prevalence of GBV & SEA resulting from interaction among construction workers, community members and camp followers	<ul style="list-style-type: none"> • Conduct GBV service mapping in the project area for effective referral and response. This coordination will be aimed at minimizing duplication of efforts since these data already exist and fostering greater coherence of approaches and programmes. • Include a GBV specialist as part of the E&S Safeguard team for the project. • Define and reinforce GBV requirements in procurement processes and contracts. • Separate toilet and shower facilities for men and women and add GBV-free signage. • Ensure regular GBV risks evaluation in order to update action/mitigation and training requirements throughout the project life cycle. • Ensure regular training of all workers on GBV and related issues throughout the life cycle of the project. • Create an effective Grievance Resolution Mechanism (GRM) with multiple channels to initiate complaint. This should have specific procedures for GBV cases confidentiality

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
		reporting with safe and ethical documenting. A parallel GRM for GBV and related issues can also be created.
	Child labour involvement in plantation work	<ul style="list-style-type: none"> • Ensure that children and minors are not employed directly or indirectly on the project. • Communication on hiring criteria, minimum age, and applicable laws should be ensured. • Enforcement of legislations that prohibits child labour. • Ensure CoCs contains texts that speak on zero tolerance on child labour and all forms of SEA/SH/VAC.
	Evolution of slums/uncontrolled human settlements around the Agro-Industrial hub with attendant overcrowding, crimes, vices and diseases.	<ul style="list-style-type: none"> • Nkanu East LGAs and Enugu State Ministry of Land should ensure slums and unauthorised developments around the Agro hub are not allowed. • ENMARD should ensure prompt reporting of illegal activities in and around the hub to the Police and relevant Nkanu East LGA authorities for action.
	Increase demand on community health and sanitation infrastructure due to influx of workers and camp followers.	<ul style="list-style-type: none"> • Provide basic amenities (water, sanitation etc to workers according to WHO standards) within the project site
	Traffic congestion and increased road traffic accident due to movement of vehicles conveying (inputs and products to and from the SAPZ.	<ul style="list-style-type: none"> • Hire drivers with appropriate driver’s license, train drivers and enforce speed limit. • Ensure movement of inputs/ products to and from site is done at off-peak period (10am – 4pm). • Ensure trucks and other vehicles are parked at the designated parking lot within the Reserve and prohibited from parking along the Enugu-Abakalikiexpress and access roads to prevent obstruction of traffic. • Ensure Traffic/caution signs at strategic locations in English and Yoruba and engage personnel to manage traffic flow during peak periods. • Cover truck conveying inputs and produce to and from the Reserve to prevent materials falling and causing injuries to pedestrians & motorists.
	Transportation and storage of hazardous materials such as petrol and gas may results in explosions, fires or spills during operation.	<ul style="list-style-type: none"> • Emergency response plan should be developed for the facility to include: • Training of workers in emergency response and procedure. • Procedures in the case of fire should be communicated to all employees. • Firefighting devices should be installed, and their position should be clearly marked and communicated to workers. • Ensure compliance of the SAPZ with fire safety is assessed by Federal Fire Agency. • Ensure fuel storage areas are clearly marked and secure to always prevent unauthorised access. • Construct bund walls to contain any accidental discharge of petroleum products
	Differences in nationality, ethnicity, religion, etc. may lead to discrimination and harassment, and differences (perceived or real) in working conditions between workers/farmers may lead to resentment. Poor management of occupational health and safety leading to accidents, injuries and illnesses among workers); mental health issues due to remote or enclosed living.	<ul style="list-style-type: none"> • Employment practices and working conditions should conform to International Labour Organization (ILO) Standards and national regulations. • Ensure priority engagement of workers from local communities. • Rest and recreational facilities and time should be provided, and rules on alcohol and drugs defined and clearly communicated to workers. • The basis for differences in the standard of accommodation should be non-discriminatory; it should be documented and communicated transparently to the workforce. • Clear and comprehensive health and safety reporting and grievance procedure system should be established and be freely available to all of the workforce.

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
Crop Production and value chain (ethanol etc) processing	Generation of wastes (by-products from cocoa and oil palm harvesting and processing)	<ul style="list-style-type: none"> Implement the Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce.
	Generation of odours from composting of spent farm materials	<ul style="list-style-type: none"> Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. Encourage reapplication of by-products of cocoa and oil palm processing in other industries or as fertilizers or animal feed
	Abstraction of large volume of water	<ul style="list-style-type: none"> Ensure water for SAPZ operation is sourced from multiple sources including rainwater harvesting, waterbodies, boreholes and water tankers to prevent overreliance on a single source. Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. An impoundment should be created as part of the SAPZ to accommodate varieties of water needs for irrigation, livestock production and value chain processing.
	Indiscriminate discharge of waste effluent into rivers	<ul style="list-style-type: none"> Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channel to Effluent Treatment Plant before discharge into the environment. Treated effluent should conform to FME_{env} Effluent Standards Implementation of standard good wastewater management and disposal procedures; wastewater drainage outlets to discharge into vegetated areas if possible; vegetation along watercourses and drainage lines to be retained if possible.
	Occupational health risks associated with farming and harvesting of cocoa and palm fruits (e.g cuts and injuries, toxicity from pesticide use, falls, etc)	<ul style="list-style-type: none"> Develop a project specific Occupational Health and Safety Plan (OHSP) commensurate to construction activities. OHSP to include: <ul style="list-style-type: none"> Prohibition of drug and alcohol use by workers while on the job. Provision of adequate first aid, first aiders, PPE, signages (English and Yoruba), engineering barriers e.g., fencing. Restrict unauthorized access to all areas of high-risk activities. Training of personnel on worksite OHS management, induction/ daily toolbox and refresher program.
	Pollution of watercourses caused by runoff from farming areas (containing fertilisers, pesticides and herbicides etc.).	<ul style="list-style-type: none"> Implement agricultural techniques minimising the use of fertilisers, pesticides, herbicides etc. Encourage the use of manure from livestock production areas to limit the
	Conflict between farmers and Employees.	<ul style="list-style-type: none"> Develop and in-house conflict resolution mechanism Each farmer or worker employed should be engaged under written down terms and conditions and benefits they are entitled to
Livestock rearing, Abattoir and Meat and Fish Processing Areas	Abstraction of large volumes of water may lead to water shortages in the zone	<ul style="list-style-type: none"> Ensure water for SAPZ operation is sourced from multiple sources including rainwater harvesting, waterbodies, boreholes and water tankers to prevent overreliance on a single source. Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. An impoundment should be created as part of the SAPZ to accommodate varieties of water needs for irrigation, livestock production and value chain processing.
	Pollution of watercourses caused by wastes from livestock, and workforce sewage effluent, as well as runoff from grazing areas and land used for growing feed (containing fertilisers, pesticides and herbicides etc.).	<ul style="list-style-type: none"> Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. Implement agricultural techniques minimising the use of fertilisers, pesticides, herbicides etc. Encourage manure recovery for use as fertiliser.

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
	Generation of waste products consisting primarily of manure with straw Generation of waste including fodder and grain dust, sludge and packaging waste	<ul style="list-style-type: none"> • Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. • Encourage manure recovery for use as fertiliser by farmers.
	Poor animal welfare (e.g., malnutrition)	<ul style="list-style-type: none"> • The cattle will be housed in insulated buildings with controlled temperature and ventilation systems and ample space per cow. • Ensure barns have solid concrete flooring covered by straw particularly during cold periods and ensure waste products consisting primarily of manure with straw which is removed from the stables daily. • Ensure animals are well fed daily and provided adequate water for sustenance. • Train all workers on good practice in animal handling and prohibit animal cruelty.
	Poor hygiene and management of abattoir may lead to bacterial contamination with attendant public health risk	<ul style="list-style-type: none"> • Strict hygiene standards will be imposed at the site with all staff entering the slaughterhouse required to wear appropriate clothing, hair nets and footwear, and follow procedures for hand and foot disinfection. • Vehicles entering and leaving the abattoir should be subject to a disinfection procedure. • Any diseased animals/contaminated meat will be segregated from other animals/carcasses and collected by the veterinary authorities. • The facility should be cleaned at the end of each working day. This includes washing of floors to remove blood and solids using hosed water, brushes and disinfectants.
	Generation of animal waste including manure, blood and inedible animal parts and chemical used for tanning may lead to environmental contamination	<ul style="list-style-type: none"> • Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. • Implementation of standard good wastewater management and disposal procedures; wastewater drainage outlets to discharge into vegetated areas if possible; vegetation along watercourses and drainage lines to be retained if possible. • Effluent treatment should include maximising the extent that solids and blood are collected before entering the wastewater stream. • Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channel through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEV Effluent Standards. • Encourage manure recovery for use as fertiliser for use in nearby farms.
	Emission of methane, ammonia and other GHGs may aggravate climate change and cause unpleasant odours	<ul style="list-style-type: none"> • Create manure lagoons (impermeable pit or tank protected from rain and sun) to temporary store manure before being used as fertilizer in forage fields and nearby farms. • The production of methane can be encouraged and recovered for use as a fuel using specially designed recovery systems. The size of the SAPZ would make methane recovery feasible, although ENSG has no plans to recover methane at this time, however, other private investors should be encouraged to do so.
	Odours from animal waste products and some carcass treatment and manure in the animal pens	<ul style="list-style-type: none"> • Odours should be minimised by good manure management; the animals will be held in their pens with slatted floors for manure collection with daily scrapping. • Odours from inedible animal parts can be managed by good housekeeping and livestock waste management practices, and for singeing odours using abatement equipment if necessary.

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
	Pollution of soil and watercourses due to run-off or discharge of untreated foul water (effluents) and improper management of waste	<ul style="list-style-type: none"> Inedible waste should be removed by specialist operators for rendering, or in the future, possibly utilised in the production of biogas that will subsequently be used as a fuel source for the facility. Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channel through Effluent Treatment Plant before discharge into the environment. ETP should consist of mechanical clarification using a 1mm screen followed by chemical flocculation, flocculent removal and dewatering and disposal of resultant solid waste in order for the output to conform to FMEV Effluent Standards. Effluent treatment should include maximising the extent that solids and blood are collected before entering the wastewater stream. Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. Encourage manure recovery for use as fertiliser. Storage of hazardous waste onsite should be done in closed/labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage.
Milk Production Areas	<p>Generation of manure waste may lead to uncontrolled release of ammonia and environmental contamination</p> <p>Generation/ uncontrolled discharge of foul water with high BOD, suspended solids and nutrients may cause pollution/eutrophication/nutrient-enrichment in waterbodies.</p>	<ul style="list-style-type: none"> Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. Ensure barns are equipped with slatted flooring and manure scrapers to reduce ammonia emissions through regular collection of manure in collection basins underneath the flooring. The under-floor manure basins will be periodically emptied to manure lagoons from where manure recovery for use as fertiliser will be done. Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channel through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEV Effluent Standards.
	Poor hygiene and management of milk may lead to bacterial contamination with attendant public health risk	<ul style="list-style-type: none"> Strict hygiene standards should be imposed at the milking parlour with all staff entering required to wear appropriate clothing, hair nets and footwear, and follow procedures for hand and foot disinfection. Vehicles entering and leaving the facility should be subject to a disinfection procedure. All animals in the barn (milking parlour) must be checked daily by Veterinary Doctor to confirm they are not infected before milking. The barns should have slatted floors and equipped with automatic cleaning scrapers with manure basins underneath to collect manure (and urine). The barns should also be regularly disinfected.
Veterinary and Disease Control	<p>Zoonoses (potential transmission of diseases between animals and humans)</p> <p>Degradation of health and size of populations of native species due to spread of diseases from livestock.</p>	<ul style="list-style-type: none"> Ensure adequate and sufficient medical and veterinary services/ clinics and presence of doctors are included within project planning. Good environmental, sanitation and hygiene conditions of the livestock processing zone Veterinary screening of all livestock for diseases prior to introduction into the grazing reserve.

Project Phase and Planned Activities	Associated and Potential Impacts	Mitigation Measure
	Increased likelihood of certain vector-, animals- or water-borne diseases spreading within workforce and local community due to presence of livestock and standing water; health risks associated with chemicals used and wastes produced during operation (e.g. pesticides, noxious gases).	<ul style="list-style-type: none"> • Proper containment of livestock, to reduce interaction with wild and other domestic animal populations. • Monitor diseases in livestock and implement appropriate actions to eliminate any diseases detected, especially those with potential to spread to wild populations (e.g., control vectors using bioenvironmental management techniques). • Ensure control of human/animal interactions. • Monitor diseases in livestock and implement appropriate actions to eliminate any diseases detected, especially those with potential to spread to humans (e.g., vector control, use of quarantine, contact avoidance, focal use of insecticides etc.). • Regulate livestock waste and ensure appropriate ventilation in livestock buildings to control emissions of noxious gases. • Safely manage chemicals (e.g., appropriate containers and labelling, workforce training, use of protective equipment).
	Generation of hazardous waste (including medical waste and animal tissues)	<ul style="list-style-type: none"> • Implement the veterinary waste management plan prepared for this project and work closely with the Enugu State Ministry of Health to provide guidance and monitoring. • Install incinerator with secondary burners and gaseous pollutant abatement technology to manage medical waste. • The receptacles for waste should be sized appropriately for the waste volumes generated, colour-coded and labelled according to the types of waste to be deposited. • Ensure workers handling waste from the facility are using appropriate PPE including coveralls, face masks, hand-gloves and safety boots.

ES 8: Estimated ESMP Implementation and Monitoring Costs

The total estimated cost for the ESMMP implementation and monitoring as shown in Table ES3 is ₦52,915,514(US\$ 64,760).

Table ES3: Estimated Budget for the Implementation of ESMP

Item	Responsibility	Cost Estimate in Nigerian Naira (₦)	Cost Estimate in US Dollars (US\$) *
ESMMP Implementation	Contractors/ ESMAAI	38,929,728	47,708
ESMMP Monitoring	ESMAAI, other MDAs	1,530,000	1,875
Training and capacity building	ESMAAI, ESMEMR and other MDAs	6,936,000	8,500
Disclosure	ESMAAI	3,000,000	3,676.47
Sub-Total		50,395,728	
Contingency	5% of Sub- Total	2,519,786	3,000
Total		52,915,514	64,760

*1 US\$ =N816

ES 9: Stakeholder Engagement and Consultation

Public consultation is a mandatory requirement and a good practice that ensures project sustainability. Prior to the execution of this ESIA, relevant stakeholders, especially potentially affected communities, were identified through a stakeholder mapping analysis. Through meetings with ESMAAI and from extensive literature review, a list of stakeholders was drawn. These stakeholders were contacted via visits and phone calls. Categories of stakeholders in the SAPZ project ecosystem include statutory MDAs, beneficiary/host/affected communities and project affected groups with varying range of influences and interests as identified. They were consulted on the 28th of September 2023. The concerns raised by the stakeholders were addressed. The ESIA team leader and the Hon Commissioner for Agriculture

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 10: ESIA/ESMP Disclosures

Following the review and clearance of this ESIA/ESMP by the FMEnv/AfDB, it will be disclosed at the National and local levels by ESMAAI in line with the applicable Nigerian EIA laws and regulations. Minimum disclosure requirements and budget is shown in Table ES4 below.

Table ES4: Disclosure Procedure to comply with Nigerian regulations

Action	Remarks	Cost (Naira)
Disclosure on 2 national newspapers	ESMAAI will disclose the ESIA/ESMP as required by the Nigeria EIA public notice and review procedures. This entails advert in 2 newspapers: one national and one local (state) newspaper	3,000,000
Disclosure at the ESMECC	The ESMAAI will disclose the ESMP as required by the Nigeria EIA public notice and review procedures	--
Disclosure at ESMAAI	The project proponent will display the ESMP as required by the Nigeria EIA public notice and review procedures	--
Disclosure at Owo, Nkanu East LGA office	The purpose will be to inform stakeholders about the project activities; environmental and social impacts anticipated and proposed environmental and social mitigation measures.	--
Total		3,000,000.00

CHAPTER 1: INTRODUCTION

1.1 Introduction

In collaboration with the African Development Bank (AfDB), important private investors, and the Federal Government of Nigeria (FGN), the Enugu State Government (ENSG) is developing a Special Agro-Industrial Processing Zone (SAPZ) project in three locations in the three senatorial zones of the State. The pilot phase is in Nkanu East Local Government Area (LGA), Enugu East Senatorial Zone of Enugu State.

The Special Agro-industrial Processing Zones (SAPZ) is a major investment program of the Federal Government of Nigeria (FGN), driven by the Federal Ministry of Agriculture and Rural Development (FMARD) in collaboration with the state governments, AfDB and other Development partners, relevant Federal Ministries, Departments and Agencies (MDAs) and private investors to develop agro-processing clusters in areas of high agricultural production across the country. It is aligned with the FGN's priority agenda and a flagship programme of the AfDB's Feed Africa Strategy. The development objective is to support inclusive and sustainable agro-industrial development. The primary goal of the SAPZ initiative is to encourage private sector investment in order to convert Nigeria's agriculture into one that is more focused on the market; increase household incomes, foster job creation in rural agricultural communities, especially for youth and women, and enhance food and nutritional security in Nigeria. The aim is to rapidly develop modern agro-processing capacity to serve the vast and growing local market, create sustainable market for farmers and reduce postharvest losses of local agricultural produce and thereby create wealth for farmers, promote import substitution and create sustainable agriculture related jobs for women and youth.

The SAPZ Program is aligned with the national policies and priorities. It seeks to sustainably contribute to poverty alleviation, hunger and inequality while providing opportunities for economic diversification, job creation, building climate resilience and improved livelihoods in Nigeria. It will also contribute to rural infrastructure development, improved access to agricultural markets, increased farm productivity, the adoption of agricultural technology, climate smart agricultural production and processing practices, increased value addition and agro-processing, increased skills acquisition and job creation, for all actors along the value chain, including the smallholder farmers, women and youth.

The first Phase of Special Agro-Industrial Processing Zone (SAPZ) Program was targeted at seven (7) states, namely: Cross River, Imo, Kaduna, Kano, Kwara, Ogun, and Oyo, and the Federal Capital Territory (FCT). The Program was valued for a total sum of USD538.05 million (net taxes), funded by AfDB, IsDB, IFAD, GCF, Federal and State Governments.

The second phase of the SAPZ program has been receiving relevant attention at appropriate quarters. Enugu State is among the twenty-one states that have submitted expression of interests (EOIs) to the Federal Ministry of Agriculture and Food Security, Abuja to participate in the second phase.

The **529.818 hectares** of land in Owo community, Nkanu East LGA, which was donated by the community and currently owned by the ENSG, will be the site of the proposed pilot site for Enugu State SAPZ. The project will involve the development of cassava and cereal crop farms, palm oil plantation, cotton farms and processing zones, large-scale cassava production and processing zones especially the production of bio-ethanol from cassava, processing of palm

fruit and palm kernel into oil palm, palm kernel oil and vegetable oil, the building of ranches and feedlots, the production of meat and milk, breed improvement zones, veterinary and disease control zones, waste management and treatment zones and the establishment of administrative offices and farmstead areas. In addition to the Akanu-Ibiam International Airport, which already serves Enugu, further supporting infrastructure for the SAPZ is being planned. This includes water supply, access roads, bridges, and drainages, as well as agro-input stores, a vocational training centre, schools, a clinic, and a truck parking area/car Park.

Numerous benefits will result from investing in agro products, including increased food production for the population (meat, milk, cheese, and other animal products), increased earning potential for farmers, the creation of jobs, economic prosperity, and an overall improvement in the standard of living for crop and livestock farmers, as well as other value chain activities. The creation and management of the SAPZ could, however, have a negative impact on both the natural and social ecosystems. The loss of plant and animal species due to habitat degradation in terrestrial and aquatic environments, the physical and economic uprooting and relocation of affected individuals and enterprises, and an increase in health and safety concerns are just a few examples of these impacts.

Consequently, in accordance with the requirements of the Environmental Impact Assessment (EIA) Act Cap E12 LFN 2004, which requires all significant public and private developments to go through the EIA process, the ENSG has contracted with **Green Engagement Limited** to conduct an Environmental and Social Impact Assessment (ESIA) for the proposed SAPZ. The ESIA will assist in identifying and assessing the potential environmental and social impacts and hazards of the proposed project, evaluating alternatives, and proposing appropriate ways to control the severe adverse consequences to ensure the project's overall sustainability over its lifetime. Thus, this ESIA is carried out for the proposed project in accordance with the Integrated Safeguards System (ISS) of the AfDB as well as the Nigerian EIA Act.

1.2 Project Key Features and Components of Enugu SAPZ

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 Enugu 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.

The project has four broad mutually reinforcing components namely:

- (v) Support the development of enabling climate adapted infrastructure for Agro-Industrial Hubs (AIHs);
- (vi) Improve agricultural productivity and enterprise development to enhance agricultural value chains and job creation in the SAPZ Catchment Areas;
- (vii) Support Agro-Industrial Zone Policy and Institutional Development; and
- (viii) Program Coordination and Management.

1.3 Project Development Objective of Enugu SAPZ

Key development Objectives of the proposed SAPZ frameworks is as follow:

Key Development Needs/SAPZ objectives include	Discussion
Increasing food production capacity and efficiency	It is anticipated that the processing hub will have the capacity to process about 200,000 tonnes of cassava and palm oil respectively; hence, the farmers will need to increase their output. The processing centre will also process other crops such as cereal crops, cocoa and tuber crops. Increased demand for these products will undoubtedly result in higher farmer incomes, which will improve their standard of living and help to reduce poverty. These factors all work together to boost food production.
Increasing value addition to agriculture produce	Rather than exporting just raw material as we practiced for many years across Africa, the processing hub will process raw materials, thus add more value to the raw material.
Promoting local, regional and international trade.	<p>The market for ethanol was estimated to be worth USD 89.1 billion globally in 2019. From 2020 to 2027, it is projected to develop at a compound annual growth rate (CAGR) of 4.8%. The demand for the product is driven by growing usage of the product as a biofuel and the rising consumption of alcoholic beverages</p> <p>By the end of 2025, the global palm oil market is anticipated to reach 111.3 million tonnes. With an output that is five to ten times more per hectare than other major vegetable oil crops, oil palm is the highest producing oil crop in the world.</p> <p>a) Ethanol, when blended with gasoline up to concentrations of 10% and 15%, tackles the problem of rising air pollution caused by automobiles. The addition of ethanol provides major advantages in terms of improved fuel economy, increased thermal efficiency and helps in cold starts during the winter season.</p>

	b) Apart from its many nutritional benefits, palm oil is quickly replacing petroleum-based products as an effective alternative in the transportation and energy industries. Furthermore, the World Health Organization's awareness efforts and government actions in Denmark and other Western European countries to reduce trans-fat consumption are expected to spur market expansion.
Promoting investments in agribusiness	c) The establishment of the processing hub, will promote investments into other linked value chain actors, such as seeds, mechanization, irrigation, aggregation storage, financial services etc.
Increasing the contribution of the agriculture sector to GDP, wealth and employment creation.	Sustainable direct and indirect employment of over 20,000 persons, as a result of the reviving of other value chain actors.

1.4 Project Categories and activities

The SAPZ project is a multi-sector intervention covering the following components:

Table 1.1: Project Categories of SAPZ and Planned Activities

S/N	Building Blocks	SAPZ Categories	Activities
1	Agricultural Transformation Centre	Nursery bed	<ul style="list-style-type: none"> Develop Nursery beds for palm trees and Cocoa
		Oil palm production	<ul style="list-style-type: none"> Support to the farmers for transplanting and of oil palm seedlings and production of oil palm
		Cassava Production	<ul style="list-style-type: none"> Support farmers for the production of cassava that will serve as feedstock for the ethanol production plant
		Maize Production	<ul style="list-style-type: none"> Support farmers for the production of maize that will serve as feedstock for animal feed production.
		Fodder Production	<ul style="list-style-type: none"> Support farmers for the production fodder plants for animal grazing.
		Yam Production	<ul style="list-style-type: none"> Support farmers for the production of yam
		Cocoa Production	<ul style="list-style-type: none"> Support to the community for transplanting and of cocoa seedlings and production of cocoa
		Poultry Production	<ul style="list-style-type: none"> Construction of poultry houses-deep litter, and battery cage systems
		Livestock Production	<ul style="list-style-type: none"> Construction of pens for Cattle, sheep and goat production

		Breed Improvement Zone	<ul style="list-style-type: none"> • Construction of breeding stations
		Soybean production	<ul style="list-style-type: none"> • Support farmers for the production of soybean that will serve as feedstock for animal (poultry) feed production.
2	Aggregation Centre (AC)	Crop Storage Zone	<ul style="list-style-type: none"> • Warehouse for the storage of crops and silos for grain storage.
		Livestock Handling and storage Zone	<ul style="list-style-type: none"> • Construction of animal handling and storage house.
			<ul style="list-style-type: none"> • Breed Improvement Zone -Construction of breeding stations.
			<ul style="list-style-type: none"> • Veterinary and Disease Control - Construction of veterinary and quarantine stations
3	Agro-Industrial Hub (AIZ)	Cassava Processing	<ul style="list-style-type: none"> • Ethanol Production Plant
		Livestock Processing Zone	<ul style="list-style-type: none"> • Construction of Abattoir/ slaughterhouse (cattle, sheep, goats, poultry) • Construction of meat processing and storage facilities (cold rooms). • Construction of leather curing facilities • Construction of boreholes for water supply • Construction of wastewater treatment plants
		Animal feed (poultry and, aquaculture)	<ul style="list-style-type: none"> • Animal feed production plant
		Oil palm Processing	<ul style="list-style-type: none"> • Processing of oil palm – palm oil, palm kernel oil and other derivatives.
		Fodder plant	<ul style="list-style-type: none"> • Fodder plant for the processing of feeds for livestock
		Infrastructure development	<ul style="list-style-type: none"> • Access roads, bridges and drainages • Livestock Market • Facilities for managing waste including wastewater, manure and dead animals. • Buildings for workers and storage facilities including Farmhouses, Offices, Agro-input shops, Stores (for feed, materials and equipment) etc. • Other Buildings including Vocational Training Centre, Primary School and Clinic • Truck parking area/car park • Solar Farm
			<ul style="list-style-type: none"> •

1.5 Project Justification

This SAPZ project will be in line with the state and federal government's vision of encouraging production and value addition to Cassava and Palm oil. Even though Cassava and Palm oil are the major cash crops cultivated in Enugu State, the main inhibiting factor affecting Cassava and Palm oil farmers is poor processing infrastructure and unfair prices between the export market and the producers, as a result, these farmers generally live in poverty, as they are unable to plan or increase their incomes. The SAPZ will combat this issue by off-taking the raw cassava tubers and palm oil seeds on a fair and consistent basis. The SAPZ will subsequently transform the cassava tubers into ethanol, cassava flour, extract starch and Garri, while the palm oil seeds will be processed for red oil, vegetable oil and palm kernel cake used for animal feed production.

The Enugu SAPZ is further justified on the ground of the multiple benefits it promises to deliver and the attendant proposed and available infrastructure within the area. Some of the potential benefits and attractions of the SAPZ include:

- Sustainable direct and indirect employment of over **2,200** persons estimated from an average of **4 workers** per hectare.
- Improved access to high quality livestock products such as meat, milk egg, cheese etc., thereby enhancing food and nutrition security for the local population.
- Infrastructural development, around the facilities of the Special Agro-processing hub (extension of infrastructure from Emene Industrial Layout/Park)
- Increased incomes for the farmers and better purchasing power for farmers across **3** senatorial zones, through access to better inputs, resulting to better yields and reduced post-harvest losses from Processing.
- Promotion of price stability with the necessary regulation by Enugu State Government.
- Expansion of demand for local agricultural produce by creating new international and local market.
- Increase in the foreign exchange (forex) earning on palm oil after meeting local demands.
- Creation of additional forex earning opportunity by exporting ethanol, starch and cassava flour.
- Improvement of the living and working conditions of local farmers and their families and workers.
- Raising the opportunities for local farmers to participate in the decision making processes behind cocoa marketing.
- Support other ancillary Infrastructural development such as:
 - Power/Electricity generation and distribution
 - Health facilities
 - Irrigation/water facilities
 - Education (Schools)
 - Roads infrastructure
 - Water infrastructure (potable water supply)
 - Vocational Training
 - Sports and leisure options for youth

Nursery Beds

A 30 ha of land will be carved out at pilot project site at Owo for use as a nursery bed for oil palm, cocoa and crop production. Here seedlings of plants of interest to be planted will be

grown in nurseries until ready for transplant. The site for the nursery beds is so situated as to benefit from the water body flowing adjacent it.

Fodder Plant

Cultivation of fodder plants will be necessary to serve as feed for farmed animals. The plants will produce concentrated animal feed from grain crops which will then be used to feed cattle, sheep, goats and poultry. The production process will include the following operations:

- Raw products will be sourced from those farmed within the crop production area
- Grain and meals will be stored in silos, where the raw products will be delivered by closed-type conveyors. Mineral products and premixes will be stored in bags in a warehouse.
- Cracking of grain, meals and mineral components.
- Dosing of vitamin-mineral complexes (micro-dosage).
- Batch mixing of raw products with use of buffer and discharge bins.
- Pelletising the raw materials by additional mixing in a blade mixer whilst applying steam before cooling of the produced feed.
- Storage of pelletised feed.

Feedlots

The feedlot is an area within the Reserve where animals will be fed with certain types of feed with the goal of growing and or fattening cattle until they reach slaughter weight. The feedlot section will contain forage of high-grain rations and other types of feed which will be determined by livestock nutrition specialists to speed up the fattening process of the animals particularly the calves or yearlings until they reach a prescribed finish (fat cover) before slaughtering.

Crop Production Area

An area within the adjoining 10,000 ha of land will be allocated for the cultivation of palm trees, cassava and maize. Following harvest, the vegetal remains from the farms will be used as raw material for fodder production.

Cassava cultivation and processing plant:

Cassava crops will be grown in the crop processing area as well as an included value chain that processes the cassava into ethanol, starch, flour and Garri. The establishment of Ethanol Plant is technically feasible and economically viable as raw materials (Cassava tubers) for its production will be produced in the SAPZ and demand for ethanol is high. The production process of ethanol from cassava involves; peeling and washing of cassava, milling/grating of cassava peeled tubers, pressure cooking, fermentation and distillation. One tonne of cassava will produce not less than 200 litres of ethanol. Cassava also contains 20 – 30 % starch.

Oil Palm Plantation and processing

A major component in the SAPZ will be the cultivation of oil Palm trees and subsequent production of Palm oil. The oil processing plant entails a mechanized process for maximum output. After the harvested fruits have been cut down at maturity, a palm fruit sterilization machine uses high temperature to cook palm fruit bunches, after which the palm fruits will go through a process known as threshing where each piece of palm fruit is separated from its bunch. Lastly the fruits is pressed to separate the oil from its skin and pulp and then filtered. Wastes generated from production will also serve as animal feed.

Water Supply Facilities

Essentially, the water supply infrastructure planned for the SAPZ will include a network of boreholes. A water holding tank will be built to ensure steady supply of water for the animals during the dry season months.

Storage Silo

Silos are required for the plants, to store large volume of raw produce delivered to the SAPZ. The storage silo will include an operational tank, standby tank, and spare tank.

Roads

In order to increase the efficiency of commodities evacuation and reduce transportation costs, roads rehabilitation, spot improvements, routine and recurrent maintenance, new road and bridge construction, will have to be carried out in different locations where the farms are located.

Abattoir (Slaughter house)

The abattoir will be designed such that the slaughtering is carried out in fully mechanised lines where workers are assigned to specific workstations and the carcasses moved on a conveyor system from station to station until the slaughter process is completed. The abattoir will have the capacity to slaughter between 100 - 500 animals weekly and require approximately 50 employees once operational. Hot water for heating, cleaning and use in the treatment of the carcasses will be provided by the site's boiler house. The site will source electricity from the onsite solar farm. Water will be drawn from the site boreholes. The abattoir, slaughtering and processing must conform to the recommendations of FAO (1991)¹.

Cold Room/ Refrigeration

Cold room will be provided as part of the abattoir so that the carcasses can go into the cooler as soon as possible in order to retard bacterial growth and extend the shelf-life. Chilling meat post-mortem from 40°C down to 0°C and keeping it cold will give a shelf-life of up to three weeks, provided high standards of hygiene were observed during slaughter and dressing. Carcasses will be placed in the cooler immediately after weighing and hang on rails and never touch the floor. After several hours, the outside of a carcass will feel cool to the touch, but the important temperature is deep inside the carcass. The internal temperature of the meat will be measured with a probe thermometer (not glass) and used as a guide to the efficiency of the cooling. FAO recommendations of deep muscle temperature of 6 –7° C achieved in 28 to 36 hours for beef, 12 to 16 hours for pigs and 24 to 30 hours for sheep carcasses will be followed.

Transportation of Beef (Carcass)

Vehicles for transporting beef carcasses will be considered as an extension of the refrigerated storage so as to maintain the meat temperature at or near 0°C. Meat will be chilled to 0°C before loading and hang on rails, not on the floor while the trucks will carry nothing other than meat. To ensure an unbroken cold chain, insulated vans and closed trucks will be considered as suitable transport for meat to maintain an unbroken cold chain and integrity of meat during transport. Loading and unloading will be done quickly. If there are any unavoidable delays then dry-ice blocks will be placed in the partly filled van.

Other Supporting SAPZ Infrastructure

¹Guidelines for slaughtering, meat cutting and further processing. FAO Animal Production and Health Paper 1991. <http://www.fao.org/3/T0279E/T0279E00.htm>.

SAPZ Hub will be developed to include power infrastructure, water, buildings and processing plants. There will be about 250 hectares of land for other agro-allied related companies to lease for Agro-industrial production such as animal feed mill, veterinary clinics and agro-chemical market. Other sub-concessions will be agro input dealers, processors, aggregators, warehouse businesses for storage etc.

1.6 Objective of the ESIA

The overall objective of this ESIA is to identify and evaluate all potential adverse environmental and social impacts and effects that could arise from the activities associated with the construction and operation of the proposed Agro processing facilities and ancillary infrastructure. Once potential adverse environmental and social impacts are identified, appropriate mitigation measures will be developed to mitigate the identified negative impacts on the bio-physical and social environment. Ultimately, the outcome of this ESIA will be mainstreamed into the final project designs and project implementation processes to ensure the sustainable management of the environment during project implementation.

1.7 ESIA Report Structure

The structure of this ESIA report as presented below will be preceded by an Executive Summary.

Chapter 1: Introduction. Provides a background to the proposed Project including the objectives, justification and components.

Chapter 2: Institutional and Legal Framework. The Legal and Regulatory Framework within which the ESIA was undertaken were also stated while other environmental legislation, standards and guidelines applicable to the Project were listed.

Chapter 3: Project location and Site Description. The chapter provides a description of the Project State and detailed Site Description.

Chapter 4: Biophysical and Socio-economic baseline. The chapter defines the areas of direct and indirect influence of the Project. It describes the biophysical and socio-economic baseline of the Project's areas of influence and presents the public participation process in the ESIA.

Chapter 5: Impact Assessment. The chapter presents the approach and methodology for the ESIA process. It identifies and assesses potential Project impacts (biophysical and socioeconomic impacts).

Chapter 6: Mitigation Measures. This chapter defines relevant mitigation measures to avoid, reduce, compensate or enhance Project impacts (as applicable).

Chapter 7: Environmental and Social Management Plan (ESMP). It presents the Project ESMP, organizing all mitigation, management and monitoring requirements and management programs.

Chapter 8: Public consultation

Appendices: This section provides support information referenced throughout the ESIA including the General Environmental Management Measures for inclusion in Contractors Contracts.

CHAPTER 2: LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 Introduction

This section provides an overview of the policies, regulations and laws as well as institutional structures applicable to the proposed development of SAPZ project as well as the environment and social (E&S) sustainability requirements in Enugu State and Nigeria at large. In addition, other relevant international E&S standards, policies and agreements to which Nigeria is a party are also discussed.

The section succinctly summarises applicable national and state policies, guidelines, edicts, regulations and laws relevant to this ESIA and the development of the proposed SAPZ.

2.2 National Policies and Laws on Environmental Protection

2.2.1 National Policy on the Environment (Revised 1999)

The National Policy on the Environment describes the conceptual framework and strategies for achieving the overall goal of sustainable development in Nigeria. Specifically, the goals of the Policy include to:

- Secure a quality of environment adequate for good health and human well-being.
- Conserve and use the environment and natural resources sustainably for the benefit of the present and future generations.
- Restore, maintain and enhance ecosystems and ecological processes essential for the functioning of the biosphere to preserve biological diversity and the principle of optimum sustainable yield in the use of living natural resources and ecosystems.
- Raise public awareness and promote understanding of the essential linkages between the environment, resources and development, and encourage individual and community participation in environmental improvement efforts.
- Co-operate with other countries, international organizations and agencies to achieve optimal use of trans-boundary natural resources and effective prevention or abatement of trans-boundary environmental degradation.

2.2.2 EIA Act Cap E12 LFN 2004

The EIA Act No. 86 of 1992 as amended by EIA Act Cap E12 LFN, 2004 is the principal legislative instrument relating to activities that may likely or to a significant extent affect the environment. The Act sets the goals and objectives of EIA and procedures including the minimum requirements for the conduct of EIA of public or private projects. The Act makes EIA mandatory for all major development projects likely to have adverse impacts on the environment and gives specific powers to FMEnv to facilitate environmental assessment of projects in Nigeria.

FMEnv categorizes mandatory study activities into three categories: Category 3 activities have beneficial impacts on the environment. For Category 2 activities (unless within the Environmentally Sensitive Area) full EIA is not mandatory, while Category 1 activities require full and mandatory EIA. Projects are pre-listed into these categories based on type and whether it would involve physical intervention of the environment. Either the listing or the result of an Initial Environmental Evaluation (IEE) is used to determine projects requiring full EIA. In accordance with the EIA Act, the development of the SAPZ at Nkanu East LGA has been classified as Category 1 project, requiring mandatory ESIA.

The FMEnv established the National EIA Procedural Guidelines in 1995 that indicate the process for conducting an EIA for projects in Nigeria in line with the requirements of the EIA Act CAP E12 LFN 2004. The process has been designed to ensure that the proposed project is implemented with maximum consideration for the environment. The basic steps in the EIA process include submission of Project Proposal/TOR, Initial Environmental Examination, Scoping, EIA Study, Review, Decision Making, Monitoring and Auditing. For smaller project with lower categorisation, the regulators allow the development of simple ESIA that will produce a focused ESMP for the project activities. In such case, the normal ESIA process may not be totally followed. These steps are shown in Figure 4.

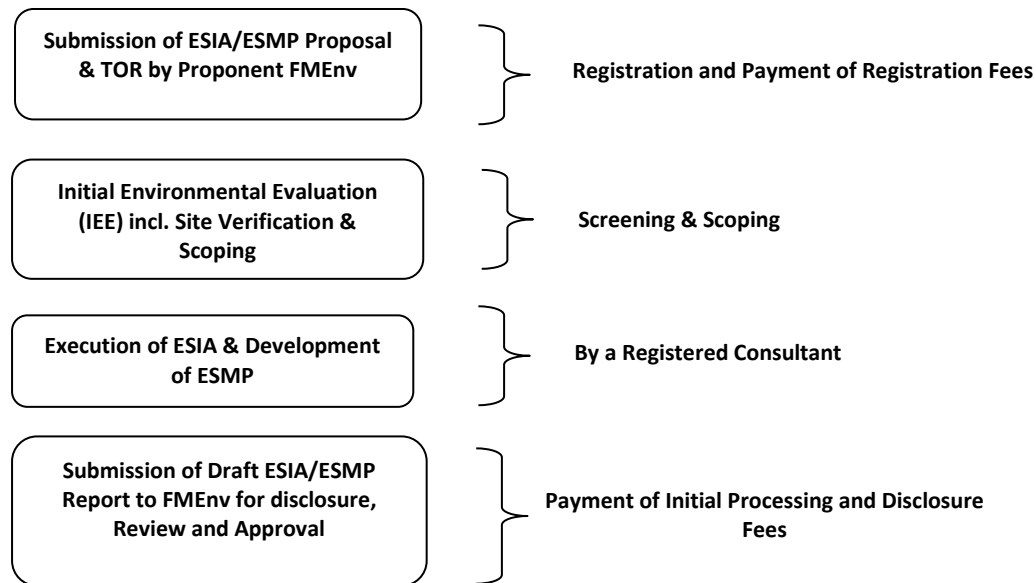


Figure.1: The ESIA/ESMP Development Flowchart

2.2.3 National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991

These Regulations address handling and management of solid, radioactive and (infectious) hazardous waste. They define the objectives of management of solid and hazardous waste, the functions of appropriate Government agencies and obligations of industries. The Regulations mandate all industries to inform FMEnv of all toxic, hazardous and radioactive substances which they keep in their premises and/or which they discharge during their production processes. Schedule 12 and 13 of the Regulations provide a comprehensive list of all waste deemed to be hazardous and dangerous.

2.2.4 National Environmental (Sanitation and Wastes Control) Regulations, 2009

The Regulations provide the legal framework for the adoption of sustainable and environment friendly practices in sanitation and control of solid wastes, hazardous wastes and effluent discharges to minimize pollution. Part 3 of the Regulations states that all owners or occupiers of premises shall provide waste receptacles for storage before collection by licensed waste managers. In addition, the Regulations make it mandatory for facilities that generate waste, to reduce, re-use, recycle and ensure safe disposal to minimize pollution. The Regulations also spell out roles and responsibilities of State and Local Government Authorities.

2.2.5 National Environmental (Noise Standards and Control) Regulations, 2009

The purpose of these Regulations is to ensure maintenance of a healthy environment for all people in Nigeria, the tranquillity of their surroundings and their psychological wellbeing by

regulating noise levels. The Regulations prescribe the maximum permissible noise levels on a facility or activity to which a person may be exposed and provide for the control of noise and for mitigating measures for the reduction of noise.

2.2.6 National Environmental (Surface & Groundwater Quality Control) Regulations 2011

The purpose of these Regulations is to restore, enhance and preserve the physical, chemical and biological integrity of the nation's surface waters and to maintain existing water uses. The Regulations also seek to protect groundwater sources by regulating the discharge of hazardous wastes, fossil fuels energy and any other substances having the potential to contaminate groundwater. The Regulations also include amongst others, the application and general provisions of water quality standards for various uses such as agriculture, industrial, aquatic life and recreation.

2.2.7 Harmful Wastes (Special Criminal Provisions etc.) Act CAP HI LFN 2004.

An Act to prohibit the carrying, depositing and dumping of harmful waste on any land, territorial waters and matters relating thereto. Specifically, Section 1 of the Act prohibits all activities relating to the purchase, sale, importation, transit, transportation, deposit and storage of harmful wastes. Section 6 of the Act spells out the penalty for offences under the Act to include life imprisonment for individual and appropriate punishment for corporate bodies.

2.2.8 National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations, 1991

The Regulations spell out the requirements for identification of solid, toxic and extremely hazardous substances to public health and provides necessary measures to facilitate the disposal of hazardous waste. The Regulations also highlight possible reuse and recycling of hazardous waste and requirements for groundwater protection, surface impoundment, land treatment, waste piles, landfills, incinerators, etc.

The Regulations prohibit industry or facility from release of hazardous or toxic substances into the air, water of Nigeria's ecosystems beyond the permissible limits of FEPA (now FMEnv). The Regulations further charge an industry or facility to have a pollution monitoring unit within their premises, (b). Have on site a pollution control and (c). Assign the responsibility for pollution control to a person or body accredited by the FMEnv. Section 5 of the Regulations mandate industry or facility to submit to the nearest office of FMEnv a list of chemicals used in the manufacture of its product, details of stored chemicals and storage conditions and where chemicals are bought, sold or obtained.

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

The Guidelines and Standards for Environmental Pollution Control in Nigeria was promulgated in March 1991 to serve as a basic instrument for monitoring and controlling industrial and urban pollution. The guidelines and standards relate to six (6) areas of concern, namely: Effluent limitations, Water quality or industrial water uses at point of intake, Industrial emission limitations, Noise exposure limitations, Management of solid and hazardous wastes and Pollution abatement in industries.

Specifically, it provides effluent limitation guidelines for various categories of industries as well as water quality requirements for various industries and processes. It adopts the WHO limits for domestic water use. It also provides gaseous emissions and ambient air quality

limitations as well as guidelines for the management of solid and hazardous wastes. It provides interim permissible limits as protective measures against indiscriminate discharge of particulate matter and untreated industrial effluents.

2.2.10 National Environmental Protection (Effluent Limitation) Regulations, 1991

The Regulations mandate every industry which discharges effluent to install antipollution equipment for the treatment or detoxification of effluent and chemical discharges emanating from the industry to ensure assimilation by the receiving water body into which the effluent is discharged. The Regulations also provide that such antipollution equipment must be based on the Best Available Technology (BAT), the Best Practical Technology (BPT) or the Uniform Effluent Standards (UES) to ensure effluents are treated to a uniform level as specified in the Second Schedule in the Regulations.

In addition, the Regulations stipulate that industry must monitor their effluents and report the composition of their treated effluents to the nearest office of the FMEnv from time to time. Schedule 1 of the Regulations provides the list of wastewater parameters to be monitored by respective industry while Schedule II states the Effluent limitation guidelines in Nigeria for all categories of industries.

2.2.11 Land Use Act CAP L5 LFN 2004

The Land Use Act is the legal framework for land acquisition and resettlement in Nigeria. The Act vests all land comprised in the territory of each State in the Governor of that State and requires that such land shall be held in trust and administered for the use and common benefit of all Nigerians. Specifically, the Act stipulates that: (a) All land in urban areas shall be under the control and management of the Governor of each State; and (b) all other land, subject to this Act, shall be under the control and management of the Local Government within the area of jurisdiction in which the land is situated. The Act gives the government the right to acquire land by revoking both statutory and customary rights of occupancy for the overriding public interest. In doing so, the Act specifies that the State or Local Government should pay compensation to the current holder or occupier with equal value.

The entire 529.818 ha of land which was donated by the Owo community have been carved out for the SAPZ and has been gazetted by the Enugu State Government. Some parts of the land were cultivated by some community members but they indicated during the consultation with the community as part of this ESIA that they have voluntarily donated the land for the SAPZ project. Other parts of the land are uncultivated and are covered with trees and shrubs depicting the derived savannah ecology typical of Enugu State. Consequently, the project will not involve any physical or economic displacement but rather provide opportunities for more farmers to come into the area and participate in the programme.

2.2.12 Public Health Law Cap 103 LFN 1990

Public Health Law examines the authority of the government at various jurisdictional levels to improve the health of the general population within societal limits and norms. The State is empowered to protect and improve the environment and safeguard the water, air and land, forest and wildlife of Nigeria. The law prohibits the public or private sector of the economy not to undertake or embark on or authorize projects or activities without prior consideration of the effect on the environment.

2.2.13 National Environmental (Construction Sector) Regulations, 2011. (S.I No. 19)

It is the regulation that covers environmental considerations in construction sector. Part II of the regulation discusses specific provisions for site waste management plans, storm water discharge, lighting activities, control of dust and fugitive emission, noise control, avoiding nuisance, hazardous substances, use of asbestos, spent oil, prevention and control of explosion hazards, radiation, polluter-pays-principle, community relations and close-out. The design of the proposed cassava and oil palm processing facilities and ancillary infrastructure must therefore consider and comply with the requirements of these Regulations.

2.2.14 Employee's Compensation Act, 2010

The Act provides for an open and fair system of guaranteed and adequate compensation for all employees or their dependants for any death, injury, disease or disability arising out of or in the course of employment. The Act also makes provision for rehabilitation of employees with work-related disabilities and establishment of a solvent compensation fund managed in the interest of employees and employers. One of the core objectives of the Act is to harness combined efforts and resources of relevant stakeholders for the prevention of workplace disabilities and the enforcement of occupational safety and health standards in Nigeria. Occupational accidents and injuries arising during the construction phase of the development will be handled using the employee's compensation Act.

