ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)
DRAFT FINAL REPORT

FOR
THE PROPOSED GULLY EROSION CONTROL SUBPROJECT AT ITUNGWA AGBURUKWE ABA, OBINGWA LGA, ABIA STATE

By

ABIA STATE INTEGRATED INFRASTRUCTURE DEVELOPMENT PROJECT (ABSIIDP)
ABIA STATE GOVERNMENT OF NIGERIA

With Support From
AFRICA DEVELOPMENT BANK (AFDB)

Submitted to
FEDERAL MINISTRY OF ENVIRONMENT, MABUSHI ABUJA

AUGUST, 2022

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THE ABIA STATE INTEGRATED INFRASTRUCTURE DEVELOPMENT PROJECT
(ABSIIDP), ABIA STATE

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List of Acronyms

%	percent
AASHTO	American Association of State Highway and Transportation Officials
ABSIIDP	Abia State Integrated Infrastructural Development Project
AbWSC	Abia State Water and Sewage Corporation
ACIL	American Council of Independent Laboratories
ADT	Average Daily Traffic
ADT	Average Daily Traffic
AfDB	African Development Bank
ALARP	As Low As Reasonably Practicable
APHA	American Public Health Association
AQI	Air Quality Index (US)
ASEPA	Abia State Environmental Protection Agency
ASTM	American Society for Testing and Materials
BKP	Break point
BOD	Biochemical Oxygen Demand
CAD	Computer Aided Design
CBO	Community Based Organization
CESA	Cumulative Equivalent Standard Axle
cT	Tropical Continental
dB(A)	Decibels (A-weighted)
DBST 3.8	Double Bituminous Surface Treatment
DO	Dissolved Oxygen
DP	Development Partners
DPR	Department of Petroleum Resources
E&S	Environment and Safety
EA	Environmental Assessment (Audit)
EHM	Environmental Hazards Management
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Audit and Environmental Management System
EQ	Equator Principle
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMP	Environmental and Social Management Plan
FEPA	Federal Environmental Protection Agency
FERMA	Federal Road Maintenance Agency
FGD	Focus Group Discussion
FGD	Focus Group Discussion
FMEnv	Federal Ministry of Environment
FPMU	Federal Project Management Unit
FRIN	Forestry Research Institute of Nigeria
GBV	Gender Based Violence
GHG	Green House Gas(es)
GIIP	Good International Industry Practice
GPS	Geographical Positioning Systems
GRI	Global Reporting Initiative
GRM	Grievance Redress Mechanism
GTF	Generated Traffic Factor

HA	Hydrological Area
HA	Hydrological Area
HGV	Heavy Goods Vehicle
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome
HMP	Hazards Management Program
HSE	Health, Safety and Environment
IEE	Initial Environmental Evaluation
IFC	International Finance Corporation
ILO	International Labour Organization
IPAN	Institute of Public Analysts of Nigeria
IPCC	Intergovernmental Panel on Climate Change
IPV	Intimate Partner Violence
ISO	International Organization for Standardization
ISS	Integrated Safeguards System
ITCZ	Inter Tropical Convergence Zone MPH
ITD	Inter-Tropical Discontinuity
ITF	Inter-Tropical Front
JHA	Job Hazard Analysis
KII	Key Informant Interviews
km	Kilometer
LGA	Local Government Authority
LRFD	Load and Resistance Factor Design
LT-EDS	Long-Term Low Emissions Development Strategy
LTI	Lost Time Injuries
LTV	Long Term Vision
LVR	Low Volume Road
m	meter
m^3/s	Cubic meters per second
MDA	Ministries, Departments and Agencies
MGV	Medium Goods Vehicle
mm	millimeter
MoW	Ministry of Works
mT	Tropical Maritime
NAAQS	National Ambient Air Quality Standards (US)
NDC	Nationally Determined Contributions
NEP	National Environmental Policy
NESREA	National Environmental Standards and Regulations Enforcement Agency
NGO	Non-Governmental Organization
NIMET	Nigerian Meteorological Services Agency
NOSCP	National Oil Spill Contingency Plan
NOSDRA	National Oil Spill Detection and Response Agency
NTU	Nephelometric Turbidity Units
OECD	Organization for Economic Cooperation and Development
OHS	Occupational Health and Safety
OHSP	Occupational Health and Safety Plan
OS	Operational Safeguards
OSHP	Occupational Health and Safety Plan
PAP	Project Affected Persons
PAP	Project Affected Persons
PCU	Passenger Car Unit
PDO	Project Development Objective
PM	Particulate Matter