2.2.15 Factories Act (CAP F1), 2004

The Act establishes a legal framework for the registration of factories and to make adequate provisions regarding the safety of workers against occupational hazards and to impose penalties for any breach of its provisions. All workplaces are covered by this Act.

2.3 Institutional Framework Relevant to Enugu State SAPZ

2.3.1 Federal Ministry of Environment (FMEnv)

The Federal Ministry of Environment (FMEnv) which was formerly known as the Federal Environmental Protection Agency (FEPA) was established in 1999 through Decree No. 58 of 1988 as amended by Decree No. 59 of 1992. The Ministry is the statutory government institution mandated to coordinate environmental protection and natural resources conservation for sustainable development in Nigeria. Some of the other mandates of the Ministry include:

- Advising the Federal Government on national environmental policies and priorities, conservation of natural resources, sustainable development as well as scientific and technological activities affecting the environment and natural resources; and
- Prescribing standards and formulating regulations on water quality, effluent limitations, air quality, atmospheric protection, ozone protection, noise control as well as the removal and control of hazardous substances.

As established in the EIA Act 86 of 1992, all public and private projects likely to negatively affect the environment must be submitted to the EIA process administered by the FMEnv including infrastructural development and agricultural activities. The EIA Division of the Environmental Assessment (EA) Department at the FMEnv is the main administrative unit responsible for overseeing the EIA process, preparing documents and developing the procedures necessary for decision making on project certification by the Minister of Environment.

2.3.2 National Environmental Standards and Regulations Enforcement Agency (NESREA)

The National Environmental Standards and Regulations Enforcement Agency (NESREA) was established by the NESREA Act of 30th July 2007 as an Agency of the FMEnv. NESREA is charged with the responsibility of enforcing all environmental laws, guidelines, policies, standards and regulations in Nigeria. It also has the responsibility to enforce compliance with provisions of international agreements, protocols, conventions and treaties on the environment to which Nigeria is a party.

2.3.3 Federal Ministry of Agriculture and Food Security (FMAFS)

The Federal Ministry of Agriculture was created in 1966 with the mandate to ensure food security in crop, livestock and fisheries, stimulate agricultural employment and services, promote the production and supply of raw materials to agro industries, provide markets for the products of the industrial sector, generate foreign exchange and aid rural socio-economic development. The vision of the Ministry is to grow Nigeria's agriculture sector, drive income growth, accelerate food and nutrition security, generate employment, and transform Nigeria into a leading global food market with wealth for farmers. The Ministry intends to achieve its vision by organising and managing the agriculture sector and facilitating agribusiness for increased food security and employment along commodity value chains and agro-industrial development to earn foreign exchange and contribute to socio-economic development of the country.

The FMAFS is the lead implementing Ministry for the SAPZ in the country. The Federal Project Management Unit (FPMU) for the programme coordinates the programmes and actions plan; prepares plans for effective project development and management; coordinates all environmental and social issues through a Safeguard unit. The FPMU also liaises with the various levels of government and other identified stakeholders, namely relevant Federal MDAs, State MDAs, LGAs, project host communities, NGOs/CSOs, Traditional Rulers; Trade Unions/Local social and professional groups, and the public. To ensure sustainability in all sub-project activities, an environmental and social development safeguards unit was formed which includes the environmental and social development safeguards officers that report directly to the Project Coordinator.

2.3.4 Enugu State Ministry of Agriculture and Agro Industrialization (ESMAAI)

The Enugu State Ministry of Agriculture has the vision to grow the agricultural sector in the State into an industrialized economy through an efficient, dynamic, competitive, sustainable and export-led agricultural sector that assures food security, increased income and generates employment. The mission is to facilitate and promote the sustainable development of our agriculture to enhance the quality of life, ensuring a safe, affordable nutrition and accessible good supply to reduce hunger. The SAPZ programme is managed at the state level by the Enugu state Ministry of Agriculture.

2.3.5 Enugu State Ministry of Environment and Climate Change (ESMECC)

The ESMECC was established in accordance with part III of Section 5(2) of Enugu State Law No. 8, 2004. The functions of the ministry are as follows:

1. General protection and development of the environment, conservation of biodiversity, natural resources and sustainable development of the State.
2. Provision and maintenance of environmental technology, including initiation of policy in relation to environmental research and technology.

3. Preparation of comprehensive State Policy for the protection of the environment and conservation of biodiversity.
4. Preparation of procedures for Environmental Impact Assessment and Environmental Audit for new industries and existing facilities in the State.
5. Preparation of Annual Environmental Report for the State.
6. Advise the State Governor on both the Federal and State Environmental Policies and priorities and on scientific and technical activities affecting the State's environment.
7. Monitoring and Regulation of commercial soil/gravel excavation through the State.
8. Maintenance of clean and healthy environment in Enugu State.
9. Establishment, maintenance and cleaning of public conveniences.
10. Controlling and supervising sewage disposal services.
11. Inspection of buildings/premises for the purpose of ensuring that sanitary conditions are maintained in such buildings/premises.
12. Controlling of pests/vectors via fumigation/, etc. and stray animals.
13. Carry out toxicological test on insecticides, herbicides and other agricultural chemicals, checking their possible adverse effects on the environment.
14. Ensure that all existing industries, petrol stations and mechanic workshops carry out EIA of their work environment and facilities etc.

2.3.6 Enugu State Waste Management Authority (ESWAMA)

The Enugu State Waste Management Authority Law was enacted in 1992.

1. To collect, remove, process, treat and safely dispose of domestic, hospital, commercial, institutional and industrial waste;
2. To recycle waste;
3. To design blue print for establishment of sewage disposal system and cleaning of sewage;
4. To clean streets;
5. To remove and dispose of abandoned vehicles;
6. To remove and dispose of carcass of dead animals from public places;
7. To design, operate and maintain waste disposal facilities;
8. To approve and keep close watch on all waste disposal systems in the State; etc.

2.3.7 Nkanu East LGA

The proposed project is within the jurisdiction of Nkanu East LGA of Enugu State. The LGA being the third tier of government is empowered to oversee primary education, public health, town and regional planning, roads and transport, refuse collection and disposal and environmental protection amongst other things within their jurisdiction.

2.4 Gender Based Institutions, Policies and Legal Provisions

This section succinctly summarises the roles of relevant national and state institutions as well as applicable policies, guidelines and laws which address Gender Based Issues in Enugu State and Nigeria.

2.4.1 Federal Ministry of Women Affairs (FMWA)

The national machinery for the promotion of gender issues in Nigeria is the Department of Women Affairs of Federal Ministry of Women Affairs and Social Development (FMWASD), which was established in 1995. The objective and vision statement of FMWASD is as follows: To have a Nigerian society that guarantees equal access to social, economic and wealth creation opportunities to all, irrespective of gender; and one that places premium on protection of the child, the aged and persons with disabilities, while focusing attention on key operators in both private and public sectors on mainstreaming the concerns of these groups of people in national development process.

Their role is to serve as the national vehicle to bring about speedy and healthy development of Nigerian women, children, the socially disadvantaged and persons with disabilities and the mainstreaming of their rights and privileges in national development processes.

2.4.2 Enugu State Ministry of Women Affairs & Social Development (ESMWASD)

At State level, ESMWASD is empowered to create a conducive environment for the development of women, children and other vulnerable people by providing equal opportunities, adequate care and support for them and harnessing their potentials. The Ministry ensures holistic development of women through Educational, Economic, Social and Political empowerment and monitoring gender responsive issues amongst other functions.

2.4.3 Gender Based Policies and Legal Provisions

The summary of relevant laws and policies with focus on gender based issues including Gender Based Violence (GBV), Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH) and other forms of abuse and discriminatory attitudes to be considered during the implementation of proposed project are provided in Table 2.1.

Table 2.1: Gender Based Policies and Legal Provisions

Instrument	Provisions
The 1999 Constitution	The Constitution of the Federal Republic of Nigeria, 1999 is the core framework for the recognition and protection of fundamental human rights in Nigeria, including the right to the dignity of the person. The Constitution provides a general framework available to all classes of individuals for the redress of specific rights violations.
National Gender Policy, 2006	Its overall goal is to promote the welfare and rights of Nigerian women and children in all aspects of life: political, social and economic. The policy seeks to plan, coordinate, implement, monitor and evaluate the development of women in the county. In concrete terms, the National Gender Policy in Nigeria focus on: <ul style="list-style-type: none"> • Contribution towards women’s empowerment and the eradication of unequal gender power relations in the workplace and economy, in trade unions and in broader society.

	<ul style="list-style-type: none"> • Encouragement of the participation, support and co-operation of men in taking shared responsibility for the elimination of sexism and redefining of oppressive gender roles. • Increase the participation of women in leadership and decision-making. • Ensure that through labour legislation and collective bargaining, the particular circumstances of women are considered and that measures are promoted to eliminate discrimination on the basis of gender. • Ensure that there is a gender perspective in all sectors of development.
The National Action Plan for the Implementation of United Nations Security Council Resolution 1325 (2009)	The development of the National Action Plan (NAP) for the implementation of United Nations Security Council Resolution 1325 became imperative for the inclusion of Women in the process of peace building, peace keeping, conflict resolution and management in Nigeria. The NAP acknowledges the heavy price the Nigerian women have paid violent conflicts that have been ravaging the country especially unprecedented levels of sexual violence and assault, along with related HIV infections, involuntary pregnancies and health complications as a result of abuses. The NAP presents a comprehensive political framework within which the protection of women and their roles in peace processes can be achieved.

International Conventions and Treaties on Gender Based Issues

The federal government of Nigeria has ratified multiple international laws and conventions to address the historical discrimination and marginalization of women and girls including the ones highlighted below.

2.4.4 Regional Treaties Relevant to GBV

- The African Charter on Human and Peoples’ Rights (ACHPR) (1982).
- The African Charter on the Rights and Welfare of the Child (ACRWC) (2007).
- The Protocol to the ACHPR on the Rights of Women in Africa (the “Maputo Protocol”) (2007).

2.4.4 International Treaties Relevant to GBV

- The International Covenant on Economic, Social and Cultural Rights (ICESCR) (2004).
- The International Covenant on Civil and Political Rights (ICCPR) (2004).
- The Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT) (1993).
- The Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) (1984).
- The Convention on the Rights of the Child (CRC) (1990).
- The Convention on the Rights of Persons with Disabilities (CRPD) (2012).
- International Convention on the Elimination of All Forms of Racial Discrimination (1976).

2.5 Development Financial Institutions Environmental and Social requirements

Environmental and social standards are established criteria for the Development Financial Institutions in terms of requirements for activities that it will or will not finance and also establish requirements for clients/investees to comply with, such as national environmental and social regulations and international standards. The commitments of DFIs to Environmental and

Social Governance in project financing are embedded in developed standards known as safeguards polices. This includes the ISS of AfDB, the ESS of World Bank amongst others.

2.5.1 The African Development Bank (AfDB) Integrated Safeguards System (ISS)

The E&S safeguards of the AfDB are a cornerstone of the Bank’s support for inclusive economic growth and environmental sustainability in Africa. AfDB will apply the Integrated Safeguards System for the proposed Enugu State SAPZ. The Bank ISS is designed to promote the sustainability of project outcomes by protecting the environment and people from the potentially adverse impacts of projects. This requires that all the activities under the project will comply with the safeguard requirements of the ISS during projects preparation and implementation. The safeguards aim to:

- Avoid adverse impacts of projects on the environment and affected people, while maximizing potential development benefits to the extent possible.
- Minimize, mitigate, and/ or compensate for adverse impacts on the environment and affected people when avoidance is not possible.
- Help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage E&S risks.

The ISS consists of four inter-related components as summarized in Figure 2 below.

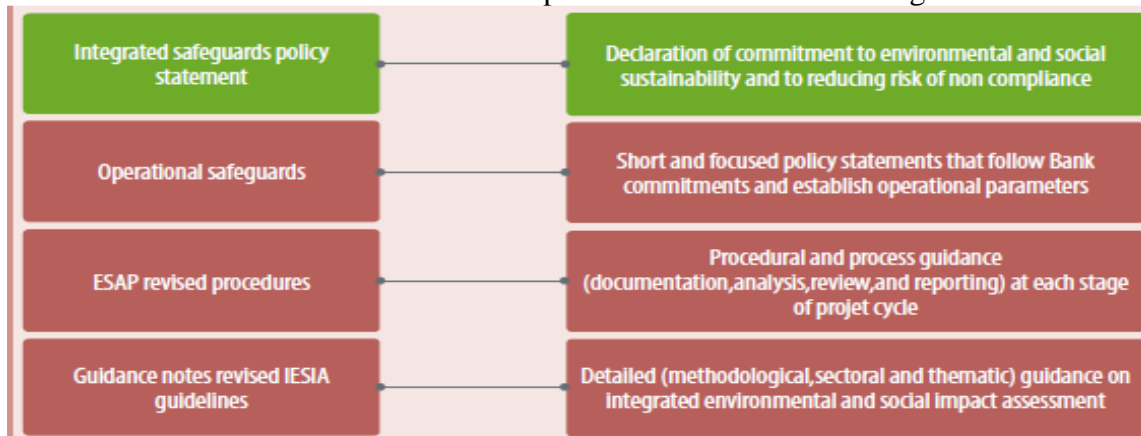


Figure.2: Structure of the AfDB ISS

2.5.1.1 The Integrated Safeguards Policy Statement

This describes common objectives of the Bank’s safeguards and lays out policy principles. It is designed to be applied to current and future lending modalities and it considers the various capacities and needs of regional member countries in both the public and private sectors. The Integrated Safeguards comprises of Policy Statement that sets out the basic tenets that guide and underpin the Bank’s approach to environmental safeguards. The Bank’s Integrated Safeguards Policy Statement sets out the Bank’s own commitments to and responsibilities for delivering the ISS: to

- ensure the systematic assessment of E&S impacts and risks.
- apply the OSs to the entire portfolio of Bank operations.
- Support clients and countries with technical guidance and practical support in meeting the requirements.
- Implement an adaptive and proportionate approach to E&S management measures to be agreed with clients as a condition of project financing.

- Ensure that clients engage in meaningful consultations with affected groups; respect and promote the protection of vulnerable groups, in a manner appropriate to the African context.

2.5.1.2 Operational Safeguards (OSs)

These are a set of five safeguard requirements that Bank clients are expected to meet when addressing social and environmental impacts and risks. Bank staff use due diligence, review, and supervision to ensure that, clients comply with these requirements during project preparation and implementation. Over time the Bank may adopt additional safeguard requirements or update existing requirements to enhance effectiveness, respond to changing needs, and reflect evolving best practices. The five OSs presented in Table 2.2 were designed in order to:

- Better integrate considerations of E&S impacts into Bank operations to promote sustainability and long-term development in Africa.
- Prevent projects from adversely affecting the environment and local communities or, where prevention is not possible, minimise, mitigate and/or compensate for adverse effects and maximise development benefits.
- Systematically consider the impact of climate change on the sustainability of investment projects and the contribution of projects to global greenhouse gas emissions.
- Delineate the roles and responsibilities of the Bank and its borrowers or clients in implementing projects, achieving sustainable outcomes, and promoting local participation.
- Assist regional member countries and borrowers/clients in strengthening their own safeguards systems and their capacity to manage E&S risks.

Table 2.2: AfDB Operational Safeguards OS1-5.

Operational Safeguard	Description	Triggered (Yes/No)
OS 1: <i>Environmental and social assessment</i>	This overarching safeguard governs the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements	This OS is triggered. The construction and operation of the SAPZ facilities and ancillary infrastructures will have environmental interactions with potential negative impacts to the people and the environment.
OS 2: <i>Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation</i>	This safeguard consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement and incorporates a few refinements designed to improve the operational effectiveness of those requirements	This OS is not triggered. The land hosting the proposed SAPZ has been gazetted and belongs to the ESG in its entirety.
OS 3: <i>Biodiversity and Ecosystem Services</i>	This safeguard aims to conserve biological diversity and promote the sustainable use of natural resources. It also translates the commitments in the Bank's policy on integrated water	This OS is not triggered. The land was deliberately carved out as an agro hub which has limited sensitive ecological receptors. Areas of ecological importance particularly the streams on the site will be conserved/enhanced as part of project

Operational Safeguard	Description	Triggered (Yes/No)
	resources management into operational requirements.	activities to ensure the preservation of the natural habitat for aquatic organisms and for plant nursery development. In addition, only the portion where construction activities will take place will be cleared.
OS 4: <i>Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency</i>	This safeguard covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions, as well as comprehensive industry-specific and regional standards, including greenhouse gas accounting, that other multilateral development banks follow.	This OS is triggered. The construction and operation activities will generate waste including hazardous waste which will require proper management to prevent environmental pollution.
OS 5: <i>Labour Conditions, Health and Safety</i>	This safeguard establishes the Bank's requirements for its borrowers or clients concerning workers' conditions, rights and protection from abuse or exploitation. It also ensures greater harmonization with most other multilateral development banks.	This OS is triggered. Many workers are envisaged to be engaged during the construction and operation of the SAPZ. These workers would need to comply with HSE policies and requirements and be kept safe.

2.5.1.3 Assessment of Nigerian Policies and Legislations and AfDB Safeguard Systems

The Nigerian E&S Safeguards system addresses most of the key elements of AfDB E&S Safeguards except for the preparation of ESMF for projects involving multiple subprojects, vulnerable groups and the required differentiated treatment of vulnerable groups which are adequately addressed by the AfDB safeguard systems. A comparison between Nigerian legislation and the AfDB ISS is presented in Table 2.3.

Apart from the gaps highlighted above, the main challenge facing E&S safeguarding in Nigeria is the overlapping functions of different agencies in relation to enforcement of these policies, guidelines and legislative provisions. To ensure E&S safeguard during implementation of the proposed Agro-industrial processing zone, both the Nigerian and AfDB E&S safeguard systems will be implemented. However, in the event of divergence and gaps the AfDB safeguard system with the more stringent requirement will take precedence.

Table 2.3: Benchmarking of Nigerian Legal Provisions and AfDB ISS requirements

Key Element	Nigerian Provisions	AfDB Integrated Safeguard System	Provision to be adopted by the ESIA preparation
ESMF for Projects involving multiple subprojects.	Not a national requirement	OS 1: Environmental and social assessment	OS 1: Environmental and social assessment
Screening	EIA Act Cap E12 LFN 2004	OS 1: Environmental and social assessment	OS 1: Environmental and social assessment
Scoping	EIA Act Cap E12 LFN 2004	OS 1: Environmental and social assessment	EIA Act Cap E12 LFN 2004
Environmental and Social Impact Assessment Guideline	EIA Procedural Guidelines, 1995	IESIA Guidance Notes ESAP	EIA Procedural Guidelines, 1995 and IESIA Guidance Notes ESAP
Environmental Categorization	EIA Procedural Guidelines, 1995 Categories I, II & III	OS 1 – Categories 1, 2, 3, and FI for operations involving lending to financial intermediaries.	OS 1 – Categories 1, 2, 3, and FI for operations involving lending to financial intermediaries.
Environmental and Social Assessment	EIA Act Cap E12 LFN 2004	OS 1: Environmental and social assessment	OS 1: Environmental and social assessment
Environmental and Social Management Plan	EIA Act Cap E12 LFN 2004	OS 1: Environmental and social assessment	OS 1: Environmental and social assessment
Consultation and Participation	EIA Act Cap E12 LFN 2004	OS 1 (include provision of IESIA Guidance Notes on consultation)	OS 1 (include provision of IESIA Guidance Notes on consultation)
Involuntary Resettlement	<ul style="list-style-type: none"> Land Use Act CAP L5 LFN 2004 Acquisition of Land Access Rights for Electricity Projects Regulations, 2012 	OS 2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation	OS 2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation
Compensation	Cash compensation is generally made based upon market value. Whilst in principle there is allowance for in-kind compensation or replacement of assets, cash compensation is common practice	OS 2: Affected Persons are compensated for all their losses at full replacement cost. They can be offered a range of different compensation packages, resettlement assistance & livelihood improvement options.	OS 2: Affected Persons are compensated for all their losses at full replacement cost. They can be offered a range of different compensation packages, resettlement assistance & livelihood improvement options.
Pollution Prevention and Control	National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations, 1991; and National Environmental (Surface &	Operational safeguard 4 – Pollution prevention and control, hazardous materials and resource efficiency	Operational safeguard 4 – Pollution prevention and control, hazardous materials and resource efficiency

Key Element	Nigerian Provisions	AfDB Integrated Safeguard System	Provision to be adopted by the ESIA preparation
	Groundwater Quality Control) Regulations 2011		
Greenhouse Gases	National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations, 1991	Operational safeguard 4 – Pollution prevention and control, hazardous materials and resource efficiency (Special screening for GHGs is also considered under OS 1)	Operational safeguard 4 – Pollution prevention and control, hazardous materials and resource efficiency (Special screening for GHGs is also considered under OS 1)
Waste and Hazardous Materials	National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991 -Harmful Wastes (Special Criminal Provisions etc.) Act CAP HI LFN 2004	Operational safeguard 4 – Pollution prevention and control, hazardous materials and resource efficiency	Operational safeguard 4 – Pollution prevention and control, hazardous materials and resource efficiency
Resources and Conservation	Natural Resources Conservation Act CAP 349 LFN 1990	Operational safeguard 3: Biodiversity and Ecosystem Services	Operational safeguard 3: Biodiversity and Ecosystem Services
Labour Conditions	Employee Compensation Act, 2010 Labour Act, 1990	Operational safeguard 5 – Labour conditions, health and safety	Employee Compensation Act, 2010 Labour Act, 1990
Health and Safety	Factories Act (CAP F1), 2004	Operational safeguard 5 – Labour conditions, health and safety	Operational safeguard 5 – Labour conditions, health and safety
Natural Habitat and Biodiversity	Forestry Law CAP 51 LFN 1994 Endangered Species (Control of International Trade and Traffic) Act No. 11 of 1985. Natural Resources Conservation Act CAP 349 LFN 1990	Operational safeguard 3: Biodiversity and Ecosystem Services	Operational safeguard 3: Biodiversity and Ecosystem Services
Gender	National Gender Policy 2010	Special consideration is given to the needs and rights of women. In the context of gender vulnerability, the client must consider the social and political constraints and barriers that women may face.	There is the need for the project to consider the implications of the AfDB Gender Marker System and how to design and implement an appropriate Gender Action Plan for the subprojects
Vulnerable Groups	Some Nigerian policies address the needs of vulnerable people, such as the Gender Policy, Child Act or NEEDS framework. However, there are no specific	OS 1: Environmental and social assessment. Special attention is given to vulnerable groups.	OS 1: Environmental and social assessment. Special attention is given to vulnerable groups.

Key Element	Nigerian Provisions	AfDB Integrated Safeguard System	Provision to be adopted by the ESIA preparation
	provisions related to E&S Assessment.		
Differentiated Measures for Vulnerable Group	No provisions	Provision for differentiated measures for inclusion	(Provision for differentiated measures for inclusion)
Environmental Monitoring	EIA Act Cap E12 LFN 2004	ESAP	ESAP
Disclosure and Access to Information	EIA Act Cap E12 LFN 2004	OS 1: Environmental and social assessment	OS 1: Environmental and social assessment

2.5.2 World Bank Environmental and Social Framework

The Environmental and Social Framework (ESF) enables the World Bank and Borrowers to better manage environmental and social risks of projects and to improve development outcomes. It was launched on October 1, 2018. The ESF offers broad and systematic coverage of environmental and social risks. It makes important advances in areas such as transparency, non-discrimination, public participation, and accountability including expanded roles for grievance mechanisms. It brings the World Bank’s environmental and social protections into closer harmony with those of other development institutions.

The ESF consists of:

- the World Bank’s Vision for Sustainable Development.
- the World Bank’s Environmental and Social Policy for Investment Project Financing (IPF), which sets out the requirements that apply to the Bank.
- the 10 Environmental and Social Standards (ESS), which set out the requirements that apply to Borrowers.
- Bank Directive: Environmental and Social Directive for Investment Project Financing.
- Bank Directive on Addressing Risks and Impacts on Disadvantaged or Vulnerable Individuals or Groups

2.5.2.1 Environmental and Social Standards (ESS)

The World Bank has set out 10 Environmental and Social Standards (ESS) requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing (Table 2.4). The Bank believes that the application of these standards, by focusing on the identification and management of environmental and social risks, will support Borrowers in their goal to reduce poverty and increase prosperity in a sustainable manner for the benefit of the environment and their citizens.

Table 2.4: The World Bank’s ESS

ESS	Description
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	This overarching standard sets out the Borrower’s responsibilities for assessing, managing and monitoring E&S risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing, in order to achieve E&S outcomes consistent with Bank’s ESS.
ESS 2: Labor and Working Conditions	ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions.
ESS 3: Resource Efficiency and Pollution Prevention and Management	ESS3 recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels
ESS 4: Community Health and Safety	ESS4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration or intensification of impacts due to project activities.
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	ESS5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons. This may cause physical or economic displacement.
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	ESS6 recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development.
ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	This ESS applies to a distinct social and cultural group identified as “ <i>Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, indigenous ethnic Minorities etc.</i> ”
ESS 8: Cultural Heritage	ESS8 sets out measures designed to protect cultural heritage throughout the project life cycle.
ESS 9: Financial Intermediaries	This ESS applies to Financial Intermediaries (FIs) that receive financial support from the Bank.
ESS 10: Stakeholder Engagement and Information Disclosure	This ESS recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice.

2.6 International Conventions and Agreements applicable to the sector

Apart from the National Laws, Acts and Regulations, Nigeria is a signatory or party to many International Environmental Conventions and Treaties that are relevant to the construction sector. A list of some of the relevant International Environmental Conventions and Treaties ratified by the Government of the Federal Republic of Nigeria are presented in Table 2.5

Table.2.5: Selected international agreements and conventions to which Nigeria is a signatory

Regulations	Year Adopted
• United Nations Framework Convention on Climate Change (UNFCCC)	1992
• Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal	1989
• Montreal Protocol on Substance that Deplete the Ozone Layer	1987
• Vienna Convention on the Ozone Layer	1985
• Convention on Conservation of Migratory Species of Wild Animals	1979
• Convention on the Protection of the World Cultural and Natural Heritage (world Heritage Convention), Paris	1975
• Convention to Regulate International Trade in Endangered Species of Fauna and Flora (CITES)	1973
• Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention) (Signatory only)	1988
• African Convention on the Conservation of Nature and Nature Resource	1968
• Paris Agreement	2015

CHAPTER THREE: PROJECT LOCATION AND SITE DESCRIPTION

3.1 Description of Enugu State

Enugu state is located in the South Eastern part of Nigeria. The State lies within latitudes 6.5364° N, and longitudes 7.4356° E. Enugu State is bordered by Benue State to the northeast, Kogi State to the northwest, Abia State and Imo State to the south, Ebonyi State to the east, and Anambra State to the west. It covers an area of 13,161 km² (5,081 sq. mi) with a population of over 3,267,837 as at 2006 census (FGN, 2006). The state has good soil-land and climatic conditions all year and the soil is well drained during the rainy seasons. February is the hottest month with a mean temperature of 87.16° F (30.64° C), while the lowest temperatures occurs in November, reaching 60.54° F (15.86° C). About 158.57 millimetres (6.24 inches) of precipitation occur in Enugu State with about 192.73 rainy days annually. The state is mostly rural and agrarian with a substantial number of the population involved in farming although some are involved in trading and services sector.

Figure 3 shows location of Enugu State in Nigeria

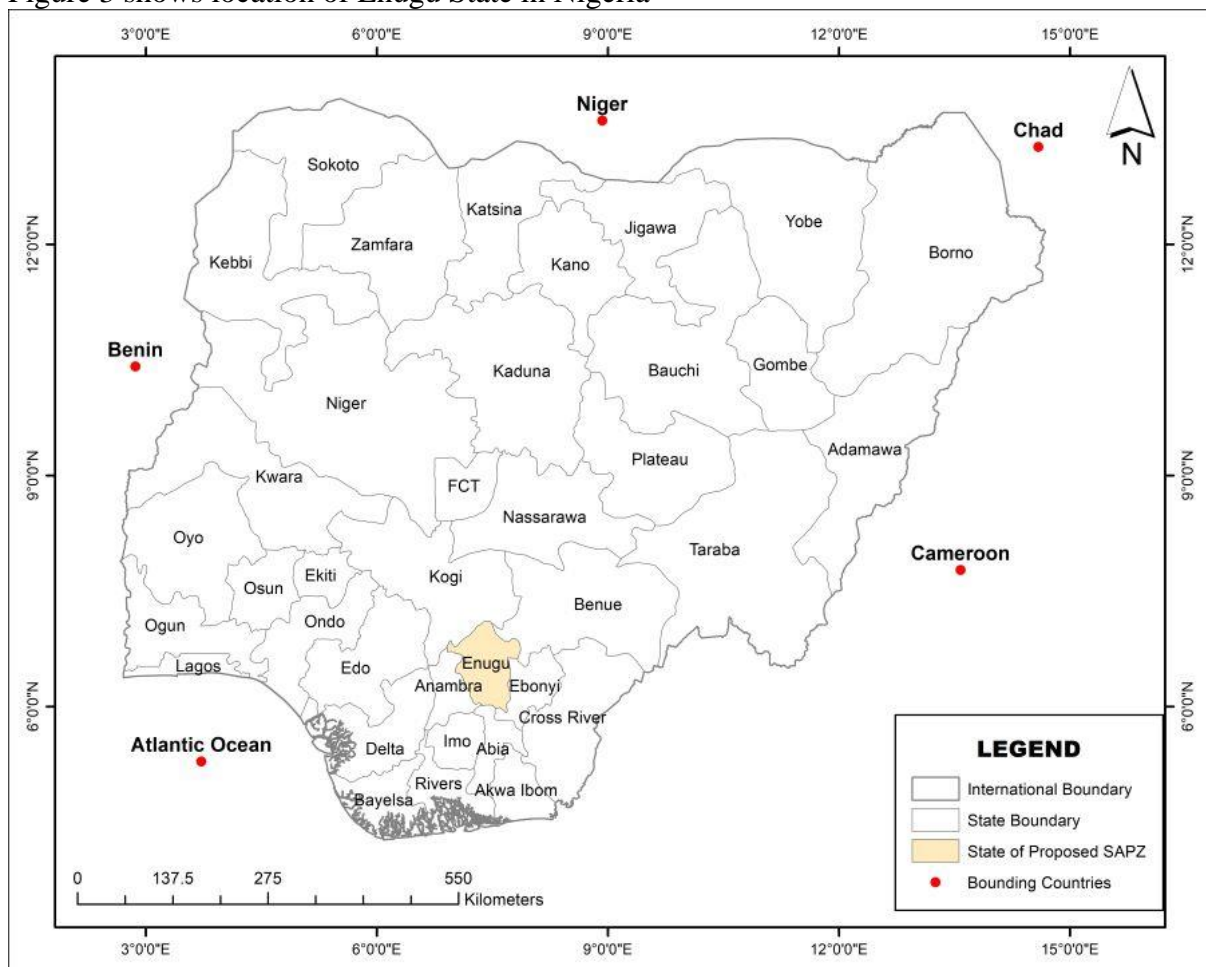


Figure 3: Map of Nigeria showing location of Enugu State

3.2 Description of the Project Location

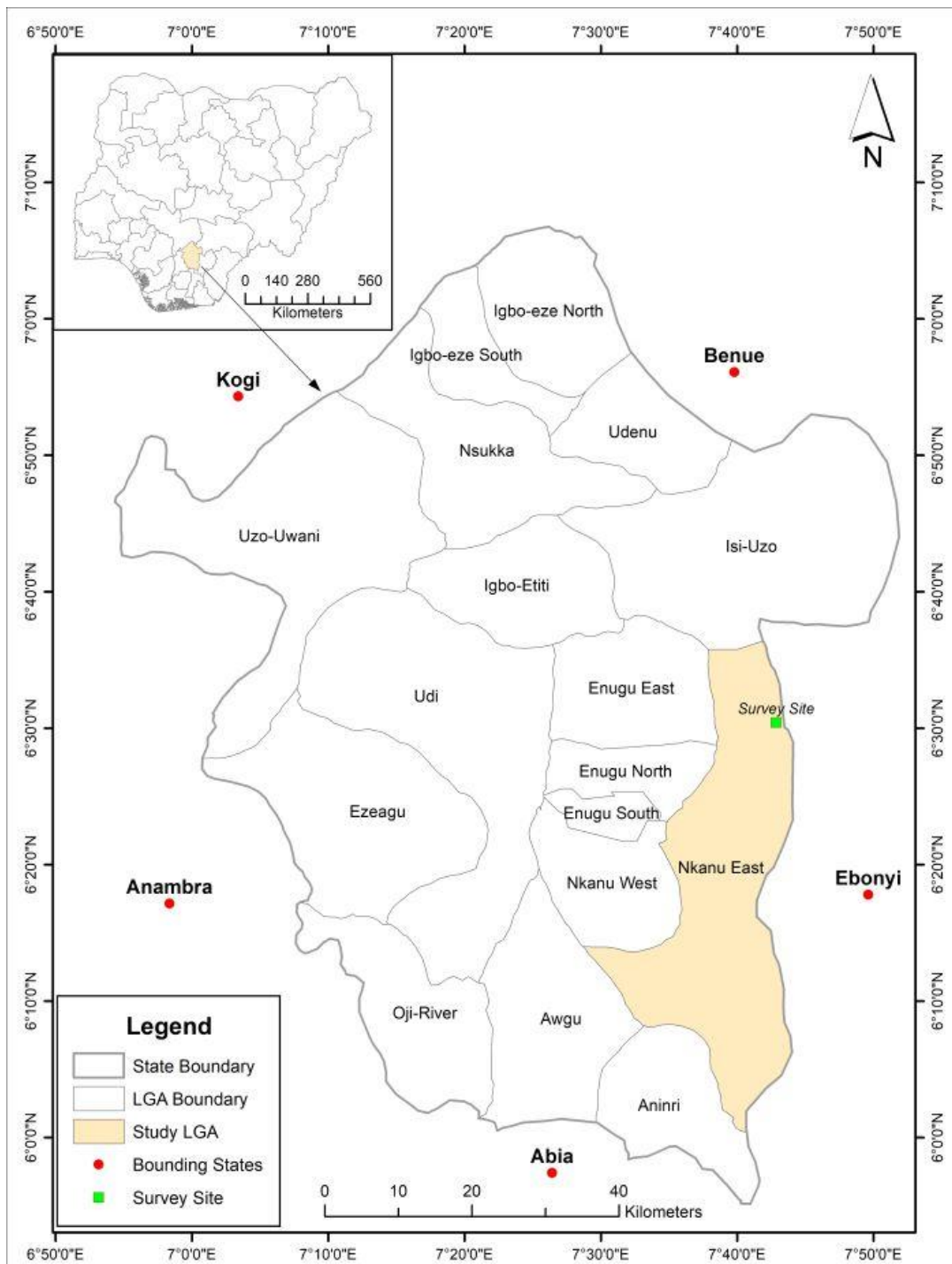


Figure 4: Map of Enugu State showing Enugu East LGA

The proposed location for the SAPZ is Owo, in Nkanu East local government area of Enugu State. Nkanu East (Figure 4) has an area of 795 km² (307sqmi) and a population of 148,774 as at the 2006 census. Owo (Figure 5) is a rural community situated in the south-eastern part of Enugu State with coordinates of 6.5076° N, 7.6932° E. Over 80% of the inhabitants are farmers. Owo population was estimated at 14,000 in 2022. Owo has rich agricultural land and many staple crops including yam, cassava, rice, maize, fruits and leafy vegetables such as *Telfaria*, *Amaranthus* among many others, are cultivated by famers in the community. The arable land

facilitates the cultivation of many cash crops, for example, oil palm, cashew, oranges, and cocoa.

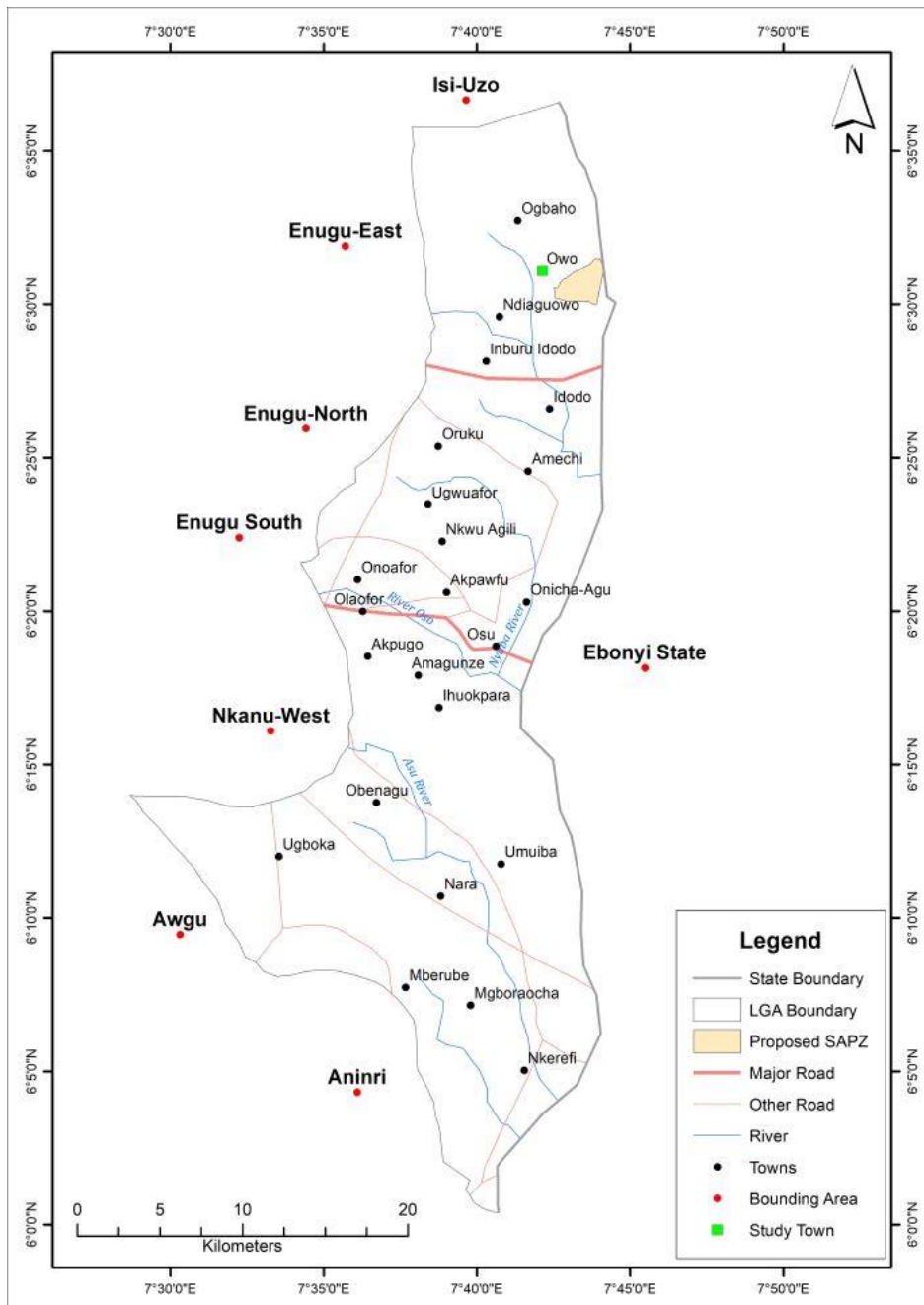


Figure 5: Map of Enugu East LGA showing the project site

3.3 Site Description

The proposed location for the SAPZ is within Owo community in Nkanu East LGA where Enugu State government have acquired 529.818 ha of land for the project. Figure 6 below is the site map that depicts the entire SAPZ land. About 300 ha will be used for the ATC and associated aggregation centre (AC), while the remaining will be used for the AIH.

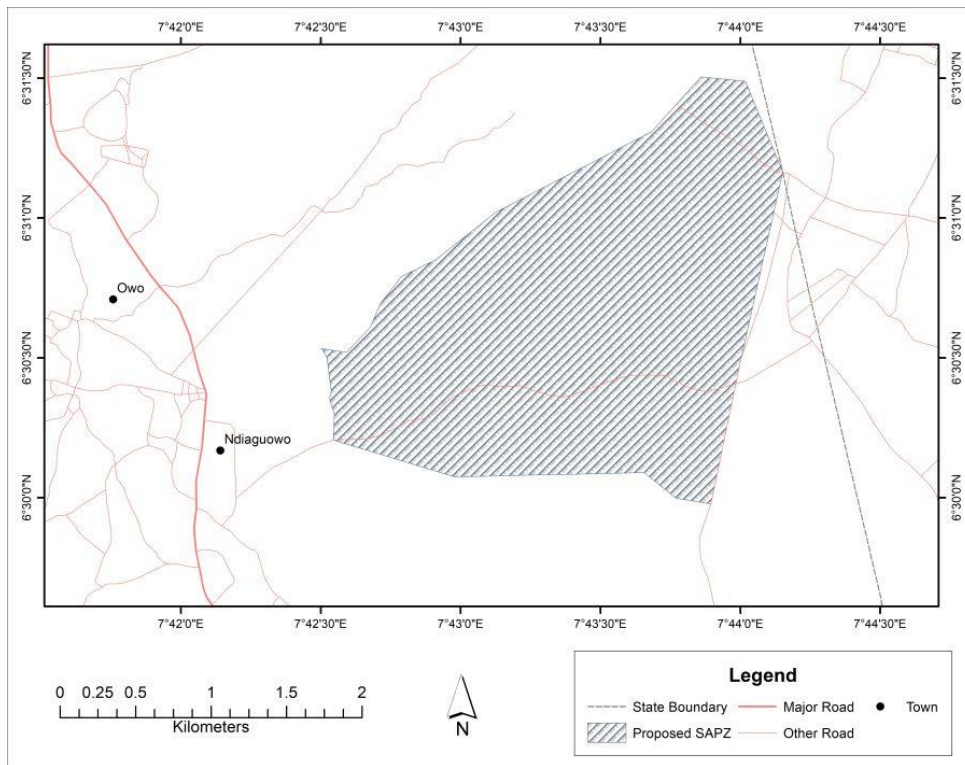
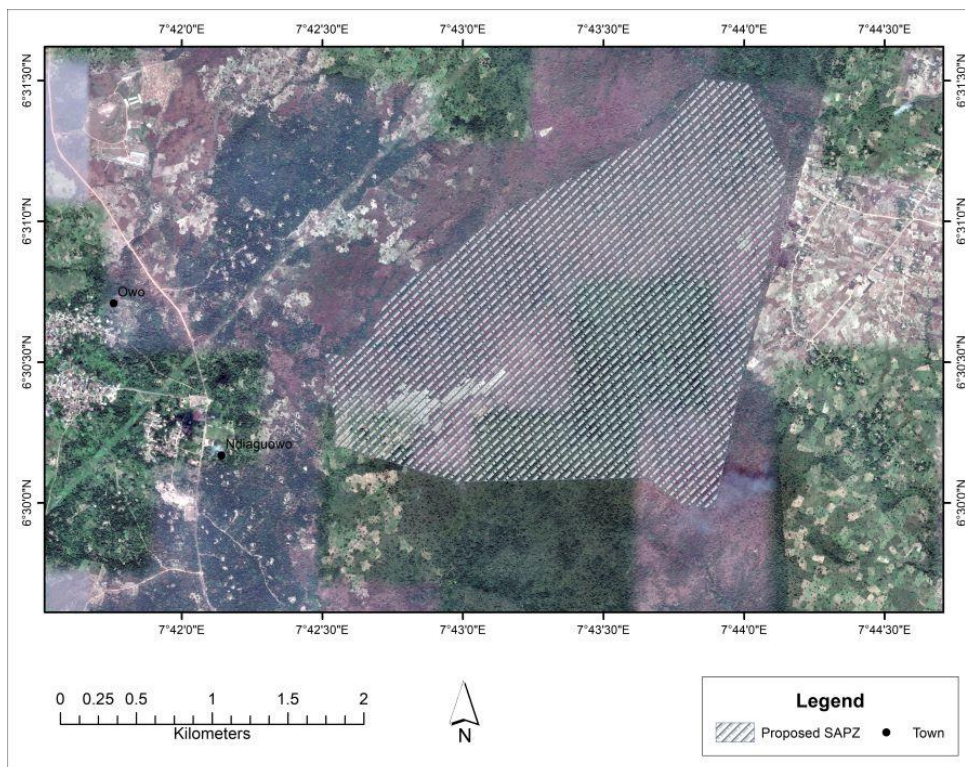


Figure 6: Site Layout showing the delineated boundaries and features



The land which has some agricultural activity has been voluntarily donated by the community and has been gazetted by the government of Enugu State. Consequently, the project will not involve any physical or economic displacement but rather provide opportunities for farmers and agro investors to come into the area and participate in the programme.

Overview of Existing Condition of the proposed SAPZ



Plate.1: ESIA team and surveyors walking the length of the demarcated land



Plate.2: ESIA team with the Igwe of the community, Chairman Nkanu East LGA and Hon Commissioner for Agriculture during a visit to the site



Plate.3: ESIA team and surveyors walking the length of the demarcated land

CHAPTER 4: ENVIRONMENTAL AND SOCIAL BASELINE

4.1 Introduction

The chapter describes the existing (baseline) status of the project environment, which may be affected by the proposed development of SAPZ. The baseline information of the project area is crucial to the ESIA process as it helps to identify the key environmental and social parameters in the project area that may be impacted by the project as well as provide data to aid the prediction of potential impacts of the proposed project. In addition, baseline information helps to describe and quantify the current characteristics (nature, condition, quality, extent, etc.) of environmental resources/receptors, and predict their likely future characteristics in the absence of the project.

The description of the baseline conditions of the project area is based on analysis of both primary (collection of samples from the project area based on receptor sensitivity) and secondary data from various sources. The baseline information is described for the following biophysical and socio-economic components including Climate and Meteorology; Air; Soils and land; Geology; Ecological Biodiversity (Flora and Fauna) as well as Socio-economic and Community Health.

4.2 Area of Influence

The project's area of influence was delineated to cover the entire 528.818 ha earmarked for the project and sections of the immediate environment up to 5 km radius around the site. This area is defined based on the extent to which the proposed project activities may interact with the surrounding environment whilst taking into considerations the nature of the project and associated activities, nature of surrounding ecosystem and ecosystem resources, spatial distribution of the affected/ host communities and professional experience of ESIA multidisciplinary team. This area is believed to capture the full reach of possible effects of the proposed project especially in relation to affected human settlement and streams. Owo and some adjoining communities as seen in the maps are within a 5km radius of the proposed site.

4.3 Data Acquisition Approach and Methods

Baseline data for the project area was generated using a combination of field studies; analysis of maps, plans, photographs; review of background project documents; site reconnaissance surveys; structured and semi-structured interviews via engagements with project implementers.

4.3.1 Desktop Research

The ESIA team conducted a comprehensive search and review of available literature on the project location, similar projects and requirements of regulators and international development partners particularly the AfDB. These included reports of previously conducted ESIA under the SAPZ programme in other states, academic research studies, technical/government publications, and meteorological data of the project area. A comprehensive understanding of the environmental and social information already available was critical for the ESIA especially in designing the field data collection program.

4.3.2 Reconnaissance Survey

A reconnaissance survey was undertaken to familiarize the team with the proposed SAPZ area in order to acquaint the ESIA team with the nature of the environmental and social nomenclature of the area. Preliminary baseline information on the existing project environment was obtained at this

stage through physical observations and interviews with key informants/ groups. As part of the survey, critical stakeholders were identified for consultation. The reconnaissance visits to project areas was undertaken along with the relevant staff of Enugu State Ministry of Agriculture and Enugu State Ministry of Environment and Climate Change.

4.3.3 Biophysical Environmental Sampling

Primary baseline data on the biophysical components of project environment were obtained through a field data gathering exercise carried out from Thursday September 28 to Friday October 6 2023, by a multidisciplinary team of experts. The baseline sampling was aimed at establishing the existing conditions of the environmental resources potentially subject to change by the project. Specifically, the team conducted the exercise to verify and fill the gaps on preliminary information obtained from literature on the environmental and social characteristics of the area. The field exercise involved real-time observations, soil-, sediment-, water sampling, and air quality measurements. The collected samples were later analysed in the laboratory following standard procedures.

4.3.4 Stakeholders Consultations and Socioeconomic Assessment

The result of the stakeholder's identification and consultation during the reconnaissance survey formed the basis for further consultation with key stakeholders during the ESIA. The team carried out desktop review, Key Informants Interview (KII); and public consultation, including Focus Group Discussions (FGD). The team carried out a consultation with the community on the 28th of September while some members of Owo community were also interviewed from October 3-6 2023.

A summary of the number and types of data collected during the field surveys is presented in Table 4.1 while the sampling locations and distribution across the study area are presented in subsequent sections.

Table 01: Summary of the Baseline Data Collected

Component		Data collected and methods																
Physical Environment	Ambient air	In order to evaluate the presentscenario for the air quality and noise level in the study area, <i>in-situ</i> measurements were taken from eight sampling points identified for the purpose of air quality and noise level measurements. The selection of sites for monitoring took into consideration the following factors: accessibility of site, wind direction (up-wind and down-wind) and areas with minimal local influence. The ambient noise levels and micro-climatic condition of the area were also measured. The <i>in-situ</i> air quality parameters were collected as indicated below.																
		<table border="1"> <thead> <tr> <th>Parameter Measured</th> <th>Measurement Method</th> </tr> </thead> <tbody> <tr> <td>Particulate matter (PM)</td> <td>HoldPeak 5800D PM Detector</td> </tr> <tr> <td>Sulphur dioxide (SO₂)</td> <td>Aeroqual S200L 1408171-3155 hand held instrument with SO₂ sensor</td> </tr> <tr> <td>Carbon monoxide (CO)</td> <td>Aeroqual S200L 1408171-3155 hand held instrument with CO sensor</td> </tr> <tr> <td>Nitrogen Dioxide (NO₂)</td> <td>Aeroqual S200L 1408171-3155 hand held instrument with NO₂ sensor</td> </tr> <tr> <td>Volatile Organic Compounds (VOCs)</td> <td>Aeroqual S200L 1408171-3155 hand held instrument with VOC sensor</td> </tr> <tr> <td>Hydrogen sulphide (H₂S)</td> <td>Aeroqual S200L 1408171-3155 hand held instrument with H₂S sensor</td> </tr> <tr> <td>Noise Level</td> <td>hand-held digital sound level meter</td> </tr> </tbody> </table>	Parameter Measured	Measurement Method	Particulate matter (PM)	HoldPeak 5800D PM Detector	Sulphur dioxide (SO ₂)	Aeroqual S200L 1408171-3155 hand held instrument with SO ₂ sensor	Carbon monoxide (CO)	Aeroqual S200L 1408171-3155 hand held instrument with CO sensor	Nitrogen Dioxide (NO ₂)	Aeroqual S200L 1408171-3155 hand held instrument with NO ₂ sensor	Volatile Organic Compounds (VOCs)	Aeroqual S200L 1408171-3155 hand held instrument with VOC sensor	Hydrogen sulphide (H ₂ S)	Aeroqual S200L 1408171-3155 hand held instrument with H ₂ S sensor	Noise Level	hand-held digital sound level meter
		Parameter Measured	Measurement Method															
		Particulate matter (PM)	HoldPeak 5800D PM Detector															
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		Volatile Organic Compounds (VOCs)	Aeroqual S200L 1408171-3155 hand held instrument with VOC sensor															
		Hydrogen sulphide (H ₂ S)	Aeroqual S200L 1408171-3155 hand held instrument with H ₂ S sensor															
		Noise Level	hand-held digital sound level meter															
The ambient noise levels in the project area were measured at same locations as the air quality.																		
Soil	Equal volumes of soil samples were collected with a soil auger at 20 cm interval, down to the depth of 40 cm (0 – 20 cm, 20 – 40 cm for top soil and subsoil respectively). A total of 10 soil samples were collected from 5 sampling points. The sampling points were geo-referenced using Germin 3 GPS and the elevations above sea level were recorded at each sampling point. Soil samples were collected into clean decontaminated containers and stored for transfer to the laboratory for physico-chemistry and microbial analyses. The soilsamples for microbial analysis were wrapped up using aluminium foil. All samples collected were preserved in ice chest and transported to the laboratory for analysis																	
	Surface Water	The surface water found within 5 km radius of the project area was sampled at the locations geo-referenced. The surface water samples were collected from the flowing stream around the project area. Each sample was transferred to two separate sterilized 1 L sample bottles for physico-chemistry and heavy metal analysis. For the heavy metals, it was ensured that the 1 L sample bottles were previously cleaned with nitric acid (HNO ₃). The collected water samples were then acidified by means of 5 mL of 6M HNO ₃ prior to laboratory analysis																

Component		Data collected and methods
Biological Environment	Flora and Fauna	Flora surveys were conducted via a detailed assessment of plant characteristics and identification and an inventory of economic crops within the project locations while Fauna survey was undertaken using a range of methods, i.e., direct observation, indirect observation, identification, and biological nomenclature, handpicking and informal Interviews.

4.4 Description of the Project Environment

This section describes the physical, biological and socioeconomic status of the project areas.

4.4.1 Climate

Owo has a Tropical wet and dry or savanna climate. There are two seasons namely, the rainy season and dry season. The wet season from April to October and the dry season from November to March, is typical of the area. The town's yearly temperature, which is 0.74% greater than Nigeria's averages, is 30.2°C (86.36°F). Owo has 205.92 rainy days (56.42% of the time) annually and typically receives precipitation of about 169.42 millimeters (6.67 inches). The summary of climate variables is presented in Table 4.2.

Table 4.2: Summary of Owo Climate variables

Annual high temperature	33.79°C (92.82°F)
Annual low temperature	25.14°C (77.25°F)
Average annual precipitation.	169.42mm (6.67in)
Warmest month	February (38.22°C / 100.8°F)
Coldest Month	August (23.55°C / 74.39°F)
Wettest Month	September (397.43mm / 15.65in)
Driest Month	December (8.66mm / 0.34in)
Number of days with rainfall (≥ 1.0 mm)	205.92 days (56.42%)
Days with no rain	159.08 days (43.58%)
Humidity	75.75%

Source: <https://weatherandclimate.com/nigeria/enugu/owo>

The proposed SAPZ activities that could cause or exacerbate climate change risks were identified in this ESIA with climate change mitigation and adaptation measures also recommended. The details of climate risks associated with the project including adaptation and mitigation measures are presented in Chapter 6 and the ESMP.

4.4.2 Ambient Air

The ambient air quality and noise pollution survey was undertaken across the project site during the month of September 2023. The purpose of the air quality and noise assessment survey was to establish the existing baseline of air quality prior to the project implementation. The baseline data is expected to provide informed knowledge about the physical atmospheric condition of the project site and the immediate environment

4.4.2.1 Approach and Methods

For the existing scenario of air quality in the study area, the major parameters measured were sulphur dioxide (SO₂), nitrogen dioxide (NO₂), hydrogen sulphide (H₂S), carbon monoxide (CO), volatile organic compounds (VOCs) and particulate matter (PM_{2.5} and PM₁₀). The geo-references of the sampling locations are indicated in Table 4.3. The noise level was conducted at a height of 1.5 meters above ground level using a hand-held digital sound level meter. The meter measured to 1.5 dB accuracy. Measurement was done as ‘A’ weighted which is the mode for environmental issues. In this mode, the meter responds like the human ear. Measurement was accompanied by switching the meter on and positioning the microphone away from the person taking measurement, while the sampling crew kept silent during measurement. Readings were taken when the meter achieved a stable reading and the time was recorded as well.

The result obtained (presented in Table 4.4) were compared to the Nigerian Ambient Air Quality Standards (NAAQS) propounded by the Federal Ministry of Environment (FMEnv) and the World Health Organization (WHO) Air Quality and Noise Guidelines. The threshold for outdoor concentration of pollutants established by FMEnv and WHO are provided in Table 4.3.

Table 4.3: Threshold for outdoor concentration of pollutants

Parameter	FMEnv		WHO	
	Guideline Value	Averaging Period	Guideline Value	Averaging Period/Time Base
CO	10 ppm 11.4 µg/m ³	1 - hour	25 ppm	1 – hour
NO ₂	0.04 – 0.06 ppm 75.0 – 113 µg/m ³	1 – hour	200µg/m ³	1 - hour
SO ₂	0.01 ppm 26 µg/m ³	1 - hour	0.175 ppm 500 µg/m ³	10mins
H ₂ S	0.008 mg/m ³	30 mins	7 µg/m ³	30 mins
PM	80 µg/m ³	1 - hour	25 µg/m ³	Annual
	250 µg/m ³		50 µg/m ³	24 - hour
LEL	-	-		-
CO ₂	-	-		-
Noise (Industrial Area)	90dB(A)	8 hour	70 dB(A)	24 hours
Noise (Residential Area)	-		55 dB(A)	16 hours

Sources: Guidelines & Standards for Environmental Pollution Control in Nigeria (FEPA 1991). Air Quality Guidelines (WHO, 2005)

4.4.2.2 Results of Air Quality and Noise Level Assessment

Table 4.4 presents the result of the concentration of gaseous pollutants and noise level around the project area as was monitored during the study. The results indicate that the values of the noise levels and air quality parameters fall below the Federal Ministry of Environment maximum allowable limits. This indicates that the air quality and noise levels around the project area are quite healthy without any form of pollution. It therefore follows that any pollution after project implementation would most likely be attributed to the operational activities of the project.

Table 4.4: Air quality and Noise

Sampling Location	Geo-ref	CO (ppm)	SO ₂ (ppm)	NO ₂ (ppm)	H ₂ S (ppm)	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	VOC (%)	Noise (dB)A
A	N 6°30 ' 31.89 " E 7°42 ' 2.90 "	ND	ND	0.003	ND	2.5	3.6	ND	43
B	N 6°30 ' 12.31 " E 7°42 ' 37.59 "	ND	ND	0.009	ND	1.8	2.7	ND	45
C	N 6°30 ' 12.45 " E 7°42 ' 37.50 "	ND	ND	0.005	ND	2.3	3.3	ND	42
D	N 6°30 ' 17.49 " E 7°42 ' 44.68 "	ND	ND	0.007	ND	2.1	3.4	ND	47
E	N 6°31 ' 18.68 " E 7°42 ' 53.57 "	ND	ND	0.005	ND	1.9	2.6	ND	48
F	N 6°30 ' 21.697 " E 7°42 ' 58.15 "	ND	ND	0.006	ND	2.4	3.9	ND	43
G	N 6°30 ' 22.21 " E 7°42 ' 58.27 "	ND	ND	0.008	ND	2.2	3.5	ND	45
H	N 6°30 ' 22.71 " E 7°42 ' 59.27 "	ND	ND	0.005	ND	1.7	2.5	ND	42
FMENV Limit (daily average)		10	0.01	0.04	-	250	250	-	90

ND: Not detected; FMENV: Federal Ministry of Environment.

4.4.3 Soils

The assessment of the soil in the project area was undertaken during the field data gathering to establish the existing soil quality prior to the project implementation. The baseline data is expected to provide informed knowledge about the physical, chemical and microbial condition of the soils of the project site and the immediate environment.

4.4.3.1 Approach and Methods

The field study of the SAPZ at Owo in Enugu State started with a reconnaissance survey of the area, aimed at observing the ecological features of the location. Soil sampling was planned to reflect the variations in the ecological features of the area which include well-dried upland area and hydromorphic soil found at the lowland area characterized by presence of heavy clay and high water-table. Equal volumes of soil samples were collected with a soil auger at 20 cm interval, down to the depth of 40 cm (0 – 20 cm, 20 – 40 cm for top soil and subsoil respectively). A total of 10 soil samples were collected from 5 sampling points. The sampling points (Table 4.4) were geo-referenced using Germin 3 GPS and the elevations above sea level were recorded at each sampling point (Table 1). The bulk (auger) samples were air-dried and passed through 2 mm sieve and used for the mechanical analysis. Sample fractions larger than 2 mm were assumed to be gravels. The Bouyoucos hydrometer method was used for the mechanical analysis (determination of soil particle size distribution). Sodium hexametaphosphate was used as the dispersing agent. The soil textures were determined using the USDA textural triangle. For chemical analysis, Composite soil samples from the field were air dried, ground and sieved and fraction less than 2 mm was taken for laboratory analyses.

For the analysis of heavy metals, the US EPA (2007) prescribed method was adopted in acid digestion of the soil samples. Succinctly, this method consists using 65% HNO₃/ 37% HCl at a ratio of 3:1 v/v to digest the soil samples in a Teflon vessel held in a microwave oven using the appropriate soil/acid mix ratio. In this study, 15 mL of acid mix was used in digesting 0.3 g of soil sample. The microwave digester (Milestone s.r.l, Italy) was operated in three sequences at 120, 150 and 200 °C for 5, 10 and 15 mins respectively. After microwave digestion, de-ionized water was added and the solution filtered using 0.45 µm filter membrane. Additional water was added to make up the volume to 50 mL and stored in the refrigerator below 4 °C until required for analysis. The heavy metals (Cu, Zn, Fe, Ni, Cr, Pb, Cd) were analyzed using SensAA GBC Flame Atomic absorption spectrometer. Table 4.4 shows the soil sampling locations and the description of land use.

Table 4.4: Coordinates of soil sampling points and description of land use

S/No	Sample code	Soil depth (cm)	Coordinates		Elevation (m)	Description/Land Use
			Latitude	Longitude		
1	1A	0 – 20	6°30.216'N	007°42.543'E	101 m	Cultivated land/large mounds/fairly flat land/Cassava farm. Predominantly grassland with shrubs, oil palm trees.
2	1B	20 – 40				
3	2A	0 – 20	6°30'205"N	007°42.621'E	99 m	Cultivated land/large mounds/undulating land/Cassava farm. Predominantly grassland with shrubs, oil palm trees. Lowland area with high water table and high potential for water logging. Presence of heavy clay.
4	2B	20 – 40				
5	3A	0 – 20	6°30'261"N	007°42.750'E	103 m	Cultivated land/large mounds/fairly flat land/Cassava farm. Predominantly grassland with shrubs, oil palm trees.
6	3B	20 – 40				
7	4A	0 – 20	6°30'289"N	007°42.890'E	105 m	Cultivated land/large mounds/fairly flat land/Cassava and yam farm. Secondary forest, elephant grassland with shrubs, scattered oil palm trees. Wet land/Water way/seasonal stream
8	4B	20 – 40				
9	5A	0 – 20	6°30'342"N	007°42.953'E	107 m	Cultivated land/large mounds/fairly flat land/Cassava and yam farm. Grassland with shrubs, scattered oil palm trees. Upland area
10	5B	20 – 40				

Source: SAPZ field study

4.4.3.2 Results of Soil Assessment

Table 4.5 shows the physical properties of the soils of the Enugu SAPZ Project Site. The textures are essentially clay loam and silty clay. The top (0 – 20 cm) soils show moderately fine to fine textures (clay loam, silty clay loam, silt clay). The subsoils (20 – 40 cm) are also dominated by moderately fine textures (clay loam, silt clay). The sand separate of the top soil is dominated by the fine fraction in most areas, except at the higher elevation (upland) area where the fine and coarse separates are evenly distributed. The ranges and means of the soil separates are as follows: coarse sand, 3 – 18 %, (mean = 8.2 %); fine sand, 3 – 18 %, (mean = 10.8 %); Silt, 37 – 55 %;

(mean = 47.4 %); clay, 28 – 38 %, (mean = 33.6 %). The high proportion of clay and silt are responsible for the characteristic strong angular to blocky structures of the soil, in addition to providing good anchorage for vegetation growth. The soils are sticky and plastic (wet) and very hard when dried. The soil colour as determined by the Revised Standard Soil Colour Chart indicated slight variations in the soil colour. The soils of this site are generally free of gravel and outcrops. The land is fairly flat with a slope of less than 2%, and with minor undulation as the major micro-topographic feature. The soil is deep and liable to flooding at the lowland area and, frequently, it is covered by flood waters for weeks at peak flood periods. The soils vary from well drained (in the upland areas) to somewhat poorly or imperfectly drained (in the lowland areas). The high proportion of clay and silt at the site accounts for the poor drainage condition of the soil.

Table 4.5: Particle size distribution and the textural class of soils at Owo, Enugu SAPZ project location

S/No.	Sample code	Soil depth (cm)	Soil Colour	Particle Size (%)				Textural Class
				Clay	Silt	Fine Sand	Coarse Sand	
1	1A	0 – 20	5YR 5/3 (dull reddish brown)	28	47	14	11	Clay Loam
2	1B	20 – 40	7.5YR 5/6 (bright brown)	34	45	12	9	Clay Loam
3	2A	0 – 20	7.5YR 8/6 (light yellow orange)	30	55	12	3	Silty Clay Loam
4	2B	20 – 40	7.5YR 6/3 (dull brown)	32	51	12	5	Silty Clay
5	3A	0 – 20	7.5YR 5/4 (dull brown)	28	51	14	7	Clay Loam
6	3B	20 – 40	7.5YR 6/6 (orange)	38	47	6	9	Silty Clay
7	4A	0 – 20	7.5YR 6/3 (dull brown)	38	53	3	6	Silty Clay
8	4B	20 – 40	7.5YR 5/4 (dull brown)	38	49	5	8	Silty Clay
9	5A	0 – 20	7.5YR 6/4 (dull orange)	36	39	12	13	Clay Loam
10	5B	20 – 40	7.5YR 5/6 (bright brown)	34	37	18	11	Clay Loam

Source: Based on the analysis of soil samples obtained from the SAPZ location

Table 4.6 shows the chemical Properties and Fertility Status of Soils of Owo, Enugu SAPZ. The pH values show that the soils ranged from very strongly acidic to moderately acidic. The values obtained in water ranged from 4.5 to 5.6 and 5.1 to 5.5 at the topsoil and subsoil respectively, while the values obtained in KCl ranged from 3.7 to 4.1 at the topsoil and 3.8 to 4.0 at the subsoil. The soil pH in water is expectedly higher than the pH values in KCl, indicating that

the soil is not extremely weathered and the colloidal surfaces are predominantly negatively charged and has the potential to attract and retain nutrients released by fertilizer application and other sources. Soil pH is a measure of hydrogen ion concentration in a soil and an indicator of other soil chemical and biological properties. It influences vegetative cover and plant growth by its effect on the activity of beneficial microorganisms. While fungi tolerate acidity, nitrogen-fixing bacteria and actinomycetes are not very active in acidic soils. However, the majority of soil microorganisms grow best at pH 7. Most plants are best suited to pH of 5.5 on organic soil and a pH of 6.5 on mineral soils.

Although the exchangeable acidity showed appreciable values of Al^{3+} ion, H^+ was the dominant acid-forming cation in both the topsoil and the subsoil. While the values of H^+ ranged from 3.00 Cmol/kg to 4.00 Cmol/kg in the topsoil, the values ranged from 2.40 Cmol/kg to 4.40 Cmol/kg in the subsoil (Table 4.6). On the other hand, the values of Al^{3+} ion ranged from 1.40 Cmol/kg to 2.60 Cmol/kg and 1.40 Cmol/kg to 5.40 Cmol/kg in the topsoil and subsoil respectively. The soils generally varied from very strongly acidic to moderately acidic. With the mean values of 3.38 Cmol/kg and 2.32 Cmol/kg for H^+ and Al^{3+} respectively, the acidic property of the soils could be attributed to the H^+ ion. The very high rainfall observed at this region accounts for high leaching losses of base-forming cations (Ca, Mg, K and Na), thus giving rise to acidic conditions.

The organic carbon of the soils was very low at the topsoil and subsoil. The values ranged from 0.320 to 0.888 % at the topsoil and 0.42 to 0.888 % at the subsoil. The generally very low level of organic carbon, especially at the upland areas, may be due to the high rate of decomposition of organic matter occasioned by adequate aeration. The nutrient elements of nitrogen, phosphorus and potassium (NPK) are very low for nitrogen, generally low for phosphorus and very low for potassium. The values of nitrogen was very low at the surface soil and subsoil as the values ranged from 0.042 – 0.070 % (mean = 0.029 %) and 0.042 – 0.070 % (mean = 0.028 %) at the topsoil and subsoil respectively. Available phosphorus was generally low as the values of P ranged from 3.80 ppm – 7.53 ppm and 2.87 to 5.66 ppm in the topsoil and subsoil respectively. The exchangeable base was low (28.37 – 36.36 %) in the topsoil and low to moderate (24.14 42.00 %) in the subsoil for most cations. The cation exchange capacity (CEC) was moderate (15.60 – 23.80 Cmol/kg) in the topsoil and varied from moderate to high (19.60 – 30.00 Cmol/kg) in the subsoil. The fertility status of the soil is generally low to medium.

The concentration values of the heavy metals in the soil of the study area are presented in Tables 4.7.

Table 4.6: Chemical characteristics of soils at Owo, Enugu SAPZ project location

S/No	Sample code	Soil depth (cm)	pH Value		Organic Matter (%)		N (%)	Exch. Base (meq/100 g)				CEC meq/100 g	Base Sat. (%)	Exch. Acidity (meq/100 g)		Av. P ppm
			H ₂ O	KCl	OC	OM		Na ⁺	K ⁺	Ca ²⁺	Mg ²⁺			Al ³⁺	H ⁺	
1	1A	0 – 20	4.9	3.7	0.888	1.531	0.070	0.03	0.07	1.00	1.80	23.80	34.94	1.40	4.00	5.66
2	1B	20 – 40	5.1	3.8	0.817	1.408	0.070	0.03	0.07	2.20	1.00	26.20	42.00	1.40	4.40	4.73
3	2A	0 – 20	5.2	3.8	0.426	0.735	0.042	0.01	0.05	0.80	1.40	21.00	32.01	1.40	3.40	3.80
4	2B	20 – 40	5.1	3.8	0.426	0.735	0.056	0.01	0.05	1.00	1.40	21.00	39.30	1.40	2.40	2.87
5	3A	0 – 20	5.6	4.1	0.320	0.551	0.056	0.01	0.05	1.00	1.20	16.60	37.29	1.80	2.00	4.73
6	3B	20 – 40	5.5	4.0	0.675	1.163	0.070	0.02	0.06	1.00	1.40	19.60	27.93	2.80	3.60	3.80
7	4A	0 – 20	5.1	3.9	0.355	1.102	0.056	0.01	0.05	0.60	1.40	15.60	28.37	1.80	3.40	7.53
8	4B	20 – 40	5.2	3.9	0.746	1.286	0.042	0.03	0.07	1.00	1.60	28.00	32.73	3.20	4.20	5.66
9	5A	0 – 20	5.3	4.0	0.817	1.408	0.070	0.03	0.07	1.00	1.20	20.00	36.36	2.60	3.00	3.80
10	5B	20 – 40	5.1	3.8	0.888	1.531	0.042	0.03	0.07	0.80	1.00	30.00	24.14	5.40	3.40	2.87

Table 4.7: Concentration of the heavy metals in the soil of the project area

Sample code	Concentration of the heavy metals (mg/kg) in the soil						
	Ni	Cr	Pb	Cu	Fe	Zn	Cd
1A	1.30	2.2252	2.4455	0.2520	8.8214	5.5756	0.3479
1B	0.5474	0.9369	1.0297	0.1061	3.7143	2.3476	0.1465
2A	1.0263	1.7568	1.9307	0.1990	6.9643	4.4018	0.2746
2B	0.8211	1.4054	1.5446	0.1592	5.5714	3.5214	0.2197
3A	0.6842	1.1712	1.2871	0.1327	4.6429	2.9345	0.1831
3B	0.6842	1.1712	1.2871	0.1327	4.6429	2.9345	0.1831
4A	1.1632	1.9910	2.1881	0.2255	7.8929	4.9887	0.3113
4B	0.6842	1.1712	1.2871	0.1327	4.6429	2.9345	0.1831
5A	0.9579	1.6396	1.8020	0.1857	6.5000	4.1084	0.2563
5B	0.7526	1.2883	1.4158	0.1459	5.1071	3.2280	0.2014
Range	0.547-1.16	0.9-2.25	1.03-2.45	0.10-0.25	3.7-8.8	2.3-5.57	0.14-0.25
BV	68	90	70	50	NA ^{*,b}	175	1.0

1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, and 5B represent soil samples collected from the project area. The A's represent samples at depth 0-20 cm whereas the B's represent samples at depth 20-40 cm. BV = background values for Nigeria's soils as reported by EGASPIN (2002).

The concentration values of the heavy metals at 0-20 cm depth are generally higher than those at 20-40 cm for all samples (Table 4.7). The concentration of the heavy metals in the soil of the study area (Table 4.7) is far below the background values of soils in Nigeria. This indicates that there are no human activities around the study area to elevate the concentration of the heavy metals to a level of concern either individually or collectively.

4.4.4 Surface Water

Surface water sources were sampled during the data gathering to allow for future evaluation and monitoring of the project impacts on surface water resource.

4.4.4.1 Approach and Methods

The surface water found within 5 km radius of the project area was sampled at the locations geo-referenced and presented in Table 4.8.

Table 4.8 Sampling locations and geo-references.

Sample code	Geo-reference	
SWA1	N 6°30'22.25"	E 7°42'58.3"
SWA2	N 6°29'2.4"	E 7°42'24.9"
SWA3	N 6°29'1.41"	E 7°42'18.8"
SWA4	N 6°29'1.9"	E 7°42'19.8"
SWA5	N 6°29'1.6"	E 7°42'13.6"

The surface water samples were collected from the flowing stream around the project area. Each sample was transferred to two separate sterilized one litre sample bottles for physico-chemistry and heavy metal analysis. For the heavy metals, it was ensured that the one litre sample bottles were previously cleaned with nitric acid (HNO₃). The collected water samples were then acidified by means of 5 mL of 6M HNO₃ prior to laboratory analysis. Physico-chemistry parameters, namely, electrical conductivity, pH, chloride, total suspended solids (TSS), total dissolved solids (TDS), sulphate, nitrate, biochemical oxygen demand (BOD) and chemical oxygen demand (COD) were determined following the American Public Health Association (APHA, 2012) method. Total petroleum hydrocarbon (TPH) was measured using gas chromatography (GC) following the procedure described in EPA 8015 Methods. Heavy metals such as Pb, Cu, Cr, Ni, Zn and Cd were determined using Atomic absorption spectrometry as prescribed by the standard method of APHA (2012). The physico-chemical parameters namely: Cl, SO₄, NO₃, pH, conductivity, total suspended solids (TSS) and total dissolved solids (TDS) were measured following the standard method of APHA (2012). For the heavy metals, the quality assurance include: determination of limit of detection (LOD), limit of quantification (LOQ) and recoveries. The LOD was determined as three times the standard deviation of 10 replicate blank measurements (Pekey et al., 2004). The LOQ was determined as three times the LOD value. The LOD varied from 0.0002-0.0005 mg/L; LOQ varied from 0.0005 – 0.0015 mg/L; recoveries varied from 82-93%. The bacteriological characteristics of the water samples limited to total coliform and faecal coliform (*Escherichia coli*) were determined using the membrane filtration method (Forster and Pinedo, 2015).

4.4.4.1 Results of Surface Water Analysis

The values of the physico-chemistry parameters, bacteriological characteristics and concentration of the heavy metals for all the water samples are as presented in Table 4.9.

pH

The ability of aquatic organisms to operate optimally is a function of the pH of their surrounding environment. Hence, it is expected that the discharge of effluent into the receiving river with pH outside the range 6-9 could alter the overall pH of the surrounding environment thereby having adverse effect on the aquatic organisms. The pH of the surface water ranges from 6.52 to 6.7 which is within acceptable range both for humans and aquatic life (Table 4.9).

Alkalinity

Alkalinity of water is simply the ability of water to neutralize acid and is measured usually as CaCO₃ concentration. This therefore simply implies that water with appropriate levels of alkalinity

is expected to have a buffering potential against acidic incursions. Two water samples can have exactly the same pH values but different alkalinity. The water sample with higher alkalinity will resist pH changes more due to higher buffering potential. However, at alkalinity in excess of 150 mg/L, the high levels of calcium carbonate causes water hardness effects that are undesired among other adverse effects. The stream has CaCO₃ concentration range of 7-9 mg/L which is below the permissible limit of 150 mg/L (Table 4.). However, this concentration of CaCO₃ is very low and might mean that the stream cannot withstand substantial level of acid intrusion to the stream with respect to buffering potential. It therefore follows that if acidic wastewater from the SAPZ activities is not treated before discharge into the stream, the stream would not be able to exert enough buffering action to contain the acid intrusion thereby causing a reduction in pH level towards acidity.

Total Dissolved Solids (TDS), Electrical Conductivity (EC), Sulphate and Chloride

Total dissolved solids are actually a measure of dissolved species in the water and will technically include entities that are less than 2-micron pore diameter size filters. Hence, ions, molecules, sols (particles small enough to pass through micro-porous filter media but not as small as ions or molecules) of both organic and inorganic matter make up TDS. TDS is therefore a very good indication of the presence of chemicals in water and their possible levels. Depending on the dissolved species, excessive total dissolved solids can produce toxic effects on fish and fish eggs. Dissolved solids are also important to aquatic life by keeping cell density balanced. In distilled or deionized water, water will flow into an organism's cells, causing them to swell. In water with a very high TDS concentration, cells will shrink as water would pass from the cell to the water body by osmosis. These changes can affect an organism's ability to move in a water column, causing it to float or sink beyond its normal range. The FMEnv permissible limit for TDS of 500 mg/L is not exceeded at concentration range of 17.33-22.1 mg/L (Table 4.). From the concentration values of chloride and sulphate, it can be deduced that the major species contributing to the TDS of the effluent are not really these inorganic ionic species.

Sulphates in water could cause undesired effects such as scaling of water pipelines that transmit portable water in addition to having laxative effects on humans and livestock. At sulphate concentration level range of 1.38-1.76 mg/L for the stream, the permissible limit for sulphate is not exceeded hence no undesirable effects (Table 4.9).

Chloride is a measure of salinity in water systems. Some aquatic organisms can survive in environment of high levels of salinity while others can only survive in environments of low salinity. In saline water bodies such as seas and brackish waters, aquatic organisms are already used to the salinity of the water and may not experience unusual shock with salinity increase (especially in seas) due to discharged effluents laden with high salinity. In fresh water bodies such as the stream under study, discharged saline effluents can disrupt the aquatic ecosystem with several species struggling to cope with the elevated values of salinity and some eventually dying. Saline effluents are usually discharged by the agro-food, petroleum and leather industries. The chloride concentration range in this study of 5.2-6.6mg/L indicates that the permissible limit is not exceeded (Table 4.9). It therefore follows that there is no threat yet from saline effluent discharge to the Stream.

The presence of ionic species in effluents to be discharged into aquatic environment tends to elevate the electrical conductivity (EC) of the water body. The EC is a measure of the ability of the water to conduct electricity and is highly dependent on the presence of ionic species in the water body. This property of conducting electricity is undesirable for most water uses sequel to the danger it might pose. In most water systems, the concentration of common ionic species such as chloride and sulphate determines the level of EC. The EC of the Stream is low deriving from the low levels of the ionic species such as chloride and sulphate hence the EC range of the Stream at 36.8-46.8 does not exceed the FMEnv permissible limits at 1000 $\mu\text{s}/\text{cm}$ (Table 4.9).

Total Suspended Solids and Turbidity

High levels of total suspended solids (TSS) have adverse effect on water quality for various reasons. Example, high levels of TSS will increase water temperatures and decrease dissolved oxygen (DO) levels. Also, high levels of TSS can inhibit photosynthesis by blocking sunlight which will ultimately reduce plant productivity at the bottom of the river. Without the needed sunlight, some aquatic plants below the water surface will not be able to continue carrying out photosynthesis and may die. The TSS concentration range of 1.8-2.3 mg/L is within the permissible limit (Table 4.9). Turbidity is actually caused by TSS hence as TSS increases, turbidity increases leading to more absorption of heat from the sun to raise water temperatures that lead to reduced dissolved oxygen levels as described above.

Table 4.9: Values of the water quality parameters in comparison with FMEnv permissible limits for drinking water

Parameters	Water Samples						FMEnv Permissible limits
	SWA1	SWA2	SWA3	SWA4	SWA5	Range	
pH	6.52	6.62	6.73	6.76	6.68	6.52-6.76	6.5-8.5
TDS (mg/L)	19.9	22.1	17.85	17.33	18.9	17.33-22.1	500
TSS (mg/L)	2.1	2.3	1.86	1.8	1.97	1.8-2.3	10.0
EC (μ S/cm)	42.3	46.8	37.9	36.8	40.1	36.8-46.8	1000
Cl ⁻ (mg/L)	5.99	6.6	5.36	5.2	5.67	5.2-6.6	250
SO ₄ ²⁻ (mg/L)	1.6	1.76	1.42	1.38	1.5	1.38-1.76	100
NO ₃ ⁻ (mg/L)	0.25	0.28	0.23	0.3	0.25	0.25-0.3	50
PO ₄ ³⁻ (mg/L)	0.79	0.88	0.71	0.69	0.75	0.69-0.88	5.0
Total Alkalinity (mg/L)	8	9	7	7	8	7-9	150
BOD ₅ (mg/L)	0.37	0.35	0.37	0.37	0.37	0.35-0.37	30.0
COD(mg/L)	1.88	1.82	1.91	1.88	1.88	1.82-1.91	NA
Fe (mg/L)	0.04	0.044	0.036	0.035	0.038	0.035-0.04	0.3
Zn (mg/L)	0.25	0.28	0.228	0.221	0.241	0.221-0.28	3
Cu(mg/L)	0.001	0.0013	0.001	0.001	0.0011	0.001-0.0013	1
Pb(mg/L)	0.01	0.01	0.01	0.0097	0.01	0.0097-0.01	0.01
Cr(mg/L)	0.01	0.011	0.009	0.0088	0.0096	0.0088-0.01	0.05
Ni(mg/L)	0.0059	0.0066	0.0053	0.0056	0.0052	0.0052-0.0066	0.02
Cd(mg/L)	0.0016	0.0018	0.0014	0.0014	0.0015	0.0014-0.0018	0.003

Source: Analysis of samples from field study (2023)

Nitrate and Phosphate

Excessive nitrate in aquatic environment causes eutrophication with the consequent alteration of the aquatic ecosystem. Also, the presence of nitrate at high levels in water for drinking purposes can cause adverse health conditions such as methemoglobinemia also known as ‘baby blue syndrome’. Like nitrates, phosphates are nutrients required by aquatic plants for growth and therefore are highly implicated in eutrophication. In fact, it could be the limiting nutrient required for eutrophication to take place. The concentration range of phosphates and nitrates at 0.69-0.88 and 0.25-0.3 mg/L respectively are below the permissible limits (Table 4.9).

Chemical Oxygen Demand and Biochemical Oxygen Demand

Biochemical oxygen demand (BOD) is a measure of the biodegradable organic load of the river whereas the chemical oxygen demand (COD) is a measure of both biodegradable and non-biodegradable organic load of the effluent and may include some inorganic wastes that are oxidizable. High levels of BOD and COD are inimical to water quality. Example, high BOD levels would lead to depletion of dissolved oxygen (DO) in water bodies which may ultimately lead to death of aquatic animals such as fishes as a result of the depletion of the oxygen resources of the water body. The concentration range of the BOD and the COD at 0.35-0.37 and 1.82-1.91 mg/kg respectively in the Stream are within permissible limits (Table 4.9).

Heavy Metals

Heavy metals have adverse health effects in humans as a good number of them are toxic. In aquatic environment, they pose tremendous ecological risks adversely affecting aquatic biota. The very fact that heavy metals cannot be biodegraded makes them persist in the environment where they continually exert their toxic effects until such a time they are removed from the environment. The concentration values of all the heavy metals were below the permissible limit of FMEnv (Table 4). However, the concentration of lead was at the same level as that of the FMEnv limit.

Summarily, all the measured physico-chemistry parameters had values within the permissible limits of the FMEnv (Table 4). The concentration values of the heavy metals also did not exceed FMEnv permissible limits. However, the concentration of lead was at par with the permissible limits indicating that this heavy metal needs to be monitored closely.

4.4.5 Surface Water Sediments

Sediments were sampled during the data gathering to allow for future evaluation and monitoring of the project impacts on sediments.

4.4.5.1 Approach and Methods

The sediments of the surface water in the project area were collected at several locations as geo-referenced and presented in Table 4.10.

Table 4.10: Sediment sampling locations and geo-references

Sample code	Geo-reference	
SE1	N 6°29'3.5"	E 7°42'58.1"
SE2	N 6°29'2.4"	E 7°42'22.1"
SE3	N 6°29'1.41"	E 7°42'18.8"
SE4	N 6°29'1.9"	E 7°42'20.1"
SE5	N 6°29'1.6"	E 7°42'12.6"

Five sediment samples were collected using core auger at depths 0-10 cm. The sediment samples were exposed to open air to dry and thereafter passed through a 2 mm mesh sieve to get rid of plant debris, stones, and coarse materials. The sieved sediment samples were ground to powder using pestle and mortar and passed through a 3 mm mesh sieve to collect fine sediment samples required for analysis. For heavy metal analysis, the US EPA (2007) prescribed method was adopted in acid digestion of the sediment samples. Succinctly, this method consists using 65% HNO₃/ 37% HCl at a ratio of 3:1 v/v to digest the sediment samples in a Teflon vessel held in a microwave oven using the appropriate sediment/acid mix ratio. In this study, 15 mL of acid mix was used in digesting 0.3 g of sediment sample. The microwave digester (Milestone s.r.l, Italy) was operated in three sequences at 120, 150 and 200 °C for 5, 10 and 15 mins respectively. After microwave digestion, de-ionized water was added and the solution filtered using 0.45 µm filter membrane. Additional water was added to make up the volume to 50 mL and stored in the refrigerator below 4 °C until required for analysis. The heavy metals (Cu, Zn, Fe, Ni, Cr, Pb, Cd) were analyzed using SensAA GBC Flame Atomic absorption spectrometer.

4.4.5.1 Results of Surface Water Sediment Analysis

The concentration values of the heavy metals in the sediments of the study area are presented in Table 4.11.

Table 4.11: Concentration of the heavy metals in the surface water sediments

Sample code	Concentration of the heavy metals (mg/kg) in sediment						
	Ni	Cr	Pb	Cu	Fe	Zn	Cd
SE1	0.88	1.52	1.7	0.17	6.04	3.8	0.24
SE2	0.96	1.63	1.8	0.19	6.5	4.1	0.26
SE3	0.88	1.62	1.7	0.17	6.04	3.8	0.24
SE4	1.7	2.9	3.2	0.33	11.6	7.3	0.45
SE5	1.2	2.1	2.3	0.23	8.3	5.3	0.34
Range	0.88-1.7	1.52-2.9	1.7-3.2	0.17-0.33	6.04-11.6	3.8-7.3	0.24-0.45
BV	68	90	70	50	NA ^{*,b}	175	1.0

BV= background value; ^b = The background value for iron is usually higher than that of any heavy metal; SE1, SE2, SE3, SE4, and SE5 represent Sediment samples collected at various points as indicated in Table 4.10.

The concentration values of the heavy metals in the sediments of the surface water are far lower than background values indicating that there may not be any pollution of the sediments arising from anthropogenic activities.

4.4.6 Flora

The ecological studies were carried out as part of the ESIA to establish the existing ecological conditions and any anticipated changes before the establishment of the special livestock processing zone project. Attention was paid to biological environment (i.e., flora and fauna types and diversity, rare and endangered species within or adjacent to the project area) and adjoining areas.

4.4.6.1 Flora (Vegetation)

The natural vegetation of this area is the upland derived savannah, composed of a variety of shrubs and hard wood timbers. In the study area, the vegetation consists of derived savannah featuring tree species like *Pterocarpus* spp. Some common economic trees in the project area include; oil palm, coconut, cashew, and herbal trees like bitterleaf.

The families/sub-families that had the highest frequency of occurrence of plant species include Caesalpiniaceae, Ochnaceae, Cochlospermaceae, Mimosaceae, Annonaceae, Verbanaceae, Ulmaceae, Cleomaceae, Lamiaceae, Loganiaceae, Euphorbiaceae, Araceae and Poaceae. Plant species with frequencies of occurrence of 50% and above within this vegetation zone along the proposed project area include:

- **Trees/shrubs:** *Daniellia oliveri*, *Lophira lanceolata*, *Pterocarpus erinaceus*, *Cochlospermum planchoni*, *Vitexdoniana*, *Annona senegalensis*, *Anacardium occidentale*,
- **Herbs:** *Aspilia africana*, *Cleome viscosa*, *Phyllanthus amarus*, *Tridax procumbens*, *Euphorbia heterophylla*, *E. hirta*, *Hyptis suaveolens*, *Anchomanes welwitschii*.
- **Grasses:** *Andropogon gayanus*, *Brachiari alata*, *Imperata cylindrica*, *Hyparrhenia involucrata*, *H. rufa*, *Sporobolus pyramidalis*, *Pennisetum polystachion*.
- Within the study area the dominant trees were *Anacardium occidentale*, *Daniellia oliveri*, *Piliostigma thonningii* (Caesalpiniaceae), *Lophira lanceolata* (Ochnaceae), and *Vitexdoniana* (Verbanaceae) and these form an association. Palm trees were also dominant in the area. Of the smaller trees and shrubs, species of *Annona senegalensis*, and *Cochlospermum planchoni* are common. The herbaceous genera encountered belonged mainly to the families *Fabaceae*, *Euphorbiaceae*, *Cleomaceae* and *Asteraceae*. The commonest monocotyledonous plants belonged to the families *Poaceae*, *Araceae* and *Cyperaceae*.

4.4.6.2 Vegetation Sampling Methods

Transect sampling method was used to determine the vegetation cover of the study areas. A transect is a straight line across an expanse of ground along which ecological measurements are taken, continuously or at regular intervals. A 25 m by 25 m and 50 cm by 50 cm transects were used for the study. Because a single transect cannot be expected to sample a community adequately, repeated transects samples were taken. The sampling points were divided up into subareas depending on habitats and apparent floristic differences; and these were sampled

separately; within subareas, transects were established randomly. This type of sampling approach ensures a representative sample of the different physical and floristic features of the study areas. This type of sampling is called stratified random sampling.

When sampling vegetation using transects, different measures of abundance were quantified to assess the influence or “importance” of each species in each marked out transects. For example, the following were taken:

- Counts – a simple tally of the number of individuals of a species
- Cover – the percent (%) area of the transect occupied by a plant species.
- Density – estimated by quantifying the number of individuals of a species per unit area.
- Frequency – the proportion of transects sampled in which the species is represented.

To determine the proportional representation of each species relative to the entire plant community, relative cover, relative density and relative frequency values were then computed. For example, relative cover is the proportional cover of an individual species as a percentage of total plant cover; hence, it is expressed as a percentage, ranging from 0 – 100%. “Importance” is a measure of overall influence of a plant species in the community. An Importance Value (IV) for each species is derived from the combined contribution of the relative cover, relative density and relative frequency of each species in the community.

Floristic Composition of Selected Sample Locations

Table 4.12 shows the floristic composition of the area.

Table 4.12: Flora Species Composition of the Project Area

SN	Species	Family Name	Common Name	Habit	Uses
1	<i>Acacia spp</i>	Fabaceae	Wattles, Acacias	Tree	Medicinal
3	<i>Afzelia africana</i>	Fabaceae	African mahogany	Tree	Timber
5	<i>Alchornea cordifolia</i>	Euphorbiaceae	Christmas bush	Tree	Medicinal
6	<i>Anacardium occidentale</i>	Anacardiaceae	Cashew	Tree	Fruit
8	<i>Annona senegalensis</i>	Annonaceae	Custard-apple	Tree	Fruit
9	<i>Anogeissus leiocarpus</i>	Combretaceae	Axle-wood tree	Tree	Timber
10	<i>Azadirachta indica</i>	Meliaceae	Neem, Dogoyaro	Tree	Medicinal
11	<i>Axonopus compressus</i>	Poaceae	Broadleaf carpet grass	grass	
11	<i>Bambusa vulgaris</i>	Poaceae	Bamboo	Tree	Construction
12	<i>Bauhinia tomentosa</i>	Fabaceae	Yellow bauhinia, Yellow bell orchid tree	Tree	Medicinal
14	<i>Borassus aethiopum</i>	Palmae	Giginya	Tree	Wine, fruit
17	<i>Daniellia oliveri</i>	Fabaceae	West African copal tree	Tree	Timber, medicinal
18	<i>Dialium guineense</i>	Fabaceae	Velvet tamarind	Tree	Food
19	<i>Dioppsyro spp</i>	Ebenaceae	African satinwood, Ayan	Tree	Timber, charcoal
20	<i>Eleais guineensis</i>	Arecaceae	African oil palm	Tree	Food, medicinal
21	<i>Gmelia arborea</i>	Verbanaceae	Gmelia	Tree	Timber
24	<i>Khaya senegalensis</i>	Meliaceae	Mahogany	Tree	Timber
25	<i>Mangifera indica</i>	Anacardiaceae	Mango	Tree	Fruit
26	<i>Parkia biglobosa</i>	Fabaceae	African locust bean tree	Tree	Seasoning
27	<i>Prosopris Africana</i>	Fabaceae	Iron tree, Guele	Tree	food, medicine, timber
28	<i>Pterocarpus erinaceus</i>	Fabaceae	African rosewood	Tree	Timber
31	<i>Vitex doniana</i>	Lamiaceae	West african plum, African oak	Tree	Food, medicinal

SN	Species	Family Name	Common Name	Habit	Uses
32	<i>Acacia nilotica</i>	Fabaceae	Scented-pod acacia	Shrub	shade, food, fodder
33	<i>Annona senegalensis</i>	Annonaceae	African custard-apple, Wild soursop	Shrub	Fruit, medicine
35	<i>Calotropis Procera</i>	Asclepiadaceae	Adams apple	Shrub	Medicinal
38	<i>Nauclea latifolia</i>	Rubiaceae	African peach	Shrub	Medicinal



Vegetation of the SAPZ location

4.4.7 Fauna

4.4.7.1 Methodologies for Fauna Assessment

Wildlife survey was carried out through direct observations, informal interviews, net trapping of terrestrial and flying Insects, Auditory and visual study of amphibians and reptiles (herpetofauna) and mammals, Nest box log, point counts and feeder counts for birds as well as signs of animal's presence which included scat (faeces); footprints, burrows, nests, or dens; cast-off larval cases or cocoons; tracks, carcasses as well as wildlife specimens provided by local residents, vigilantes, hunters and bush-meat traders to show evidence of their occurrence. Characteristic sounds, such as bird song, were also used to reveal an animal's presence and sometimes information about relative abundance. Wildlife species known to be mostly secretive and nocturnal were sampled at night times with the help of the locals and vigilante group in the community. Species targets

- Migratory birds
- Resident birds
- Game animals
- Carnivores
- Prey species
- Rodents
- Insects
- Reptiles
- Amphibians

The list of animal species encountered in the project area is provided in Table 4.13.