PPE	Personal Protective Equipment
ppm	Parts per Million
QALS	Quality Analytical Laboratory Services
RAM	Risk Assessment Matrix
RAP	Resettlement Action Plan
RAP	Resettlement Action Plan
RoW	Right of Way
SDG	Sustainable Development Goal
SLS	Serviceability Limit State
SMART	Specific, Measurable, Achievable and Relevant Time based
SME	Small and Medium Enterprises
SPIU	State Project Implementation Unit
SPM	Suspended Particulate Matter
STD	Sexually Transmitted Diseases
STI	Sexually Transmitted Infections
TDS	Total Dissolved Solids
TMP	Traffic Management Plan
ToR	Terms of Reference
Tr	Return Period
TSDF	Treatment, Storage and Disposal Facility
TSS	Total Suspended Solids
ULS	Ultimate Limit State
UN	United Nations
UNCED	United Nations Conference on the Environment and Development
UNEP	United Nations Environment Programme
UNFCCC	United Nations Climate Change Conference
USA	United States of America
VAPP	Violence Against Persons (Prohibition) Act
VEC	Valued Environmental Component
VOCs	Volatile Organic Compounds
WHO	World Health Organization
WIM	Warsaw International Mechanism
WMO	World Meteorological Organization
WMP	Waste Management Plan

EXECUTIVE SUMMARY

ES 1.0 INTRODUCTION

ES 1.1 Project Background

The Abia State Government, through the State Ministry of Works and Abia State Integrated Infrastructure Development Project (ABSIIDP), seeks to invest in the following six infrastructural subprojects in the State, namely:

- **One erosion control site in Aba;**
- One gully erosion control site in Umuahia.
- 19 priority roads in Umuahia, with a combined distance of 92 km;
- 31 priority roads in Aba, with a combined length of 199.69 km;
- One Waste Transfer Station in Umuahia; and
- One Integrated Waste Management facility in Aba.

On gully erosion control, ABSIIDP seeks to rehabilitate degraded sites and reduce longer-term erosion vulnerability in targeted areas: one gully erosion control site in Aba and the other in Umuahia. This Environmental and Social Impact Assessment (ESIA) report addresses Environmental and Social risk associated with the proposed works at gully erosion site located at Itungwa Agburukwe community in Obingwa LGA, Abia State, which occupies a landmass of 5,833.77 square kilometres, lies between Latitudes 06° 00' and 04° 45' East and Longitudes 07° 00' and 8° 09' North of the Greenwich Meridian (Figure 1).

The aim of the ESIA study is to proactively evaluate the associated, potential and cumulative environmental (including beneficial and adverse) impacts of the proposed project. This is to ensure that the planned activities The scope of the ESIA encompassed the identification of valued environmental components which describe the elements of the physical, biological, or socio-economic environment, including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use and persons that may be affected by the proposed project. The assessment was conducted in the Itungwa Agburukwe community in Obingwa LGA, Abia State, Nigeria. The project is expected to impact 200 respondents (PAPs), which formed the respondents for the socio-economic characteristics of the typical persons in the project's host community.
exert minimal impacts on the environment and the stakeholder communities.