4.4.7.2 Conservation Status of Animal Species in the Study Area

The conservation status of the animal species in the study area was evaluated using the International Union for Conservation of Nature (IUCN) Red List Categories and Criteria. The IUCN Red List of Threatened Species is widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of animal, fungi and plant species and their links to livelihoods. The IUCN Red List is set upon precise criteria to evaluate the extinction risk of thousands of species and subspecies. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as help the international community to try to reduce species extinction. Species are classified by the IUCN Red List into nine groups as follows:

- Extinct (EX) – No known individuals remaining.
- Extinct in the wild (EW) – Known only to survive in captivity, or as a naturalized population outside its historic range.
- Critically endangered (CR) – Extremely high risk of extinction in the wild.
- Endangered (EN) – High risk of extinction in the wild.
- Vulnerable (VU) – High risk of endangerment in the wild.
- Near threatened (NT) – Likely to become endangered in the near future.
- Least concern (LC) – Lowest risk. Does not qualify for a more at-risk category. Widespread and abundant taxa are included in this category.
- Data deficient (DD) – Not enough data to make an assessment of its risk of extinction.
- Not evaluated (NE) – Has not yet been evaluated against the criteria.

When discussing the IUCN Red List, the official term "threatened" is a grouping of three categories: Critically Endangered, Endangered, and Vulnerable.

Table.4.13: List of animal species encountered in the project area

Scientific name	Common name	Family	Conservation Status
MAMMALIAN			
<i>Cricetomys gambianus</i>	African giant rat	Muridae	NT
<i>Viveracivita</i>	African civet cat	Viverridae	VU
<i>Canis catus</i>	Domestic cats	Felidae	NE
<i>Canis lupus familiaris</i>	Domestic dog	Canidae	NE
<i>Sus scrofa domesticus</i>	Domestic pig	Suidae	NE
<i>Capra aegagrus hircus</i>	Domestic goat	Bovidae	NE
<i>Ovis aries</i>	Domestic sheep	Bovidae	NE
<i>Ratus ratus</i>	House rats	Muridae	NE
<i>Bos taurus</i>	Cow	Bovidae	NE
<i>Chaerephon nigeriae</i>	Nigerian Free- Tailed Bat	Molossidae	NT
REPTILIAN			
<i>Varanus niloticus</i>	Nile Monitor Lizard	Varanidae	VU
<i>Naja melanoleuca</i>	Black Cobra	Elapidae	EN
<i>Agama agama</i>	Native agama	Agamidae	LC
<i>Plestiodoon fasciatus</i>	Five lined skink	Scincidae	LC
AMPHIBIAN			
<i>Ptychadena taenioscelis</i>	Dwarf grass Frog	Ptychadenidae	Least concern
<i>Bufo regularis</i>	Common toad	Bufonidae	Least concern

Scientific name	Common name	Family	Conservation Status
AVIAN			
<i>Columba liviademestica</i>	domestic pigeon	Columbidae	LC
<i>Bubulcus ibis</i>	Cattle Egret	Ardeidae	LC
<i>Merops albicollis</i>	White-throated Bee-eater	Meropidae	LC
<i>Tockus fasciatus</i>	African Pied Hornbill	Bucerotidae	LC
<i>Motacilla aguimp</i>	African Pied Wagtail	Motacillidae	NT
<i>Pycnonotus barbetus</i>	Common Garden Bulbul	Pycnonotidae	LC
<i>Nectarinia chloropygia</i>	Olive-bellied Sunbird	Nectariniidae	LC
<i>Passer griseus</i>	Grey-headed Sparrow	Passeridae	LC
<i>Lagonosticta senegala</i>	Red-billed Fire-Finch	Estrildidae	LC
<i>Actophilornis africana</i>	Lilly trotters, African jacana	Jacanidae	LC
<i>Cossypha natalensis</i>	Red capped robin chat	Muscicapidae	LC
<i>Venellus superciliosis</i>	Wattled plover	Charadriidae	LC

4.4.7.3 Invertebrates

The results of the invertebrate species assessment indicated that phylum Arthropoda was predominant in the study area. The observed invertebrates included a total of 19 arthropod species belonging to different taxa. There were frequent sightings of butterflies (Lepidoptera) and grasshoppers (Orthoptera). Table 4.14 below shows the classification of the invertebrate fauna observed in the study area.

Table.4.8: Classification of Invertebrate Fauna observed in the Project Area

Taxa /Common Names	Scientific Names	Order	IUCN Status
Phylum Arthropoda			
Bee	<i>Apis spp</i>	Hymenoptera	NE
Termites	<i>Marcotermes bellicosus</i>	Isoptera	NE
Common Black Ground Beetle	<i>Pterostichus melanarius</i>	Coleoptera	NE
Rhinoceros beetle	<i>Pentodon idiota</i>	Coleoptera	NE
Grass hopper	<i>Zonocerus variegates</i>	Orthoptera	NE
Gray bird grasshopper	<i>Schistocerca nitens</i>	Orthoptera	NE
Praying mantis	<i>Mantodea religiosa</i>	Orthoptera	NE
House Cricket	<i>Acheta domestica</i>	Orthoptera	NE
Field cricket	<i>Gryllus spp</i>	Orthoptera	NE
Mole cricket	<i>Gryllotalpa orientalis</i>	Orthoptera	NE
Black Ant	<i>Lepisiota spp.</i>	Hymenoptera	NE
Millipede	<i>Narceus americanus</i>	Spirobolida	NE
House Flies	<i>Musca domestica</i>	Diptera	NE
Monarch Butterfly	<i>Danaus plexippus</i>	Lepidoptera	NE
Black Pansy	<i>Junonia oenone</i>	Lepidoptera	LC
Plain Tiger	<i>Danaus chrysippus</i>	Lepidoptera	NE
Centipede	<i>Lithobius forticatus</i>	Chilopoda	NE

LC – Least Concern; NE = Not endangered

4.4.8 Social Environment

4.4.8.1 Project Host Community

Owo is a town in Nkanu East Local Government Area (LGA) of Enugu state, Nigeria. Owo consists of six main villages: Ashishi, Ohuani, Ishiegu, Ogere, Emene and Ndiagu. Other settlements which were originally part of the main villages are Ejaogbo, Mbulu, Ekeagu, Obegu Ishiagu, Obegu Emene, Obegu Ogere, and Obegu Ohuani. These make up Mbulu Owo autonomous community created in the year, 2006. The residents are largely agrarians, artisans, traders and very few skilled professionals who work in schools and health institutions located in the community. Many of its population are Christians, while the rest are African Traditional worshippers. As of the field visit, most residents said they had unreliable access to the national electricity grid, which did not meet household energy demand. Therefore, a small proportion of the residents make up their home lightening, cooking and other demands by generating their electricity with petrol generators, leaving the vast majority to depend on firewood, hurricane lanterns and other local alternatives. Furthermore, except for the rainy season and few household boreholes and wells, more households rely on a local stream (Idodo) to supply their demand for water as the community has no access to public pipe-borne water.

When considering the existing basic infrastructure/amenities, Owo community has seven (7) nursery schools, seven (7) primary schools and four (4) secondary schools. It can also boast of a hospital, a health centre, about four (4) maternity homes, three (3) traditional healing homes, and seven (7) patent medicine stores. Regarding sanitation and environmental waste management, the community has no public waste management infrastructure. On security issues, Owo has a police station and a vigilante group that works under Police supervision to secure the community. Apart from the availability of amenities in the community, a sample of a few residents' opinions shows that it takes most households about one hour of walk time to access the only public water source (Idodo stream), public transportation pack and the public secondary schools. It was also estimated that an average household spends about 30 minutes walking time to access food markets, healthcare facilities and a public primary school.

CHAPTER 5: ASSOCIATED AND POTENTIAL IMPACTS

5.1 Introduction

The activities associated with the proposed construction and operation of the SAPZ at Owo, Nkanu East LGA in Enugu State, Nigeria, will inevitably result in varying degrees of impacts on the bio-physical and social environment. In this Chapter, the potential impacts of the proposed project are identified and assessed to determine their significance. Subsequently, mitigation measures are proffered to avoid, reduce or compensate for all potentially significant impacts on the physical (air, surface water, soils, etc.), biological (terrestrial and aquatic flora and fauna) and human (particularly host community and farmers etc.) environment.

The impact identification was based on the envisaged interaction of different project activities with individual receptors within these broad groups while the value, sensitivity and importance of these receptors form the bases upon which the impacts were assessed to determine their significance and the proposed mitigation measures.

5.2 Impact Assessment Approach and Methods

The impacts of the construction and operation of the SAPZ on the physical, biological and social environment were assessed using a combination of the hazard effect management process (HEMP) and the matrix interaction methods. The impacts were assessed using a combination of primary and secondary information collected from project areas as well as professional experience and judgements of the multidisciplinary ESIA team. The impact assessment process involved 3 key stages, namely:

5.2.1 Impact Prediction or Identification

This first stage entails prediction of changes to the environment that could result from the proposed construction and installations at the selected facilities. The prediction of these changes is based on the identification of potential interactions between aspects/ activities of the project and the physical, biological and social resources/receptors.

5.2.2 Impact Characterization

This entails characterizing/forecasting the nature, magnitude, extent, duration, frequency and scale of the impacts. Characterization will essentially help determine the magnitude of impacts and degree of change the impact is likely to have on the receptor.

5.2.3 Impact Evaluation

This entails determination of the significance of impacts based on the magnitude of impacts and the value, sensitivity/fragility and recoverability of the affected receptors. This requires an in-depth appraisal of the attributes of potential receptors which has been carried out during the baseline studies and documented in Chapter 4.

The impact assessment process was undertaken in line with the process summarised in Figure 10.

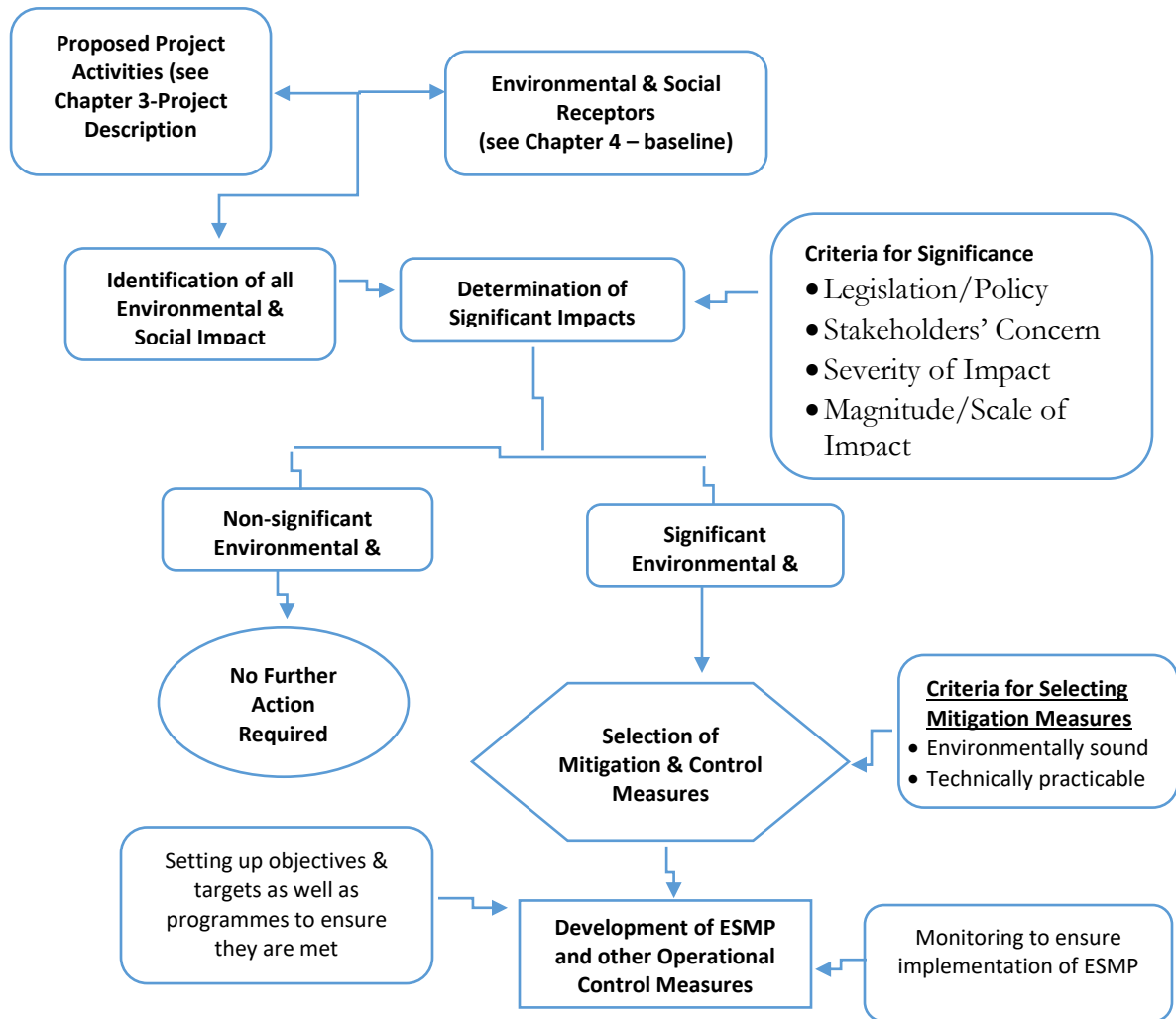


Figure 10: Overview of Impact Assessment Process

5.2.4 Environmental and Social Impact Identification

The potential impacts of the project were predicted in the context of the interactions of the environmental aspects of project activities and the environmental (and social) receptors in the project area of influence during the construction and operational phases of the project. The prediction of impacts based on the linkages (the source-pathway-receptor approach) among project activities, aspects and receptors. The positive impacts of the proposed project are presented below.

5.2.4.1 Potential Positive Impacts

The potential positive impacts of the project include but not limited to the following:

- The project will reduce poverty by creating direct and indirect jobs for farmers (crop farmers, animal farmers and fish farmers) and herders, traders, and other agro value chain participants.
- The output of the project (particularly the crops and poultry) will lead to improved food and nutrition security for the local population.
- Provision of employment opportunities for the teeming youths of Owo and Nkanu East LGA at large and many others.
- Increased income and foreign exchange for farmers and processors from cassava due to processing of cassava into ethanol.
- Support other ancillary Infrastructural development such as: Power/Electricity Health facilities, Irrigation/water facilities, Education (Schools), Roads infrastructure, Water infrastructure (potable water supply), Vocational Training, Sports and leisure options for youth
- Increased incomes for the farmers and better purchasing power for farmers across 3 senatorial zone of Enugu State, through access to better inputs, resulting to better yields and reduced post-harvest losses from Processing.
- Reduced conflicts in Owo and environ communities especially among farmers and herders as they will better managed production, increased income for famers and reduced poverty.
- Expand demand for local agricultural produce by creating new international and local market.
- Increase the forex earning on palm produce by reduction of raw material exports and begin exports of value-added by-products, for example, vegetable oils, after meeting local demands
- Improving the living and working conditions of smallholder farmers and their families and workers.
- Contribution to reduced national expenditure on importation of livestock products and increased export and foreign exchange earnings.
- Increased private sector capacity and skills in livestock management and value chain development.
- Provision of enabling infrastructure for livestock value chain development.
- The project will contribute to the realisation of the following UN SDG in Nigeria: Goal 1: End poverty in all its forms everywhere. Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture. Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all. Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation and Goal 12: Ensure sustainable consumption and production patterns.

5.2.4.2 Impact Characterization

In order to further qualify the impacts of the various proposed project activities on the environment and people, all identified impacts were characterised based on the nature, duration and reversibility of impacts as shown in

Table5.1.

Table 5.1: Impact Characterization Parameters and Definition

Impact Parameters	Definition
Beneficial Impacts	Impacts with positive and beneficial effects.
Adverse Impacts	Impacts with negative and untoward effects.
Direct Impacts	Impacts that are most obvious, result solely and are directly related to the proposed project and can be connected to the action that caused them.
Indirect Impacts	Secondary impacts that do not occur directly from a project activity but occur as a consequence of the project as a result of some intermediate step or processes.
Cumulative Impacts	Impacts that typically occur from the incremental impact of an action when combined with impacts from projects that have been undertaken recently or would be carried out in the near future.
Reversible Impacts	Impacts over which the components involved have the ability to recover after the disturbances caused by the impact.
Irreversible Impacts	Impacts whose effects are such that the affected environmental/socioeconomic component cannot be returned to its original state even after adequate mitigation measures are applied.
Residual Impacts	Impacts whose effects remain after mitigation measures have been applied.
Short Term Impacts	Impacts which last only within the period of a specific project activity.
Long Term Impacts	Impacts which have their effects remain after a specific project activity.

5.2.4.3 Impact Evaluation

The third stage in the assessment procedure involved the evaluation of the concerns, issues and impacts identified. This was based on the Risk Assessment Matrix (RAM). The risk of the impacts occurring was analysed by determining the consequence/severity of the impacts and the probability of occurrence. The severity of the consequences was determined using a Consequence Severity Table and the probability of an impact resulting from a pathway was determined with a Likelihood Ranking Table. The RAM in Table 5.2 was then used to determine the level of risk and the significances or otherwise of the impacts.

Table 5.2: Probability of Occurrence, Consequence Severity, Likelihood Ranking and Risk Matrix

Probability	Attributes			
Certain	Impacts that can reasonably be expected to occur during the project			
Likely	Impacts that are likely to occur during the project			
Possible	Impacts that might occur sometime during the project			
Unlikely	Impacts that can reasonably be expected NOT to occur during the project			
Rare	Impacts that are unlikely to occur except in exceptional circumstances			
Severity	Attributes			
Negligible	No detectable environmental and socio-economic impact			
Marginal	Minimum environmental and socio-economic impact. Localised reversible habitat loss or minimal long term effects on habitat species or media/ public health and safety			
Critical	Significant environmental and socio-economic harm. Significant widespread and persistent changes in species, habitat and media (e.g., widespread habitat degradation/public health and safety)			
Catastrophic	Detrimental environmental and socio-economic impact. Loss of a significant portion of a valued species or effective ecosystem function on a landscape scale/ injury and death is possible			
	Severity			
Probability	Negligible	Marginal	Critical	Catastrophic
Certain				
Likely				
Possible				
Unlikely				
Rare				
	<p>Impact Rating</p> <ul style="list-style-type: none"> • Low Risk: No response plans will be needed for these risks. • Medium Risk: Actions may be required to control acceptable risk. • High Risk: Adequate action and management attention are required to control risk. There is need for some response planning for these risks. • Extreme Risk: Significant additional action and high priority management attention will be required to control risk. There is need for an in-depth response plan for these risks. 			
Low				
Medium				
High				
Extreme				

Table 05.3: Characterization and Evaluation of Potential Impacts of Proposed Project

Project Activity	Potential Impact	Impact Qualification										Risk		Impact Category
		Direct	Indirect	Reversible	Irreversible	Cumulative	Long term	Short term	Beneficial	Adverse	Residual	Probability	Severity	
PRE-CONSTRUCTION PHASE														
Site Preparation and Clearing for Access/ Internal Road, Forage development and other SAPZ Infrastructure. Mobilization and storage of equipment, materials on site Installation of Site Offices & Workers Camp Site	Air quality deterioration from release of dusts and gaseous emissions from exposed soil surfaces and vehicles may affect receptors such as motorist plying the nearby roads, for example Enugu-Abakaliki road.	X		X				X		X		CERTAIN	MARGINAL	HIGH
	Noise and vibration from the use of machineries and motorized equipment	X		X				X		X		LIKELY	MARGINAL	HIGH
	Loss of vegetation cover due to clearing for forage development and construction	X		X				X		X		CERTAIN	MARGINAL	HIGH
	Exposure of wild animals to poaching/hunting	X		X				X		X		LIKELY	MARGINAL	HIGH
	Reduction in carbon sequestration in the project area due to trees removal.	X		X			X			X		LIKELY	NEGLIGIBLE	MEDIUM
	Removal of vegetation and trees leading to habitat destruction and fauna loss	X		X				X		X		LIKELY	NEGLIGIBLE	MEDIUM
	Movement of equipment, vehicles and workforce into project area, could introduce invasive species which adversely impact fauna, flora, ecosystems, and crops.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Depletion of soil fauna due to removal of vegetation	X		X				X		X		LIKELY	NEGLIGIBLE	MEDIUM
	Soil erosion and loss of soil quality from exposure of soil to weather elements	X		X				X		X		LIKELY	MARGINAL	HIGH
	Soil contamination from spillages of oil and other petroleum products from leakages and/or improper handling during maintenance of vehicles and equipment	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Soil compaction and predisposition to erosion due to movement of vehicles on site and stacking of heavy-duty equipment	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Generation of vegetal wastes from de-vegetation and site clearing activities	X		X				X		X		CERTAIN	MARGINAL	HIGH
	Contamination/pollution of sources of water, food and fodder for animals during clearing	X		X				X		X		LIKELY	MARGINAL	HIGH
	Alteration of aquatic habitat in rivers as a result of pollution and sedimentation may lead to depletion of aquatic biota	X		X				X		X		LIKELY	MARGINAL	HIGH

Project Activity	Potential Impact	Impact Qualification									Risk		Impact Category	
		Direct	Indirect	Reversible	Irreversible	Cumulative	Long term	Short term	Beneficial	Adverse	Residual	Probability		Severity
	Traffic congestion/travel delay along the access road to project site will occur as a result of mobilization of workers, equipment and other materials to the site	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	There could be security breaches and theft of materials and equipment stored on site and threat to lives, for example, through kidnapping.	X		X				X		X		POSSIBLE	CRITICAL	HIGH
	There could be increased exposure to health risks from fugitive dusts and exhausts fumes.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Site clearing and mobilization of workers, equipment and other materials to the site may cause an upsurge in noise nuisance in the area which can have adverse health impacts	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Injuries from falling of trees	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Occupational accidents and injuries from use of heavy machineries and equipment	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
CONSTRUCTION PHASE														
Construction of SAPZ Infrastructure such as Access/Internal Roads, Buildings, ethanol factory and equipment installation, Livestock Containments, Boreholes	Air Quality deterioration from dusts generated during excavation, filling, backfilling and compaction activities	X		X				X		X		LIKELY	MARGINAL	HIGH
	Noise and vibration from the use of machineries and vehicles during excavation, burrowing, backfilling and compaction activities	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Predisposition of soil to erosion during excavation and earth movement	X		X				X		X		LIKELY	MARGINAL	HIGH
	Loss, damage or disruption of soil/sediments during construction works.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Release of hazardous substances associated with construction activities or with transport of goods (e.g., accidental spills & leaks), leading to soil, surface or groundwater contamination.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Generation of construction waste including spoils, debris and concrete wastes.	X		X				X		X		LIKELY	MARGINAL	HIGH
	Generation of scrap wastes from mechanical and electrical works such as pieces of electric cables, timbers, metals cuttings, nails and packaging materials	X		X				X		X		LIKELY	MARGINAL	HIGH

Project Activity	Potential Impact	Impact Qualification									Risk		Impact Category	
		Direct	Indirect	Reversible	Irreversible	Cumulative	Long term	Short term	Beneficial	Adverse	Residual	Probability		Severity
	Inefficient waste management during construction leading to excess consumption of materials, generation of wastes/emissions, pollution of soils and water.	X		X				X		X		POSSIBLE	CRITICAL	HIGH
	Introduction of air pollutants into the atmosphere from asphalt laying on access/internal roads.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Disruption to livelihood activities such as farming and grazing due to interruptions caused by construction activities	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Construction activities will likely intercept or terminate the flow of the existing surface water bodies and Wells; and cause lack of water for human and livestock drinking as well as water for irrigation.	X		X				X		X		LIKELY	MARGINAL	HIGH
	Abstraction of large volume of water from ground or surface water sources may affect supply for other water users and result in conflicts over water use.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Traffic congestion and increased road traffic accident on the major highways near the SAPZ, for example, Enugu-Abakaliki road, and site access road due to movement of heavy-duty vehicles in and out of the construction site.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	The project has no safeguard officers and is likely not able to implement the ESMP prepared for the project	X		X			X			X		LIKELY	CRITICAL	HIGH
	Risk of health problems from exposures to noise, fugitive dust and exhaust emissions from the use of machineries & motorized equipment for construction	X		X				X		X		LIKELY	MARGINAL	HIGH
	Risk of occupational accidents and injuries from working in excavations and the use of machineries and equipment	X		X				X		X		POSSIBLE	CRITICAL	HIGH
Presence of Migrant Workers & Business Opportunists	Direct employment of local population in workforce, and stimulation of local economy through export of and demand for goods and services will enhance livelihoods and economic activity in local communities; potential for adverse effects if expectations not met and community relations are not well managed.	X		X			X		X			CERTAIN	MARGINAL	HIGH POSITIVE
	Threat to community culture, beliefs, safety and security due to influx of workers and business opportunists.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Real or perceived disruption to normal community life, through the influx of a non-local workforce.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM

Project Activity	Potential Impact	Impact Qualification									Risk		Impact Category	
		Direct	Indirect	Reversible	Irreversible	Cumulative	Long term	Short term	Beneficial	Adverse	Residual	Probability		Severity
	Risk of illicit behaviour and crime (including prostitution, theft, robbery and substance abuse)	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Interaction between non-local workforce and local communities may increase occurrence of communicable diseases, including HIV/AIDS and sexually transmitted diseases (STDs).	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Potential increased prevalence of GBV & SEA resulting from interaction among construction workers, community members and camp followers	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Child labour and school drop-out in nearby communities of Ore due to availability of construction work	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Individuals are likely to migrate into the project area from the local/regional area, which may cause conflict with residents, and put pressure on resources and infrastructure.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Pollution of River Oluwa and dam from open defaecation of construction workers may lead to increased risk of water borne diseases in nearby communities.	X		X				X		X		POSSIBLE	MARGINAL	MEDIUM
	Assault of workers, kidnapping and vandalization of equipment by local youths over local jobs	X		X				X		X		POSSIBLE	CRITICAL	HIGH
	Conflicts between investors and farmers over labour related issues	X		X				X		X		POSSIBLE	CRITICAL	HIGH
	Loss of employment for temporary construction workers	X		X				X		X		CERTAIN	MARGINAL	HIGH
Creation of borrow pits.	Unsustainable excavation and non-rehabilitation of borrow pits may lead to land degradation and increased susceptibility to erosion and flooding	X		X				X		X		POSSIBLE	CRITICAL	HIGH
	Borrow-pit may become inundated with water and pose possible risk of accident and drowning to human and animals.	X		X				X		X		POSSIBLE	CRITICAL	HIGH
OPERATION AND MAINTENANCE PHASE														
Operation and Maintenance of SAPZ and Ancillary Infrastructure	Dust and emissions from maintenance activities, and from vehicles and machinery during operation, could affect human health, vegetation and wildlife.	X		X			X			X		POSSIBLE	MARGINAL	MEDIUM
	Increase ambient noise from machineries and equipment including haulage trucks	X		X			X			X		LIKELY	MARGINAL	HIGH

Project Activity	Potential Impact	Impact Qualification									Risk		Impact Category	
		Direct	Indirect	Reversible	Irreversible	Cumulative	Long term	Short term	Beneficial	Adverse	Residual	Probability		Severity
	Odours associated with waste from ethanol processing and other activities may have nuisance implications for nearby receptors and workers/farmers	X		X			X			X		LIKELY	MARGINAL	HIGH
	Abstraction of large volumes of water from surface or groundwater sources for watering poultry and livestock and irrigation may affect supply for human communities and ecosystems.	X		X			X			X		LIKELY	CRITICAL	HIGH
	Inefficient waste management during operation and maintenance leading to excess consumption of materials, generation of wastes/emissions, pollution of soils and water.	X		X			X			X		LIKELY	CRITICAL	HIGH
	Loss, damage or disruption of soil/sediments from livestock presence (e.g. trampling).	X		X			X			X		POSSIBLE	MARGINAL	MEDIUM
	Development of agro hub in remote or undeveloped areas leading to further development, increased disturbance and pressure on natural resources through bush meat hunting, logging, fire, etc.	X		X		X	X			X		POSSIBLE	MARGINAL	MEDIUM
	Increased development in remote areas could lead to greater demand for bush meat (from workforce and wider community), stimulate the wildlife trade and facilitate access to hunting areas.	X		X			X			X		POSSIBLE	MARGINAL	MEDIUM
	Presence of humans may displace animals and disturb their habitats, by direct disturbance during construction and operation (e.g., increased human and vehicle presence, noise, light disturbance at night, construction of associated facilities).	X		X			X			X		POSSIBLE	MARGINAL	MEDIUM
	Degradation of health and size of populations of native species due to spread of diseases from animal production and farmed crops	X		X			X			X		POSSIBLE	CRITICAL	MEDIUM
	Increased likelihood of certain vector-, animals- or water-borne diseases spreading within workforce and local community due to animal production and standing water; health risks associated with chemicals used and wastes produced during operation (e.g. pesticides, noxious gases).	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Poor animal welfare (e.g., malnutrition)	X		X			X			X		LIKELY	CRITICAL	HIGH

Project Activity	Potential Impact	Impact Qualification									Risk		Impact Category	
		Direct	Indirect	Reversible	Irreversible	Cumulative	Long term	Short term	Beneficial	Adverse	Residual	Probability		Severity
	Pollution of watercourses from open defaecation of construction workers may lead to increased risk of water borne diseases in nearby communities.	X		X		X	X			X		LIKELY	CRITICAL	HIGH
	Fear of sustainability of the project amidst change of political leadership	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Marginalization of the vulnerable groups and minority tribes	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Risk of illicit behavior and crime (including prostitution, theft and robbery)	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Individuals are likely to migrate into the project area from the local/regional area, which may cause conflict with residents, and put pressure on resources and infrastructure.	X		X			X			X		LIKELY	CRITICAL	HIGH
	Labour Influx which could lead to increase in sexual activities and potential spread of STDs/STIs including HIV/AIDS in the project location	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Potential increased prevalence of GBV & SEA resulting from interaction among construction workers, community members and camp followers	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Child labour and school drop-out in Ore community due to availability of construction work	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Traffic congestion and increased road traffic accident due to movement of vehicles conveying (inputs and products to and from the SAPZ.	X		X		X	X			X		LIKELY	MARGINAL	MEDIUM
	Transportation and storage of hazardous materials such as petrol and gas may results in explosions, fires or spills during operation.	X		X		X	X			X		POSSIBLE	CRITICAL	HIGH
	Threat to Ore community culture, safety and security due to presence of workers and business opportunists.	X		X			X			X		POSSIBLE	MARGINAL	MEDIUM
	Evolution of slums/uncontrolled human settlements around the SAPZ with attendant overcrowding, crimes, vices and diseases.	X		X			X			X		POSSIBLE	MARGINAL	MEDIUM
	Poor management of occupational health and safety leading to accidents, injuries and illnesses among workers); mental health issues due to remote or enclosed living.	X		X			X			X		LIKELY	MARGINAL	MEDIUM
	Differences in nationality, ethnicity, religion, etc. may lead to discrimination and harassment, and differences (perceived	X		X			X			X		LIKELY	MARGINAL	MEDIUM

Project Activity	Potential Impact	Impact Qualification									Risk		Impact Category	
		Direct	Indirect	Reversible	Irreversible	Cumulative	Long term	Short term	Beneficial	Adverse	Residual	Probability		Severity
	or real) in working conditions between workers may lead to resentment.													
Forage Fields and Fodder Plants	Generation of waste products consisting primarily of palm fronts, spent kernels and pods, manure with straw	X		X		X	X			X		CERTAIN	MARGINAL	HIGH
	Continuous air emission sources will include a service boiler house, transportation, grain cracking, husking, drying and cooling of finished products.	X		X			X			X				
	Abstraction of large volume of water	X		X		X	X			X		POSSIBLE	CRITICAL	HIGH
	Generation of waste including fodder and grain dust, sludge and packaging waste	X		X		X	X			X		CERTAIN	MARGINAL	HIGH
	Pollution of watercourses caused by wastes from livestock, and workforce sewage effluent, as well as runoff from grazing areas and land used for growing feed (containing fertilisers, pesticides and herbicides etc.).	X		X			X			X		POSSIBLE	CRITICAL	HIGH
Abattoir and Meat Processing Areas	Abstraction of large volumes of water may lead to water shortages in the zone	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Poor hygiene and management of abattoir may lead to bacterial contamination with attendant public health risk	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Generation of animal waste including manure, blood and inedible animal parts and chemical used for tanning may lead to environmental contamination	X		X		X	X			X		CERTAIN	MARGINAL	HIGH
	Emission of methane, ammonia and other GHGs may aggravate climate change and cause unpleasant odours	X		X		X	X			X		CERTAIN	MARGINAL	HIGH
	Odours from animal waste products and some carcass treatment and manure in the lairage pens	X		X		X	X			X		LIKELY	MARGINAL	MEDIUM
	Pollution of soil and watercourses due to run-off or discharge of untreated foul water (effluents) and improper management of waste	X		X		X	X			X		LIKELY	CRITICAL	HIGH
Ethanol Production Areas	Deterioration of air quality by the possible presence of ammonia	X		X		X	X			X		CERTAIN	MARGINAL	HIGH
	. Water quality deterioration arising from the discharge of untreated wastewater containing high levels of nutrient, BOD and suspended solids	X		X		X	X			X		LIKELY	CRITICAL	HIGH
	Increase in concentration of greenhouse gas such as methane in the atmosphere to exacerbate climate change challenges	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	water quality deterioration, water availability	X		X			X			X		POSSIBLE	CRITICAL	HIGH

Project Activity	Potential Impact	Impact Qualification									Risk		Impact Category	
		Direct	Indirect	Reversible	Irreversible	Cumulative	Long term	Short term	Beneficial	Adverse	Residual	Probability		Severity
Veterinary and Disease Control	Zoonoses (potential transmission of diseases between animals and humans)	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Degradation of health and size of populations of native species due to spread of diseases from livestock.	X		X			X			X		POSSIBLE	CRITICAL	HIGH
	Generation of hazardous waste (including medical waste and animal tissues)	X		X			X			X		CERTAIN	MARGINAL	HIGH
Crop Production Area	Pollution of watercourses caused by run-off from farming areas (containing fertilisers, pesticides and herbicides etc.).	X		X		X	X			X		POSSIBLE	CRITICAL	HIGH
	Conflict between farmers and investors over labour related issues	X		X		X	X			X		LIKELY	CRITICAL	HIGH
Cocoa Plantation and processing	Risk of child labour on plantations	X		X			X			X		POSSIBLE	MARGINAL	HIGH
	Generation of wastes from production and processing of cocoa	X		X			X			X		CERTAIN	CRITICAL	HIGH
	Occupational hazards from operation of machinery in processing plant	X		X			X			X		POSSIBLE	MARGINAL	HIGH
Oil palm plantation and processing	Risk of child labour on plantations	X		X			X			X		POSSIBLE	MARGINAL	HIGH
	Generation of wastes from production and processing of oil palm	X		X			X			X		CERTAIN	CRITICAL	HIGH
	Occupational hazards from operation of machinery in processing plant	X		X			X			X		POSSIBLE	MARGINAL	HIGH

CHAPTER 6: MITIGATION AND ENHANCEMENT MEASURES

6.1 Introduction

This Chapter describes mitigation measures that are technically and financially feasible to address environmental and social impacts associated with the development SAPZ at Owo, Nkanu East LGA of Enugu State, Nigeria. The mitigation measures recommended are commensurate with the nature and magnitude of the potential impacts taking into cognisance the peculiarity of the proposed project and activities as well as environmental and social setting of the project area.

6.2 Mitigation Approach

The approach adopted for selecting appropriate mitigation measures followed a hierarchy that favours the avoidance of impacts over minimization, and where residual impacts remain, compensate/offset for impacts to workers, affected communities and the environment.

6.2.1 Avoidance

To avoid the impact altogether by not using certain type of resources, or areas considered to be environmentally sensitive nor taking certain actions or parts of an action that could result in negative impacts. This is considered to be the most acceptable form of mitigation.

6.2.2 Minimization

To minimize impacts by limiting or reducing the degree, extent, magnitude or duration of adverse impacts. Negative impacts can be minimized through environmental and social measures/treatments/design. Available options to minimize negative impacts include abate, rectify, repair, and/or restore.

6.2.3 Compensation

To compensate for the impact by replacing or providing substitute resources especially for unavoidable and residual impacts. This does not eliminate the adverse impact but seeks to offset it with an (at least) comparable positive one.

6.3 Mitigation and Enhancement Measures

A summary of all identified significant impacts as well as the proposed mitigation measures is presented in Table 6.1.

Table 6.1: Mitigation and Enhancement Measures

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
PRE-CONSTRUCTION PHASE				
Site Preparation and Clearing for Access/ Internal Road, Forage development, Crop production and other SAPZ Infrastructure. Mobilization and storage of equipment, materials on site Installation of Site Offices & Workers Camp Site	Air quality deterioration from release of dusts and gaseous emissions from exposed soil surfaces and vehicles may affect motorist plying the Enugu-Abakaliki expressway and other roads around the SAPZ.	HIGH	<ul style="list-style-type: none"> Use spraying devices such as water tanker to sprinkle water on exposed soil surfaces to limit dusts. Ensure all vehicles and machines are serviced and meet appropriate emissions standards before being brought to site. Train drivers/ workers on proper operation of vehicles & equipment to include fuel efficiency and anti-idling techniques. Tarpaulins should be used to cover trucks transporting earth materials or spoil on public roads 	LOW
	Noise and vibration from the use of machineries and motorized equipment	HIGH	<ul style="list-style-type: none"> Ensure equipment not in use are turned off. Ensure construction work is limited to daytime hours to limit impact of noise. Provide appropriate PPE for hearing protection and enforce usage. Ensure use of low-noise machineries and equipment or fit with exhaust mufflers/silencers to minimize noise. 	LOW
	Loss of vegetation cover due to clearing for crop production and construction	HIGH	<ul style="list-style-type: none"> Schedule vegetation clearing to occur in phases so that the entire area is not cleared at once. 	LOW
	Reduction in carbon sequestration in the project area due to removal of trees	HIGH	<ul style="list-style-type: none"> Avoid Land clearing by bush burning to reduce the amount of CO2 released in the course of establishing the hub 	LOW
	Removal of vegetation and trees leading to habitat destruction and fauna loss	MEDIUM	<ul style="list-style-type: none"> Where possible, ensure site clearing is done during the dry season to protect work areas from erosion. 	LOW
	Depletion of Soil fauna due to removal of vegetation	MEDIUM	<ul style="list-style-type: none"> Restrict removal of vegetation and trees to ONLY areas of need within the Agri hub 	
	Soil erosion and loss of soil quality from exposure of soil to weather elements	HIGH	<ul style="list-style-type: none"> Protect all vegetation not required to be removed against damage particularly riparian vegetation along the watercourses to act as buffer zone and sediment trap. Ensure early installation of temporary drainage and diversion structures to include silt traps. Re-vegetate cleared unused areas and ensure site landscaping plan include green areas where indigenous plant species and tolerant grasses and shrubs are planted. Use vegetal waste as compost to aid rapid vegetal propagation. 	Low
	Movement of equipment, vehicles and workforce into project area, could introduce invasive species which adversely impact fauna, flora, ecosystems, and crops.		<ul style="list-style-type: none"> Training and awareness-raising amongst workers, farmers and communities on potential impacts of invasive species. No introduction of exotic species (e.g., for site rehabilitation) without specialist vetting and approval by ESMARD. 	

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
			<ul style="list-style-type: none"> Ensure clearance of invasive species upon completion of construction and periodically during SAPZ operations. 	
	Soil contamination from spillages of oil and other petroleum products from leakages and/or improper handling during maintenance of vehicles and equipment	MEDIUM	<ul style="list-style-type: none"> Ensure all vehicles and machines are serviced before being brought to site to avoid leaks of oil. Install impermeable surface and bund walls at fuel storage areas, vehicle servicing & limit zone to contain potential leakages. Prevent unregulated dumping of fuel waste by ensuring that spent oil drained from equipment during maintenance are properly collected and sent to recycling facility. 	Low
	Soil compaction and predisposition to erosion due to movement of vehicles on site and stacking of heavy-duty equipment	MEDIUM	<ul style="list-style-type: none"> Limit zone of vehicle and equipment weight impacts by designating an area for parking and stacking equipment 	Low
	Generation of vegetal wastes from de-vegetation and site clearing activities	HIGH	<ul style="list-style-type: none"> Prepare and Implement Waste Management Plan (WMP). Waste to be disposed should be evacuated by ESWAMA or ESWAMA approved private sector providers. To the extent possible, woody debris and slash generated from vegetation clearance should be given to locals for use as fuel wood for cooking or mulched for use in farms or site restoration. 	LOW
	Contamination/pollution of sources of water, food and fodder for animals during clearing	HIGH	<ul style="list-style-type: none"> Schedule vegetation clearing to occur in phases so that the entire area is not cleared at once. Where possible, ensure site clearing is done during the dry season to protect work areas from erosion. 	LOW
	Eutrophication/nutrient-enrichment due to Siltation of streams around the site as a result of sediment runoffs from exposed soils during clearing	HIGH	<ul style="list-style-type: none"> Restrict removal of vegetation and trees to ONLY areas of need within the Reserve. 	LOW
	Alteration of aquatic habitat as a result of pollution and sedimentation may lead to depletion of aquatic biota	HIGH	<ul style="list-style-type: none"> Protect all vegetation not required to be removed against damage particularly riparian vegetation along the watercourses to act as buffer zone and sediment trap. Ensure early installation of temporary drainage and diversion structures to include silt traps. Re-vegetate cleared unused areas and ensure site landscaping plan include green areas where indigenous plant species and tolerant grasses and shrubs are planted. Use vegetal waste as compost to aid rapid vegetal propagation. 	LOW
	Traffic congestion/travel delay along the access road into the project site will occur as a result of mobilization of workers, equipment and other materials to the site	MEDIUM	<ul style="list-style-type: none"> Implement Traffic Management Plan (TMP) prepared for the project, including the following: Hire drivers with appropriate driver's license, train drivers and enforce speed limit. Mobilization of equipment and machinery should be done at off-peak period (10am – 4pm). 	Low

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
			<ul style="list-style-type: none"> • Ensure trucks and other vehicles are parked at the designated parking area within the project site and prohibited from parking along major high way, for example, the Enugu-Abakaliki expressway to prevent obstruction of traffic. • Ensure Traffic/caution signs at strategic locations in English and Igbo and engage personnel to manage traffic flow during peak periods. • Cover truck conveying materials to site to prevent materials falling and causing injuries to pedestrians & motorists. 	
	Storage of materials and equipment on site may attract theft and security breaches and threat to lives and properties.	HIGH	<ul style="list-style-type: none"> • Ensure deployment of 24-hour security guards and distribution of suitable security light. • Ensure consultation and collaboration with local Police 	Low
	There could be increased exposure to health risks from fugitive dusts and exhausts fumes.	MEDIUM	<ul style="list-style-type: none"> • Use spraying devices such as water tanker to sprinkle water on exposed soil surfaces to limit dusts. • Ensure provision of appropriate PPE for eye/respiratory protection and enforce usage. 	Low
	Site clearing and mobilization of workers, equipment and other materials to the site may cause an upsurge in noise, fugitive dust and exhaust fumes nuisance in the area which can have adverse health impacts	MEDIUM	<ul style="list-style-type: none"> • Ensure use of low-noise machineries and equipment or retrofit with exhaust mufflers/ silencers to minimize noise. • Ensure equipment not in use are turned off. • Ensure construction work is limited to daytime hours to limit impact of noise. • Provide appropriate PPE for hearing, eyes and respiratory protection and enforce usage by workers and visitors. • Restrict access of non-project personnel to work areas where dusts and emissions exist/persist from project works. 	Low
	Occupational accidents and injuries from use of heavy machineries and equipment as well as struck by injuries from falling of trees, insect bites and exposure to dangerous animals etc.	MEDIUM	<ul style="list-style-type: none"> • Develop a project specific Occupational Health and Safety Plan (OHSP) commensurate to construction activities. OHSP to include: <ul style="list-style-type: none"> • Prohibition of drug and alcohol use by workers while on the job. • Provision of adequate first aid, first aiders, PPE, signage (English and Igbo), engineering barriers e.g., fencing. • Restrict unauthorized access to all areas of high-risk activities. • Training of personnel on worksite OHS management, induction/ daily toolbox and refresher program. • Adequate safety signage and barriers at construction sites, staging areas, pits, equipment parking areas etc should be installed to alert workers, community members, drivers and pedestrians. • Lighting and reflective tapes and signage should be made available in all worksites for safety at night. 	LOW
CONSTRUCTION PHASE				

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
Construction of SAPZ Infrastructure such as Internal Roads, Buildings, Ethanol Processing facilities, Oil palm processing facilities, Livestock Containments, Impoundment and Boreholes	Air Quality deterioration from dusts generated during excavation, filling, backfilling and compaction activities	HIGH	<ul style="list-style-type: none"> Use spraying devices such as water tanker to sprinkle water on exposed soil surfaces to limit dusts. Ensure all vehicles and machines are serviced and meet appropriate emissions standards before being brought to site. Train drivers/ workers on proper operation of vehicles & equipment to include fuel efficiency and anti-idling techniques. Tarpaulins should be used to cover trucks transporting earth materials or spoil on public roads	LOW
	Noise and vibration from the use of machineries and vehicles during excavation, burrowing, backfilling and compaction activities	MEDIUM	Ensure equipment not in use are turned off. Ensure construction work is limited to daytime hours to limit impact of noise. Provide appropriate PPE for hearing protection and enforce usage. Ensure use of low-noise machineries and equipment or fit with exhaust mufflers/silencers to minimize noise.	LOW
	Introduction of air pollutants into the atmosphere from asphalt laying on internal roads.	MEDIUM	<ul style="list-style-type: none"> Use dust control and suppression measures such as wetting, dampening. Use modern equipment that meet appropriate and ensure regular preventive maintenance. 	LOW
	Predisposition of soil to erosion during excavation and earth movement	HIGH	<ul style="list-style-type: none"> Use erosion protection structures such as sediment traps, riprap, gabions etc. as additional measures to control erosion and run-off to waterbodies. 	LOW
	Loss, damage or disruption of soil/sediments during construction works.	MEDIUM	<ul style="list-style-type: none"> If possible, schedule construction to take place in dry season to prevent run-off to waterbodies. 	
	Siltation of streams due to runoff of spoils and topsoil from exposed soils	HIGH	<ul style="list-style-type: none"> Ensure stockpile and disposal areas are stable and protected against erosion and not interfere with run off or subsequent construction activities. Stockpile to be covered and stored in a sealed and bonded area in order to divert storm water away. Reuse stockpile as fill materials for reclamation of river channel. Establish vegetation buffers and green belts between project area and waterbodies. 	LOW
	Release of hazardous substances associated with construction activities or with transport of goods (e.g., accidental spills & leaks), leading to soil, surface or groundwater contamination.	HIGH	<ul style="list-style-type: none"> Ensure all vehicles and machines are serviced before being brought to site. to avoid leaks of oil. Install impermeable surface at fuel storage areas, vehicle servicing & limit zone to contain potential leakages. Ensure that equipment maintenance on site is done at the designated site where the surface is impervious. Prevent unregulated dumping of fuel waste by ensuring that spent oil drained from equipment during maintenance are properly collected and sent to recycling facility. 	LOW
				LOW

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
	Generation of construction waste including spoils, debris and concrete wastes.	HIGH	<ul style="list-style-type: none"> • Prepare Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. • Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. • Unsuitable soils can be used for reclamation. • Ensure recycling of scraps and other recyclables through approved recycling facilities to conserve resources. • Storage of hazardous waste onsite should be done in closed/ labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. • Ensure no waste is left behind at project site after construction. 	LOW
	Generation of scrap wastes from mechanical and electrical works such as pieces of electric cables, timbers, metals cuttings, nails and packaging materials	HIGH		LOW
	Inefficient waste management during construction leading to excess consumption of materials, generation of wastes/emissions, pollution of soils and water.	HIGH		LOW
	Construction activities will likely intercept or terminate the flow of the existing surface water bodies and Wells; and cause lack of water for human and livestock drinking as well as water for irrigation.	HIGH	<ul style="list-style-type: none"> • Proper channelization of surface water flow should be undertaken as part of measures to preserve water availability to the settlement and livestock during construction works. • An impoundment should be created as part of the SAPZ to accommodate varieties of water needs for irrigation, livestock production and value chain processing. 	Low
	Abstraction of large volume of water from ground or surface water sources may affect supply for other water users downstream of the hub resulting in conflicts over water use.	MEDIUM	<ul style="list-style-type: none"> • Ensure water for construction is sourced from multiple sources including rainwater harvesting, waterbodies, borehole and water tankers to prevent overreliance on a single source. • Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. • Water for construction SHOULD not be sourced from perennial streams during the dry season. 	LOW
	Traffic congestion and increased road traffic accident along Enugu-Abakaliki expressway and site access road due to movement of heavy-duty vehicles in and out of the construction site.	MEDIUM	<ul style="list-style-type: none"> • Implement Traffic Management Plan (TMP) prepared for the project, including the following: • Hire drivers with appropriate driver's license, train drivers and enforce speed limit. • Mobilization of equipment and machinery should be done at off-peak period (10am – 4pm). • Ensure trucks and other vehicles are parked at the designated parking area within the project site and prohibited from parking along the Enugu-Abakaliki expressway and the Agri hub access road to prevent obstruction of traffic. • Ensure Traffic/caution signs at strategic locations in English and Igbo and engage personnel to manage traffic flow during peak periods. 	LOW

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
			<ul style="list-style-type: none"> Cover truck conveying materials to site to prevent materials falling and causing injuries to pedestrians & motorists. 	
	The project has no safeguard officers and is likely not able to implement the ESMP prepared for the project	HIGH	<ul style="list-style-type: none"> Employ or train personnel on environmental and social safeguards best practices. Work closely with the Ministry of Environment and Mineral Resources to achieve success in environmental management including waste management 	Low
	Risk of health problems from exposures to noise, fugitive dust and exhaust emissions from the use of machineries & motorized equipment for construction	HIGH	<ul style="list-style-type: none"> Ensure use of low-noise machineries and equipment or retrofit with exhaust mufflers/ silencers to minimize noise. Ensure equipment not in use are turned off. Ensure construction work is limited to daytime hours to limit impact of noise. Provide appropriate PPE for hearing, eyes and respiratory protection and enforce usage by workers and visitors. Restrict access of non-project personnel to work areas where dusts and emissions exist/persist from project works. 	Low
	Poor management of occupational health and safety leading to accidents, injuries and illnesses among workers; mental health issues due to remote or enclosed living	HIGH	<ul style="list-style-type: none"> Implement the Occupational Health and Safety Plan (OHSP) developed for this project. Prohibition of drug and alcohol use by workers while on the job. Provision of adequate first aid, first aiders, PPE, signages (English and Yoruba), engineering barriers e.g., fencing. Restrict unauthorized access to all areas of high-risk activities. Training of personnel on worksite OHS management, induction/ daily toolbox and refresher program. Adequate safety signage and barriers at construction sites, staging areas, pits, equipment parking areas etc should be installed to alert workers, community members, drivers and pedestrians. Lighting and reflective tapes and signage should be made available in all worksites for safety at night. Rest and recreational facilities and time should be provided, and rules on alcohol and drugs defined and clearly communicated to workers. The basis for differences in the standard of accommodation should be non-discriminatory; it should be documented and communicated transparently to the workforce. 	LOW
Creation of borrow pits.	Unsustainable excavation and non-reclamation of borrow pits may lead to land degradation and increased susceptibility to erosion and flooding	HIGH	<ul style="list-style-type: none"> Avoid the production of excess spoil material and reduce the need for borrow pit materials. 	LOW

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
	Borrow-pit may become inundated with water and pose possible risk of accident and drowning to human and animals.	HIGH	<ul style="list-style-type: none"> Where burrowing becomes unavoidable, develop and implement Borrow pit Reclamation Plan to ensure that site is rehabilitated and restored to a safe and stable state. Plan should include measures to: <ul style="list-style-type: none"> Re-contour/grade site to blend with natural topography. Reuse excess stockpile to back fill pits during grading. Revegetate with appropriate plant species. Avoid material borrowing or restrict borrowing to approve quarry and ensure rehabilitation before the onset of wet season. 	LOW
	Community health & safety risks associated with creation and poor management of borrow pits and staging areas.	HIGH		LOW
Presence of Migrant Workers & Business Opportunists	Direct employment of local population in workforce, and stimulation of local economy through export of and demand for goods and services will enhance livelihoods and economic activity in local communities; potential for adverse effects if expectations not met and community relations are not well managed.	POSITIVE	<ul style="list-style-type: none"> Employment practices and working conditions should conform to International Labour Organization (ILO) Standards and national regulations. Ensure priority engagement of workers from local communities. Rest and recreational facilities and time should be provided, and rules on alcohol and drugs defined and clearly communicated to workers. The basis for differences in the standard of accommodation should be non-discriminatory; it should be documented and communicated transparently to the workforce. 	Low
	Real or perceived disruption to normal community life, through the physical presence of a non-local workforce.	MEDIUM	<ul style="list-style-type: none"> Adopt a Stakeholder Engagement Plan, as a framework for early and ongoing community consultation. Ensure priority engagement of workers from local communities. Implement the Grievance Redress Mechanism designed for this project. Define works procedure and Code of Appropriate Conduct for all workers, including acceptable behaviour with respect to community interactions. 	Low
	Risk of illicit behaviour and crime (including prostitution, theft, robbery and substance abuse)	MEDIUM	<ul style="list-style-type: none"> Ensure payment of adequate salaries for workers to reduce incentive for theft. Pay salaries into workers' bank accounts rather than in cash. Partner with the existing local vigilante and seek cooperation with the Police to curb the activities of theft and robbery. Ensure priority engagement of workers from local communities. Ensure creation of supervised leisure areas in workers' camp. Introduce sanctions (e.g., dismissal) for workers involved in criminal activities. Prohibit the use of illicit drugs by workers. 	Low
	Potential increased prevalence of GBV & SEA resulting from interaction among construction workers, community members and camp followers	MEDIUM	<ul style="list-style-type: none"> Mandatory and regular training for workers on required lawful conduct in host community and legal consequences for failure to comply with laws. Training program for project personnel to include GBV and SEA issues. 	Low

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
			<ul style="list-style-type: none"> • Contractor to engage locals from the communities as labour force where possible. • All workers must be trained and retrained on the provisions of the Code of Conducts and have it signed. Training can be done in local language to ensure that it is understood by all. • Ensure cross gender participation in project implementation. • Provision of gender-based awareness campaign within the communities. • Commitment to cooperate with law enforcement agencies investigating perpetrators of GBV 	
	Interaction between non-local workforce and local communities may increase occurrence of communicable diseases, including HIV/AIDS and sexually transmitted diseases (STDs).	MEDIUM	<ul style="list-style-type: none"> • Institute HIV prevention programs (peer education, condom distribution etc.) • Liaise with appropriate health focused NGOs to undertake health awareness and education initiatives on STDs amongst workers and in the host community. • Provide opportunities for workers to regularly return to their families. • Implement community-based Grievance Redress Mechanism (GRM). 	Low
	Threat to community culture, safety and security due to presence of workers and business opportunists.	MEDIUM	<ul style="list-style-type: none"> • Develop an induction program including a code of appropriate conduct for all workers. Code of conduct to address the following: Respect for local residents; No hunting or unauthorized taking of products or livestock; Zero tolerance of illegal activities such as child sexual exploitation and underage sex, prostitution, harassment of women, 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. 	LOW
	Increased social vices/crimes and dilution of indigenous culture, norms and traditions in surrounding communities, due to influx of migrant workers and business opportunists	MEDIUM	<ul style="list-style-type: none"> • Provide cultural sensitization training to improve awareness of and sensitivity of workers to local cultures, traditions, and lifestyles. • Implement GRM and Labour Influx Management Plan prepared for this project. • Limit the number of migrant workers by engaging local workers. 	Low
	Child labour and school drop out in nearby communities of Ore due to availability of construction work	MEDIUM	<ul style="list-style-type: none"> • Ensure children and minors are not employed directly or indirectly on the project. • Communication on hiring criteria, minimum age, and applicable laws should be ensured. • Enforcement of legislations that prohibits child labour. • Ensure CoCs contains texts that speak on zero tolerance on child labour and all forms of SEA/SH/VAC. 	LOW

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
	Individuals are likely to migrate into the project area from the local/regional area, which may cause conflict with residents, and put pressure on resources and infrastructure.	MEDIUM	<ul style="list-style-type: none"> Implement the Labour Influx Management Plan prepared for this project in consultation with Enugu East LGA Limit the number of migrant workers by engaging local workers. 	
	Increase demand on community health and sanitation infrastructure due to influx of workers and camp followers.	MEDIUM	<ul style="list-style-type: none"> Provide basic amenities (water, sanitation etc to workers according to WHO standards). Provide separate toilets for male and female workers. 	LOW
	Pollution of streams from open defaecation of construction workers may lead to increased risk of water borne diseases in nearby communities.	MEDIUM	<ul style="list-style-type: none"> Provide water and sanitation amenities at the construction site and camp site so that workers will not use nearby bushes. Provide separate toilets for male and female workers. 	LOW
	Assault of workers, kidnapping and vandalizing of equipment by local youths over local jobs	HIGH	<ul style="list-style-type: none"> Adopt a Stakeholder Engagement Plan, as a framework for early and ongoing community consultation. Ensure priority engagement of workers from local communities. 	Medium (Residual)
	Conflicts between contractors and community members over labour intake	HIGH	<ul style="list-style-type: none"> Implement the GRM and Labour Influx Management Plan prepared for this project. Engage competent security to protect workers and assets 24/7 in collaboration with the Police 	Low
	Loss of employment for temporary construction workers	HIGH	<ul style="list-style-type: none"> Ensure compliance with all legal and contractual agreement with workers. Ensure all workers receive notice of dismissal and severance payments mandated by law and collective agreements in a timely manner. Provide a grievance mechanism for workers to raise workplace concerns. 	LOW
OPERATIONAL PHASE				
Operation and Maintenance of SAPZ and Ancillary Infrastructure	Increase ambient noise from machineries and equipment including haulage trucks	HIGH	<ul style="list-style-type: none"> Ensure installation of modern processing equipment fitted with noise abatement technology such as silencers to exhaust systems. Ensure installation of enclosure and cladding of processing plants. Ensure installation of proper sound barriers and / or noise containments, with enclosures and curtains at or near the source equipment. Ensure regular maintenance of processing plants to ensure noise is minimal. Ensure provision of appropriate hearing PPE (earmuffs) for workers and enforce usage. Ensure installation of processing plants on anti-vibration mountings. 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 	LOW

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
	Odour associated with livestock and waste can constitute nuisance for nearby receptors.	HIGH	<ul style="list-style-type: none"> • Ensure all processing facilities are installed in an enclosed plant and processing activities are taking place within an enclosed system to prevent odour. • Ensure provision of appropriate PPE (respiratory protection) for workers and enforce usage. • Ensure waste storage areas are covered including waste pond and effluent treatment plants. • Ensure proper sanitary conditions in livestock pens or ranches 	LOW
	Abstraction of large volumes of water from surface or groundwater sources for ethanol and oil palm processing, irrigation and watering livestock may affect water availability and ecosystems.	HIGH	<ul style="list-style-type: none"> • Ensure water for SAPZ operation is sourced from multiple sources including rainwater harvesting, waterbodies, borehole and water tankers to prevent overreliance on a single source. • Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. • The existing impoundments within the project site should be rehabilitated as part of the SAPZ to accommodate varieties of water needs for irrigation, value chain processing and livestock production 	Medium
	Inefficient waste management during operation and maintenance leading to excess consumption of materials, generation of wastes/emissions, pollution of soils and water.	HIGH	<ul style="list-style-type: none"> • Implement the general and Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. • Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. • Encourage manure recovery for use as fertiliser and reapplication of by-products of cocoa and oil palm processing • Ensure treatment of effluents through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEffluent Standards. • Storage of hazardous waste onsite should be done in closed/ labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. 	LOW
	Generation of normal and hazardous waste during maintenance including obsolete parts (batteries, WEEE, solar panels etc)	HIGH	<ul style="list-style-type: none"> • Liaise with contractor/ manufacturer to take back obsolete parts including batteries, spent oils during maintenance and repair. • Alternatively, use waste vendor licensed by ESWAMA to evacuate and process hazardous waste. • Storage of hazardous waste onsite should be done in closed/ labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. 	LOW
	Pollution of soil and watercourses due to run-off of untreated effluents and improper management of hazardous waste from the processing complexes	HIGH	<ul style="list-style-type: none"> • Storage of hazardous waste onsite should be done in closed/ labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. 	

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
			<ul style="list-style-type: none"> • Ensure treatment of effluents through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEnv Effluent Standards. • use waste vendor licensed by ESWAMA to evacuate and process hazardous waste. • Establish vegetation buffers and green belts between project area and waterbodies. 	
	Loss, damage or disruption of soil/sediments from livestock presence (e.g., trampling).	MEDIUM	<ul style="list-style-type: none"> • Establish clearly defined grazing areas within the zone (ranching) • Restrict livestock access to fragile/unstable soil; adapt the type and number of animals to the land carrying capacity. 	Low
	Development of the Agri-hub and its ancillary infrastructure in its proposed remote or undeveloped area can lead to further development, increased disturbance and pressure on natural resources through bushmeat hunting, logging, fire, etc.	MEDIUM	<ul style="list-style-type: none"> • Where possible, instate access controls on roads leading to livestock containment areas or associated facilities in otherwise undeveloped or remote areas. • Develop an induction program including a code of appropriate conduct for all workers. Code of conduct to prohibit hunting for bushmeat or unauthorized taking of products or livestock. • Sensitisation and public awareness campaigns against hunting and bushmeat trade amongst livestock project workers and local communities. 	Low
	Presence of livestock and humans may displace animals and disturb their habitats, by direct disturbance during operation (e.g, increased human and vehicle presence, noise, light disturbance at night, construction of associated facilities).	MEDIUM	<ul style="list-style-type: none"> • 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. 	Low
	Pollution of watercourses from open defaecation of construction workers may lead to increased risk of water borne diseases in nearby communities.	HIGH	<ul style="list-style-type: none"> • Provide and maintain water and sanitation amenities at the construction site and camp site to prevent open defecation • Provide separate toilets for male and female workers. 	LOW
	Fear of sustainability of the project amidst change of political leadership	HIGH	<ul style="list-style-type: none"> • Create a Special Purpose Vehicle (SPV) to manage the SAPZ in order to encourage private sector involvement and participation. SPV will manage critical aspects of the project such as the dam/water supply and other necessary infrastructure, solar farm, coca/oil palm processing, etc 	Low
	Marginalization of the vulnerable groups and minority tribes in employment opportunities	HIGH	<ul style="list-style-type: none"> • As much as possible, groups should be encouraged to organize themselves as cooperatives with structures and be trained/sensitized for meaningful participation in the SAPZ. • Ensure gender inclusivity in employment opportunities • Develop compensation measures for affected parties (e.g., excluded farmers, downstream water users). 	Low

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
	Conflict between farmers and Employees over wage related issues	HIGH	<ul style="list-style-type: none"> Develop and in-house conflict resolution mechanism Each farmer or worker employed should be engaged under written down terms and conditions and benefits that they are entitled to 	Low
	Risk of illicit behavior and crime (including prostitution, theft and robbery)	HIGH	<ul style="list-style-type: none"> Ensure payment of adequate salaries for workers to reduce incentive for theft. Pay salaries into workers' bank accounts rather than in cash. Partner with the existing local vigilante and seek cooperation with the Police to curb the activities of theft and robbery. Ensure priority engagement of workers from local communities. Ensure creation of supervised leisure areas in workers' camp. Introduce sanctions (e.g., dismissal) for workers involved in criminal activities. Prohibit the use of illicit drugs by workers. 	Low
	Threat to community culture, safety and security due to presence of workers and business opportunists.	HIGH	<ul style="list-style-type: none"> Develop an induction program including a code of appropriate conduct for all workers. Code of conduct to address the following: Respect for local residents; No hunting or unauthorized taking of products or livestock; Zero tolerance of illegal activities such as child sexual exploitation and underage sex, prostitution, harassment of women, 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. Provide cultural sensitization training to improve awareness of and sensitivity of workers to local cultures, traditions, and lifestyles. Implement GRM and Labour Influx Management Plan prepared for this project. Limit the number of migrant workers by engaging local workers. 	Low
	Individuals are likely to migrate into the project area from the local/regional area, which may cause conflict with residents, and put pressure on resources and infrastructure.	HIGH	<ul style="list-style-type: none"> Implement the Labour Influx Management Plan prepared for this project in consultation with Nkanu East LGA Limit the number of migrant workers by engaging local workers. 	Low
	Labour Influx which could lead to increase in sexual activities and potential spread of STDs/STIs including HIV/AIDS in the project location	HIGH	<ul style="list-style-type: none"> Institute HIV prevention programs (peer education, condom distribution etc.) Liaise with appropriate health focused NGOs to undertake health awareness and education initiatives on STDs amongst workers and in the host community. Provide opportunities for workers to regularly return to their families. Implement community-based Grievance Redress Mechanism (GRM). 	LOW

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
	Potential increased prevalence of GBV & SEA resulting from interaction among construction workers, community members and camp followers	HIGH	<ul style="list-style-type: none"> Conduct GBV service mapping in the project area for effective referral and response. This coordination will be aimed at minimizing duplication of efforts since these data already exist and fostering greater coherence of approaches and programmes. Include a GBV specialist as part of the E&S Safeguard team for the project. Define and reinforce GBV requirements in procurement processes and contracts. Separate toilet and shower facilities for men and women and add GBV-free signage. Ensure regular GBV risks evaluation in order to update action/mitigation and training requirements throughout the project life cycle. Ensure regular training of all workers on GBV and related issues throughout the life cycle of the project. Create an effective Grievance Resolution Mechanism (GRM) with multiple channels to initiate complaint. This should have specific procedures for GBV cases confidentiality reporting with safe and ethical documenting. A parallel GRM for GBV and related issues can also be created. 	LOW
	Child labour involvement in plantation work	HIGH	<ul style="list-style-type: none"> Ensure that children and minors are not employed directly or indirectly on the project. Communication on hiring criteria, minimum age, and applicable laws should be ensured. Enforcement of legislations that prohibits child labour. Ensure CoCs contains texts that speak on zero tolerance on child labour and all forms of SEA/SH/VAC. 	LOW
	Evolution of slums/uncontrolled human settlements around the Agro-Industrial hub with attendant overcrowding, crimes, vices and diseases.	HIGH	<ul style="list-style-type: none"> Nkanu East LGAs and Enugu State Ministry of Land should ensure slums and unauthorised developments around the Agro hub are not allowed. ENMARD should ensure prompt reporting of illegal activities in and around the hub to the Police and relevant Nkanu East LGA authorities for action. 	LOW
	Increase demand on community health and sanitation infrastructure due to influx of workers and camp followers.	HIGH	<ul style="list-style-type: none"> Provide basic amenities (water, sanitation etc to workers according to WHO standards) within the project site 	LOW
	Traffic congestion and increased road traffic accident due to movement of vehicles conveying (inputs and products to and from the SAPZ.	MEDIUM	<ul style="list-style-type: none"> Hire drivers with appropriate driver's license, train drivers and enforce speed limit. Ensure movement of inputs/ products to and from site is done at off-peak period (10am – 4pm). Ensure trucks and other vehicles are parked at the designated parking lot within the Reserve and prohibited from parking along the Enugu-Abakaliki express and access roads to prevent obstruction of traffic. Ensure Traffic/caution signs at strategic locations in English and Yoruba and engage personnel to manage traffic flow during peak periods. 	LOW

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
			<ul style="list-style-type: none"> Cover truck conveying inputs and produce to and from the Reserve to prevent materials falling and causing injuries to pedestrians & motorists. 	
	Transportation and storage of hazardous materials such as petrol and gas may results in explosions, fires or spills during operation.	HIGH	<ul style="list-style-type: none"> Emergency response plan should be developed for the facility to include: Training of workers in emergency response and procedure. Procedures in the case of fire should be communicated to all employees. Firefighting devices should be installed, and their position should be clearly marked and communicated to workers. Ensure compliance of the SAPZ with fire safety is assessed by Federal Fire Agency. Ensure fuel storage areas are clearly marked and secure to always prevent unauthorised access. Construct bund walls to contain any accidental discharge of petroleum products 	LOW
	Differences in nationality, ethnicity, religion, etc. may lead to discrimination and harassment, and differences (perceived or real) in working conditions between workers/farmers may lead to resentment.	MEDIUM	<ul style="list-style-type: none"> Employment practices and working conditions should conform to International Labour Organization (ILO) Standards and national regulations. Ensure priority engagement of workers from local communities. Rest and recreational facilities and time should be provided, and rules on alcohol and drugs defined and clearly communicated to workers. 	Low
	Poor management of occupational health and safety leading to accidents, injuries and illnesses among workers); mental health issues due to remote or enclosed living.	MEDIUM	<ul style="list-style-type: none"> The basis for differences in the standard of accommodation should be non-discriminatory; it should be documented and communicated transparently to the workforce. Clear and comprehensive health and safety reporting and grievance procedure system should be established and be freely available to all of the workforce. 	LOW
Crop Production and value chain (ethanol etc) processing	Generation of wastes (by-products from cocoa and oil palm harvesting and processing)		<ul style="list-style-type: none"> Implement the Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce. 	Low
	Generation of odours from composting of spent farm materials		<ul style="list-style-type: none"> Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. Encourage reapplication of by-products of cocoa and oil palm processing in other industries or as fertilizers or animal feed 	Low
	Abstraction of large volume of water	HIGH	<ul style="list-style-type: none"> Ensure water for SAPZ operation is sourced from multiple sources including rainwater harvesting, waterbodies, boreholes and water tankers to prevent overreliance on a single source. Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. 	Medium

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
			<ul style="list-style-type: none"> An impoundment should be created as part of the SAPZ to accommodate varieties of water needs for irrigation, livestock production and value chain processing. 	
	Indiscriminate discharge of waste effluent into rivers		<ul style="list-style-type: none"> Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channel to Effluent Treatment Plant before discharge into the environment. Treated effluent should conform to FMEnv Effluent Standards Implementation of standard good wastewater management and disposal procedures; wastewater drainage outlets to discharge into vegetated areas if possible; vegetation along watercourses and drainage lines to be retained if possible. 	Low
	Occupational health risks associated with farming and harvesting of cocoa and palm fruits (e.g cuts and injuries, toxicity from pesticide use, falls, etc)		<ul style="list-style-type: none"> Develop a project specific Occupational Health and Safety Plan (OHSP) commensurate to construction activities. OHSP to include: Prohibition of drug and alcohol use by workers while on the job. Provision of adequate first aid, first aiders, PPE, signages (English and Yoruba), engineering barriers e.g., fencing. Restrict unauthorized access to all areas of high-risk activities. Training of personnel on worksite OHS management, induction/ daily toolbox and refresher program. 	
	Pollution of watercourses caused by runoff from farming areas (containing fertilisers, pesticides and herbicides etc.).	HIGH	<ul style="list-style-type: none"> Implement agricultural techniques minimising the use of fertilisers, pesticides, herbicides etc. Encourage the use of manure from livestock production areas to limit the 	Low
	Conflict between farmers and Employees.	HIGH	<ul style="list-style-type: none"> Develop and in-house conflict resolution mechanism Each farmer or worker employed should be engaged under written down terms and conditions and benefits they are entitled to 	Low
Livestock rearing, Abattoir and Meat and Fish Processing Areas	Abstraction of large volumes of water may lead to water shortages in the zone	HIGH	<ul style="list-style-type: none"> Ensure water for SAPZ operation is sourced from multiple sources including rainwater harvesting, waterbodies, boreholes and water tankers to prevent overreliance on a single source. Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. An impoundment should be created as part of the SAPZ to accommodate varieties of water needs for irrigation, livestock production and value chain processing. 	Medium

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
	Pollution of watercourses caused by wastes from livestock, and workforce sewage effluent, as well as runoff from grazing areas and land used for growing feed (containing fertilisers, pesticides and herbicides etc.).	HIGH	<ul style="list-style-type: none"> • Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. • Implement agricultural techniques minimising the use of fertilisers, pesticides, herbicides etc. • Encourage manure recovery for use as fertiliser. 	Low
	Generation of waste products consisting primarily of manure with straw Generation of waste including fodder and grain dust, sludge and packaging waste	HIGH	<ul style="list-style-type: none"> • Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. • Encourage manure recovery for use as fertiliser by farmers. 	Low
	Poor animal welfare (e.g., malnutrition)	HIGH	<ul style="list-style-type: none"> • The cattle will be housed in insulated buildings with controlled temperature and ventilation systems and ample space per cow. • Ensure barns have solid concrete flooring covered by straw particularly during cold periods and ensure waste products consisting primarily of manure with straw which is removed from the stables daily. • Ensure animals are well fed daily and provided adequate water for sustenance. • Train all workers on good practice in animal handling and prohibit animal cruelty. 	Low
	Poor hygiene and management of abattoir may lead to bacterial contamination with attendant public health risk	HIGH	<ul style="list-style-type: none"> • Strict hygiene standards will be imposed at the site with all staff entering the slaughterhouse required to wear appropriate clothing, hair nets and footwear, and follow procedures for hand and foot disinfection. • Vehicles entering and leaving the abattoir should be subject to a disinfection procedure. • Any diseased animals/contaminated meat will be segregated from other animals/carcasses and collected by the veterinary authorities. • The facility should be cleaned at the end of each working day. This includes washing of floors to remove blood and solids using hosed water, brushes and disinfectants. 	Low
	Generation of animal waste including manure, blood and inedible animal parts and chemical used for tanning may lead to environmental contamination	HIGH	<ul style="list-style-type: none"> • Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. • Implementation of standard good wastewater management and disposal procedures; wastewater drainage outlets to discharge into vegetated areas if possible; vegetation along watercourses and drainage lines to be retained if possible. • Effluent treatment should include maximising the extent that solids and blood are collected before entering the wastewater stream. 	Low

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
			<ul style="list-style-type: none"> • Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channel through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEnv Effluent Standards. • Encourage manure recovery for use as fertiliser for use in nearby farms. 	
	Emission of methane, ammonia and other GHGs may aggravate climate change and cause unpleasant odours	HIGH	<ul style="list-style-type: none"> • Create manure lagoons (impermeable pit or tank protected from rain and sun) to temporary store manure before being used as fertilizer in forage fields and nearby farms. • The production of methane can be encouraged and recovered for use as a fuel using specially designed recovery systems. The size of the SAPZ would make methane recovery feasible, although ENSG has no plans to recover methane at this time, however, other private investors should be encouraged to do so. 	Low
	Odours from animal waste products and some carcass treatment and manure in the animal pens	MEDIUM	<ul style="list-style-type: none"> • Odours should be minimised by good manure management; the animals will be held in their pens with slatted floors for manure collection with daily scraping. • Odours from inedible animal parts can be managed by good housekeeping and livestock waste management practices, and for singeing odours using abatement equipment if necessary. • Inedible waste should be removed by specialist operators for rendering, or in the future, possibly utilised in the production of biogas that will subsequently be used as a fuel source for the facility. 	Low
	Pollution of soil and watercourses due to run-off or discharge of untreated foul water (effluents) and improper management of waste	HIGH	<ul style="list-style-type: none"> • Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channel through Effluent Treatment Plant before discharge into the environment. • ETP should consist of mechanical clarification using a 1mm screen followed by chemical flocculation, flocculent removal and dewatering and disposal of resultant solid waste in order for the output to conform to FMEnv Effluent Standards. • Effluent treatment should include maximising the extent that solids and blood are collected before entering the wastewater stream. • Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. • Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. • Encourage manure recovery for use as fertiliser. • Storage of hazardous waste onsite should be done in closed/ labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. 	Low

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
Milk Production Areas	Generation of manure waste may lead to uncontrolled release of ammonia and environmental contamination	HIGH	<ul style="list-style-type: none"> Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. 	Low
	Generation/ uncontrolled discharge of foul water with high BOD, suspended solids and nutrients may cause pollution/eutrophication/nutrient-enrichment in waterbodies.	HIGH	<ul style="list-style-type: none"> Ensure barns are equipped with slatted flooring and manure scrapers to reduce ammonia emissions through regular collection of manure in collection basins underneath the flooring. The under-floor manure basins will be periodically emptied to manure lagoons from where manure recovery for use as fertiliser will be done. Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channel through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEV Effluent Standards. 	Low
	Poor hygiene and management of milk may lead to bacterial contamination with attendant public health risk	HIGH	<ul style="list-style-type: none"> Strict hygiene standards should be imposed at the milking parlour with all staff entering required to wear appropriate clothing, hair nets and footwear, and follow procedures for hand and foot disinfection. Vehicles entering and leaving the facility should be subject to a disinfection procedure. All animals in the barn (milking parlour) must be checked daily by Veterinary Doctor to confirm they are not infected before milking. The barns should have slatted floors and equipped with automatic cleaning scrapers with manure basins underneath to collect manure (and urine). The barns should also be regularly disinfected. 	Low
Veterinary and Disease Control	Zoonoses (potential transmission of diseases between animals and humans)	HIGH	<ul style="list-style-type: none"> Ensure adequate and sufficient medical and veterinary services/ clinics and presence of doctors are included within project planning. Good environmental, sanitation and hygiene conditions of the livestock processing zone Veterinary screening of all livestock for diseases prior to introduction into the grazing reserve. 	Low
	Degradation of health and size of populations of native species due to spread of diseases from livestock.	HIGH	<ul style="list-style-type: none"> Proper containment of livestock, to reduce interaction with wild and other domestic animal populations. 	Low
	Increased likelihood of certain vector-, animals- or water-borne diseases spreading within workforce and local community due to presence of livestock and standing water; health risks associated with chemicals used and wastes produced during operation (e.g. pesticides, noxious gases).	HIGH	<ul style="list-style-type: none"> Monitor diseases in livestock and implement appropriate actions to eliminate any diseases detected, especially those with potential to spread to wild populations (e.g., control vectors using bioenvironmental management techniques). Ensure control of human/animal interactions. Monitor diseases in livestock and implement appropriate actions to eliminate any diseases detected, especially those with potential to spread to humans (e.g., vector control, use of quarantine, contact avoidance, focal use of insecticides etc.). Regulate livestock waste and ensure appropriate ventilation in livestock buildings to control emissions of noxious gases. 	Low

Project Phase and Planned Activities	Associated and Potential Impacts	Pre-Mitigation Significance	Mitigation Measure	Post mitigation (Residual) significance
			<ul style="list-style-type: none"> • Safely manage chemicals (e.g., appropriate containers and labelling, workforce training, use of protective equipment). 	
	Generation of hazardous waste (including medical waste and animal tissues)	HIGH	<ul style="list-style-type: none"> • Implement the veterinary waste management plan prepared for this project and work closely with the Enugu State Ministry of Health to provide guidance and monitoring. • Install incinerator with secondary burners and gaseous pollutant abatement technology to manage medical waste. • The receptacles for waste should be sized appropriately for the waste volumes generated, colour-coded and labelled according to the types of waste to be deposited. • Ensure workers handling waste from the facility are using appropriate PPE including coveralls, face masks, hand-gloves and safety boots. 	Low

6.4 Climate Change Consideration for the SAPZ

Agriculture and climate change are intrinsically linked. Agriculture and food production contributes significantly to anthropogenic greenhouse gas emission especially methane and nitrous oxide (Lynch et al., 2021), while agriculture is considered the most endangered activity climate change has affected adversely (Raza et al., 2019). For example, the entire value chain of livestock production accounts for 18-25 % of the world's GHG emissions². Also, oil palm production involving deforestation releases global anthropogenic emissions of 6%-17% CO₂ (Baccini et al., 2012). Climate change led to a 34 per cent drop in agricultural productivity growth in Africa including Nigeria, beyond that of any other region since 1961, and current predictions show that, compared to 2005 yields, global warming above 2°C will result in reduced yield of most staple crops across Africa especially Nigeria (IPCC, 2022).

The primary route of GHG emissions particularly in crop production is through land clearing for forage production. Plantation farming has the potential to increase climate change through deforestation and bush burning as a method of land clearing. Other sources include Nitrous oxide and methane from manure, water abstraction etc. Aspects of livestock production with regards to climate change potential include; deforestation for grazing, forage production, nitrous oxide from manure and slurry (31%) and methane from animal digestion (25%) (UNEP, 2011). These considerations have been extensively captured as part of the impacts with appropriate mitigation measures proffered to reduce the climate change potential of the SAPZ. Organisations such as FAO³ provides support to help countries identify and conserve livestock breed diversity, which allows for evolution in line with environmental changes. There are Regional and global gene banks of the FAO which provide the maintenance of backup collections of genetic material that can be drawn upon to support climate change adaptation measures.

6.4.1 SAPZ Vulnerability to Climate Change

Nigeria, in particular, is highly vulnerable to climate change, and with a score of 37.1, the country is ranked 161 out of 182 countries in ND-GAIN⁴ index of climate change vulnerability in 2019. Crop production, the primary focus of the SPAZ is sensitive to climate change. Ayanlade et al. (2017) discovered that farmers had a negative impact of climate change on both crop and animal production with 62.8%, 52.2% and 49.7% of the farmers observing higher impact in maize, yam, and rice respectively; also 67%, 63.2%, 49.9% and 47.15% perceived that climate change impacts are high in chicken, cattle, pig, sheep, and goat respectively. Conditions for optimum crop production are both abiotic (rainfall, temperature, CO₂ etc) and biotic (disease, pests, pollinators, etc), all of which can be influenced negatively by climate change to reduce crop yield and nutritional quality contained in crop biomass without adaptation and mitigation strategies being applied. Table 6.2 below shows how variability of rainfall and increased temperature; the major climate change impacts increases the vulnerability of the different aspects of the SPAZ as well as mitigation and adaptation measures available.

²<https://unfccc.int/resource/docs/2012/smsn/ngo/194.pdf>

³<http://www.fao.org/3/i6345e/i6345e.pdf>

⁴The ND-GAIN "(Notre Dame Global Adaptation Initiative) Index summarizes a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience".

Table 6.2: SAPZ Vulnerability to Climate Change and Mitigation Measures

Climate Change Parameters	Crops (cocoa, oil palm, cassava)	Animals	Labour Force & Capital
Variability in Rainfall	<ul style="list-style-type: none"> Decreased yields Decreased forage quality Changes in nutritional quality of crops Changes in production system (e.g., from mixed crop-livestock to rangelands) Increased susceptibility to cocoa pod disease 	<ul style="list-style-type: none"> Shortages in drinking & servicing water Diseases Increased & changed distribution of pathogens, parasites & vector. Evolution of new diseases. 	<ul style="list-style-type: none"> Reduced income Increased vulnerability from threat to livelihood Decreased productivity Migration
Temperature	<ul style="list-style-type: none"> Decreased yields Decreased forage quality. Change in pasture composition Reduced amount of some pollinators 	<ul style="list-style-type: none"> Heat stress Decreased feed intake & livestock yields. Decreased conception rates. Altered metabolism & increased mortality. Diseases Increased pathogens, parasites & vectors. Decreased resistance of livestock New diseases Domestic biodiversity loss 	<ul style="list-style-type: none"> Reduced income Increased vulnerability from threat to livelihood. Decreased productivity Heat stress Increased need for more plantations
CO₂ in the Atmosphere	<ul style="list-style-type: none"> Partial stomata closure & reduced transpiration. Delayed flowering 		<ul style="list-style-type: none"> Heat stress
Climate change Mitigation & Adaptation Solutions for the SAPZ	<ul style="list-style-type: none"> Developing varieties resistant to climate change Use of cover crops to maintain canopy cover Use of mixed crops in plantation to help maintain canopy cover Breed feed crops & forage resistance to drought and heat. Changes in cropping calendar. Agroforestry. Increase mobility for resources 	<ul style="list-style-type: none"> Water management (e.g., boreholes). Breed for resistance to drought, heat and harsh environments. Shifts in species, breeds and/or production system (e.g., small ruminants, poultry). Disease control & animal health. Cooling (indoor systems) or provide shade (e.g., trees) 	<ul style="list-style-type: none"> On and off farm diversification. Insurance. Training farmers on good agricultural practices to increase yield Institutional changes (e.g. trade, conflict resolution, income stabilisation programs)

Source: Adapted from FAO (2016)

6.4.2 SAPZ Potential Contribution to Climate Change

Agriculture contributes 17% of the global greenhouse gas emissions that are causing climate change and an additional 7-14% through land use changes (OECD, 2016). The major source of GHG emission associated with crop production is through deforestation and bush burning. Mitigations against these major sources have been captured in this ESIA and is being addressed in the ESMP table with attendant cost implications.

Production of cassava-based bioethanol will lead to clearing of fallow and forest areas for cassava production resulting in the loss of above ground carbon stock and carbon emissions. Laura et al. (2012) estimated that changing the land use from fallow or forest to cassava production led to loss of carbon stocks in aboveground biomass of about 4-13Mg C/ha. The study also estimates that it takes about 8-25 years to repay the carbon debt associated with above-ground biomass loss. To reduce carbon emission due to the production of cassava-based bioethanol, effort should be made to reduce the amount of tress cut and agroforestry should be encouraged. This is critical given that the amount of above ground carbon lost depends on the age of the fallow cut down and whether all trees are removed or the larger, useful trees are preserved (Laura et al., 2012).

In addition, the livestock sector contributes 380 million tonnes CO₂-eq per year with beef and dairy cattle contributing 75% of the total emission (beef 45% and dairy 30% cattle) according to FAO (2016). The four major sources of GHGs emission are described below showing feeding and enteric fermentation accounting for over 85% of emission. Enteric fermentation is a natural part of the digestive process in animals such as cattle, sheep, goats etc where microbes in the digestive tract, or rumen, decompose and ferment food, producing methane as a by-product. To significantly reduce carbon emission, the development of the SAPZ should focus on the 2 major contributors (feeding and enteric fermentation).

S/N	Aspects	% Contribution	Colour Code
1	Energy Consumption	4.7	Yellow
2	Manure management	9.7	Blue
3	Enteric Fermentation	39.1	Dark Blue
4	Feeding	46.7	Orange

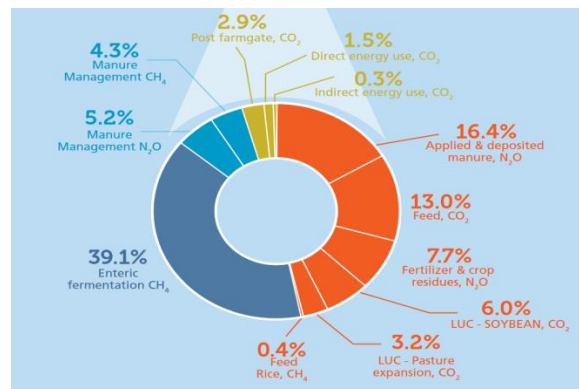


Figure 6.1: Sources of GHGs Emission in Livestock Production

Source: Adapted from FAO (2016)

6.4.2.1 Adaptation and Mitigation Measures

- Avoid land clearing by bush burning
- Planting of cover crops and operating a mixed plantation to increase carbon sequestration by crops.
- Re-vegetate cleared unused areas and ensure site landscaping plan include green areas where indigenous plant species and tolerant grasses and shrubs are planted.

- Restricting land clearing strictly to areas needed by the SAPZ
- Practice agroforestry to reduce the loss of trees with resultant carbon emissions.
- Optimizing feed digestibility and availability, balancing and fine-tuning feed rations; promoting better animal health, and improving performance through breeding.
- Improving the quality and usage of crop residues as fodder. Recently in Ethiopia, the Climate and Clean Air Coalition⁵ (CCAC, 2016) has reported that supplementing feed with leguminous shrubs, urea treated crop residue, control of trypanosomiasis, and artificial insemination) would increase milk production by 62 to 225% and decrease enteric methane emission intensity by 44 to 68% across production systems, relative to the baseline.
- In addition, the CCAC work in Bangladesh has also revealed that the key drivers of the low productivity and corresponding high emission intensity in dairy cattle sector are poor animal nutrition, animal health, genetics, and environmental constraints such as heat stress. The strong correlation between greenhouse gas emissions and milk productivity points to an opportunity for meeting food and nutrition security needs and reducing methane emissions.
- High consideration should be given to the reapplication of value chain by-products to avoid the release of large quantities of CO₂ from decomposition of generated biomass.
- The SAPZ should also consider natural grass and pastureland for livestock feeding. This strategy will ensure livestock emission reductions by sequestering carbon in soils and biomass.

⁵<https://www.ccacoalition.org/en/activity/enteric-fermentation>

⁶https://www.oecd.org/agriculture/ministerial/background/notes/4_background_note.pdf

CHAPTER 7: ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

7.1 Introduction

This chapter presents the Environmental and Social Management and Monitoring Plan (ESMMP) for development of the Enugu State SAPZ in Owo, Nkanu East LGA of Enugu state.

This ESMMP tool contains the plans and actions to facilitate a proactive management of all identified (and unidentified) impacts of the proposed projects. The overarching objective of the ESMMP is to ensure that all potential significant adverse impacts of the project are mitigated and brought to an acceptable level to guarantee economic, environmental and social sustainability of the projects.

The ESMMP has been developed to meet international and national standards on environmental and social (E&S) performance and covers the project implementation phases (i.e., Pre-construction, construction and operation phases) of the project. Furthermore, it details the mitigation and enhancement measures that ENSG being represented by the State Ministry of Agriculture and Agro Industrialization (ESMAAI) and their Contractors will be committed to implement throughout project life cycle as well as desired outcomes, performance indicators, monitoring, timing for actions and responsibilities.

The ESMAAI shall have the principal responsibility for all measures outlined in this ESMMP but shall delegate certain responsibilities to its Contractors and other private investors. Such delegation of responsibility shall be adequately documented as part of contractual agreements to guarantee absolute compliance and commitment on the part of the contractors to implement the ESMMP. It is instructive to note that most of the mitigation measures are the obligations of the Contractor during project implementation. Consequently, the contractor shall prepare its proposals taking into account the measures in this ESMMP and the detailed general environmental management conditions during civil works which is attached as [Appendix 6](#).

In addition, as most of the mitigation measures are the obligations of the Contractor during project implementation, the contractor shall prepare the Contractor's ESMP (C-ESMP), taking into account the measures in this ESMMP. The estimated costs of mitigation measures associated with the civil work activities, as stated in Tabl.1, will be included in the project's Bill of Quantities (BoQ). The contractor is responsible for implementing the proposed mitigation measures as per ESMAAI's instructions.

7.2 Environmental and Social Impacts and Mitigation

The significant potential E&S impacts for which management actions are required have been identified in Chapter 5 of this Report. The feasible, practical and cost-effective measures and actions to avoid, minimize, mitigate the potentially significant negative E&S impacts of the project to acceptable levels and enhance positive impacts are also described in Chapter 6 of this Report. The mitigation measures mainly relate to the adoption of environmentally friendly designs and the application of sound construction and operations management practices. All the management measures will be included in the bid documents for the successful enterprise to implement.

7.3 Institutional Arrangement for ESMMP Implementation

The successful implementation of the monitoring program will depend on the commitment and capacity of ESMAAI and their contractors as well as other third parties (including private investors and institutions of government) to implement the program effectively. The specific roles and responsibilities of those that will be involved in the implementation and monitoring of this ESMMP are highlighted in Table 7.1 below.

Table 7.1: Roles and Responsibility of Institutions in the implementation and monitoring of the ESMMP

Category	Roles & Responsibilities
Federal Ministry of Environment	<ul style="list-style-type: none"> • Lead role - provision of advice on screening, scoping, review of draft ESMP report (in liaison with State Ministry of Environment and Water Resources), receiving comments from stakeholders, public hearing of the project proposals and social liability investigations, monitoring and evaluation process and criteria.
Enugu State Ministry of Environment and Climate Change (ESMECC)	<ul style="list-style-type: none"> • Environmental monitoring and compliance overseer at the State level • Site assessment and monitoring of ESMMP implementation.
Enugu State Waste Management Authority (ESWAMA)	<ul style="list-style-type: none"> • Agency of ESMECC • Provide support to ESMEMR in the area of Waste Management. • Monitors ESMMP implementation particularly waste management and pollution control aspects.
Federal Ministry of Agriculture and Food Security (FMAFS)	<ul style="list-style-type: none"> • Provides overall leadership and direction to other MDAs by engaging all the critical stakeholders to support, cooperate with and participate in established policy direction for the SAPZ; and • Pursues an agenda of encouraging and ensuring investors comply with all environmental laws and policies
Enugu State Ministry of Agriculture and Agro Industrialization	<ul style="list-style-type: none"> • Coordinates the overall implementation of the SAPZ in Enugu State in through the Departments of Agriculture Services, Animal Production and Veterinary Services. • Pursues an agenda of encouraging and ensuring investors comply with all environmental laws and policies governing the SAPZ in consonance with the FMAFS Safeguard Unit.
Safeguard Unit, ESMAAI (yet to be created)	<p>Environmental Safeguards</p> <ul style="list-style-type: none"> • Collate environmental baseline data on relevant environmental characteristics of the selected project sites. • Analyze potential community/individual sub-projects and their environmental impacts. • Ensure that project activities are implemented in accordance with best practices and guidelines set out in the ESMMP. • 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. <p>Social Safeguards</p> <ul style="list-style-type: none"> • Develop, coordinate and ensures the implementation of the social aspects of the ESMMP. • Identify and liaise with all stakeholders involved in social related issues in the project. • Conduct impact evaluation and beneficiary's assessment; and • Establish partnerships & liaise with organizations, CBOs and CSOs.
Other State MDAs including ESMWR, ESMWSD	<ul style="list-style-type: none"> • Ensure monitoring of mitigation measures and the impacts of the project during implementation as it relates to gender and health issues respectively. • Establish partnerships & liaise with organizations relevant NGOs as well as CBOs and CSOs.
E&S Consultant	<ul style="list-style-type: none"> • Development of ESMMP • Training of relevant project Staff, regulators, MDAs and contractor on ESMP implementation and monitoring.

Category	Roles & Responsibilities
	<ul style="list-style-type: none"> Implementation of ESMMP
Contractors	<ul style="list-style-type: none"> Compliance to BOQ specification in procurement of material and construction Implement ESMMP during project implementation. Ensure all contractors and workers sign the Code of Conduct (CoC) and are routinely trained on the contents of the CoC. Prepare C-ESMP for approval of FMAFS/ ESMAAI. Implement C-ESMMP during project implementation. Ensure that all construction personnel and subcontractors are trained on the content of the C-ESMP and are made aware of the required measures for environmental and social compliance and performance. Prepare OHS manual and abide by labour laws as set out in the agreement. Provide adequate basic amenities and PPEs to workers and ensure that the PPEs are worn by workers during works. Prepare and maintain records and all required reporting data as stipulated by the ESMMP, for submission to the Supervising Consultant
Nkanu East LGA	<ul style="list-style-type: none"> Provision of oversight function across project within its jurisdiction for ESMMP compliance. Monitoring of activities related to public health, sanitation, waste management amongst others.
Owo Community	<ul style="list-style-type: none"> Promote environmental awareness. Review environmental and social performance report made available by project developer. Provide comments, advice and/or complaints on issues of nonconformity. Attend public meetings organized by the project developer to disseminate information and receive feedback.
NGOs/CSOs	<ul style="list-style-type: none"> Assisting in their respective ways to ensure effective response actions, conducting scientific research alongside government groups to evolve and devise sustainable environmental strategies and techniques.
AfDB	<ul style="list-style-type: none"> Recommend additional measures for strengthening management framework and implementation performance. Implementation support missions and ensuring that the SAPZ of ESSG and its subprojects comply with the E & S conditions of the loan agreement with the AfDB
General Public	<ul style="list-style-type: none"> Identify issues that could derail the project and support project impacts and mitigation measures, Awareness campaigns.