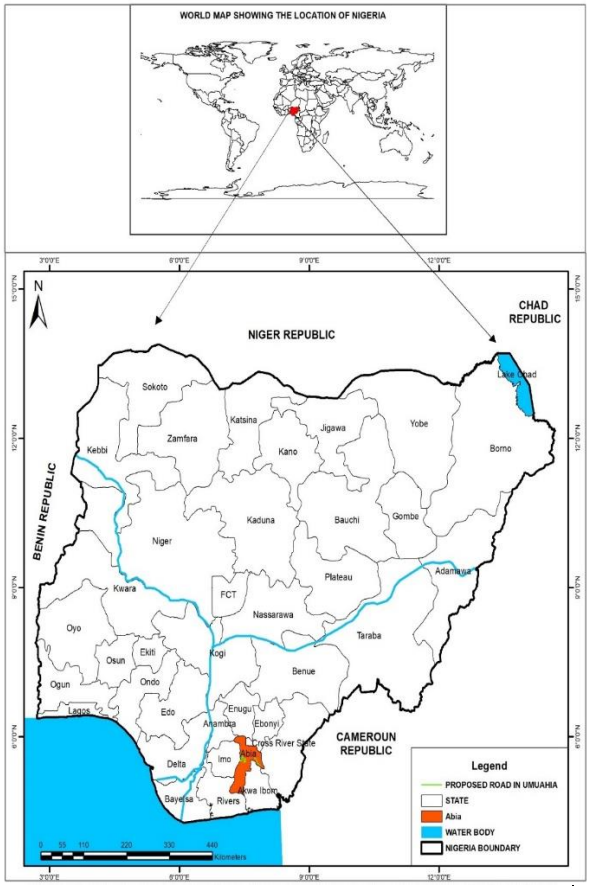
ES 1.2 The Project Proponent

The Project proponent is the Abia State Integrated Infrastructure Development Project (ABSIIDP), on behalf of the Abia State Government. with the support of the African Development Bank (AfDB). Under the supervision of the ABSIIDP which is also the State Project Implementation Unit (SPIU), the Abia State Ministry of Works shall undertake the implementation of the project in the State. The Ministry of Works has the responsibilities to ensure wholesome development of all government infrastructure on behalf of the State Government.

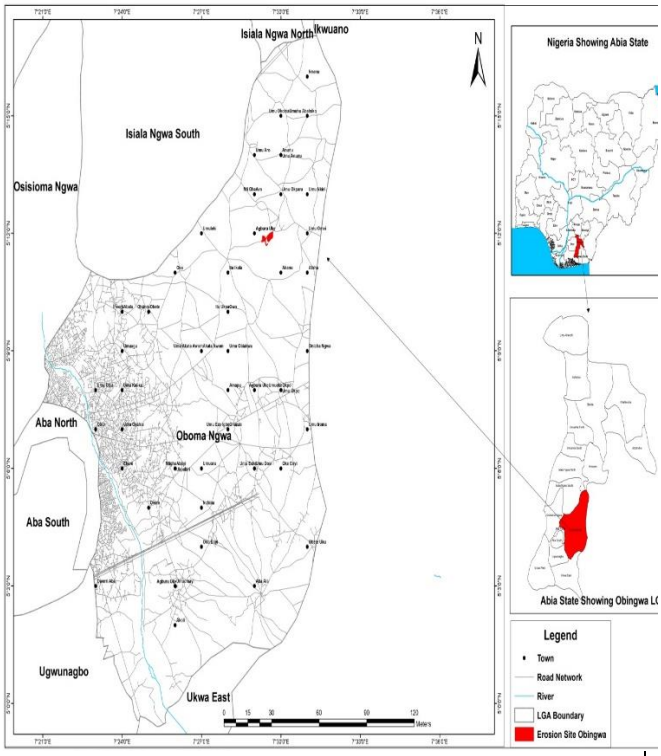
ES 1.3 Proposed Project Location

The Aba gully erosion site is situated in Itungwa Agburukwe community in Obingwa LGA, Abia State. Abia State is located in the south-eastern part of Nigeria (Fig. 1.1). The State is known for its commercial activities centered at Aba, which was formerly a British Colonial Government outpost. The entire state lies approximately between latitudes 4º48'N and 6 º02'N and Longitudes 7º09'E and 7º58'E of the Greenwich Meridian. On the north and the northeast, the state is bounded by Enugu and Ebonyi states respectively. The eastern boundary is occupied by the Cross River State, while the southeast border is shared by Akwa Ibom State. Rivers State occupies the southern and southwest boundaries. The western and northwest Imo and Anambra States respectively. The entire State is divided into seventeen (17) administrative units called

Local Government Authorities (LGAs). Figure 1.1 shows the map of Nigeria showing Abia state while figure 1.2 shows the map of Obingwa showing the gully erosion site.



Map of Nigeria showing Abia State



Map of Erosion Site in Obingwa L.G.A

ES 1.4 Objectives of the ESIA

The primary purpose of the ESIA was to assess and predict potential adverse environmental and social impacts of the project and to develop suitable mitigation measures, which have been documented in the Environmental and Social Management Plan (ESMP) and Resettlement Action Plan (RAP).

The specific objectives are outlined below:

- Establishment of the existing state of the physical and social environment.
- Identification of the project-sensitive components of the existing physical and social environment within the project area and area of influence.
- Appraisal of the project activities including construction (site preparation and installation), operations and decommissioning that may result in significant modification of any human or natural environmental resources.
- Determination of existing environmental risk of the site/effect of the proposed operational activities on the environment.
- Identification of any impacts that cannot be avoided, and outline ways of enhancing the beneficial ones.
- Recommendation of measures to avoid, ameliorate, or mitigate the identified impacts.
- Establishment of an appropriate Environmental Management Plan (the "EMP") or Environmental and Social Management Plan (the "ESMP") to verify and improve the accuracy of the EIA predictions, control levels for the life of the project; and
- Preparation of a detailed EIA report, presenting clear and concise and information on the environmental impact of the proposed project activities.

ES 1.5 Scope of the EIA/ESIA

EIAs include environmental, social, and consultation elements which are integrated into the planning and decision-making process to avoid, reduce, or mitigate adverse impacts and to maximize the benefits of a proposed Project. The emphasis of the EIA is to produce robust environmental and social management plans which are able to effectively implement the recommended mitigation measures identified in the E.LA, during the life of the Project and at the time of project decommissioning.

Thus, the study includes the identification of valued environmental components (the "VECs") which include elements of the physical, biological or socio-economic environment, including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use that may be affected by a proposed project. To develop the baseline status of the Project Site for the proposed sanitary landfill, the study consisted of a series of specific and interrelated tasks, which include:

- Extensive literature review to acquire background information on the environmental characterization and components within the study area;
- Fieldwork and laboratory analysis for the season that shall be approved by the Regulators to cover a number of subjects such as: Noise, Air quality, Water resources, Soil, Climatic and Meteorological conditions of the proposed project area, Socio economic and health impact studies, Waste Management studies, visual impacts, traffic risks, archaeology, biodiversity, etc.
- Identification of Associated and Potential Impact.
- Development of Mitigation Measures.
- Development of Environmental and Social Management Plans
- Report preparation and submission.

ES 1.6 ESIA Preparation Approaches

The ESIA Report was prepared in a manner consistent with applicable African Development Bank (AfDB) Integrated Safeguards System (ISS) and the Environmental Impact Assessment (EIA) Act No 86 (1992) of Nigeria (Act CAP E12 LFN 2004). The approach followed the path of: screening and scoping exercise, literature review, stakeholder consultation and engagement, field visits, identification of potential impacts and mitigation measures and development of environmental and social management plan

The ESIA report contains the following 8 Chapters, viz: Chapter 1: Introduction, Chapter 2: Project Justification and Alternatives, Chapter 3: Project Description, Chapter 4: Description of the Project Environment; Chapter 5: Associated and Potential Impacts; Chapter 6: Mitigation/Enhancement Measures; Chapter 7: Environmental and Social Management Plan; Chapter 8: Conclusion; with the relevant appendices.

ES 1.7 Existing Policy, Legal and Administrative Frameworks

The institutional and regulatory framework was comprehensively analyzed to take into consideration environmental and social protection policies/strategies with the Project's sector (erosion control), relevant standards/norms and E&S Health and safety,

Administrative frameworks

In Nigeria, the power of regulation of all environmental matters is vested in the Federal Ministry of Environment (FMEnv).

The State Governments are also encouraged to set up their Ministries of Environment and Environmental Protection Agencies to maintain good environmental quality around related pollutants under their control. Thus there is the State Ministry of Environment with an agency named the Abia State Environmental Protection Agency (ASEPA).

The Local Governments liaise and cooperate with the Federal and State Ministries of the Environment to achieve healthy or better management of the environment within their domains with the relevant bye-laws.

Legal instruments

Development Partners/Agencies such as the AfDB and other financial organizations interested in development projects have sets of environmental and social Safeguards policies and instruments which must be complied with by the borrower (Nigeria) before these institutions invest in or fund them.

To this end, the duty and responsibility for environmental and social protection and management related to project execution in various sectors of the Nigerian economy come under the following mandate:

- Current Federal, State, Local and relevant acts, rules, regulations and standards, and the common law of the Federal Republic of Nigeria (FRN);
- International environmental agreements and treaties ratified by the Federal Republic of Nigeria; and
- Safeguard Policies of supporting/development partners like AfDB's ISS

Below is an outline of relevant regulatory instruments to this ESIA relating to the Federal, State and International arenas.