7.4 Training, Awareness and Competence

Assessment of the Enugu State Ministry of Agriculture and Rural Development project implementation team revealed that there is currently no safeguard unit and relevant safeguard staff. Training and the establishment of Safeguard Unit is essential for ensuring that the ESMMP is implemented efficiently and effectively. It is therefore imperative that the ESMAAI and other institutions and persons that have roles to play in the implementation of the ESMMP are competent with appropriate education, training or experience.

This study therefore, recommends that competent E&S Safeguard persons should be recruited for the project. Alternatively, relevant staff from the ESMEMR and ESMWR can be seconded and trained to serve to fill the gap. Capacity assessment generally revealed that most institutions with roles in the ESMMP are not very conversant with AfDB ISS as well as some components of the ESMMP implementation with regards to gender-based issues, labour influx, climate change and grievance redress mechanisms. Consequently, the training program in Table 7.2 has been proposed to enhance the capacities of those that will be involved in ESMMP implementation.

Table 7.2: Proposed Training Program for the Implementation of ESMMP

Capacity Building Activity	Proposed Topics	Objectives	Target Audience	Duration	Estimated Budget (Naira)
Module 1: AfDB's ISS and Nigeria Extant Laws on Environmental Protection	<ul style="list-style-type: none"> Introduction to E&S policies and laws in Nigeria AfDB's ISS & OS Operational Safeguards triggered by project activities. The roles and responsibilities of regulators and the AfDB during project implementation 	To enhance awareness of AfDB's OS and applicable national regulatory requirements for project activities	ESMAAI, Contractors, FMEnv, ESMEMR, ESWAMA, ESMWR, ESMoH, Nkanu East LGA officials	1 day	1,000,000
Module 2: Training on Environmental and Social Management Plan (ESMP) Implementation	<ul style="list-style-type: none"> Overview of ESMMP Potential Impacts of Project Pollution & Control Measures Environmental Management Labour influx, GBV, Code of Conduct, vulnerable people etc. Environmental Performance Monitoring Environmental Reporting 	To enhance competence in environmental sustainability and regulatory practice	ESMAAI, Contractors, FMEnv, ESMEMR, ESWAMA, ESMWR, ESMoH, Nkanu East LGA officials	1 day	1,000,000
Module 3: Climate Smart Agriculture Production	<ul style="list-style-type: none"> Introduction to agriculture production and climate change Climate-smart strategies for agricultural production Climate-smart agriculture production systems in practice Creation of an enabling environment for climate-smart crop and animal production. Financing Climate Smart Agriculture Production 	To mainstream climate change adaptation strategies to enhance project sustainability.	Farmers, ESMAAI, Contractors, FMEnv, ESMEMR, ESWAMA, ESMWR, ESMoH, Nkanu East LGA officials	1 day	1,000,000
Module 4: Livestock Waste Management	<ul style="list-style-type: none"> Livestock waste streams and management Livestock waste recycling strategies Composting Biogas Production Vermicomposting 	To develop & implement eco-friendly and modern methods of livestock waste recycling to prevent environmental degradation and enhance profitability	ESMAAI, Contractors, FMEnv, ESMEMR, ESWAMA, ESMWR, ESMoH, Nkanu East LGA officials	1 day	1,000,000
Module 5: Training on Construction HSE	<ul style="list-style-type: none"> Introduction to Construction HSE Overview of Health and Safety Hazards in Construction Incidents: Causation, Investigation & Reporting Excavation Safety First Aid, Defensive Driving etc. Project/Site Specific OHS Construction Site Inspection Personal Protective Equipment 	To ensure completion of project with zero fatalities, zero Lost Time Injuries (LTI) or occupational illness by promoting safe & healthy working conditions for workers and monitoring officers	ESMAAI, Contractors, FMEnv, ESMEMR, ESWAMA, ESMWR, ESMoH, Nkanu East LGA officials	1 day	1,000,000
	TOTAL			5 days	5,000,000

7.5 Monitoring and Reporting

The monitoring plan (Internal and External Monitoring) for the ESMMP is presented in Table 7.3. Monitoring results shall be documented with preventive/corrective actions to be implemented.

Table 7.3: Internal and External Monitoring of the implementation of the ESMP

Monitoring	Action	Responsibility	When	Deliverables
Internal Monitoring	Regular site visit to ensure that the mitigation measures and actions specified in the monitoring plan and as bound by the contract is satisfactorily implemented.	E&S Safeguard Unit – ESMAAI)	During Preconstruction, Construction Phases	Monitoring Reports and documentation
	Site visit for monitoring and inspection to ensure contractor adhere strictly to the engineering designs and specifications for the project	E&S Supervision Consultants	During Construction Phase	Observations and Monitoring Reports to be compiled and presented to the ESMAAI.
External Monitoring	Regular site visit to ensure project is implemented in an environmentally & socially sustainable manner using the monitoring indicators specified in the monitoring plan and other national and international environmental & social requirements	FMEEnv, ESMECC	During Preconstruction, Construction Phases	Inspect monitoring reports from Safeguard units and provide feedback on observations. Enforce corrective actions where necessary.

7.6 Contractual Measures

Most of the mitigation measures are the obligation of the Contractors particularly during the pre-construction and construction phases of the project. Consequently, the contractors will have to prepare their proposals taking into account the measures in Table 7.4 and the E & S clauses detailed in Appendix 6.

Table 7.4: Contractual Measures

Action	Remarks
The measures as described in this ESMP shall be included in the tender documents with appropriate flexibility to adjust these measures to site circumstances, and that the potential contractor will have to prepare their proposals taking into account these measures.	The non-inclusion of these measures in the proposal will lead to a disqualification of the proponent. The contract with the successful bidder should contain these environmental and social management measures as firm conditions to be complied with.
Specifically, the measures should be translated into a suite of environmental specification that are written in the same language style and format as the rest of the contract document	This approach will ensure that the environmental and social controls integrate seamlessly into the tender document and are presented in a familiar form to the Contractor
Cost of mitigation measures be added to the cost of the contractual document	The contractor must take into account and put the cost for the environmental and social requirements specified in the ESMP.

7.7 ESIA/ESMP Disclosures

Following the review and clearance of this ESIA by the FMEnv/AfDB, it will be disclosed at the National and local levels by ESMAAI in line with the applicable Nigerian EIA laws and regulations. Minimum disclosure requirements and budget is shown in Table 7.5 below.

Table 7.5: Disclosure Procedure to comply with Nigerian regulations

Action	Remarks	Cost (Naira)
Disclosure on 2 national newspapers	ESMAAI will disclose the ESIA/ESMP as required by the Nigeria EIA public notice and review procedures. This entails advert in 2 newspapers: one national and one local (state) newspaper	3,000,000
Disclosure at the ESMECC	The ESMAAI will disclose the ESMP as required by the Nigeria EIA public notice and review procedures	--
Disclosure at ESMAAI	The project proponent will display the ESMP as required by the Nigeria EIA public notice and review procedures	--
Disclosure at Owo, Nkanu East LGA office	The purpose will be to inform stakeholders about the project activities; environmental and social impacts anticipated and proposed environmental and social mitigation measures.	--
Total		3,000,000.00

7.8 Cost Estimates for ESMMP Implementation

To effectively implement the mitigation and monitoring measures recommended in this ESMMP, necessary provision will have to be made. The cost of these measures has been estimated, included in the ESMP and presented in Table 7.6.

Table 7.6: Estimated Budget for the Implementation of ESMP

Item	Responsibility	Cost Estimate in Nigerian Naira (₦)	Cost Estimate in US Dollars (US\$) *
ESMMP Implementation	Contractors/ ESMAAI	38,929,728	47,708
ESMMP Monitoring	ESMAAI, other MDAs	1,530,000	1,875
Training and capacity building	ESMAAI, ESMEMR and other MDAs	6,936,000	8,500
Disclosure	ESMAAI	3,000,000	3,676.47
Sub-Total		50,395,728	
Contingency	5% of Sub- Total	2,519,786	3,000
Total		52,915,514	64,760

*1 US\$ = ₦816

The total estimated cost for the ESMMP implementation and monitoring as shown in Table 7.6 is **₦52,915,514**(US\$ 64,760).

7.9 Implementation Schedule

The activities related to E&S management and monitoring must be integrated in the overall construction schedule. The project construction phase is estimated to be completed in 12 months. The implementation schedule is presented in 7.7.

Table 7.7: Tentative ESMP Implementation Schedule

S/N	Activity Description	Responsible Party	Preliminary Stages (Weeks)				Preconstruction (Weeks)				Construction (Months)													
			1	2	3	4	1	2	3	4	1	2	3	4	5	6	7	8	9	10	11	12		
•	Clearance and Formal Disclosure of ESMP	ESMAAI	█																					
•	Inclusion of Environmental & Social Requirements in Bid Docs	ESMAAI	█																					
•	Allocating Budget for ESMP	ESMAAI	█																					
•	Appointing Support Staff for ESMP	ESMAAI		█																				
•	Review & Approval of Contractor's ESMP, Waste & HSE Plan	ESMAAI			█																			
•	Finalization of Designs, studies and other preliminary	ESMAAI Engineering Design Consultant				█																		
•	Environmental and Social Training	E&S Consultant					█																	
•	Mobilization to site	Contractor						█																
•	Site Clearing and preparation	Contractor							█															
•	Construction Phase	Contractor								█														
•	Implementation of Mitigation	Contractor									█													
•	Supervising ESMP Implementation	ESMAAI										█												
•	Monitoring & Reporting on ESMP Implementation	ESMAAI /Contractor/ MDAs											█											
14.	Environmental and Social Auditing	ESMAAI's E&S Consultant																				█	█	█

Table 7.8: Environmental and Social Management & Monitoring Plan (ESMMP)

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
PRE-CONSTRUCTION PHASE										
Site Preparation and Clearing for Access/Internal Road, Forage development and other SAPZ Infrastructure. Mobilization and storage of equipment, materials on site Installation of Site Offices & Workers Camp Site	Air quality deterioration from release of dusts and gaseous emissions from exposed soil surfaces and vehicles may affect sensitive receptors such as people in Owo community and surrounding stream	<ul style="list-style-type: none"> Ensure all vehicles and machines are serviced and meet appropriate emissions standards before being brought to site. Use spraying devices such as water tanker to sprinkle water on exposed soil surfaces to limit dusts. Train drivers/ workers on proper operation of vehicles & equipment to include fuel efficiency and anti-idling techniques. Tarpaulins should be used to cover trucks transporting earth materials or spoil on public roads 	Contractor	500,000	Air quality parameters (PM _{2.5} , PM ₁₀ , CH ₄ , CO, NO ₂ , SO ₂ , CO ₂) Maintenance records Driver's training records	In-situ Air Quality measurement	FMEnv air pollutants and noise level permissible limit	Agro industrial hub Owo Weekly	ESME&CC	500,000 for monitoring activities during the pre-construction phase.
	Noise and vibration from the use of machineries and motorized equipment	<ul style="list-style-type: none"> Ensure use of low-noise machineries and equipment or fit with exhaust mufflers/silencers to minimize noise. Ensure equipment not in use are turned off. Ensure construction work is limited to daytime hours to limit impact of noise. Provide appropriate PPE for hearing protection and enforce usage. 	Contractor	-- 500,000	Noise level	In-situ noise level measurement	FMEnv noise level permissible limit	Agro industrial hub Owo Weekly	ESME&CC	
	Loss of vegetation cover due to clearing for forage development and construction. Reduction in carbon sequestration in the project area due to removal of trees Removal of vegetation and trees leading to habitat destruction and fauna loss.	<ul style="list-style-type: none"> Restrict removal of vegetation and trees to areas of need within the Reserve. Schedule vegetation clearing to occur in phases so that the entire area is not cleared at once. Where possible, ensure site clearing is done during the dry season to protect work areas from erosion. Protect all vegetation not required to be removed against damage 	Contractor Contractor Contractor	--	Clearly defined boundaries of protected areas	Visual observation	Protection of all vegetation outside of marked working areas. Floristic composition of adjoining areas within baseline condition	Agro industrial hub Weekly during Site clearing	ESME&CC	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Soil erosion and loss of soil quality from exposure of soil to weather elements	<ul style="list-style-type: none"> particularly riparian vegetation along the watercourses to act as buffer zone and sediment trap. Ensure early installation of temporary drainage and diversion structures to include silt traps. Re-vegetate cleared unused areas and ensure site landscaping plan include green areas where indigenous plant species and tolerant grasses and shrubs are planted. Use vegetal waste as compost to aid rapid vegetal propagation. 	Contractor	600,000						
	Depletion of Soil fauna due to removal of vegetation		Contractor	300,000						
	Movement of equipment, vehicles and workforce into project area, could introduce invasive species which adversely impact fauna, flora, ecosystems, and crops.	<ul style="list-style-type: none"> Training and awareness-raising amongst workers, livestock herders and communities on potential impacts of invasive species. No introduction of exotic species (e.g., for site rehabilitation) without specialist vetting and approval by ESMARD. Ensure clearance of invasive species upon completion of construction and periodically during SAPZ operations. 	Contractor	500,000	Training and awareness raising Non usage of exotic species for revegetation	Visual Observation and Interview	Little or no invasive species within the Agro hub	Agro industrial hub	ESMARD	
	Soil contamination from spillages of oil and other petroleum products from leakages and/or improper handling during maintenance of vehicles and equipment	<ul style="list-style-type: none"> Ensure all vehicles and machines are serviced before being brought to site to avoid leaks of oil. Install impermeable surface (bunds) at fuel storage areas, vehicle servicing & limit zone to contain potential leakages. Prevent unregulated dumping of fuel waste by ensuring that spent oil drained from equipment during maintenance are properly collected and sent to recycling facility. 	Contractor	300,000	Installation of impermeable bunds and platform at limit zone. Vehicle's maintenance records	Visual Observation	Soil Quality within baseline condition	Agro industrial hub Monthly	ESMARD	
Soil compaction and predisposition to erosion due to	<ul style="list-style-type: none"> Limit zone of vehicle and equipment weight impacts by 	Contractor	--	Designation of parking zones	Visual Observation		Agro industrial hub	ESME&CC		

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	movement of vehicles on site and stacking of heavy-duty equipment	designating an area for parking and stacking equipment								
	Generation of vegetal wastes from de-vegetation and site clearing activities	<ul style="list-style-type: none"> Implement Waste Management Plan (WMP). See Appendix 3. Waste to be disposed should be evacuated by ESWAMA approved vendors. To the extent possible, woody debris and slash generated from vegetation clearance should be given to locals for use as fuel wood for cooking or mulched for use in farms or site restoration. 	Contractor	340,000 400,000	WMP developed. Waste transfer documentation Evidence of waste reuse and recycling	Visual Observation Waste Tracking Report	Zero waste left behind at project site	Agro industrial hub Monthly	ESWAMA	
	Contamination/pollution of sources of water, food and fodder for animals during clearing	<ul style="list-style-type: none"> Schedule vegetation clearing to occur in phases so that the entire area is not cleared at once. Where possible, ensure site clearing is done during the dry season to protect work areas from erosion. 	Contractor	--	Evidence of erosion/sediment control such as silt trapping measures	Visual Observation	Water Quality of Reserve Waterbodies within baseline condition	Agro industrial hub Near-ny streams Monthly	ESME&CC	
	Eutrophication/nutrient-enrichment due to Siltation streams around the site as a result of sediment runoffs from exposed soils during clearing	<ul style="list-style-type: none"> Restrict removal of vegetation and trees to ONLY areas of need within the Agro hub. Protect all vegetation not required to be removed against damage particularly riparian vegetation along the watercourses to act as buffer zone and sediment trap. Ensure early installation of temporary drainage and diversion structures to include silt traps. 	Contractor							
	Alteration of aquatic habitat in rivers as a result of pollution and sedimentation may lead to depletion of aquatic biota	<ul style="list-style-type: none"> Re-vegetate cleared unused areas and ensure site landscaping plan include green areas where indigenous plant species and tolerant grasses and shrubs are planted. Use vegetal waste as compost to aid rapid vegetal propagation. 	Contractor	600,000 300,000						

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Traffic congestion/travel delay along Enugu-Abakaliki express way will occur as a result of mobilization of workers, equipment and other materials to the site	<ul style="list-style-type: none"> Implement Traffic Management Plan (TMP) prepared for the project (See Appendix 5), including the following: Hire drivers with appropriate driver's license, train drivers, enforce speed limit. Mobilization of equipment and machinery should be done at off-peak period (10am – 4pm). Ensure trucks and other vehicles are parked at the designated parking area within the project site and prohibited from parking along the Enugu-Abakaliki expressway and access road to Owoto prevent obstruction of traffic. Ensure Traffic/caution signs at strategic locations in English and Yoruba and engage personnel to manage traffic flow during peak periods. Cover truck conveying materials to site to prevent materials falling and causing injuries to pedestrians & motorists. 	Contractor	300,000	TMP Drivers training and licence. Period of mobilisation Appropriate traffic signages in English and Igbo Incident/Accident Report	Visual observation Interview	Zero incident/accident/complaints	Enugu-Abakaliki Expressway. Along Site Access Road Weekly during Pre-construction	FRSC Police Nkanu East LGA	
	Storage of materials and equipment on site may attract theft and security breaches and threat to lives and properties.	<ul style="list-style-type: none"> Ensure deployment of 24-hour security guards and distribution of suitable security light. Ensure consultation and collaboration with Owo local vigilante and Police 	Contractor	500,000	No of security personnel engaged.	Records and Interviews	No of security incidents	Agro hub, Camp site, staging areas Monthly	Police Nkanu East LGA ESMARD	
	There could be increased exposure to health risks from fugitive dusts and exhausts fumes.	<ul style="list-style-type: none"> Use spraying devices such as water tanker to sprinkle water on exposed soil surfaces to limit dusts. Ensure provision of appropriate PPE for eye/respiratory protection and enforce usage. 	Contractor	Cost included as part of Air Quality Management Above	Air quality parameters (PM10, CH ₃ , CO, NO ₂ , SO ₂ , CO ₂) Provision and usage of PPE	In-situ Air Quality measurement	FMEnv air pollutants and noise level within permissible limit	Agro hub Owo Monthly	ESME&CC	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Site clearing and mobilization of workers, equipment and other materials to the site may cause an upsurge in noise, fugitive dust and exhaust fumes nuisance in the area which can have adverse health impacts	<ul style="list-style-type: none"> Ensure use of low-noise machineries and equipment or retrofit with exhaust mufflers/silencers to minimize noise. Ensure equipment not in use are turned off. Ensure construction work is limited to daytime hours to limit impact of noise. Provide appropriate PPE for hearing, eyes and respiratory protection and enforce usage by workers and visitors. Restrict access of non-project personnel to work areas where dusts and emissions exist/persist from project works. 	Contractor		Noise Level & Air quality parameters (PM10, CH ₃ , CO, NO ₂ , SO ₂ , CO ₂) Provision and usage of PPE Restriction of access by non-project personnel	In-situ Air Quality and Noise Level Measurement	FME _{env} air pollutants and noise level within permissible limit	Agro hub Owo Monthly	ESME&CC	
	Occupational accidents and injuries from use of heavy machineries and equipment as well as struck by injuries from falling of trees, insect bites and exposure to dangerous animals etc.	<ul style="list-style-type: none"> Implement Occupational Health and Safety Plan (OHSP) developed for the project (See Appendix 4) OHSP to include: Prohibition of drug and alcohol use by workers while on the job. Provision of first aid, first aiders, PPE, signages (English and Yoruba), engineering barriers e.g., fencing. Restrict unauthorized access to all areas of high-risk activities. Training of personnel on worksite OHS management, induction/ daily toolbox and refresher program. Adequate safety signage and barriers at construction sites, staging areas, pits, equipment parking areas etc should be installed to alert workers, community members, drivers and pedestrians. Lighting and reflective tapes and signages should be made available in all worksites for safety at night. 	Contractor	500,000	No of trained first Aiders Usage of appropriate PPE Usage of signages and demarcations Accident/ Incident Report	Visual observation Records	Zero incident/ accident	Agro hub Monthly	ESME&CC Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)	
CONSTRUCTION PHASE											
Construction of SAPZ Infrastructure such as Access/Internal Roads, Buildings, Livestock Containments, Impoundment and Boreholes	Air Quality deterioration from dusts generated during excavation, filling, backfilling and compaction activities	<ul style="list-style-type: none"> Use spraying devices such as water tanker to sprinkle water on exposed soil surfaces to limit dusts. Ensure all vehicles and machines are serviced and meet appropriate emissions standards before being brought to site. Train drivers/ workers on proper operation of vehicles & equipment to include fuel efficiency and anti-idling. Tarpaulins should be used to cover trucks transporting earth materials or spoil on public roads 	Contractor	1,500,000	Air quality parameters (PM2.5, PM10, CH ₃ , CO, NO ₂ , SO ₂ , CO ₂) Maintenance records Driver's training records	In-situ Air Quality measurement	FMEnv air pollutants and noise level permissible limit	Agro hub Owo Monthly	ESME&CC	2,000,000 for monitoring activities during the construction phase	
	Noise and vibration from the use of machineries and vehicles during excavation, burrowing, backfilling and compaction activities	<ul style="list-style-type: none"> Provide appropriate PPE for hearing protection and enforce usage. Turn off equipment not in use. Ensure construction work is limited to daytime hours to limit impact of noise. Ensure use of low-noise machineries and equipment or fit with exhaust mufflers/silencers to minimize noise. 	Contractor	500,000	Noise level	In-situ noise level measurement	FMEnv noise level permissible limit	Agro hub Owo Monthly	ESME&CC		
	Introduction of air pollutants into the atmosphere from asphalt laying on internal roads.	<ul style="list-style-type: none"> Use dust control and suppression measures such as wetting, dampening. Use modern equipment that meet appropriate and ensure regular preventive maintenance. 	Contractor	Same as Air Quality Management above							
	Predisposition of soil to erosion during excavation and earth movement	<ul style="list-style-type: none"> Use erosion protection structures such as sediment traps, riprap, gabions etc. as additional measures 	Contractor	500,000	Evidence of erosion/ sediment control such	Visual Observation	Water Quality of Reserve Waterbodies	Agro hub Stream around project site	ESME&CC		

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Loss, damage or disruption of soil/sediments during construction works. Siltation of Stream near the project site due to runoff of spoils and topsoil from exposed soils	<ul style="list-style-type: none"> to control erosion and run-off to waterbodies. If possible, schedule construction to take place in dry season to prevent run-off to waterbodies. Ensure stockpile and disposal areas are stable and protected against erosion and not interfere with run off or subsequent construction activities. Reuse stockpile as fill materials for reclamation of river channel. Establish vegetation buffers and green belts between project areas and waterbodies. 		300,000	as silt trapping measures		within baseline condition	Monthly		
	Release of hazardous substances associated with construction activities or with transport of goods (e.g., accidental spills & leaks), leading to soil, surface or groundwater contamination.	<ul style="list-style-type: none"> Install impermeable surface at fuel storage areas, vehicle servicing & limit zone to contain potential leakages. Ensure that equipment maintenance on site is done at the designated site where the surface is impervious. Ensure all vehicles and machines are serviced before being brought to site to avoid leaks of oil. Prevent unregulated dumping of fuel waste by ensuring that spent oil drained from equipment during maintenance are properly collected and sent to recycling facility. 	Contractor	300,000	Presence of impermeable surface at designated areas for servicing	Visual Observation	Soil/water quality within baseline values	Agro hub Stream around the project site Monthly	ESME&CC	
	Generation of construction waste including spoils, debris and concrete wastes. Generation of scrap wastes from mechanical and electrical works such as pieces of electric cables, timbers, metals cuttings, nails and packaging materials	<ul style="list-style-type: none"> Prepare Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. 	Contractor	1,500,000	WMP developed. Waste transfer documentation Evidence of waste reuse and recycling	Visual Observation Waste Tracking Report	Zero waste left behind at project site	Agro hub Monthly	ESWAMA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Inefficient waste management during construction leading to excess consumption of materials, generation of wastes/emissions, pollution of soils and water.	<ul style="list-style-type: none"> • Unsuitable soils can be used for reclamation. • Ensure recycling of scraps and other recyclables through approved recycling facilities to conserve resources. • Storage of hazardous waste onsite should be done in closed/ labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. • Ensure no waste is left behind at project site after construction. 								
	Disruption to livelihood activities such as farming and grazing due to interruptions of construction activities	<ul style="list-style-type: none"> • Conduct survey to identify best alternatives to prevent disruptions to livelihood within on & off-site work areas before commencement of civil works. • Provide alternative source of water for livestock, in the areas where existing surface water supply will be disrupted. • Sensitize farmers/herders about the locations for alternative water supply. 	ESMARD	1,500,000	Alternative sources of water and other initiatives to ensure minimal disruption.	Visual Observation Interview	High level of satisfaction expressed by farmers/ and livestock rearers	Agro hub Owo Monthly	Nkanu East LGA	
	Construction activities will likely intercept or terminate the flow of the existing surface water bodies and cause lack of water for human, irrigation and agro processing productions.	<ul style="list-style-type: none"> • Proper channelization of surface water flow and de-siltation of the existing dam should be undertaken as part of measures to preserve water availability to the agro hub. • An impoundment should be created as part of the SAPZ to accommodate varieties of water needs for irrigation, livestock production and value chain processing. 	Contractor	1,500,000	Channelization of surface water Provision of impoundment	Visual Observation	High level of satisfaction expressed by farmers/ herders.	Agro hub Owo Monthly	Nkanu East LGA	
	Abstraction of large volume of water from ground or surface water sources may affect supply for other water	<ul style="list-style-type: none"> • Ensure water for construction is sourced from multiple sources including rainwater harvesting, waterbodies, dam and water tankers 	Contractor	1,500,000	Water for construction from multiple sources.	Visual Observation	High level of satisfaction among water users	Agro hub Owo	ESME&CC Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	users and result in conflicts over water use.	to prevent overreliance on a single source. <ul style="list-style-type: none"> Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. Water for construction SHOULD not be sourced from perennial streams during the dry season. 			Evidence of water reuse on site			Monthly		
	Traffic congestion and increased road traffic accident along F121 expressway and site access road due to movement of heavy-duty vehicles in and out of the construction site.	<ul style="list-style-type: none"> Implement Traffic Management Plan (TMP) prepared for the project, including the following: Hire drivers with appropriate driver's license, train drivers and enforce speed limit. Mobilization of equipment and machinery should be done at off-peak period (10am – 4pm). Ensure trucks and other vehicles are parked at the designated parking area within the project site and prohibited from parking along the F121 expressway to prevent obstruction of traffic. Ensure Traffic/caution signs at strategic locations in English and Yoruba and engage personnel to manage traffic flow during peak periods. Cover truck conveying materials to site to prevent materials falling and causing injuries to pedestrians & motorists. 	Contractor	500,000	Drivers training and licence. Period of mobilisation Appropriate traffic signages in Yoruba Incident/ Accident Report	Visual observation Interview	High level of satisfaction expressed by other road users Zero incident/ accident	Enugu-Abakaliki Expressway Monthly during construction	FRSC Police Nkanu East LGA	
	The project has no safeguard officers and is likely not able to implement the ESMP prepared for the project	<ul style="list-style-type: none"> Employ or train personnel on environmental and social safeguards best practices. Work closely with the Ministry of Environment to achieve success in environmental management including waste management 	ESMARD	1,500,000	No of E&S Safeguard experts	Interview Records	Presence of experienced and competent E&S Safeguard Experts	Agro hub	ESME&CC	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Risk of health problems from exposures to noise, fugitive dust and exhaust emissions from the use of machineries & motorized equipment for construction	<ul style="list-style-type: none"> Ensure use of low-noise machineries and equipment or retrofit with exhaust mufflers/silencers to minimize noise. Ensure equipment not in use are turned off. Ensure construction work is limited to daytime hours to limit impact of noise. Provide appropriate PPE for hearing, eyes and respiratory protection and enforce usage by workers and visitors. Restrict access of non-project personnel to work areas where dusts and emissions exist/persist from project works. 	Contractor	Same as Air Quality Management above	Noise Level & Air quality parameters (PM10, CH ₃ , CO, NO ₂ , SO ₂ , CO ₂) Provision and usage of PPE Restriction of access by non-project personnel	In-situ Air Quality and Noise Level Measurement	FME _{env} air pollutants and noise level within permissible limit	Agro hub Owo Monthly	ESME&CC	
	Poor management of occupational health and safety leading to accidents, injuries and illnesses among workers; mental health issues due to remote or enclosed living	<ul style="list-style-type: none"> Implement the Occupational Health and Safety Plan (OHSP) developed for this project. Prohibition of drug and alcohol use by workers while on the job. Provision of first aid, first aiders, PPE, signages (English and Yoruba), engineering barriers e.g., fencing. Restrict unauthorized access to all areas of high-risk activities. Training of personnel on worksite OHS management, induction/ daily toolbox and refresher program. Adequate safety signage and barriers at construction sites, staging areas, pits, equipment parking areas etc should be installed to alert workers, community members, drivers and pedestrians. Lighting and reflective tapes and signages should be made available in all worksites for safety at night. 	Contractor	1,500,000	No of trained first Aiders Usage of appropriate PPE Usage of signages and demarcations Accident/ Incident Report	Visual observation Records	Zero incident/ accident	Agro hub Monthly	ESME&CC Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		<ul style="list-style-type: none"> Rest and recreational facilities and time should be provided, and rules on alcohol and drugs defined and clearly communicated to workers. The basis for differences in the standard of accommodation should be non-discriminatory; it should be documented and communicated transparently to the workforce. 								
Creation of borrow pits.	<p>Unsustainable excavation and non-rehabilitation of borrow pits may lead to land degradation and increased susceptibility to erosion and flooding</p> <p>Borrow-pit may become inundated with water and pose possible risk of accident and drowning to human and animals.</p> <p>Community health & safety risks associated with creation and poor management of borrow pits and staging areas.</p>	<ul style="list-style-type: none"> Avoid the production of excess spoil material and reduce the need for borrow pit materials. Where burrowing becomes unavoidable, develop and implement Borrow pit Reclamation Plan to ensure that site is rehabilitated and restored to a safe and stable state. Plan should include measures to: <ul style="list-style-type: none"> Re-contour/grade site to blend with natural topography. Reuse excess stockpile to back fill pits during grading. Revegetate with appropriate plant spp. Avoid material borrowing or restrict borrowing to approve quarry and ensure rehabilitation before the onset of wet season. 	Contractor	1,000,000	<p>Quarry Lease of quarry sites</p> <p>Spoil management</p> <p>Developed borrow site Reclamation Plan.</p> <p>Number of borrow pits.</p>	Visual observation and Pictures	<p>Compliance</p> <p>Evidence of spoil management/ Spoil stockpiling for reclamation</p> <p>Site reclamation after construction</p>	<p>Material borrow sites</p> <p>Agro hub</p> <p>Monthly</p>	<p>ESME&CC</p> <p>Nkanu East LGAs</p>	
Presence of Migrant Workers & Business Opportunists	<p>Direct employment of local population in workforce, and stimulation of local economy through export of and demand for goods and services will enhance livelihoods and economic activity in local communities; potential for adverse</p>	<ul style="list-style-type: none"> Employment practices and working conditions should conform to International Labour Organization (ILO) Standards and national regulations. Ensure priority engagement of workers from local communities. Rest and recreational facilities and time should be provided, and rules on alcohol and drugs defined and clearly communicated to workers. The basis for differences in the 	Contractor	500,000	<p>ILO employment practices</p> <p>Ratio of local vs migrant workers</p>		<p>High level of satisfaction expressed by workers/ farmers</p>	<p>Agro hub</p> <p>Owo</p>	<p>Nkanu East LGA</p> <p>ESMARD</p>	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	effects if expectations not met and community relations are not well managed.	standard of accommodation should be non-discriminatory; it should be documented and communicated transparently to the workforce.								
	Real or perceived disruption to normal community life, through the physical presence of a non-local workforce.	<ul style="list-style-type: none"> Adopt a Stakeholder Engagement Plan, as a framework for early and ongoing community consultation. Ensure priority engagement of workers from local communities. Implement the Grievance Redress Mechanism designed for this project. Define works procedure and Code of Appropriate Conduct for all workers, including acceptable behaviour with respect to community interactions. 	Contractor ESMAAI	--	SEP developed. Ratio of local vs migrant workers GRM	Visual observation Interview	High level of satisfaction expressed by workers/farmers.	Agro hub Owo	Nkanu East LGAs ESMARD	
	Risk of illicit behaviour and crime (including prostitution, theft, robbery and substance abuse)	<ul style="list-style-type: none"> Ensure payment of adequate salaries for workers to reduce incentive for theft. Pay salaries into workers' bank accounts rather than in cash. Partner with the existing local vigilante and seek cooperation with the Police to curb the activities of theft and robbery. Ensure priority engagement of workers from local communities. Ensure creation of supervised leisure areas in workers' camp. Introduce sanctions (e.g., dismissal) for workers involved in criminal activities. Prohibit the use of illicit drugs by workers. 	ENSG Contractor	--	Mode of payment and amount paid. Ratio of local vs migrant workers	Records Interview	Crime level not exceeding baseline condition. High level of satisfaction expressed by workers/farmers	Agro hub Owo	Police Enugu East LGA	
	Potential increased prevalence of GBV & SEA resulting from interaction among construction workers,	<ul style="list-style-type: none"> Mandatory and regular training for workers on required lawful conduct in host community and legal consequences for failure to comply with laws. Training program for project 	Contractor ESMARD	500,000	Level of awareness of local culture by migrant workers.	Visual observation and interviews Rapid health survey	Community perception and level of satisfaction.	Agro hub Owo Monthly	Police Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	community members and camp followers	<p>personnel to include GBV and SEA issues.</p> <ul style="list-style-type: none"> Contractor to engage locals from the communities as labour force where possible. All workers must be trained and retrained on the provisions of the Code of Conducts and have it signed. Training can be done in local language to ensure that it is understood by all. Ensure cross gender participation in project implementation. Provision of gender-based awareness campaign within the communities. Commitment to cooperate with law enforcement agencies investigating perpetrators of GBV 			<p>Training on GBV</p> <p>Worker's manual, employment codes etc</p> <p>Ratio of migrant to local workers</p> <p>Ratio of male vs female workers</p>	<p>Consultations</p> <p>GBV Incident Report</p>	<p>GBV/SEA not exceeding baseline condition.</p> <p>Signed CoCs</p>		ESSMWASD	
	Interaction between non-local workforce and local communities may increase occurrence of communicable diseases, including HIV/AIDS and sexually transmitted diseases (STDs).	<ul style="list-style-type: none"> Institute HIV prevention programs (peer education, condom distribution etc.) Liaise with appropriate health focused NGOs to undertake health awareness and education initiatives on STDs amongst workers and in the host community. Provide opportunities for workers to regularly return to their families. Implement community-based Grievance Redress Mechanism (GRM). 	<p>Contractor</p> <p>ESMAAI</p>	<p>500,000</p> <p>1,000,000 for GRM operation</p>	<p>level of awareness and knowledge of preventive measures.</p>	<p>Rapid health survey</p> <p>Consultations</p>	<p>High level of awareness and knowledge of preventive measures.</p> <p>HIV/AIDS level not exceeding baseline condition.</p>	<p>Agro hub</p> <p>Owo</p> <p>Monthly</p>	<p>Nkanu East LGA</p> <p>ESMoH</p>	
	Threat to community culture, safety and security due to presence of workers and business opportunists.	<ul style="list-style-type: none"> Develop an induction program including a code of appropriate conduct for all workers. Code of conduct to address the following: Respect for local residents; No hunting or unauthorized taking of products or livestock; Zero tolerance of illegal activities such as 	Contractor	50digbe00,000	<p>Induction programme and CoC developed and signed by all workers.</p> <p>level of</p>	<p>Interview</p> <p>Records</p>	<p>High level of satisfaction expressed by farmers in the agro hub</p>	<p>Agro hub</p> <p>Ore</p> <p>Annually.</p>	<p>Police</p> <p>Nkanu East LGA</p>	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Increased social vices/crimes and dilution of indigenous culture, norms and traditions in surrounding communities, due to influx of migrant workers and business opportunists	<p>child sexual exploitation and underage sex, prostitution, harassment of women, 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.</p> <ul style="list-style-type: none"> • Provide cultural sensitization training to improve awareness of and sensitivity of workers to local cultures, traditions, and lifestyles. • Implement GRM and Labour Influx Management Plan (LIMP) prepared for this project. • Limit the number of migrant workers by engaging local workers. 	ESMAAI		<p>awareness and knowledge of local culture.</p> <p>GRM</p> <p>LIMP</p>					
	Child labour and school drop out in Ore due to availability of construction work	<ul style="list-style-type: none"> • Ensure children and minors are not employed directly or indirectly on the project. • Communication on hiring criteria, minimum age, and applicable laws should be ensured. • Enforcement of legislations that prohibits child labour. • Ensure CoCs contains texts that speak on zero tolerance on child labour and all forms of SEA/SH/VAC. 	Contractor ESMAAI	--	Employment Records	<p>Visual observation</p> <p>Interview</p>	Zero number of workers under the age of 18 years	<p>Agro hub</p> <p>Agro hub</p> <p>Monthly</p>	<p>Police</p> <p>Nkanu East LGA</p> <p>ESMWASD</p>	
	Individuals are likely to migrate into the project area from the local/regional area, which may cause conflict with residents, and put pressure on resources and infrastructure.	<ul style="list-style-type: none"> • Implement the Labour Influx Management Plan prepared for this project in consultation with Nkanu East LGA • Limit the number of migrant workers by engaging local workers. 	Contractor ESMAAI	--	LIMP Ratio of migrant to local workers	<p>Interview</p> <p>Records</p>	Community perception and level of satisfaction.	<p>Agro hub</p> <p>, Ore</p> <p>Monthly</p>	<p>Police</p> <p>Nkanu East LGA</p>	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Increase demand on community health and sanitation infrastructure due to influx of workers and camp followers.	<ul style="list-style-type: none"> Provide basic amenities (water, sanitation etc to workers according to WHO standards). Provide separate toilets for male and female workers. 	Contractor	1,500,000	No of amenities in worker's camp	Visual observation	Availability of all essential amenities in workers' camp	Workers camp site Monthly	ONSME Nkanu East LGA ONSMA	
	Pollution of Oluwa River from open defaecation of construction workers may lead to increased risk of water borne diseases in nearby communities.	<ul style="list-style-type: none"> Provide water and sanitation amenities at the construction site and camp site so that workers will not use nearby bushes or the sisters. Provide separate toilets for male and female workers. 								
	Assault of workers, kidnapping and vandalization of equipment by local youths over local jobs	<ul style="list-style-type: none"> Adopt a Stakeholder Engagement Plan, as a framework for early and ongoing community consultation. Ensure priority engagement of workers from local communities. 	Contractor ESMAAI	--	SEP, LIMP, GRM No of local workers	Visual observation Interview	No of complaint received by the GRC for GRM.	Agro hub, Ore Monthly	Police Nkanu East LGA	
	Conflicts between contractors and community members over labour intake	<ul style="list-style-type: none"> Implement the GRM and Labour Influx Management Plan prepared. Engage competent security to protect workers and assets 24/7 in collaboration with the Police 			No of security personnel engaged.	Review Grievance redress Log	Community perception and level of satisfaction.			
	Loss of employment for temporary construction workers	<ul style="list-style-type: none"> Ensure compliance with all legal and contractual agreement with workers. Ensure all workers receive notice of dismissal and severance payments mandated by law and collective agreements in a timely manner. Provide a grievance mechanism for workers to raise workplace concerns. 	Contractor	--	Compliance with workers contract of employment Timely payment of workers dues	Records and Interviews	Nigerian Labour Law No of grievances	Site Office Once after construction	Nkanu East LGA ESMARD	
	OPERATIONAL PHASE									
Operation and Maintenance of SAPZ and Ancillary Infrastructure	Increase ambient noise from machineries and equipment including haulage trucks	<ul style="list-style-type: none"> Ensure installation of modern processing equipment fitted with noise abatement technology such as silencers to exhaust systems. Ensure installation of enclosure and cladding of processing plants. 	ESMAAI SPV/Private Investors	--	Processing plants fitted with noise abatement technology.	Visual Observation Records	Noise level for all installed processing plants to conform with the	SAPZ Annually	ESME&CC Nkanu East LGA	2,000,000 (for monitoring activities) during the 1 st year of Operation.

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		<ul style="list-style-type: none"> Ensure installation of proper sound barriers and / or noise containments, with enclosures and curtains at or near the source equipment. Ensure regular maintenance of processing plants to ensure noise is minimal. Ensure provision of hearing PPE (earmuffs) for workers & enforce usage. Ensure installation of processing plants on anti-vibration mountings. 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 			<p>All plants installed in enclosed facilities.</p> <p>Maintenance records</p> <p>Provision and usage of hearing protection PPE.</p> <p>Workers shift</p>	<i>In-situ</i> noise level measurement	FMEEnvpermissible limits			
	Odour associated with livestock and waste may have nuisance value for nearby receptors.	<ul style="list-style-type: none"> Ensure all processing facilities are installed in an enclosed plant and processing activities are taking place within an enclosed system to prevent odour. Ensure provision of appropriate PPE (respiratory protection) for workers and enforce usage. Ensure waste storage areas are covered including waste pond and effluent treatment plants. 	ESMAAI SPV/Private Investors	--	<p>All plants installed in enclosed facilities.</p> <p>Provision and usage of PPE</p> <p>Waste storage in closed containers</p>	<p>Visual Observation</p> <p>Records</p> <p>Interview</p>	Worker's perception and level of satisfaction.	SAPZ Bi-annually	ESME&CC Nkanu East LGA	
	Abstraction of large volumes of water from surface or groundwater sources for watering livestock may affect supply for human communities and ecosystems.	<ul style="list-style-type: none"> Ensure water for SAPZ operation is sourced from multiple sources including rainwater harvesting, waterbodies, borehole and water tankers to prevent overreliance on a single source. Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. An impoundment should be created as part of the SAPZ to accommodate varieties of water needs for irrigation, livestock 	ESMAAI SPV/Private Investors	--	<p>Water from multiple sources.</p> <p>Evidence of water reuse on site</p> <p>Presence of an impoundment</p>	Visual Observation	High level of satisfaction among water users	SAPZ Owo Monthly	ESME&CC Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		production and value chain processing.								
	Inefficient waste management during operation and maintenance leading to excess consumption of materials, generation of wastes/emissions, pollution of soils and water.	<ul style="list-style-type: none"> Implement Livestock Waste Management Plan (Appendix 2) following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. Encourage manure recovery for use as fertiliser. Ensure treatment of effluents through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEnv Effluent Standards. Storage of hazardous waste onsite should be done in closed/ labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. 	ESMAAI SPV/Private Investors		LWMP developed. Waste documentation Evidence of reuse and recycling Presence of an Effluent Treatment Plant Waste storage in labelled and closed containers.	Visual Observation Records	Good housekeeping	SAPZ Bi-annually	ESME&CC Nkanu East LGA	
	Generation of normal and hazardous waste during maintenance including obsolete parts (batteries, , solar panels etc)	<ul style="list-style-type: none"> Liaise with contractor/ manufacturer to take back obsolete parts including batteries, spent oils during maintenance and repair. Alternatively, use waste vendor licensed by ESWAMA to evacuate and process hazardous waste. Storage of hazardous waste onsite should be done in closed/ labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. 	ESMAAI SPV/Private Investors	Part of construction cost	MoU with manufacturer/ supplier to take back obsolete equipment. Waste storage in labelled and closed containers	Visual Observation Waste Tracking Report	Good housekeeping Effluents conforming to FMEnv standards. Soil/Water Quality within baseline.	SAPZ Monthly	ESWAMA	

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	Pollution of soil and watercourses due to run-off of untreated effluents and improper management of hazardous waste from the processing complexes	<ul style="list-style-type: none"> Storage of hazardous waste onsite should be done in closed/ labelled containers, stored away from direct sunlight/ rain with bunds provided to contain spillage. Ensure treatment of effluents through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEnv Effluent Standards. use waste vendor licensed by ESWAMA to evacuate and process hazardous waste. Establish vegetation buffers and green belts between project area and waterbodies. 			Waste transfer documentation					
	Loss, damage or disruption of soil/sediments from livestock presence (e.g., trampling).	<ul style="list-style-type: none"> Establish clearly defined grazing area/ranche routes/t within the agro hub. Restrict livestock access to fragile/unstable soil; adapt the type and number of animals to the land carrying capacity. 	ESMARD SPV/Private Investors	Part of construction cost	Availability of a clearly defined grazing routes/track	Visual Observation	Preservation of the pristine nature of grazing reserve	SAPZ Monthly	ESME&CC Nkanu East LGA	
	Development of livestock projects in remote or undeveloped areas leading to further development, increased disturbance and pressure on natural resources through bushmeat hunting, logging, fire, etc. Increased development in remote areas could lead to greater demand for bushmeat (from workforce and wider community), stimulate the wildlife trade and	<ul style="list-style-type: none"> Where possible, instate access controls on roads leading to SAPZ. Develop an induction program including a code of appropriate conduct for all workers. Code of conduct to prohibit hunting for bushmeat or unauthorized taking of products or livestock. Sensitisation and public awareness campaigns against hunting and bushmeat trade amongst livestock Farmers and local communities. 	ESMARD	Part of construction cost	Control of access to SAPZ Code of conduct for workers Public awareness campaign	Visual Observation Records Interview	Strict enforcement of access restriction. Prohibition of hunting, logging, wildlife trade.	SAPZ Monthly	ESME&CC Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	facilitate access to hunting areas.									
	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).	<ul style="list-style-type: none"> 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. 	ESMAAI	--	Demarcation and restriction of access to sensitive ecological areas	Visual Observation	Conservation of areas of high value species, feeding or breeding sites, migration routes, etc.	SAPZ Monthly	ESME&CC Nkanu East LGA	
	Poor animal welfare (e.g., malnutrition)	<ul style="list-style-type: none"> The cattle will be housed in insulated buildings with controlled temperature and ventilation systems and ample space per cow. Ensure barns have solid concrete flooring covered by straw particularly during cold periods and ensure waste products consisting primarily of manure with straw removed from the stables daily. Ensure animals are well fed daily and provided adequate water for sustenance. Train all workers on good practice in animal handling & prohibit animal cruelty. 	ESMAAI SPV/Private Investors	Part of construction cost	Compliance of SAPZ structures to international standard	Visual Observation	Satisfactory overall animal's wellbeing and welfare	SAPZ Monthly	ESMARD	
	Pollution of watercourses from open defaecation of construction workers may lead to increased risk of water borne diseases in nearby communities.	<ul style="list-style-type: none"> Provide water and sanitation amenities at the construction site and camp site so that workers will not use nearby bushes or the sisters. Provide separate toilets for male and female workers. 	SPV/Private Investors	1,000,000	No of amenities in worker's camp	Visual observation	Availability of all essential amenities at SAPZ	SAPZ Annually	ESME&CC NkanuEast LGA ESMARD	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Fear of sustainability of the project amidst change of political leadership	<ul style="list-style-type: none"> Create a Special Purpose Vehicle (SPV) to manage the SAPZ in order to encourage private sector involvement and participation. SPV will manage critical aspects of the project such as the dam/water supply infrastructure, Palm Oil processing, solar farm, diary processing, etc 	ESMARD	--	No of private sector investors	Records	Development of all project components and presence of private sector investors	SAPZ Annually	FMARD Nkanu East LGA	
	Marginalization of the vulnerable groups and minority tribes	<ul style="list-style-type: none"> All settlements (tribes and groups) within the project area should be registered and project benefits shared on merits and interest to participation by stakeholders. As much as possible, groups should be encouraged to organize themselves as cooperatives with structures and be trained/sensitized for meaningful participation in the SAPZ. Develop detailed baseline of existing reliance on land resources in the project area; from this, identify specific groups that may not benefit from the project and adopt corrective measures as required. Develop compensation measures for affected parties (e.g., excluded farmers, downstream water users). 	ESMAAI	--	Identification, registration and sensitization of all existing tribes and groups using the reserve and their interests.	Records of Consultation Interview	High level of satisfaction among various interest groups.	Agro hub Ore Annually	FMARD Nkanu East LGA	
	Risk of illicit behavior and crime (including prostitution, theft and robbery)	<ul style="list-style-type: none"> Ensure payment of adequate salaries for workers to reduce incentive for theft. Pay salaries into workers' bank accounts rather than in cash. Partner with the existing local vigilante and seek cooperation with the Police to curb the activities of theft and robbery. Ensure priority engagement of workers from local communities. 	ESMAAI SPV/Private Investors		Mode of payment and amount paid. Ratio of local vs migrant workers	Records Interview	Crime level not exceeding baseline condition. High level of satisfaction expressed by workers/farmers.	Agro hub Owo	Police Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		<ul style="list-style-type: none"> Ensure creation of supervised leisure areas in workers' camp. Introduce sanctions (e.g., dismissal) for workers involved in criminal activities. Prohibit the use of illicit drugs by workers. 								
	Threat to community culture, safety and security due to presence of workers and business opportunists.	<ul style="list-style-type: none"> Develop an induction program including a code of appropriate conduct for all workers. Code of conduct to address the following: Respect for local residents; No hunting or unauthorized taking of products or livestock; Zero tolerance of illegal activities such as child sexual exploitation and underage sex, prostitution, harassment of women, 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. Provide cultural sensitization training to improve awareness of and sensitivity of workers to local cultures, traditions, and lifestyles. Implement GRM and Labour Influx Management Plan prepared for this project. Limit the number of migrant workers by engaging local workers. 	ESMAAI SPV/Private Investors	1,500,000 Annually for Sensitization and GRM Operations.	Induction programme and CoC developed and signed by all workers. level of awareness and knowledge of local culture. GRM LIMP	Interview Records	High level of satisfaction expressed by farmers in the hub and adjoining communities.	Agro hub Owo Annually.	Police Nkanu East LGA	
	Individuals are likely to migrate into the project area from the local/regional area, which may cause conflict with residents,	<ul style="list-style-type: none"> Implement the Labour Influx Management Plan prepared for this project in consultation with Nkanu East LGA Limit the number of migrant workers by engaging local workers. 	ESMAAI SPV/Private Investors		LIMP Ratio of migrant to local workers	Interview Records	Community perception and level of satisfaction.	SAPZ, Owo community Bi-Annually	Police Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	and put pressure on resources and infrastructure.									
	Labour Influx which could lead to increase in sexual activities and potential spread of STDs/STIs including HIV/AIDS in the project location	<ul style="list-style-type: none"> Institute HIV prevention programs (peer education, condom distribution etc.) Liaise with appropriate health focused NGOs to undertake health awareness and education initiatives on STDs amongst workers and in the host community. Provide opportunities for workers to regularly return to their families. Implement community-based Grievance Redress Mechanism (GRM). 	ESMAAI SPV/Private Investors	1,000,000 annually.	level of awareness and knowledge of preventive measures.	Rapid health Survey Consultations	High level of awareness and knowledge of preventive measures. HIV/AIDS level not exceeding baseline condition.	Agro hub Owo community Monthly	Nkanu East LGA ESMoH ESSMWAS D	
	Potential increased prevalence of GBV & SEA resulting from interaction among construction workers, community members and camp followers	<ul style="list-style-type: none"> Conduct GBV service mapping in the project area for effective referral and response. This coordination will be aimed at minimizing duplication of efforts since these data already exist and fostering greater coherence of approaches and programmes. Include a GBV specialist as part of the E&S Safeguard team for the project. Define and reinforce GBV requirements in procurement processes and contracts. Separate toilet and shower facilities for men and women and add GBV-free signage. Ensure regular GBV risks evaluation in order to update action/mitigation and training requirements throughout the project life cycle. Ensure regular training of all workers on GBV and related issues 	ESMAAI SPV/Private Investors	1,000,000 annually	Level of awareness of local culture by migrant workers. Training on GBV Worker's manual, employment codes etc Ratio of migrant to local workers Ratio of male vs female workers	Visual observation and interviews Rapid health survey Consultations GBV Incident Report	Community perception and level of satisfaction. GBV/SEA not exceeding baseline condition. Signed CoCs	SAPZ Ore Monthly	Police Nkanu East LGA ESMWASD	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		throughout the life cycle of the project. <ul style="list-style-type: none"> Create an effective Grievance Resolution Mechanism (GRM) with multiple channels to initiate complaint. This should have specific procedures for GBV cases confidentiality reporting with safe and ethical documenting. A parallel GRM for GBV and related issues can also be created. 								
	Child labour and school drop out in Ore due to availability of construction work	<ul style="list-style-type: none"> Ensure that children and minors are not employed directly or indirectly on the project. Communication on hiring criteria, minimum age, and applicable laws should be ensured. Enforcement of legislations that prohibits child labour. Ensure CoCs contains texts that speak on zero tolerance on child labour and all forms of SEA/SH/VAC. 	ESMAAI SPV/Private Investors	--	Employment Records	Visual observation Interview	Zero number of workers under the age of 18 years	Agro hub Owo community Monthly	Police Nkanu East LGA ESMWASD	
	Increase demand on community health and sanitation infrastructure due to influx of workers and camp followers.	<ul style="list-style-type: none"> Provide basic amenities (water, sanitation etc to workers according to WHO standards) within the grazing reserve. 	ESMAAI SPV/Private Investors	Part of construction costs	No of amenities in worker's camp	Visual observation	Availability of all essential amenities in workers' camp	Workers camp site Monthly	ESME&CC Nkanu East LGA ESME&CC	
	Traffic congestion and increased road traffic accident due to movement of vehicles conveying (inputs and products to and from the SAPZ.	<ul style="list-style-type: none"> Hire drivers with appropriate driver's license, train drivers and enforce speed limit (TMP is presented in Appendix 5) Ensure movement of inputs/ products to and from site is done at off-peak period (10am – 4pm). Ensure trucks and other vehicles are parked at the designated parking lot within the Reserve and prohibited 	SPV/Private Investors	400,000	Drivers training and licence. Period of mobilisation Appropriate traffic	Visual observation Interview	High level of satisfaction expressed by other road users Zero incident/accident	Monthly during construction	FRSC Police Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		<p>from parking along the F124 expressway and access roads to prevent obstruction of traffic.</p> <ul style="list-style-type: none"> • Ensure Traffic/caution signs at strategic locations in English and Yoruba and engage personnel to manage traffic flow during peak periods. • Cover truck conveying inputs and produce to and from the Reserve to prevent materials falling and causing injuries to pedestrians & motorists. 	ESMAAI	Part of construction costs	<p>signages in Yoruba</p> <p>Incident/Accident Report</p>					
	Transportation and storage of hazardous materials such as petrol and gas may result in explosions, fires or spills during operation.	<ul style="list-style-type: none"> • Emergency response plan should be developed for the facility to include: • Training of workers in emergency response and procedure. • Procedures in the case of fire should be communicated to all employees. • Firefighting devices should be installed, and their position should be clearly marked and communicated to workers. • Ensure compliance of the SAPZ with fire safety is assessed by Federal Fire Agency. • Ensure fuel storage areas are clearly marked and secure to always prevent unauthorised access. 	ESMAAI SPV/Private Investors	800,000	<p>Emergency response plan</p> <p>Workers Training on emergency procedures.</p> <p>Presence of firefighting devices.</p>	<p>Visual observation</p> <p>Interview</p>	<p>Zero emergency incidents/accidents</p> <p>Compliance with fire safety recommendations of fire agency</p>	<p>SAPZ</p> <p>Annually</p>	<p>Fire Agency</p> <p>LGAs</p>	
	Differences in nationality, ethnicity, religion, etc. may lead to discrimination and harassment, and differences (perceived or real) in working conditions between workers may lead to resentment.	<ul style="list-style-type: none"> • Employment practices and working conditions should conform to International Labour Organization (ILO) Standards and national regulations. • Ensure priority engagement of workers from local communities. • Rest and recreational facilities and time should be provided, and rules 	SPV/Private Investors	--	<p>ILO Employment Practices and Labour Conditions</p> <p>Ratio of local vs migrant workers</p>	<p>Records</p> <p>Interview</p> <p>Visual Observation</p>	<p>Compliance with ILO Employment Practices and Labour Conditions.</p>	<p>Nkanu East LGA</p>	<p>ESMARD</p> <p>Nkanu East LGA</p>	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Poor management of occupational health and safety leading to accidents, injuries and illnesses among workers); mental health issues due to remote or enclosed living.	<p>on alcohol and drugs defined and clearly communicated to workers.</p> <ul style="list-style-type: none"> The basis for differences in the standard of accommodation should be non-discriminatory; it should be documented and communicated transparently to the workforce. Clear and comprehensive health and safety reporting and grievance procedure system should be established and be freely available to all of the workforce. 			<p>Presence of recreational facilities</p> <p>HSE reporting and GRM</p>					
Palm products, cocoa products Forage Fields and Fodder Plants	Generation of waste products consisting primarily of manure with straw	<ul style="list-style-type: none"> Implement Livestock Waste Management Plan (Appendix 2) following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. Encourage manure recovery for use as fertiliser by farmers. 	ESMAAI SPV/Private Investors	2,500,000 annually	LWMP Manure recovery	Records	Good housekeeping Compliance with LWMP	SAPZ Bi-Annually	ESMARD Nkanu East LGA	
	Generation of waste including fodder and grain dust, sludge and packaging waste					Interview Visual Observation				
	Pollution of watercourses caused by wastes from livestock, and workforce sewage effluent, as well as runoff from grazing areas and land used for growing feed (containing fertilisers, pesticides and herbicides etc.).	<ul style="list-style-type: none"> Implement Livestock Waste Management Plan (Appendix 2) following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. Implement agricultural techniques minimising the use of fertilisers, pesticides, herbicides etc. Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channelled through Effluent Treatment Plant (ETP) before discharge into the environment. Output should conform to FMEnv Effluent Standards. 	ESMAAI SPV/Private Investors	As above Part of construction cost	LWMP Manure recovery Site drainages and ETP	Records Interview Visual Observation	Good housekeeping Compliance with LWMP Output of ETP should conform to FMEnv Effluent Standards	SAPZ Bi-Annually	ESMARD Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		<ul style="list-style-type: none"> Encourage manure recovery for use as fertiliser in forage fields & nearby farms. 								
	Abstraction of large volume of water	<ul style="list-style-type: none"> Ensure water for SAPZ operation is sourced from multiple sources including rainwater harvesting, waterbodies, boreholes and water tankers to prevent overreliance on a single source. Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. An impoundment should be created as part of the SAPZ to accommodate varieties of water needs for irrigation, livestock production and value chain processing. 	ESMAAI SPV/ Private Operators	Part of construction cost	Water from multiple sources. Evidence of water reuse on site Presence of an impoundment	Visual Observation	High level of satisfaction among water users	SAPZ Ore community Annually during the dry season	ESME&CC Nkanu East LGA	
Abattoir and Meat Processing Areas	Poor hygiene and management of abattoir may lead to bacterial contamination with attendant public health risk	<ul style="list-style-type: none"> Strict hygiene standards will be imposed at the site with all staff entering the slaughterhouse required to wear appropriate clothing, hair nets and footwear, and follow procedures for hand and foot disinfection. Vehicles entering and leaving the abattoir should be subject to a disinfection procedure. Any diseased animals/contaminated meat will be segregated from other animals/carcasses and collected by the veterinary authorities. The facility should be cleaned at the end of each working day. This includes washing of floors to remove blood and solids using hosed water, brushes and disinfectants. 	ESMAAI SPV/ Private Operators	--	Hygiene standards for each facility Compliance with mitigation	Visual Observation Records Interview	The abattoir, slaughtering and processing must conform to the recommendations of FAO - Guidelines for slaughtering, meat cutting and further processing. http://www.fao.org/3/T0279E/T0279E00.htm	SAPZ Quarterly	ESME&CC ESMoH NESREA NAFDAC	
	Generation of animal waste including	<ul style="list-style-type: none"> Implement Livestock Waste Management Plan (Appendix 2) 	ESMAAI	As above	LWMP	Records	Good housekeeping	SAPZ	ESWAMA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	manure, blood and inedible animal parts and chemical used for tanning may lead to environmental contamination	<p>following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community.</p> <ul style="list-style-type: none"> • Implementation of standard good wastewater management and disposal procedures; wastewater drainage outlets to discharge into vegetated areas if possible; vegetation along watercourses and drainage lines to be retained if possible. • Effluent treatment should include maximising the extent that solids and blood are collected before entering the wastewater stream. • Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channelled through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEnv Effluent Standards. • Encourage manure recovery for use as fertiliser for use in nearby farms. 	SPV/ Private Operators	Part of construction cost	Manure recovery Site drainages and ETP	Interview Visual Observation	Compliance with LWMP Output of ETP should conform to FMEnv Effluent Standards	Bi-Annually	Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
	Abstraction of large volumes of water may lead to water shortages in the zone	<ul style="list-style-type: none"> Ensure water for SAPZ operation is sourced from multiple sources including rainwater harvesting, waterbodies, boreholes and water tankers to prevent overreliance on a single source. Promotion of water efficiency (including leak detection, preventative maintenance of equipment) and water recycling. An impoundment should be created as part of the SAPZ to accommodate varieties of water needs for irrigation, livestock production and value chain processing. 	ESMAAI SPV/ Private Operators	Part of construction cost	Water from multiple sources. Evidence of water reuse on site Presence of an impoundment	Visual Observation	High level of satisfaction among water users	SAPZ Farmers Annually during the dry season	ESME&CC Nkanu East LGA	
	Emission of methane, ammonia and other GHGs may aggravate climate change and cause unpleasant odours	<ul style="list-style-type: none"> Create manure lagoons (impermeable pit or tank protected from rain and sun) to temporary store manure before being used as fertilizer in forage fields and nearby farms. The production of methane can be encouraged and recovered for use as a fuel using specially designed recovery systems. The size of the SAPZ would make methane recovery feasible, although ENSG has no plans to recover methane at this time, however, other private investors should be encouraged to do so. 	ESMAAI SPV/ Private Operators	Part of construction cost	Recycling of manure as fertilizer	Visual Observation	Good housekeeping and waste management measures	SAPZ Bi-Annually	ESWAMA Nkanu East LGA	
	Odours from animal waste products and some carcass treatment and manure in the lairage pens	<ul style="list-style-type: none"> Odours should be minimised by good manure management; the animals will be held in lairage pens with slatted floors for manure collection with daily scrapping. Odours from inedible animal parts can be managed by good housekeeping and livestock waste management practices, and for 	ESMAAI SPV/ Private Operators	Part of construction cost	LWMP Manure recovery	Records Interview Visual Observation	Good housekeeping Compliance with LWMP	SAPZ Bi-Annually	ESWAMA Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		<p>singeing odours using abatement equipment if necessary.</p> <ul style="list-style-type: none"> Inedible waste should be removed by specialist operators for rendering, or in the future, possibly utilised in the production of biogas that will subsequently be used as a fuel source for the facility. 								
	Pollution of soil and watercourses due to run-off or discharge of untreated foul water (effluents) and improper management of waste	<ul style="list-style-type: none"> Establish site drainage structures for both foul water and storm water with interceptor (oil and water separator). Foul water to be channelled through Effluent Treatment Plant before discharge into the environment. ETP should consist of mechanical clarification using a 1mm screen followed by chemical flocculation, flocculent removal and dewatering and disposal of resultant solid waste in order for the output to conform to FMEnv Effluent Standards. Effluent treatment should include maximising the extent that solids and blood are collected before entering the wastewater stream. Implement Livestock Waste Management Plan following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. Use of authorised contractors for hazardous and any other wastes which the project cannot dispose of safely. Encourage manure recovery for use as fertiliser. Storage of hazardous waste onsite should be done in closed/ labelled containers, stored away from direct 	ESMAAI SPV/ Private Operators	As above Part of construction cost	LWMP Manure recovery Site drainages and ETP Waste transfer records	Records Interview Visual Observation	Good housekeeping Compliance with LWMP Output of ETP should conform to FMEnv Effluent Standards	SAPZ Bi-Annually	ESWAMA Nkanu East LGA	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		sunlight/ rain with bunds provided to contain spillage.								
Milk Production Areas	Generation of manure waste may lead to uncontrolled release of ammonia and environmental contamination.	<ul style="list-style-type: none"> Implement Livestock Waste Management Plan (Appendix 2) following the waste hierarchy, supported by training and awareness-raising around topic of waste for workforce and for local community. Ensure barns are equipped with slatted flooring and manure scrapers to reduce ammonia emissions through regular collection of manure in collection basins underneath the flooring. The under-floor manure basins will be periodically emptied to manure lagoons from where manure recovery for use as fertiliser will be done. Establish site drainage structures for both foul water and storm water with interceptors (oil and water separator). Foul water to be channelled through Effluent Treatment Plant before discharge into the environment. Output should conform to FMEffluent Standards. 	ESMAAI SPV/ Private Operators	As above Part of construction cost	LWMP Manure recovery Site drainages and ETP	Records Interview Visual Observation	Good housekeeping Compliance with LWMP Output of ETP should conform to FMEffluent Standards	SAPZ Bi-Annually	ESWAMA Nkanu East LGA	
	Generation/ uncontrolled discharge of foul water with high BOD, suspended solids and nutrients may cause pollution/eutrophication/nutrient-enrichment in waterbodies.									
	Poor hygiene and management of milk may lead to bacterial contamination with attendant public health risk	<ul style="list-style-type: none"> Strict hygiene standards should be imposed at the milking parlour with all staff entering required to wear appropriate clothing, hair nets and footwear, and follow procedures for hand and foot disinfection. Vehicles entering and leaving the facility should be subject to a disinfection procedure. All animals in the barn (milking parlour) must be checked daily by 	ESMAAI SPV/ Private Operators	--	Hygiene standards for each facility Compliance with mitigation	Visual Observation Records Interview	The milking barn should conform with FAO Guidelines.	SAPZ Quarterly	ESME&CC ESMoH NESREA NAFDAC	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		<p>Veterinary Doctor to confirm they are not infected before milking.</p> <ul style="list-style-type: none"> The barns should have slatted floors and equipped with automatic cleaning scrapers with manure basins underneath to collect manure (and urine). The barns should also be regularly disinfected. 								
Veterinary and Disease Control	<p>Zoonoses (potential transmission of diseases between animals and humans)</p> <p>Degradation of health and size of populations of native species due to spread of diseases from livestock.</p> <p>Increased likelihood of certain vector-, animals- or water-borne diseases spreading within workforce and local community due to presence of livestock and standing water; health risks associated with chemicals used and wastes produced during operation (e.g. pesticides, noxious gases).</p>	<ul style="list-style-type: none"> Ensure adequate and sufficient medical and veterinary services/clinics and presence of doctors are included in project planning. Good environmental, sanitation and hygiene conditions of the livestock processing zone Veterinary screening of all livestock for diseases prior to introduction into the grazing reserve. Proper containment of livestock, to reduce interaction with wild and other domestic animal populations. Monitor diseases in livestock and implement appropriate actions to eliminate any diseases detected, especially those with potential to spread to wild populations (e.g., control vectors using bioenvironmental management techniques). Ensure control of human/animal interactions. Monitor diseases in livestock and implement appropriate actions to eliminate any diseases detected, especially those with potential to spread to humans (e.g., vector control, use of quarantine, contact avoidance, focal use of insecticides etc.). Regulate livestock waste and ensure appropriate ventilation in livestock 	ESMAAI SPV/ Private Operators	Part of project cost	<p>Medical and Veterinary Services</p> <p>Veterinary screening of all livestock</p> <p>Livestock containment</p> <p>Control of human/animal interactions</p> <p>LWMP</p>	<p>Visual Observation</p> <p>Records</p> <p>Interview</p>	<p>Absence of Zoonoses</p> <p>Zero outbreak of diseases.</p>	<p>SAPZ and adjoining communities</p> <p>Quarterly</p>	<p>ESME&CC</p> <p>ESMoH</p> <p>Nkanu East LGA</p>	

Project Activities	Associated and Potential Impacts	Mitigation Measure	Responsibility for Mitigation	Cost of Mitigation (Naira)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location & Frequency	Responsibility for Monitoring	Cost of Monitoring (Naira)
		buildings to control emissions of noxious gases. <ul style="list-style-type: none"> Safely manage chemicals (e.g., appropriate containers and labelling, workforce training, use of protective equipment). 								
	Generation of hazardous waste (including medical waste and animal tissues)	<ul style="list-style-type: none"> Implement the veterinary and livestock waste management plan prepared for this project and work closely with the KWS Ministry of Health to provide guidance and monitoring. Install incinerator with secondary burners and gaseous pollutant abatement technology to manage medical waste. The receptacles for waste should be sized appropriately for the waste volumes generated, colour-coded and labelled according to the types of waste to be deposited. Ensure workers handling waste from the facility are using appropriate PPE including coveralls, face masks, hand-gloves and safety boots. 	ESMAAI SPV/ Private Operators	Part of project cost	LWMP Installation of abatement technology – incinerators Waste segregation Usage of PPE by waste handlers.	Visual Observation Records Interview	Good housekeeping	SAPZ Veterinary and Medical Clinics. Quarterly	ESWAMA ESMoH Nkanu East LGA	
Crop Production Area	Pollution of watercourses caused by run-off from farming areas (containing fertilisers, pesticides and herbicides etc.).	<ul style="list-style-type: none"> Implement agricultural techniques minimising the use of fertilisers, pesticides, herbicides etc. Encourage the use of manure from livestock production areas to limit the 	ESMARAI SPV/ Private Operators	--	Agric practices implemented to reduce fertilizer application. Manure recycling as fertilizer	Visual observation	Water quality of the receiving rivers within baseline condition	SAPZ Annually	ESME&CC ESMARD Nkanu East LGA	

7.10 Project Grievance Redress Mechanism (GRM)

The grievance redress mechanism will take into consideration the existing social and administrative structures present within Owo to constitute a GRM that is localised and acceptable. This structure will be adapted and enhanced using the AfDB approach. The AfDB's approach to resolving grievances on project interventions is described below:

7.10.1 AfDB Grievance Redress Mechanism Approach

The AfDB defines project GRM as a systematic process for receiving, evaluating and facilitating resolution of affected people's project-related concerns, complaints and grievances about the borrower's/client's social and environmental performance on a project. AfDB requires its clients to be aware of and respond to stakeholders' concerns related to the project in a timely manner. For this purpose, the program will establish an effective grievance mechanism, process, or procedure to receive and facilitate resolution of stakeholders' concerns and grievances, in particular, about the client's E&S performance.

In OS 1, the Bank requires the borrower/client to establish a "credible, independent and empowered local grievance and redress mechanism to receive, facilitate and follow up on the resolution of the affected people's grievances and concerns regarding the E&S performance of the project. The local grievance mechanism needs to be sufficiently independent, empowered and accessible to the stakeholders at all times during project cycle and all responses to grievances shall be recorded and included in project supervision formats and reports."

Some Bank's intervention may inevitably have the potential to impact the local population's well-being. The aim of a project GRM is, therefore, to enable people fearing or suffering adverse impacts to be able to be heard and assisted. People potentially or actually affected by a Bank-funded project need a trusted way to voice and resolve project related concerns and the project needs an effective way to address affected people's concerns. The GRM provides a structured and managed way of allowing the concerns of affected people to be heard and addressed, including by the borrower's/client's project management staff and in certain circumstances, by Bank staff.

The main advantages of establishing and maintaining an appropriate GRM linked to a Bank-funded project are:

- Helping maintain good development conditions in the field, conducive to harmonious, sustainable development.
- Minimising the risk of violent or otherwise destructive behaviours, and the associated economic and social costs.
- Helping to protect the most vulnerable local groups and individuals.
- Alleviating the risk of dispute or conflict escalation, such as cases being brought to the Bank's Independent Review Mechanism.

The process by which the GRM is designed should be integrated into the overall approach to project preparation as prescribed in the Bank's ISS. The Bank ISS through its (IESIA) Guidelines Notes provides guidance on development and Implementation of GRM. It should also be included in the concrete actions required in the ESMP for Category 1 projects and on a case-by-case basis, for Category 2 projects that exhibit specific potential social tensions, in particular risks of

mismanagement of compensation/resettlement schemes or the presence of particularly vulnerable groups in the project's area of influence.

7.10.2 GRM at project level

The GRM in the Program will be established under the guidance provided in the Bank's ISS through its IESIA Guidelines Notes. The first step is to determine the primary goal of the GRM which would generally be to resolve specific grievances in a manner that meets both project management and community needs, but with important local variations. The scope of the grievances that may legitimately be brought forward by the communities and/or individuals affected shall be defined in advance. That scope will generally cover most, if not all, of the issues raised in a typical E&S Assessment: natural resources, pollution, cultural property, land acquisition, the income of resettled/displaced populations, the welfare of vulnerable groups, etc.

The second step is to design the GRM by:

- Preparing a preliminary design.
- Selecting ways and means to receive, register, assess and respond to grievances.
- Select grievance resolution approaches.
- Design a means to track and monitor grievances.
- Develop the grievance mechanism infrastructure.
- Review and refine the design.

At the project level, the design of GRM may be done with the assistance of the specialized Independent consulting team as part of the ESMP implementation. The GRM shall be designed based on the following principles:

- Involvement of individuals of mixed levels and functions from the entity (e.g., operations, environmental affairs, community relations, legal affairs, contractors, farmers). Staffing the design team from just one function such as community relations or human resources is unwise.
- The inclusion of a balanced group of representatives from the community, representing the range of constituencies and demographics that will be using the grievance mechanism, while keeping the team small enough to be responsive.
- GRM Relying upon clear terms of reference and a work plan that outlines team goals, roles, and responsibilities, level of decision-making authority, reporting lines, tasks, time frame, and products.
- Making the use of multiple channels (e.g., face to face, phone conversation, mail, text or e-mail, message on a dedicated website), sensitive to cultural customs and traditional methods that may influence or impede the expression of grievances.
- The existence of a central point of contact that will receive complaints and log them into a central register.
- Existence and operation of designated complaint resolution staff.
- Processes for acknowledging the receipt of a grievance and informing the complainant about the time frame in which a response can be expected.

7.10.3 Appointing members of Grievance Redress Committees (GRC)

The Program will involve the formulation of a Grievance Redress Committee (GRC) at project level, i.e., GRM staff, for handling grievances. Generally, all project staff, the management staff of agencies involved in the project, and government administrators will take on grievance handling as a responsibility. The GRC members shall be qualified, experienced, and competent personnel who can win respect and confidence of the affected communities. It is also important to maintain a gender balance within the GRMs. Criteria for selecting members of GRCs shall include the following:

- Knowledge of the project, its objectives, and outcomes.
- Technical knowledge and expertise to understand project design and requirements.
- Understanding of the social, economic, and cultural environments and the dynamics of the communities.
- Capacity to absorb the issues dealt with and to contribute actively to decision-making processes.
- Social recognition and standing; and
- equitable representation of males and females.

Specifically, for the SAPZ implementation, the GRC at project level shall constitute among other members:

- Director, Agricultural Services Department (ESMAAI)
- Representatives from Nkanu East LGA
- Igwe of Owo town.
- A Representative of Crop and Animal Farmers Group
- A Representative of Community Women
- Youth Leader (Owo town)
- a member from a recognized Non-Government Organization
- SAPZ Liaison Officer from ESMAAI (Secretary).

The GRC shall have the right to request the project technical staff, and officers from relevant state or non-state institutions to attend the meetings and provide information. A complainant has the right to appear in person, to be accompanied by a community member, and/or to request to be represented by a community elder. GRCs shall be established at the project level to assure accessibility for Project Affected Persons.

7.10.4 Procedures, complaints channels and time frame for GRM

As there is no ideal model or one-size-fits-all approach to grievance resolution, the best solutions to conflicts are generally achieved through localized mechanisms that take account of the specific issues, cultural context, local customs, and project conditions and scale. The process by which a complaint will be accepted or rejected needs shall be carefully designed and shall maximize interactivity and cultural sensitivity. The acceptance/rejection of a complaint will go through a discussion stage where the plaintiff and the GRM staff interact on the grounds and motives of the complaint, after which the plaintiff should clearly and transparently be told whether or not the complaint is eligible and will be processed. The acceptance/rejection of the complaint shall be based on objective criteria that are posted by the GRC, including a written copy displayed in the public access area of the GRM in an appropriate language.

The processing of the complaint, if accepted should go through various phases:

- Filing of the complaint and labelling with an identification code communicated immediately to the plaintiff.
- Assessment of the complaint (including severity of the risk/impact).
- Formulation of the response.
- Selection of the grievance resolution approach is a key. There are four general approaches to choose from:
 - The project's management proposes a solution.
 - The community and the project's management decide together.
 - The project's management and the community defer to a third party to decide.
 - The project's management and the community utilize traditional or customary practices to reach a solution.

AfDB's ISS recommends the application of a "Decide together" approach that is usually the most accessible, natural and unthreatening ways for communities and a project's management to resolve differences. With the potential to resolve perhaps the majority of all grievances, "decide together" should be the centrepiece of any grievance mechanism's resolution options. In its simplest form, a grievance mechanism can be broken down into the following primary components:

1. Receive and register a complaint.
2. Screen and validate the complaint (based on the nature and type of a complaint).
3. Formulate a response.
4. Select a resolution approach, based on consultation with affected person/group.
5. Implement the approach.
6. Settle the issues.
7. Track and evaluate results.
8. Learn from the experience and communicate back to all parties involved.

The time for the Grievance Redress Committees to be held shall be agreed and documented, depending on the nature and severity of the complaint.

A number of mechanisms will be available to aggrieved parties to access redress. These shall include institutions specific (internal) to a project and set up from its inception or others that might have emerged over time in response to needs identified while the project evolved. Other institutions which are already established within a country's judicial, administrative, and/or political systems and exist outside a project shall also be used. These include the government bureaucracy; judicial institutions; and political institutions such as Local Government Authorities, etc.

In addition, the Bank itself sometimes shall provide a forum for grievance redress. GRMs shall include avenues for resolving conflicts between Affected Persons or other stakeholders and can provide information sought by the public on the project.

The channels of presenting complaints could include the presentation of complaints via third parties (e.g., village elites/traditional leaders, community-based organizations, lawyers, non-

government organizations [NGOs], etc.); face-to-face meetings; facsimile, telephone, and email communications; written complaints; etc.

The projects to be implemented under this intervention will have diverse E&S contexts. It is therefore expected that as part of the implementation of these projects, the projects shall develop GRM which will bring simpler means of addressing complaints. If the complainant is not satisfied, the complainer will have to appeal to the ENSG SAPZ Project Implementation Unit domiciled in the ESMAAI, headed by the Permanent Secretary.

7.10.5 The AfDB's Independent Review Mechanism (IRM)

AfDB has also established its own accountability mechanism, the Independent Review Mechanism (IRM). The IRM seeks to assess whether a Bank approved project complies with relevant AfDB's ISS. The IRM makes itself accessible to any group (a minimum of 2 persons living in the project's area of influence) actually or potentially negatively affected by a Bank-funded project. The IRM report to the Bank's Board of Directors and is thus independent of Bank management.

The IRM has been set up by the Bank to achieve more transparency. It is also a costly mechanism to trigger. The establishment of local GRMs can help to alleviate the need for plaintiffs to resort to the IRM, while problem-solving can be more rapidly and cost-effectively done locally. The cultural context in which GRMs operate also helps to defuse complaints and to find appropriate and commensurate solutions.

CHAPTER 8: PUBLIC CONSULTATION

8.1 Introduction

Public consultation is a mandatory requirement and a good practice that ensures project sustainability. Prior to the execution of this ESIA, relevant stakeholders, especially potentially affected communities, were identified through a stakeholder mapping analysis, so that adequate engagement and consultation can be carried out during the ESIA process and beyond. This stakeholder mapping analysis then informed the development and implementation of a Stakeholder Engagement Plan (SEP) that includes a detailed description of the plan for stakeholder engagement through the ESIA process.

For this ESIA, the fundamental principle of consultations is meaningful engagement with the various identified groups (i.e., free, prior and informed), with the objective of informing the stakeholders and to ultimately achieve Broad Community Support (BCS) for the SAPZ. The consultation targeted stakeholders within Owo and the environ including MDAs, farmers, women and minority groups ensuring that the requirements for meaningful engagement and consultation are adequately fulfilled. These consultations served as a two-way process between the project and its host/affected communities and other stakeholders to adequately inform them about the project (including its benefits and adverse impacts) and to obtain their input, concerns and fears which were then mainstreamed into this ESIA.

8.2 Stakeholder Analysis and Identification

The stakeholder analysis focused on the identification of stakeholders, roles and influence they wield in decision making and implementation of the ESIA and development of the SAPZ in general. This is apt for determining the capacities, concerns and influence on policy formulation and implementation. For example, this ESIA acknowledges that it is possible for an agency, organization or a group to have the dominant influence over formulation of a policy but at the same time have less practical impact than a large number of groups who have no knowledge of the regulations and information about the project, but nevertheless control day to day events or actions that affects the project. By plotting the relative influence and impacts of different stakeholders on a graph, valuable insights can be gained in terms of the actions that need to be taken to make policies more effective.

Through meetings with ESMAAI and from extensive literature review, a list of stakeholders was drawn. These stakeholders were contacted via visits and phone calls. Categories of stakeholders in the SAPZ project ecosystem include statutory MDAs, beneficiary/host/affected communities and project affected groups with varying range of influences and interests as identified below:

Table 8.1: Categorization and Analysis of Stakeholders Influence and interest

Stakeholders	Influence	Interest	Engagement Plan
Federal Ministry of Environment FMEnv)	High	High	Fully engage this group and ensure that their requirements are satisfied at all times.
Nkanu East LGA	High	High	As in above
Traditional Rulers/Community leaders	High	High	As in above
Enugu State Ministry of Agriculture and Rural Development			
Enugu State Ministry of Environment and Climate Change (ESMECC)	High	High	As in above
Enugu State Waste Management Authority (ESWAMA)	High	High	As in above
Special Assistant to the Governor of Enugu State on Agriculture	High	High	Fully engage on the progress of project
Host Community -Owo	High	High	As in above
Farmers	High	High	As in above
CBOs, NGOs, CSOs	High	High	As in above
Enugu State Ministry of Women Affairs and Social Development	Low	High	Keep this group informed, ensuring that no major issues arise because of the project
Enugu State Ministry of Health (ESMoH)	Low	High	As in above
Market/ community Women	Low	High	As in above
Vulnerable persons	Low	High	As in above

8.3 Summary of Consultations

The summary of the stakeholder consultation is presented in Tables 8.2 below while the attendance at these meetings and pictures is attached as Appendix 6.

Table 8.2: Summary of Public Consultation with SAPZ Stakeholders

Date	28th September, 2023
Attendance	Representatives from the Ministry of Environment, Ministry Agriculture, Traditional Ruler, Nkanu East LGA Chairman, ESIA Consulting team, Community groups (including men, women, farmers, etc)
Language	English and Igbo
Venue	Owo Community Hall
Introduction	<p>After a brief prayer and introductory remark by the traditional ruler, the Commissioner for Agriculture and Rural Development gave an overview of the purpose of the project. He informed the participants about the project and pleaded for their cooperation to the successful implementation of the project. He introduced the ESIA Consultant. The team leader introduced the proposed SAPZ project and members of his team. He gave an overview of the purpose of the ESIA study. He informed the participants that his team was in the meeting to consult with the community on their willingness to host the SAPZ, to find out their concerns about the SAPZ and to educate them on potential positive and negative environmental and social externalities associated with the project. According to the team leader, the town hall meeting was aimed at ascertaining the public approval of the community/land owners to host the project and also ascertain their concerns about the project. The meeting also aimed at ensuring that there is no conflict of interest on the land designated for the project.</p> <p>He inquired to know from the people if there are concerns about implementation of the project in their area and went further to explain the scoping activities that will be carried out in the period of the field study. The scoping activities involved focus group discussions with various stakeholders, collection of water and soil samples at strategic locations for environmental parameter analysis and description of the Bio-physical features that borders the project area. The study would be useful in addressing the adverse impact of the project.</p> <p>The consultant stated that the conduct of the ESIA is in line with the extant law of Nigeria EIA Act Cap E12 LFN 2004 which requires Environmental Assessment for major development activities. This is also in compliance with the requirement of African Development Bank for support and funding of the project. He informed the people about the grievance redress mechanism (GRM), which will be established for the project, who's aim is to provide a platform for lodgement and settlement of grievances which may affect the project. He stated that the operational guideline for the GRM will be revealed at the end of the preparation of the ESIA and that the Enugu State Ministry of Agriculture and Rural Development will also sensitize the stakeholders further about it.</p> <p>The consultant informed the stakeholders that the prepared ESIA report will be disclosed at community level, LGA level, State Ministry of Environment and Climate Change, State Ministry of Agriculture and Rural Development office when it is ready for the public to have access to it for comments. In addition, the ESIA report according to the consultant will be disclosed on the website of AfDB.</p>
Remarks	The Igwe thanked the project team, the government officials and community members present. He stated that the community freely donated land for the project as a means to

	<p>support the development agenda of the State Government and to create opportunities for the welfare of its citizenry and the State at large. In his statement, he mentioned that the community previously called for a town hall meeting where the State government's request for 500 hectares of land for the SAPZ project was discussed and the community voted to give the proposed site to the government with no opposition in the meeting. It was based on the outcome of the town hall meeting that the twelve (12) villages in the community sent their delegates, which comprise the village chairmen, women leaders and youth leaders to represent them in the consultation meeting with the ESIA team and the Enugu State government representatives. In support, the Igwe, the President General of the community and a few key speakers maintain that the community has a vast expanse of land where displaced farmers will be relocated to continue their farming activities. They also emphasize that the use of the site for SAPZ which intends to utilize a mechanised farming system will create huge welfare gains and pave the way for rapid urbanisation in the community through the multiplier effect. They also emphasize that the use of the site for SAPZ which intends to utilize a mechanised farming system will create huge welfare gains and pave the way for rapid urbanisation in the community through the multiplier effect.</p>
<p><i>Perception about the Project</i></p>	<p>The stakeholders took their time in turns to express their appreciation to the government of the state and African Development Bank for the project. They believe that the project is a step in the right direction to enhance the livelihood of the people and create employment. They gave their assurance that the Community would give their full support to make sure that the project is successful and sustainable.</p>
<p><i>Concerns, Questions and Request raised by the stakeholders</i></p>	<p>Concerns raised by the stakeholders include the following:</p> <ul style="list-style-type: none"> • Will the farmers be allowed access to the hub after start-up? • How will farmers be engaged? • What are the solutions to the environmental impacts and ecological issues mentioned by the consultant? • Will government provide compensation package for those whose crops were still on the land at the time of site clearing and construction. • How will the project benefit the crop farmers and what will happen to their crops? • The project should mainstream the participation of women • How will security on farmlands be ensured?
<p><i>How concerns questions and requests were addressed.</i></p>	<p>The questions and concerns of the people were addressed by the consultant as follows:</p> <ul style="list-style-type: none"> • Farmers will be allowed access to the hub in line with an agreed plan. • 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 renovate existing water sources in the project location as a veritable alternative. • The project will compensate farmers who may lose their crops due to the project. However, it is hoped that they farmers must have harvested their crops before the start of the project.

	<ul style="list-style-type: none"> • 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 Igwe and Nkanu East LGA Chairman. He also stated that the investment company would be responsible for maintaining security during operations. • The location description with common landmarks were provided as well as coordinate points
<i>Conclusion</i>	<p>The consultant and the Hon Commissioner for Agriculture 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.</p>

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APPENDICES

APPENDIX 1: Waste Management Plan for Enugu State SAPZ

1.0 Introduction

1.1 Objectives of the Waste Management Plan

The overarching objectives of this Waste Management Plan in line with the TOR are:

- (i) Determination of Waste Streams, Sources, Management options on site and in relation to the community where SAPZ is located.
- (ii) Description of a sustainable Plan of action, including measures for achieving objectives on infrastructural facility generated waste collection systems, b) waste management facilities, c) responsibilities d) economy and financing.

Specifically, the Waste Management Plan:

- Identifies the waste streams generated from the canal locations;
- Indicates source reduction opportunities for each waste stream;
- Specifies means to collect, store, and transport waste prior to disposal;
- Identifies waste treatment, recycle/reuse opportunities;
- Specifies the waste disposal facilities for each waste stream; and
- Emphasizes strict documentation and manifestation of waste management activities.

1.2 Type of Wastes Expected in the SAPZ Environment

Waste materials expected in and around the SAPZ fall into the following categories:

- Inert Waste - Waste that is physically, chemically or biologically inert. Examples include construction and demolition (C&D) debris or landscaping trash
- Non-Hazardous Waste- Waste that is within the legal limits for discharge or release into the environment.
- Domestic Waste- Waste that is generated from human activities, including solid (e.g., food remnants, food containers, office waste, etc.), liquid (e.g. used cooking oils, etc.), or sanitary waste (e.g., waste from toilets, bathrooms, and kitchen drains).
- Hazardous Waste- Waste that has physical or chemical properties exceeding legal disposal limits (e.g spent transformer oils).

These wastes are generated mainly from farms, industries/processing factories at the SAPZ and households around the SAPZ thus the highest

1.3 Legislations on Waste Management in Nigeria

In Nigeria waste management practices are regulated by a number of international and national/state legislations, guideline, conventions and agreements. Statutory legislations on solid waste management in Nigeria include the following:

- **The National Environmental Standards and Regulations Enforcement Agency Act 2007 (NESREA Act)**

After the repealing of the Federal Environmental Protection Act of 1988, the NESREA Act, 2007 became the major statutory regulation or instrument guiding environmental matters in Nigeria. It specially makes provision for solid waste management and its administration and prescribes sanction for offences or acts which run contrary to proper and adequate waste disposal procedures and practices.

- **Environmental Impact Assessment Act of 1992**
 The purpose of the EIA Act is to among other things establish before a decision taken by any person, authority corporate body or unincorporated body including the Government of the Federation, State or Local Government intending to undertake or authorise the undertaking of any activity that may likely or to a significant extent affect the environment. Such activities include the disposal of solid waste in the environment.
- **National Environmental (Sanitation and Wastes Control) Regulations, 2009**
 This regulation that was promulgated in 2009 among other things makes adequate provisions for waste control and environmental sanitation including punishments in cases of malfeasances.
- **The Harmful Waste (Special Criminal Provisions, etc) Act**
 The Decree prohibits the Carrying, depositing and dumping of harmful waste on any land, territorial Waters, contagious zone, Exclusive Economic Zone of Nigeria or its inland Water ways and prescribes severe penalties for any person found guilty of any Crime relating thereto.
- **The NEP (Pollution Abatement in Industries and Facilities Generating Waste) Regulations**
 Restrictions are imposed hereunder on the release of toxic substances and requirement of Stipulated Monitoring of pollution to ensure permissible limits are not exceeded; Unusual and accidental discharges; Contingency plans; Generator's liabilities; Strategies of waste reduction and safety for workers.
- **The Management of Solid and Hazardous Wastes Regulations**
 These regulate the collection, treatment and disposal of solid and hazardous waste for municipal and industrial sources and give the comprehensive list of chemicals and chemical waste by toxicity categories.
- **The National Oil Spill Detection And Response Agency Act 2005 (NOSDRA Act)**
 This statutory regulation makes adequate regulations on waste emanating from oil production and exploration and its potential consequences to the environment.
- **The National Effluents Limitations Regulation**
 This instrument makes it mandatory that industrial facilities install anti-pollution equipment, make provision for further effluent treatment, prescribe maximum limit of effluent parameters allowed for discharge, and spell out penalties for contravention.
- **The National Guidelines and Standards for Environmental Pollution Control in Nigeria.**
 This was launched on March 12th 1991 and represents the basic instrument for monitoring and controlling industrial and urban pollution.
- **National Policy on Environment**
 Launched by Government on 27th November 1989, this document prescribe guidelines and strategies for achieving the Policy Goal of Sustainable Development

Other existing legislations on waste management are as per Table 1.1 of Appendix 1 below.

Table 1.1 of Appendix 1: Legislations on waste management in Nigeria

National Legislations		
Water Regulations		
3	Water Works Act, 1915	Prohibits pollution of water works in Nigeria by injurious or noxious waste
4	Minerals Act, 1917	Prohibits pollution of water works in Nigeria by injurious or noxious waste
5	Public Health Act, 1917	Prohibits pollution of water works in Nigeria by injurious or noxious waste
6	River Basin Development Authorities Act, No. 35 of 1987	Prohibits pollution of water works in Nigeria by injurious or noxious waste
General Statutes		
10	Environmental Protection Board Act, 1997	State regulation regarding sound management of waste
International regulations		
11	The Montreal Protocol on Substances/actions that Deplete the ozone layer, 1987	Ratified by Nigeria
12	The Framework Convention on climate change, 1992	Ratified by Nigeria
13	The London Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matters, 1972	Ratified by Nigeria

Enugu State also has a specific legislation on waste management which is the Enugu State Waste Management Authority (ESWMA) Law.

2.0 Waste Management Procedure for the Canal Locations

Waste management strategy for the SAPZ is to first sensitize the various stakeholders in the SAPZ, namely farmers, industry workers and management, residents of Owo community on proper waste management procedure; waste collection and categorize waste into types; while waste reduction and pre- treatment options are explored before final treatment or disposal.

2.1 Awareness Plan

In other to enhance proper refuse disposal at the SAPZ, there should be general awareness to sensitize the various stakeholders on the culture of sound waste management. They should be educated on proper refuse disposal, regular waste collection from the area, ensuring that the those working in the SAPZ use disposal bags and bins etc. Awareness plan and requirements should include:

- Waste reduction or minimization options
- Proper options for discarding various waste materials

2.2 Waste Collection Plan

- ESWAMA should continue to encourage everyone in the State especially those that will work in the SAPZ to bag their wastes in cellophane bags.
- ESWAMA should also encourage the residents to segregate their wastes.

- Waste receptacles/bins with cover should also be used. It is advisable that the cellophane bags are put inside the bins so that wastes are collected and the bags tied after they are filled with wastes.
- Waste bins (small sizes) should be made available in the living rooms (for residents) and office areas, factories and other locations.
- The medium bins will be within offices and kitchen area.
- Safety boxes will be positioned at the consulting rooms in the clinics/hospitals in the SAPZ.
- After collection, the wastes should be disposed in waste collection bins kept along the streets which will be evacuated daily by ESWAMA. Figure 1.1 shows the various sizes of waste bins that can be used. It is important that ESWAMA keep separate bins for different types of wastes so as to encourage waste segregation.
- Also, bagged wastes can be disposed directly into the compactor trucks that are operated by ESWAMA and the Private sector operators.



Figure 1.1: Various sizes of Bins/Trash Cans

2.3 Source Separation/Segregation of Waste

Waste segregation at source of generation is critical to proper waste management. For this purpose, colour -coding of bins should be adopted especially for offices and industries in the SAPZ. The following protocol should be adopted:

- General waste e.g packaging materials must be put in BLACK bin
- Food/Garden waste in GREEN bin
- Electric bulbs, fluorescent tubes and glass waste in BLUE bin
- Paper waste: to be shredded in BLACK PLASTIC BAGS
- IT Consumables e.g toners, cartridges in WHITE bin
- Metal junk must be put into the YELLOW colored bins
- Waste plastic containers in BROWN bin
- Spent batteries, empty drums (oil/chemical) in GREY bin
- Contaminated soil, absorbent in PURPLE bin

It is important to note that sorted wastes should be stored in the appropriate labelled bins; bio-hazard wastes should not be sorted but put inside the safety box; and as much as possible re-use of papers, bottles and plastics should be encouraged

2.4: Waste Transportation and Disposal

- Waste collection from final storage point should be undertaken by ESWAMA.
- Waste disposal must be done in a government designated sites.
- Contractors collecting wastes must agree to and implement the standards for waste collection including use of pollution-proof trucks and PPEs for workers.