Environment-related regulatory instruments

At the National level, some of the Environment-related regulatory instruments include: National Policy on Environment, 1989 (revised 2016), Environmental Impact Assessment (EIA) ACT 86 (CAP E12, LFN 2004), EIA Procedure and Charges Regulations 2021, National Guidelines for Environmental Audit in Nigeria, Guidelines and Standards for Environmental Pollution Control 1991, National Guidelines on Environmental Management Systems, Endangered Species (Control Of International Trade And Traffic) Act , No. 11 of 20th April, 1985 which provides for the conservation and management of Nigeria's wild life and the protection of some of her endangered species in danger of extinction as a result of over-exploitation, as required under certain international treaties to which Nigeria is a signatory, The National Environmental Standards and Regulations Enforcement Agency (NESREA) and Regulations Gazetted as supplementary to NESREA Act, Nigeria Climate Act, 2021, etc.

At the State level, the relevant instruments include Abia State Basic Environmental Law No. 1, Abia State Policy on Environment, Abia State Flood and Erosion Control and Soil Conservation, Abia Riverine Area Management Policy, Abia State Watershed Management Policy, Abia State Flood and Erosion Control Management Support System, Abia State Flood Control and Water Conservation, Abia State Waste Management Law and Waste Management (Enforcement and Offences) Provisions Regulations, Abia State Environmental Protection Agency Law, Cap50, Vol. 2, Laws of Abia State, Abia state Ministry of Physical Planning and Urban Development Law and Abia State Environmental Protection Agency Law Cap 14 of July 1994.

Social protection-related regulatory instruments

In consideration of social legislation, the acts and policies relevant to the proposed Project include Labour Act Cap L1, LFN 2004, Violence Against Persons (Prohibition) Act, 2005, National Gender Policy, 2006, Land Use Act of 1978, **CAP 202, LFN 2004**, Nigerian Urban and Regional Planning Act, CAP N138, LFN 2004 and National Policy on Child Labour (2013).

Sector-related regulatory instruments

In Nigeria, the primary legal framework for managing disasters in Nigeria is based on the provisions of the Constitution of the Federal Republic of Nigeria, 1999. Section 20 of the 1999 Constitution of the Federal Republic of Nigeria protects and improves the environment and safeguards Nigeria's water, air, land, forest and wildlife. Some specific instruments or governance frameworks include the following:

- National Disaster Management Framework (NDMF),
- Ecological fund established through the Federation Account Act 1981 with modification order of 2002 with the prime objective to pool funds to fund ecological projects to ameliorate serious ecological problems nationwide,
- Nigeria Meteorological Agency (NiMET) was established by ACT 2003 with the mandate of observing, analyzing, and timely and accurate reporting weather and climate information for socio-economic development and safety of lives and property,
- Nigeria Hydrological Services Agency (NIHSA) was established in August 2010 and
- Nigeria's National Emergency Management Agency (NEMA) oversees disaster response and management with state-level counterparts.

Other Concerned Government Agencies corresponding to critical State institutions involved in soil erosion and watershed management include:

1. The State Ministry of Works.
2. The State Ministry of Water Resources (SWR), with the River Basin Development Authorities (RMDAs), the State Integrated Water Resources Management Commission, the State Hydrological Services Agency, and the State Water Resources Institute.

3. The State Ministry of Agriculture and Rural Development (SMARD), with the multi-sector State Sustainable Land Management Committee.
4. The State Emergency Management Agency.
5. State Ministry of Environment.

Health and safety
The relevant instruments include the National Policy on Occupational Safety and Health, revised in 2020, which has the chief goal of facilitating the improvement of occupational health and safety performance of all workers in all sectors of economic activity, and the National Health Policy 2016 which, *among other things,* has the goal to significantly reduce the burden of non-communicable diseases in Nigeria in line with the targets of the 3rd Sustainable Development Goal.

Some of the relevant international instruments on good international industry practice in Health and safety which will be of benefit to the proposed Project include the International Labour Standards on Occupational Safety and Health such as **the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)**, Occupational Safety and Health Convention, 1981 (No. 155) and its Protocol of 2002, Occupational Health Services Convention, 1985 (No. 161), and **Working Environment (Air Pollution, Noise and Vibration) Convention, 1977 (No. 148)**.

International policies and standards- protocols signed by Nigeria
Several Conventions, Protocols and Treaties that promote the maintenance of a viable environment and achieve sustainable development have been endorsed by Nigeria. They are applicable to the proposed Project based on the environmental and social dimensions alongside the inherent health and safety implications such as Paris Accord, Aarhus, 1998, United Nations Guiding Principles on the Human Environment, and Agenda 21 – United Nations Conference on Environment and Development. About the Project, the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts (WIM), which provides the mechanism to implement Article 8 of the Paris Agreement, is of significance as this encourages "Parties" to recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage in Paragraphs 48–52 (Loss and Damage) of Decision -/CP.21. Also of relevance is the Sendai Framework for Disaster Risk Reduction 2015-2030 which aims to achieve the substantial reduction of disaster risk and losses in lives, livelihoods and Health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries over the next 15 years. Alongside all these instruments are Voluntary International Standards such as Equator Principles and ISO26000, Guidance on Social Responsibility are Applicable.

African Development Bank (AfDB) policies
As part of the international environmental and social requirements of project financing institutions, AfDB policies are usually considered. For the AfDB, borrowers/ clients, such as in the case of the proposed project, are required to comply with her safeguards requirements during project preparation and implementation as enshrined in her Integrated Safeguards Systems (ISS), which sets out the basic tenets that guide and underpin the Bank's approach to environmental and social safeguards. The ecological and social safeguards of the Bank form the cornerstone of the Bank's support for inclusive economic growth and environmental sustainability in Africa.

To achieve the goals and optimal functioning of the ISS, the Bank adopted five OSs, namely: Environmental and Social Impact Assessment (OS1), Involuntary resettlement, land acquisition, population displacement, and compensation (OS2), Biodiversity and ecosystems services (OS3), Pollution Prevention and Control, Green House Gases, Hazardous Materials and Resources Efficiency (OS4), Labour Conditions, Health and Safety (OS5).

The proposed project triggers these OSs in the following ways:

- The proposed gully erosion treatment activities are likely to result in impacts such as raising dust due to soil movement, noise from equipment and clearance of vegetation and thus triggered OS.1, which has led to the preparation of an ESIA with the ESMP to manage the impacts identified. The proposed project will displace people's assets; this has necessitated the preparation of a Resettlement Action Plan. Thus, OS.2 is triggered.
- The proposed project will not require extensive land clearance of vegetation and removal of Biodiversity. Thus OS 3 is not triggered.
- OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency has not been triggered, although there are provisions for avoiding and preventing pollution and ensuring water efficiency during project implementation activities as captured in the ESMP; and
- The project would demand or necessitate the deployment of qualified civil engineers and other experts, including various technicians, and a reasonable labour force to work. The related labour conditions, Health and Safety, need to be managed, and the measures on these have been included in the ESMP; hence it could be said that OS 5 is triggered.

It is worthy to say here that the principles inherent in the safeguard requirements of the AfDB ISS are in tandem with the EIA procedures and processes of the FMEnv and shall guide the project implementation. However, in the event of divergence between them, the most beneficial, environmentally, and socially speaking, shall take precedence in executing the project and utilising the ESIA instrument.

Summary of the institutional and regulatory framework analysis

The analysis of the applicable policies and regulatory framework reveals no shortage of regulatory instruments for environmental and social management, including health and safety issues relating to the proposed project. In summary, the following was shown:

- The Federal and the State Ministries of Environment provide overarching guidance, which includes policies and legal and regulatory framework.
- The State have a good governance framework and laws to back up and manage the environmental and social safeguard issues. The State has considerable experience in the ESIA process and safeguards issues. In addition to the EIA Act, critical environmental laws and guidelines in the State would support monitoring and enforcement.
- The Local Government Authorities are charged with direct responsibility to manage these issues in their domain, although largely lacking the technical, financial and personnel capacity to fulfil this obligation effectively. Hence, they have been identified as one of the training target groups. State government support in the execution of the proposed project is assured; and
- Without doubt, there will be a need to continually strengthen the capacity of project staff and that of the State Ministry of Environment and other relevant actors charged with implementing this ESIA and other attendant safeguards instruments through in-depth training courses in environmental and social management risk.