2.5 Management of Hazardous Waste

- Hazardous wastes MUST be put in separate bags/boxes, closed and coded with red or brown colour as 'HAZARDOUS WASTES'.
- Hazardous waste will be treated before final disposal into channels designated for disposal
- Hazardous waste shall not be disposed together with non-hazardous wastes.

2.6 Management of Biohazard Waste

Bio-hazardous waste must be done with extreme care. These wastes come from the clinics and hospitals in the locations and include sharp object - syringes and blades

- The final disposal of sharps waste should be in autoclave or an incinerator
- Health care workers are to minimize their interaction with sharps waste by disposing of it in a sealable container
- If the sharps waste incorporates an additional part, such as a syringe, tube, or handle, the whole unit should be disposed together.



Figure 1.2: Safety Box

The self-locking and sealable containers are made of plastic so that the sharps waste cannot easily penetrate through the sides. The unit is designed so that the whole container can be disposed of with the other bio-hazardous waste.

Figure 4 demonstrate the safety use of hand glove in handling/disposing of bio-hazardous waste.

2.7: The Waste Hierarchy

The waste hierarchy refers to the technical options available for waste management. It is an expression of the order of preference or desirability of actions or programmes to achieve waste management objectives. The following options shall be considered while implementing a waste management plan for the canal locations:

1. Avoidance/Source reduction- The preferred option is to avoid the generation of waste in the first place. If the generation of waste cannot be avoided, both the quantity of the waste and the degree of hazard it poses, should be minimized (e.g. avoidance or reduction of waste through the purchase and stocking of only what is needed, process modification, and good housekeeping practices).
2. For those that must be generated, the preferred option is reuse, recycling and recovery (e.g. the use of reusable materials such as chemical containers & wood pallets or the conversion or extraction of waste into reusable materials such as generator waste oil) Where reuse is not possible, recover for reprocessing – provided that there is an end use and a demand for the product, and there is a net environmental benefit in doing so
3. For wastes which must be generated and cannot be recycled, treatment should be considered to remove the hazard (e.g. by neutralisation, incineration), reduce the volume (e.g. by precipitation of heavy metals) or render the wastes into a less mobile form (e.g. stabilisation/solidification).
4. Only when all the options have been fully explored, should consideration be given to environmentally sound disposal methods such as a properly controlled landfill or the safe disposition of waste residues in facilities such as a Government approved land disposal sites.

All field and office operations of ESWAMA will be guided by the hierarchy of waste management options. Fig. 1.3 is a pictorial representation of the waste hierarchy. It shows desirability of options increasing towards the apex.

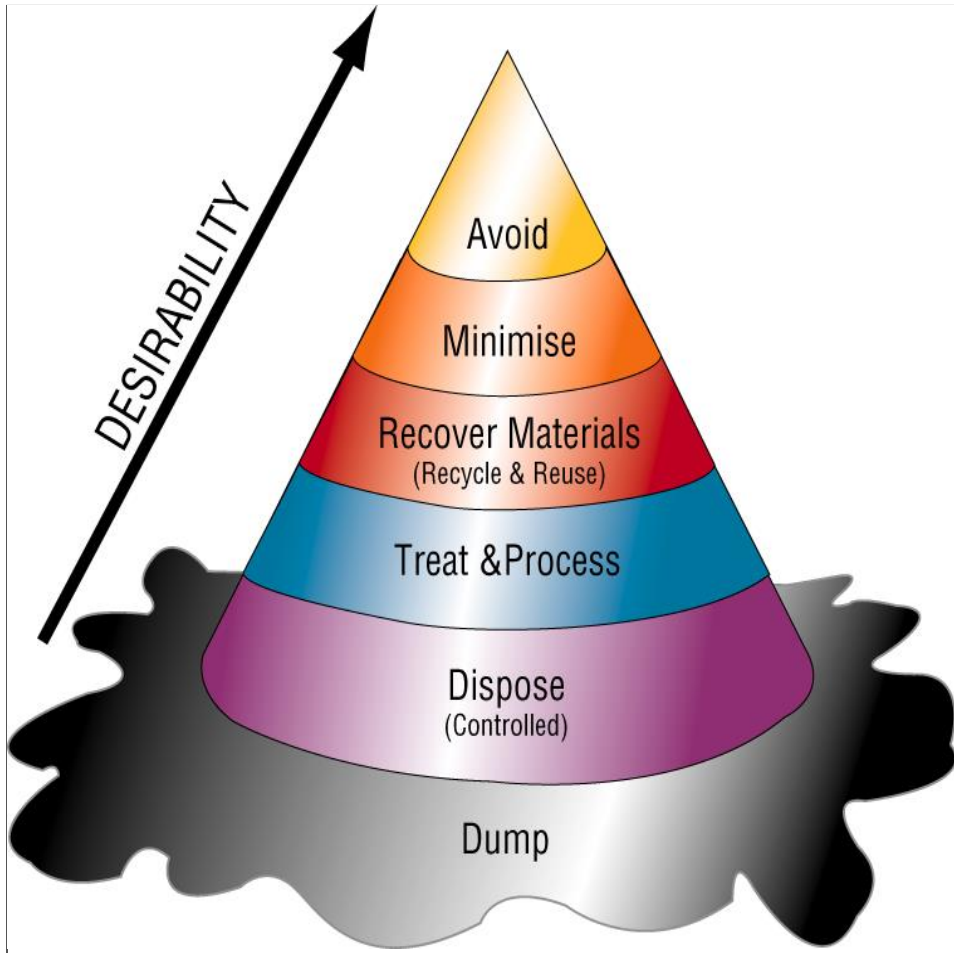


Figure 1.3: Hierarchy of waste management options (Source: Wilson et al (2002)).

2.8: Documentation of Waste Management

ESAWMA is required to:

- Keep accurate records that track the amount of waste generated and the management strategies used
- Waste generating facilities must use the Waste Tracking Log. The log includes the date and Type(s) and Quantity of waste manifested and transferred for handling/disposal. The Supervisor of the waste generating facility ensures that all records of waste transferred are logged.
- Ensure that all waste shipments are accompanied by a Waste Manifest. The Supervisor of the waste generating facility ensures that waste transferred from his facility is properly manifested.

2.9 Cost of Waste Management

The SAPZ management is not expected to make an allocation for waste management in the canal locations as this will be part of routine work of ESWAMA. However, it is recommended that ₦500,000 may be provided by SAPZ monthly to remit to ESWAMA for waste management and sensitization.

APPENDIX 2: Worksite Waste Management Plan

General construction waste in each phase of the Enugu SAPZ project life cycle has been identified in the Table below which specifies proactive management approach to prevent environmental pollution, construction waste and degradation.

Overview of Potential Waste Streams and Management

S/N	Potential Source	Waste Type	Waste Streams	Management
A	PRECONSTRUCTION PHASE			
1	Site Clearing and Installation of temporary workers camp and offices and workshops	Non-Hazardous	<ul style="list-style-type: none"> Vegetal Waste Industrial Waste: Metal scraps, packaging waste 	<p>Vegetal waste shall be supplied to farmers for use as compost.</p> <p>Woody vegetal waste shall be supplied to host communities for domestic uses including as fuel wood for cooking.</p> <p>Segregated and stored on site to be collected at least once a week for reuse or recycle through licensed third-party facilities.</p>
2	Movement of vehicles on unpaved surface and engine exhaust	Emission	CO _x , SO _x , NO _x , CO, Dust	<p>Use water suppression to prevent dust emission.</p> <p>Maintain vehicles and machineries to reduce emission.</p> <p>Maintain low speed to reduce dust and gaseous emission.</p> <p>Allow aerial dispersal over a large area.</p>
3	Workers' camp	Domestic and Sanitary	<ul style="list-style-type: none"> Food remnant, kitchen wastes. Food packaging etc <p>Domestic Sewage</p>	<p>To be transferred to locals for use as compost and animal feed.</p> <p>Plastic and other packaging to be recycled through licensed recycling third parties.</p> <p>Temporary stored and transferred to licensed carrier for disposal</p>
4	Demolition of existing structures and dismantling infrastructure	Non-Hazardous	<ul style="list-style-type: none"> Rubbles, metal scraps, wood products, steel, concrete. 	Segregated and stored on site to be collected for reuse or recycle through licensed third-party facilities.
		Hazardous	<ul style="list-style-type: none"> Asbestos 	Store on site in closed skips with and transferred to a registered waste contractor with off-site permitted hazardous waste treatment, storage, or disposal facilities
B	CONSTRUCTION PHASE			
1	Movement of vehicles on unpaved surface and engine exhaust	Emission	CO _x , SO _x , NO _x , CO, Dust	<p>Use water suppression to prevent dust emission.</p> <p>Maintain vehicles and machineries to reduce emission.</p> <p>Maintain low speed to reduce dust and gaseous emission.</p> <p>Allow aerial dispersal over a large area.</p>

S/N	Potential Source	Waste Type	Waste Streams	Management
2	Civil works Workers' camp/offices	Non-Hazardous /Industrial	<ul style="list-style-type: none"> • Spoils • Waste Packaging and Dunnage such as scrap wood, scrap metal, steel, glass, plastic, paper and cardboard, empty metal containers, excess concrete, broken equipment, or components • Domestic-type waste: wastepaper and food scraps, metal cans 	<p>Reuse spoils as fill materials as much as possible.</p> <p>Segregated and kept securely in closed containers on site. To be transferred to approved recycling third parties for reuse/recycling.</p> <p>Non-recyclables to be removed by approved waste contractor for onward disposal at approved sites.</p> <p>To be transferred to locals for use as compost and animal feed.</p> <p>Plastic and other packaging to be recycled through licensed recycling third parties.</p>
3	Civil Works	Hazardous Waste	<p>Solid Wastes: used batteries, chemical containers, concrete etc</p> <p>Liquid Waste: spent lubricating oils, hydraulic fluids, brake fluids, battery electrolyte, chemical cleaning agents, paints, primers, thinners etc.</p>	Store 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
	Civil works	Wastewater	Wastewater 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	<ul style="list-style-type: none"> • Food remnant, kitchen wastes. Food packaging etc • Domestic Sewage 	<p>To be transferred to locals for use as compost and animal feed.</p> <p>Plastic and other packaging to be recycled through licensed recycling third parties.</p> <p>Temporary stored and transferred to licensed carrier for disposal</p>
C	OPERATION PHASE			
1	Operation of Ondo state livestock Processing zone facilities including generators, boreholes	Emission	CO _x , SO _x , NO _x , CO, Dust	
		Non-Hazardous /Industrial	Packaging waste, scrap metals, plastic, paper and cardboard, empty metal containers, broken	Segregated and kept securely in closed containers on site. To be transferred to approved recycling third parties for reuse/recycling.

S/N	Potential Source	Waste Type	Waste Streams	Management
			equipment, or components Sludge	Non-recyclables to be removed by approved waste contractor for onward disposal at approved sites. Sludge should be disposed by land application through approved vendors.
		Hazardous	<ul style="list-style-type: none"> • Chemicals and containers • Oils and lubricants 	Store 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.
2	Maintenance of Ondo state Agro Processing zone Workers' camp/offices	Non-Hazardous /Industrial	<ul style="list-style-type: none"> • Packaging waste, scrap metals, plastic, empty metal containers, broken equipment, or components • Domestic-type waste: wastepaper and food scraps, metal cans, paper and cardboard, 	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 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.
		Hazardous	Solid Wastes: used batteries, chemical containers, concrete etc	Store 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.
			Liquid Waste: spent lubricating oils, hydraulic fluids, brake fluids, battery electrolyte, chemical cleaning agents, paints, primers, thinners etc.	

APPENDIX 3: Occupational Health and Safety Plan

1.0 Introduction

Every project poses its HSE risks. This plan was necessitated to meet up with OHS standards and to achieve the objectives set for the proposed project. The project team shall implement this OHS to ensure high performance standards and conformity with contract requirements by managing the works in a systematic and thorough manner.

2.1 Purpose

The purpose of this document is to describe the Project Occupational Health and Safety (OHS) plan for the proposed project and the specific management controls, risk control systems and workplace precautions required to ensure compliance with Occupational Health and Safety Laws and Standards.

2.2 Scope of Work

The OHS plan covers the entire project phases for this SAPZ. This includes Preconstruction, Construction, Operation & Maintenance and Demobilization phases.

2.3 Policy Statement

In addition to the existing HSE policy, other policies shall be developed which includes:

- Substance Abuse Policy – Prohibiting the consumption or possession of narcotics, drugs, alcohol and other banned substances.
- Emergency Response Policy – Stating commitment to ensure adequate resources and arrangement are in place in the case an emergency.
- Community Affairs Policy – Stating commitment to foster healthy relationships with communities through observance of the highest standard of conduct.
- Road Safety Policy – Stating commitment to complying with Road Traffic regulations and continuously improving its road safety performance by implementing a Road Safety Management Plan (RSMP)

3.0 Key Responsibilities

Involvement of all in implementing, maintaining and continually improving OHS processes is the key to successful completion and achievement of quality objectives set by the management. All project personnel shall therefore be required to be familiar with the content of this OHS plan and shall participate in implementing, maintaining and improving the management system.

It is the responsibility of the project manager and all key personnel to ensure that the requirements for quality are fulfilled for works under their responsibility.

All new staff and staff who are given new responsibilities are to be inducted into the requirements set out in this plan in general and into their function and responsibilities in particular.

3.1 Project Manager Responsibilities

- Ensure the availability of resources essential to establish, implement, maintain and improve the OHS Management System.
- Define, document and communicate roles, allocate responsibilities and accountabilities, delegating authorities, to facilitate effective OHS management.
- Ensure that all of the activities undertaken in the Project conform to Nigerian legislation, client requirements or international standards when applicable.
- Review objectives achievements throughout the year.
- Ensure that project staffs are instructed on the NCDC/WHO public health, e.g. COVID-19 and other public health issue guidelines
- Provide all necessary requirements/protocols for use against the spread of diseases for example, COVID-19, such as running water for washing of hands, face masks and hand sanitizers.

3.2 Project Supervisors Responsibilities

- Enforcing all phases of the established OHS plan
- Preparing Job Hazard Analysis when required.
- Ensuring the safety of all workers associated with the site.
- Conducting HSE inspections.
- Ensuring workers are competent for their allocated tasks.
- Attending and participating in OHS meetings.
- Participating in accident investigations.

3.3 HSE Manager/Supervisor Responsibilities

- Prepare relevant OHS documentation and procedures.
- Monitor the efficient implementation of OHS requirements.
- Participate and organize the OHS risk assessments.
- Advise management of compliance and of conditions requiring attention.
- Conduct regular HSE inspections.
- Make thorough analysis of statistical data and inspections; delineates problem areas; and makes recommendation for solutions.
- Take part in the review of all OHS incidents and assist in investigating incident.
- Monitor the efficient implementation of the Project's OHS requirements.
- Organize the Project's OHS risk assessment exercises.
- Check on the use of all types of personal protective equipment specifies the use of appropriate PPE for the various work activities. Evaluates their effectiveness and suggests improvements where indicated.

3.4 HSE Advisor Responsibilities

- Check on the use of all types of personal protective equipment and specifies the use of appropriate PPE for the various work activities. Evaluates their effectiveness and suggests improvements.
- Conduct independent inspections to observe conformance with established OHS Plan and determines the effectiveness of individual elements of the plan (pre-task briefing, weekly toolbox talk, etc)
- Establish contact with Subcontractors with the objective of maintaining good relations and coordination of accident prevention activities and compliance with the established OHS plan.
- Correct unsafe acts and unsafe conditions.
- Deliver HSE induction/orientation course to all employees, including subcontractors.
- Deliver HSE awareness course and toolbox talk.
- Advise employees on OHS matters.

3.5 All Employees Responsibilities

- Take all reasonable and practical steps to care for their own health and safety and avoid affecting the health and safety of co-workers and the general public.
- Follow all instructions and use the equipment properly.
- Adhere to use of face masks and all public health and COVID-19 sanitation rules.
- Report all accidents and near misses to project supervisor.
- Adhere to the code of conduct.
- Report any circumstances which may not comply with the project's OHS management system.

4.0 General requirements

In order to ensure safety of workers, construction and operation of facilities must pay attention to the following details: Integrity of workplace structures, Workspace and exit, Fire precautions, Lavatories and showers, Potable water supply, Clean eating areas, Adequate lighting, Safe access (segregation of vehicles

and pedestrians, Railings covers for falling items, prevent unauthorized access), First aid, Air supply, Work environment temperature.

6.0 HSE Training

6.1 Induction/Orientation

Every new or rehired employee and Subcontractors employees must undergo mandatory OHS orientation / induction. The purpose of the Induction is to educate workers and make them aware of the major potential hazards he or she shall come into contact with while working on the site.

The content of the HSE orientation / induction shall cover the following subjects:

- Site safety rules.
- Personnel protective equipment requirements (PPE).
- Task specific training
- Preparation and planning of the job (Daily Pre-task talk).
- Emergency plan and muster points.

7.0 Hazard identification & HSE risk assessment

7.1 Project HSE Risk Assessment

The project HSE risk assessment shall be developed and recorded. The Project's HSE risk assessment shall be conducted by a team consisting of HSE Manager/ Supervisor and technical managers/supervisors. It must be approved by the Project manager.

7.3 Job Hazard Analysis

Job hazard analysis is required when the hazards and risks associated with a specific task is to be identified so as to implement control measures. The HSE department together with the technical managers/supervisors shall develop a job hazard analysis when applicable.

8.0 Emergency Preparedness And Response

Emergency procedures and evacuation plan shall be developed by the HSE Department and displayed on the notice board. These procedures shall be communicated to all staff. Also each section/department shall have at least a trained first aider at all times. This will include Planning and coordination in events of fires or accidents, availability of emergency equipment such as mode of transport, first aid kits etc and training of employees in relevant procedures.

9.1 HSE Meetings

HSE management meetings shall be held once a month. The meeting is to help identify safety problems, develop solutions, review incident reports, provide training and evaluate the effectiveness of our safety program. Some of the meetings shall be:

- Project/Site Management HSE Meeting for management and supervision (Monthly).
- Tool box talk meetings for all workforce (Weekly).
- Pre-task briefing for all workforces (Daily).
- Special situation meeting (As required).

9.2 HSE Reporting

All incidents and illnesses must be reported to site supervisor after which investigation shall commence and recorded so that appropriate corrective actions shall be implemented to prevent any re-occurrence and report findings shall be forwarded to management for review. Reporting requirements shall include notification of incident, investigation report, and monthly report. Notification of Incident form shall be developed which shall be filled and submitted to HSE department for investigation.

9.3 HSE Inspection and Audits

For continual improvement of HSE management system, HSE inspection and audit shall be conducted. An inspection checklist shall be developed. This is to ensure that the HSE management system is being adhered to. The inspection shall be conducted by the HSE department together with site management.

9.4 Corrective and Preventive Actions and Non-Conformities

During the course of inspections, concerns raised shall be addressed and closed out. It is expected that in a period of two weeks, a close out inspection shall take place to verify that the corrective actions have been closed.

Personal Protective Equipment (PPE)

The basic PPE required for the project shall be Safety Glasses, Safety Boots, Hand Gloves, Face masks, Hard Hat and Overall. Any other PPE shall be used as applicable. Management is responsible for the provision of PPE and usage shall be enforced at all time. PPE shall be provided in circumstances where exposure to hazards cannot be avoided by other means or to supplement existing control measures identified by a risk assessment. An assessment shall be made to ensure that the PPE is suitable for purpose and is appropriate to the risk involved. Information, instruction & training shall be given to all employees on safe use, maintenance and storage of PPE. Employees shall, in accordance with instructions given, make full use of all PPE provided and maintain it in a serviceable condition and report its loss or defect immediately to the maintenance department where it shall be replaced. PPE shall be replaced when it is no longer serviceable and returned on a new for old basis. Employees shall sign to state that they have received PPE when issued.

The Table below contain specific anticipated risks in different phases of the project; preconstruction, construction and operational phases and their mitigation measures.

Potential Impact	Mitigation Measures	Responsibility for Mitigation	Mitigation Cost (NGN)	Indicators	Monitoring Frequency	Monitoring Responsibility	Monitoring costs	
PRE-CONSTRUCTION PHASE (A)								
Major Activities								
<ul style="list-style-type: none"> Land Acquisition, clearing of site, and Creation of access road and Mobilization, Creation of borrow pits, Staging area & Campsite. And Installation of Site Structures 								
OHS associated Risks and Hazards								
A1	Injuries from falling of trees. Injuries from falling into ditches.	<ul style="list-style-type: none"> A HSE personnel employed by contractor should be present on site Conduct HSE training for every new or rehired employee and sub-contractor employee. All personnel required to operate or work with any equipment or machine must be competent, be tested for each equipment that he/she shall be operating. Provision of adequate first aid, first aiders, PPE, appropriate signage (English and Local languages), engineering barriers or positive separation e.g. fencing, road closures. Restrict unauthorized access to all areas of high-risk activities including staging areas. Any uncovered work pits should have appropriate signage and protection around them. Inspect machinery before use Ensure all Incident/ accident are reported to the HSE supervisor and investigated for future prevention Implement the emergency preparedness plan in the case of serious injury Implement HSE meetings once a month to identify safety problems develop solutions, review incident 	Contractor Project Supervisor HSE personnel	2,000,000 for PPE	No of trained first Aiders Usage of appropriate PPE Usage of signage and demarcations Accident/ Incident Report Hours of shifts by each worker	Daily	OSMA-PMU OSMA-PMU	2,000,000
A2	Accidents and injuries from the use of machineries and equipment							

	Potential Impact	Mitigation Measures	Responsibility for Mitigation	Mitigation Cost (NGN)	Indicators	Monitoring Frequency	Monitoring Responsibility	Monitoring costs
		<ul style="list-style-type: none"> reports and provide training where necessary Use of high visibility clothing Strict rules of no drugs or alcohol during working time and steep punishments if found guilty (see code of conduct) Ensure workers do not work more than 8hr shifts to prevent fatigue Provision of adequate lighting for night works 						
A3	Risk of sexually transmitted diseases (STDs) including HIV/AIDS from interaction among construction workers and host community	<ul style="list-style-type: none"> Vaccinating workers against common and locally prevalent diseases or evidence of previous vaccination Provide opportunities for workers to regularly return to their families. Institute sexual health and HIV prevention programs (peer education etc.) Provision of condoms to workers 	Contractor Project Supervisor HSE personnel	1,000,000	Evidence of sexual health programs Number of condoms shared	Monthly	OSMA-PMU	
Sub Total				3,000,000.00				2,000,000
B CONSTRUCTION PHASE								
Major Activities								
Road construction, Construction of abattoir, Construction of meat and milk processing facilities and other associated structures								
B1	Accidents and injuries from the use of machineries and equipment	Mitigations for A1/A2	Contractor HSE personnel	Captured in A1/A2	Availability and usage of PPEs Number of accidents and injury from use of machinery and equipment	Daily	OSMA-PMU	3,000,000
B2	Risk of exposure to hazardous substances	Hazardous materials should be well labelled All workers should be made aware of hazardous materials present and their location All hazardous wastes should be handled by licensed and reputable waste handlers	Contractor HSE personnel	Captured in waste management plan	Number of accidents and injury from exposure to hazardous substances, Evidence of training received	Monthly	OSMA-PMU	
B3	Falls from heights	Workers must wear a safety belt or harness whenever the worker is more than 3 meters above ground or machinery Workers must be trained and supervised on the appropriate use of ladders	Contractor HSE personnel	Captured in A1/A2-	Availability and usage of PPEs Number of accidents and injury from use of machinery and equipment	Monthly	OSMA-PMU	
B4	Risk of injury from vibration using hand and power tools Risk of pain or injury from performing repetitive tasks	installation of vibration dampening pads or devices where possible Workers should work in shifts to limit duration of exposure	Contractor HSE personnel	-	Exposure time of workers to source of vibration	Weekly	OSMA-PMU	
B5	Exposure to noise Risk of eye injury from flying particles	Selecting equipment with lower sound power levels Workers should work in shifts to limit duration of exposure Installing suitable mufflers on engine exhausts and compressor components where possible	Contractor HSE personnel	-	Noise Levels Availability and usage of PPEs	Monthly	OSMA-PMU	

	Potential Impact	Mitigation Measures	Responsibility for Mitigation	Mitigation Cost (NGN)	Indicators	Monitoring Frequency	Monitoring Responsibility	Monitoring costs
		Use of PPEs (Safety glasses with side-shields, protective shades and Ear muffs where appropriate)						
B6	Spread of communicable diseases	Ensure good living quarters of workers with adequate spacing and ventilation Ensure proper functional sanitation facilities for workers with adequate supply of water Employment of cleansers to ensure facilities remain clean Ensure clean supply of water for consumption within camp Providing clean eating areas within camp Regular medical check-up for workers	Contractor HSE personnel	3,000,000	Incidence of communicable diseases among workers	Monthly	OSMA-PMU	
B7	Risk of Gender based violence (rape, sexual harassment, molestation amongst workers and host community)	Separate facilities for men and women Provision of well lighted work areas and walk ways Sensitization and awareness of hired staff against GBV Stiff punishments and penalties for perpetrators	Contractor HSE personnel	500,000 for sensitization efforts	Reported cases of GBV	Monthly	OSMA-PMU	
B8		SUB-TOTAL		3,500,000				3,000,000
C	OPERATION PHASE							
C1	Cuts and bruises from equipment	Mitigations for A1/A2 Ensure no waste is left behind at project site after construction.	Project Supervisor HSE personnel	5% of Annual operational budget	Accident/ Incident Report	Monthly	OSMA-PMU	
C2	Injuries, accidents and deaths	Mitigations for A1/A2 Establish an occupational accidents and disease compensation system in line with Nigeria's profile on occupational health and safety Implement a road safe	Project Supervisor HSE personnel		Accident/ Incident Report	Monthly	OSMA-PMU	
C3	Risk of disease transmission between workers and animals	Presence of veterinary doctors and services to ensure animal health Immunizations and vaccinations where appropriate to prevent spread of disease Maintain sanitary conditions in work areas through regular cleaning and disinfection Proper disposal of wastes as contained in the waste management plan. Use of appropriate PPE when handling animals Inspection of work areas to ensure sanitary measures are being upheld	Project Supervisor HSE personnel		Incidence of communicable diseases among workers	Monthly	OSMA-PMU	
C4	Animal kick injuries	Only experienced personnel should be involved in animal handling Use of appropriate safety techniques when handling animals Adoption of technologically advanced methods in cow slaughter	Project Supervisor HSE personnel		Accident/ Incident Report	Monthly	OSMA-PMU	
C5	Offensive odors from animal handling	Maintain hygienic and sanitary conditions in work areas Proper disposal of wastes as contained in the waste management plan.	Project Supervisor HSE personnel		Presence of odors in working areas	Daily	OSMA-PMU	
C6	Risk of pain or injury from performing repetitive tasks	See B4	Project Supervisor HSE personnel		Prevalence of pain/injury amongst workers	Monthly	OSMA-PMU	
C7	Exposure to dust from feed processing	Use of granulation method to reduce exposure to dust in workplace Correct use of equipment and PPE	Project Supervisor HSE personnel		Availability and use of PPEs by workers	Daily	OSMA-PMU	

	Potential Impact	Mitigation Measures	Responsibility for Mitigation	Mitigation Cost (NGN)	Indicators	Monitoring Frequency	Monitoring Responsibility	Monitoring costs
C8	Risk of fires and electrical fault hazards	Implement Emergency preparedness plan Provision of firefighting and prevention equipment (fire extinguisher, fire hydrants and detection equipment) Provision and sensitization of staff on muster point area	Project Supervisor HSE personnel		Existence of a functional emergency preparedness plan	Monthly	OSMA-PMU	
C9	Risk of Gender based violence (rape, sexual harassment, molestation amongst workers and host community	See B7	Project Supervisor HSE personnel		Number of reported GBV related cases	Monthly	OSMA-PMU	
		TOTAL COST OF MITIGATION		6,500,000				5,000,000

APPENDIX 4: Traffic Management Plan

A Traffic Management Plan is required for this project, because the project could have an impact on:

- **MOBILITY** - including interruptions to pedestrians, cyclists and vehicular traffic; and
- **COMMUNITY**- including interruptions to surrounding businesses and residents from construction activity and worker parking needs.

The objective of this TMP is to provide safe passage for pedestrians, cyclists and vehicular traffic along the during the construction phase of the project.

Components of the Traffic Management Plan

The proposed TMP for the construction works should to a minimum address the following:

The Contractor should designate a TMP Supervisor who will oversee traffic management within the Ondo state Agro processing zone during the preconstruction and construction stage;

Traffic Management Plan for the project will address the following:

- **Safety Signage:** Safety signage will be put up along all major roads within the project corridors. This would inform motorists and other road users of the ongoing construction works within the area. These signages will indicate that there are “Men at Work”. Caution is most required by motorists and cyclists who transverse the project areas.
- **Road Diversion Signage:** Diversion signage will be erected at sensitive places where diversions will exist from the project implementation.
- **Traffic Calming:** The traffic calming, also known as Local Area Traffic Management (LATM), the contractor should engage with the locals in different localities to identify traffic and parking issues in the area, and coming up with solutions to improve the liveability, safety and amenity in those areas. It also includes installation of traffic calming devices such as speed bumps, roundabout, speed cushions, bulb outs and more.
- **Communication:** The Contractor, with support from the PIU, will prepare a communication protocol including road safety campaigns where leaflets on road safety issues from the project will be shared with the communities within the respective zones. The communication protocol will also provide a stepwise approach to informing residents about traffic plan alterations 48hrs before they are implemented. Communication with communities will be directly facilitated by the Contractor’s Community Liaison Officer and the Secretary of each respective Community Association. Additionally, communications should be made with the PIU, FRSC and Community associations a week prior to notifying the general populace.
- **Liaisons with Government Traffic Agencies.** The TMP will ensure liaisons with the FRSC at the State level. In situations where heavy traffic impacts are envisaged, the Contractor will liaise with the FRSC to ensure traffic coordination and mitigate adverse traffic impacts.

The contractor shall ensure that all construction activities are performed in accordance with the approved Traffic Management Plan.

APPENDIX 5: General Environmental Management Conditions for Construction Contracts

General Conditions of Contract

1. In addition to these general conditions, the Contractor shall comply with any specific Environmental Management Plan (EMP) or Environmental and Social Management Plan (ESMP) for the works he is responsible for. The Contractor shall inform himself about such an ESMP, and prepare his work strategy and plan to fully take into account relevant provisions of that ESMP. If the Contractor fails to implement the approved EMP after written instruction by the Supervising Engineer (SE) to fulfil his obligation within the requested time, the Owner reserves the right to arrange through the SE for execution of the missing action by a third party on account of the Contractor.

2. Notwithstanding the Contractor's obligation under the above clause, the Contractor shall implement all measures necessary to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by any environmental performance requirements specified in an ESMP. In general, these measures shall include but not be limited to:

- a. Minimize the effect of dust on the surrounding environment resulting from earth mixing, vibrating equipment, temporary access roads, etc., to ensure the safety, health and protection of workers and communities living in the vicinity of producing activities.
- b. Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, drilling of boreholes) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.
- c. Prevent oils, lubricants and waste water used or produced during the execution of works from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs, and also ensure that stagnant water is channelled into drains in the best way to avoid creating possible breeding grounds for mosquitoes.
- d. Upon discovery of ancient heritage, relics or anything that might or believed to be of archaeological or historical importance during the execution of works, immediately report such findings to the project Engineer and the developer so that the appropriate authorities may be expeditiously contacted for fulfilment of the measures aimed at protecting such historical or archaeological resources.
- e. Implement soil erosion control measures in order to avoid surface run off and prevents siltation, of existing drainage system
- f. Ensure that garbage, sanitation and drinking water facilities are provided during construction.
- g. Ensure that, in as much as possible, local materials are used to avoid importation of foreign material and long distance transportation.
- h. Ensure public safety, and meet traffic safety requirements for the operation of work to avoid accidents.
- i. Develop and Implement Code of Conduct for workers that specifically prohibit GBV and SEA
- j. Create partnership with local NGO to report workers' misconduct and complains on Gender Based Violence.
- k. Liaise with the Health Care Facilities to conduct awareness campaigns for workers and the general populace on communicable diseases.

3. The Contractor shall indicate the period within which he/she shall maintain status on site after completion of civil works to ensure that significant adverse impacts arising from such works have been appropriately addressed.

4. The Contractor shall adhere to the proposed activity implementation schedule and the monitoring plan / strategy to ensure effective feedback of monitoring information to project management so that impact management can be implemented properly, and if necessary, adapt to changing and unforeseen conditions.

5. Besides the regular inspection of the sites by the SE for adherence to the contract conditions and specifications, the Owner may appoint an Inspector to oversee the compliance with these environmental conditions and any proposed mitigation measures. State environmental authorities may carry out similar inspection duties. The African Development Bank and other donor organizations may also carry out site visits to oversee the implementation of the ESMP. In all cases, as directed by the SE, the Contractor shall comply with directives from such inspectors to implement measures required to ensure the adequacy rehabilitation measures carried out on the bio-physical environment and compensation for socio-economic disruption resulting from implementation of any works.

Worksite Waste Management

6. All vessels (drums, containers, bags, etc.) containing oil/fuel/surfacing materials and other hazardous chemicals shall be banded in order to contain spillage. All waste containers, litter and any other waste generated during the construction shall be collected and disposed of at designated disposal sites in line with applicable government waste management regulations.

7. All drainage and effluent from storage areas, workshops and work sites shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations.

8. Used oil from maintenance shall be collected and disposed of appropriately at designated sites or be re-used or sold for re-use locally.

9. Construction waste shall not be left in stockpiles along the road, but removed and reused or disposed of on a daily basis.

11. If disposal sites for clean spoil are necessary, they shall be located in areas, approved by the SE, of low land use value and where they will not result in material being easily washed into drainage channels. Whenever possible, spoil materials should be placed in low-lying areas and should be compacted and planted with species indigenous to the locality.

Rehabilitation and Soil Erosion Prevention

12. To the extent practicable, Contractor shall rehabilitate the site progressively so the rate of rehabilitation is similar to the rate of construction.

13. Always remove and retain topsoil for subsequent rehabilitation. Soils shall not be stripped when they are wet as this can lead to soil compaction and loss of structure.

14. Topsoil shall not be stored in large heaps. Low mounds of no more than 1 to 2m high are recommended.

15. Re-vegetate stockpiles to protect the soil from erosion, discourage weeds and maintain an active population of beneficial soil microbes.

16. Locate stockpiles where they will not be disturbed by future construction activities.

17. To the extent practicable, reinstate natural drainage patterns where they have been altered or impaired.

18. Remove toxic materials and dispose of them in designated sites. Backfill excavated areas with soils or overburden that is free of foreign material that could pollute groundwater and soil.

19. Identify potentially toxic overburden and screen with suitable material to prevent mobilization of toxins.

20. Ensure reshaped land is formed so as to be inherently stable, adequately drained and suitable for the desired long-term land use, and allow natural regeneration of vegetation.

21. Minimize the long-term visual impact by creating landforms that are compatible with the adjacent landscape.

22. Compacted surfaces shall be deep ripped to relieve compaction unless subsurface conditions dictate otherwise.

23. Revegetate with plant species that will control erosion, provide vegetative diversity and, through succession, contribute to a resilient ecosystem. The choice of plant species for rehabilitation shall be done in consultation with local research institutions, forest department and the local people.

Water Resources Management

24. The Contractor shall at all costs avoid conflicting with water demands of local communities.

25. Abstraction of both surface and underground water shall only be done with the consultation of the local community and after obtaining a permit from the relevant Water Authority.

26. Abstraction of water from wetlands shall be avoided. Where necessary, authority has to be obtained from relevant authorities.

27. No construction water containing spoils or site effluent, esp. cement and oil, shall be allowed to flow into natural water drainage courses.

28. Wash water from washing out of equipment shall not be discharged into water courses or road drains.

29. Site spoils and temporary stockpiles shall be located away from the drainage system, and surface run off shall be directed away from stockpiles to prevent erosion.

Traffic Management

30. Location of access roads/detours shall be done in consultation with the local community especially in important or sensitive environments. Access roads shall not traverse wetland areas.

31. Untarred access roads shall be sprinkled with water at least 2 times a day to suppress dust emissions.

Disposal of Unusable Elements

32. Unusable materials and construction elements such as electro-mechanical equipment, pipes, accessories and demolished structures will be disposed of in a manner approved by the SE. The Contractor has to agree with the SE which elements are to be surrendered to the Client's premises, which will be recycled or reused, and which will be disposed of at approved landfill sites.

33. As far as possible, abandoned pipelines shall remain in place. Where for any reason no alternative alignment for the new pipeline is possible, the old pipes shall be safely removed and stored at a safe place to be agreed upon with the SE and the local authorities concerned.

34. Asbestos Contaminated materials shall be quarantined until they are disposed by licensed waste management contractor

35. Unsuitable and demolished elements shall be dismantled to a size fitting on ordinary trucks for transport.

Health and Safety

36. During construction phase, the Contractor shall in conjunction with the health care facilities organize an awareness and hygiene campaign where workers and local residents shall be sensitized on health risks particularly of AIDS.

37. Adequate road signs to warn pedestrians and motorists of construction activities, diversions, etc. shall be provided at appropriate points.

38. Construction vehicles shall not exceed maximum speed limit of 30km per hour.

Repair of Private Property

39. Should the Contractor, deliberately or accidentally, damage private property, he shall repair the property to the owner's satisfaction and at his own cost. For each repair, the Contractor shall obtain from the owner a certificate that the damage has been made good satisfactorily in order to indemnify the Client from subsequent claims.

40. In cases where compensation for inconveniences, damage of crops etc. are claimed by the owner, the Client has to be informed by the Contractor through the SE. This compensation is in general settled under the responsibility of the Client before signing the Contract. In unforeseeable cases, the respective administrative entities of the Client will take care of compensation.

Contractor's Environment, Health and Safety Management Plan (EHS-MP)

41. Within 6 weeks of signing the Contract, the Contractor shall prepare an EHS-MP to ensure the adequate management of the health, safety, environmental and social aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an ESMP for the works. The Contractor's EHS-MP will serve two main purposes:

- For the Contractor, for internal purposes, to ensure that all measures are in place for adequate EHS management, and as an operational manual for his staff.
- For the Client, supported where necessary by a SE, to ensure that the Contractor is fully prepared for the adequate management of the EHS aspects of the project, and as a basis for monitoring of the Contractor's EHS performance.

42. The Contractor's EHS-MP shall provide at least:

- a description of procedures and methods for complying with these general environmental management conditions, and any specific conditions specified in an EMP;
- a description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
- the internal organizational, management and reporting mechanisms put in place for such.

43. The Contractor's EHS-MP will be reviewed and approved by the Client and the Bank before start of the works. This review should demonstrate if the Contractor's EHS-MP covers all of the identified impacts, and has defined appropriate measures to counteract any potential impacts.

EHS Reporting

44. The Contractor shall prepare bi-weekly progress reports to the SE on compliance with these general conditions, the project EMP if any, and his own EHS-MP. An example format for a Contractor EHS report is portrayed below. It is expected that the Contractor's reports will include information on:

- EHS management actions/measures taken, including approvals sought from local or national authorities;
 - Problems encountered in relation to EHS aspects (incidents, including delays, cost consequences, etc. as a result thereof);
 - Lack of compliance with contract requirements on the part of the Contractor;
 - Changes of assumptions, conditions, measures, designs and actual works in relation to EHS aspects;
- and
- Observations, concerns raised and/or decisions taken with regard to EHS management during site meetings.

45. It is advisable that reporting of significant EHS incidents be done "as soon as practicable". Such incident reporting shall therefore be done individually. Also, it is advisable that the Contractor keep his own records on health, safety and welfare of persons, and damage to property. It is advisable to include such records, as well as copies of incident reports, as appendixes to the bi-weekly reports. A sample format for an incident notification is shown below. Details of EHS performance will be reported to the Client through the SE's reports to the Client.

Training of Contractor's Personnel

46. The Contractor shall provide sufficient training to his own personnel to ensure that they are all aware of the relevant aspects of these general conditions, any project ESMP, and his own EHS-MP, and are able to fulfil their expected roles and functions. Specific training should be provided to those employees that have particular responsibilities associated with the implementation of the EHS-MP. General topics should be:

- EHS in general (working procedures); emergency procedures; and social and cultural aspects (awareness raising on social issues).

Cost of Compliance

47. It is expected that compliance with these conditions is already part of standard good workmanship and state of art as generally required under this Contract. The item “Compliance with Environmental Management Conditions” in the Bill of Quantities covers this cost. No other payments will be made to the Contractor for compliance with any request to avoid and/or mitigate an avoidable EHS impact.

Example Format: EHS Report

Contract:		Period of reporting:	
EHS management actions/measures:			
Summarize EHS management actions/measures taken during period of reporting, including planning and management activities (e.g. risk and impact assessments), HSE training, specific design and work measures taken, etc.			
EHS incidents			
Report on any problems encountered in relation to EHS aspects, including its consequences (delays, costs) and corrective measures taken. Include relevant incident reports.			
EHS compliance			
Report on compliance with Contract HSE conditions, including any cases of non-compliance.			
Changes			
Report on any changes of assumptions, conditions, measures, designs and actual works in relation to EHS aspects.			
Concerns and observations			
Report on any observations, concerns raised and/or decisions taken with regard to EHS management during site meetings and visits.			
Name, Title of Contractor Representative		Signature	Date

Example Format: EHS Incident Notification

EHS Incident Notification

Provide within 24 hrs to the Supervising Engineer

Originators Reference No:.....

Date of Incident:..... **Time:**.....

Location of incident:.....

Name of Person(s) involved:.....

Employing Company:.....

Type of Incident:.....

Description of Incident:

Where, when, what, how, who, operation in progress at the time (only factual)

Immediate Action:








Immediate remedial action and actions taken to prevent reoccurrence or escalation

Signature (Name, Title, Date):.....

Contractor Representative

APPENDIX 6: Attendance at Consultations

ATTENDANCE LIST FOR STAKEHOLDER CONSULTATION ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE PROJECT AT OWO, NKANU EAST LOCAL GOVERNMENT AREA ENUGU STATE.

S/NO	NAME	DESIGNATION	PHONE NUMBER	SIGNATURE
1	Nwanneji Ignatius	Owo	09157695914	
2	Nnamchi Chisweu	Owo	08151819663	
3	Nnaji Monday	Owo	0815523012	M.O
4	Regina Majigbo	Owo	08147760671	Regina
5	Christina Okor	Owo	08070672692	
6	Grace Agusa	Owo	07051132856	G.A.
7	Anih Richard	Owo	08111436050	
8	DEET Hillang Okizoba	Owo	08115736837	
9	Emefa Nnamani	Owo	08051805504	
10	Josphine Nnaji	Owo	07055534878	
11	Yzu Nnabusi	Owo	09138742467	
12	Abaka Nnamchi	Owo	08077015101	



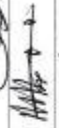








ATTENDANCE LIST FOR STAKEHOLDER CONSULTATION ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE PROJECT AT OWO, NKANU EAST LOCAL GOVERNMENT AREA ENUGU STATE

S/NO	NAME	DESIGNATION	PHONE NUMBER	SIGNATURE
1	Mr. Ignace G. v. Arum	Technical Officer	0806046850	<i>[Signature]</i>
2	Hon. Chief John Obioroke	P.G. OWO	071921660	<i>[Signature]</i>
3	Prof. Christian Nkora	Professor of Mass Comm.	08033477920	<i>[Signature]</i>
4	Chief Eze Job	Per. Mbulu Owo	08037326363	<i>[Signature]</i>
5	Mr. Matthew Ogburn	Mbulu Owo Chairman	08022820440	<i>[Signature]</i>
6	MR. NNANJA TOBIAS C.	Mbulu Owo Chairman	0808277607	<i>[Signature]</i>
7	Chief Mbah John Kechi	Mbulu Owo	08057575110	<i>[Signature]</i>
8	Chief David Ede	Amieke Chairman	09074702267	<i>[Signature]</i>
9	Stephen A. Clifford	Asiwu Owo	09151301276	<i>[Signature]</i>
10	Minaji Elizabeth	Amieke Amasaram	07056777715	<i>[Signature]</i>
11	Igwe Alice	Amieke Amasaram	09157283193	<i>[Signature]</i>
12	Prin Joseph	Asiwu Owo	08079438841	<i>[Signature]</i>


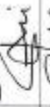
ATTENDANCE LIST FOR STAKEHOLDER CONSULTATION ON ENVIRONMENTAL AND SOCIAL
 IMPACT ASSESSMENT (ESIA) FOR THE SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE
 PROJECT AT OWO, NKANU EAST LOCAL GOVERNMENT AREA ENUGU STATE

S/NO	NAME	DESIGNATION	PHONE NUMBER	SIGNATURE
1	Hon. Gammaguel Mbah	Owo	08145667838	
2.	Mr Igwe Chinedu Kenneth	Owo	08066941123	
3	Hon. Nwajiac Reuben	Owo	08068921491	
4.	Igwemagbol Jernoyisa	Owo	0706898826	
5.	Egbo Chigbo K.	Owo	0903752259	
6	Akwon Sunday	Owo	08052656483	
7	Chief Vincent nke	Owo		
8	Chief Keh John	Owo	08082887470	
9	Onamari Osita	Owo	09165060904	
10	Adeniyi Sebastine	Owo	08050683734	
11	Anih Angela	Owo	09067708511	
12	Abonji Onyebuchi A	Owo	09157065336	

ATTENDANCE LIST FOR STAKEHOLDER CONSULTATION ON ENVIRONMENTAL AND SOCIAL
 IMPACT ASSESSMENT (ESIA) FOR THE SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE
 PROJECT AT OWO, NKANU EAST LOCAL GOVERNMENT AREA ENUGU STATE

S/NO	NAME	DESIGNATION	PHONE NUMBER	SIGNATURE
1	Nnamdika Chiketaik	DWB	08059929749	
2	Onyempeke Nnamini	DWB	08157977856	
3	Godwin Gbommod	DWB	0905909959	
4	Mah Chibike	DWB	08077805740	
5	Lake Nnamchi	DWB	09055739752	
6	Godwin Gbommod	DWB	09048580765	
7	Ukazi Chiketaik	DWB	0909959116	
8	Imdester Mbah	DWB	08119165165	
9	Godwin Chiketaik	DWB	09157399560	
10	Perfe. Oluchi Agn	DWB	08118823899	
11	Anthony Odeh	DWB	0708449727	

ATTENDANCE LIST FOR STAKEHOLDER CONSULTATION ON ENVIRONMENTAL AND SOCIAL
 IMPACT ASSESSMENT (ESIA) FOR THE SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE
 PROJECT AT OWO, NKANU EAST LOCAL GOVERNMENT AREA ENUGU STATE

S/NO	NAME	DESIGNATION	PHONE NUMBER	SIGNATURE
1	Nwando Super	OWO	08161197589	
2	Igweddu Babanis	OWO	09154049210	
3	Mbunday Mbah	OWO	09044673125	



Pictures during consultation with the community, Ministry of Agriculture staff including the Hon Commissioner, Ministry of Environment and Climate Change Staff and Local Government Staff including the Chairman of the Nkanu East LGA