ES 2.0 Project Justification

Gully erosion is a severe threat to Abia State, and Abia NEWMAP (2017) identified 279 gullies across the State's LGAs. Gully erosion is an essential signature of land degradation with many

consequences such as damaged infrastructure, altered transportation corridors, damaged agricultural fields, detrimental sediment, and degraded surface water quality. Gullies are caused by runoff water cutting, or collecting in, surface depressions and flowing at a velocity sufficient to detach and carry away soil particles. The power to erode increases in size, speed, and duration. If the depression or drainage way is not protected, this widens. Continuous land degradation results in the loss of fertile topsoil leading to low agricultural productivity.

The soil in the proposed project site is highly susceptible to water erosion, and once the gully starts, it expands rapidly towards the head and requires urgent control. Otherwise, it impacts the populace's economic growth by inhibiting communities from accessing essential products and public services, such as education, healthcare, water, and markets to sell crops and goods.

The project site gully resulted from human activities such as the construction of buildings and roads with no proper drainage channel. At Obingwa, there is no existing drainage system in town. On the other hand, a significant amount of flow is coming from the upland of the town. Hence proper drainage system is required so that the community will not be affected. Therefore, to solve this problem drainage system is proposed that will collect the flow and safely discharge it out of the town. While doing so, the channels cross the bush and outfall in a place where there are no downstream settlements.

In the 2021 Climate Risk Profile for Nigeria (2021) by The World Bank Group, Climate change trends are expected to increase the risk and intensity of flooding through increased frequency and intensity of heavy rainfall events. The Project site area is part of the State that wishes to continue to be the hotspot of gully erosion and other geomorphic processes. If nothing is done, it will continue to result in significant economic losses, damage to agricultural lands and infrastructure, and human casualties. Thus, the climate risk dimension is anticipated to worsen the scenario as the link between heavy rainfall and the speed at which gullies expand are closely linked. Climate projections recognise extreme precipitation events likely to happen in Nigeria with the proposed project area included. This extreme precipitation event is expected to cause more flooding when downpours exceed the capacity of a river or urban drainage system. This could have severe consequences in populated areas as it would not only have a detrimental effect on agriculture and water quality but could also entail problems such as muddy floods and the destruction of roads and other infrastructure. All these justify the need for the proposed project as it is envisaged to stop the following negative impacts:

- Increase flooding that affects farms, roads, culverts, etc.
- Increase in the rate of erosion by exposing subsoil.
- Sediment generation and wash into waterways and water supplies.
- Reduction in land available for purposeful use; and
- Difficulties in accessing affected land

The drainages from the villages have no close natural drainage outlet. Unless there is proper channelization that joins the these and the natural drainage system, the downstream villagers in the village will face flooding. In addition, the road passes beside the town also will face similar problem of flooding. Thus, the intervention activity will immediately stop the gully erosion from widening with head cuts moving upstream because of concentrated flow from upload, especially on the road. This will prevent the threat to the road, which is already partially impacted by the erosion. It will also reduce the erosion and climate vulnerability in the area with the potential impact of fostering transportation/communication and sustainable development in the local communities, specifically and statewide.

The geographical setting of the gully erosion site enhances the development and progressions of erosion in the community as runoff from residential buildings that are indiscriminately

channeled lead to incision on the ground creating irregular channels with attendant sidewalls collapse and developing into gullies in several sections along the several interconnecting roads in the Community. At the proposed project site, the intervention activity will immediately stop the gully erosion from widening with headcuts moving upstream because of concentrated-flow from upload, especially the paved road. This will stop the threat to the road which is already partially impacted by the erosion. It will also reduce the erosion and climate vulnerability in the area with potential impact of fostering transportation/communication and sustainable development in the local communities specifically and state wide.

The proposed project will save Abia State from rapidly expanding gully complexes that have resulted in extensive impacts including loss of human life and loss of both built and natural assets. Damage to infrastructure includes highways, rural and urban roads, and pipelines severed by large gullies; houses and buildings; and silted waterways, reservoirs and ports. Losses to natural assets include loss of productive farmland and forest. It will be a great relief to the people of Abia State.
For AfDB, the project stands to demonstrate a model that the Bank can showcase for a complete integrated urban infrastructure development. This is even more so as the project is in line with the Bank's Ten-Year Strategy (TYS) as it supports infrastructure development. The project particularly supports the Bank's High 5 priority areas of Industrialize Africa and Improve the quality of life of the people of Africa.

ES 2.2 Project Alternatives
Gully erosion is a result of the interaction of land use, climate and slope. In the context of this report, analysis of project alternatives referred to the performance of the natural and socio-economic resources with or without the project or with or without the implementation of the measures proposed for the project and outlined in this report and/or other safeguard instrument considered appropriate.

For adequate coverage, the options considered having this interaction of environmental phenomenon in mind included: the no project option, delayed project, alternative site/location, and project execution options. The Go-Ahead Option, which means going ahead to implement the proposed gully erosion control work, recognized the need to ensure best practices in executing the proposed work. The Go-ahead option stands to reassure the public of their safety and the environment due to the road incision by the gully erosion head. This option was therefore considered the most viable and recommended for implementation.

The project implementation option was further considered in the light of the different methods for gully erosion management which include treatment of the watershed draining into the gully and the gully itself, backfilling the gully and forming a stable drainage state, partially backfilling the gullies using natural sedimentation processes, partially backfilling using local or imported materials, and stabilization of gully without partial backfilling of the beds. The **treatment of the watershed draining into the gully and the gully itself** was chosen. This project implementation option includes gully control that considers the treatment of the watershed draining into the gully and the treatment of the gully itself, which is in tandem with the outcome of the feasibility study and the proposed engineering design. The method includes such practices as critical area plantings, grassed outlets, grade stabilization structures, diversions, and debris basins and is used singly or in combination with other techniques. The ESMP for the ESIA outlined the best practice way to ensure environmentally benign in the course of the project execution.

ES 3 PROJECT DESCRIPTION

ES 3.1 Project Components and Activities

The intervention at the proposed gully erosion project site will involve civil works such as infrastructure construction and stabilization or rehabilitation in and around the gully area. The proposed project activities will include:

- Grassed and paved channels.
- Buried pipe outlets.
- Diversion terraces.
- Benches.
- Grade control structures.
- Chutes with inlets and debris basins

The Obingwa Main Gully (MG) erosion channel has a total length of 0.915 km and based on the amount of flow, different sections are proposed for the channel section. The first part of the upstream side of the gully is a concrete channel. A concrete channel has been proposed since the track passes close to the road and houses. Otherwise, a wider area will be required to affect the existing structures. The channel has been designed with an average velocity of 3.4 m/s, which a natural channel cannot carry such erosive velocity. After it passes the village, it is proposed with gabion channel. Downstream of MG, no settlement or structures exist nearby the drain. Therefore, has no impact on the downstream part of the project. In addition to MG, a small length of field drain is also designed to join MG at the upstream section.

Gully erosion treatment depends on various factors, including the size of the gully, whether it is actively eroding, the soil type, the size and frequency of water flow, the gradient of the area and the desired use of the land after rehabilitation. The situation of the proposed control works at the gully site/area shows that the best option to be employed, especially at the gully head, will require filling and compaction with imported materials. The anticipated scope of the gully erosion control works will consist singly or a combination of:

1. Filling of the gullied portion of the road
2. Use of reinforced rectangular concrete drainage channels on both sides of the road. The tangible media are made to stop at the section where the gully erosion is stabilised without destroying the vegetation cover, which is beneficial to mitigating the effects of gully erosion.
3. As applicable, construction of chute channel, catch pit, baffled funnel-shaped drainage channel.
4. Repair of the part of the road impacted by the gully head
5. Adoption of stabilisation measures such as stone pitching of the gully erosion slope.
6. The practical alternative involves the use of Gabions for enhanced erosion slope stability. Gabions have the added advantage of being modular and adaptable to different shapes. They are also resistant to washing away by moving water. Gabions are also preferred over rigid structures because they dissipate the energy of moving water and drain freely. They also get reinforced by vegetation with time. They are, therefore, a very suitable approach toward stabilisation of erosion slopes.
7. The use of concrete channels along the site is deemed a feasible and acceptable measure, as well as temporary structures along the track to reduce flow and retain sediment, helping in vegetation growth.

These activities are envisaged to cause significant environmental and social impacts that may be reversible depending on their magnitude and mitigation measures to be put in place. Prevention of such impacts is the priority, but where they cannot be avoided, appropriate mitigation and impact reduction measures have been designed in the ESMP to minimise environmental and

social damage and RAP to compensate for any losses. Figure 3 shows the Obingwa Erosion site's general site layout.

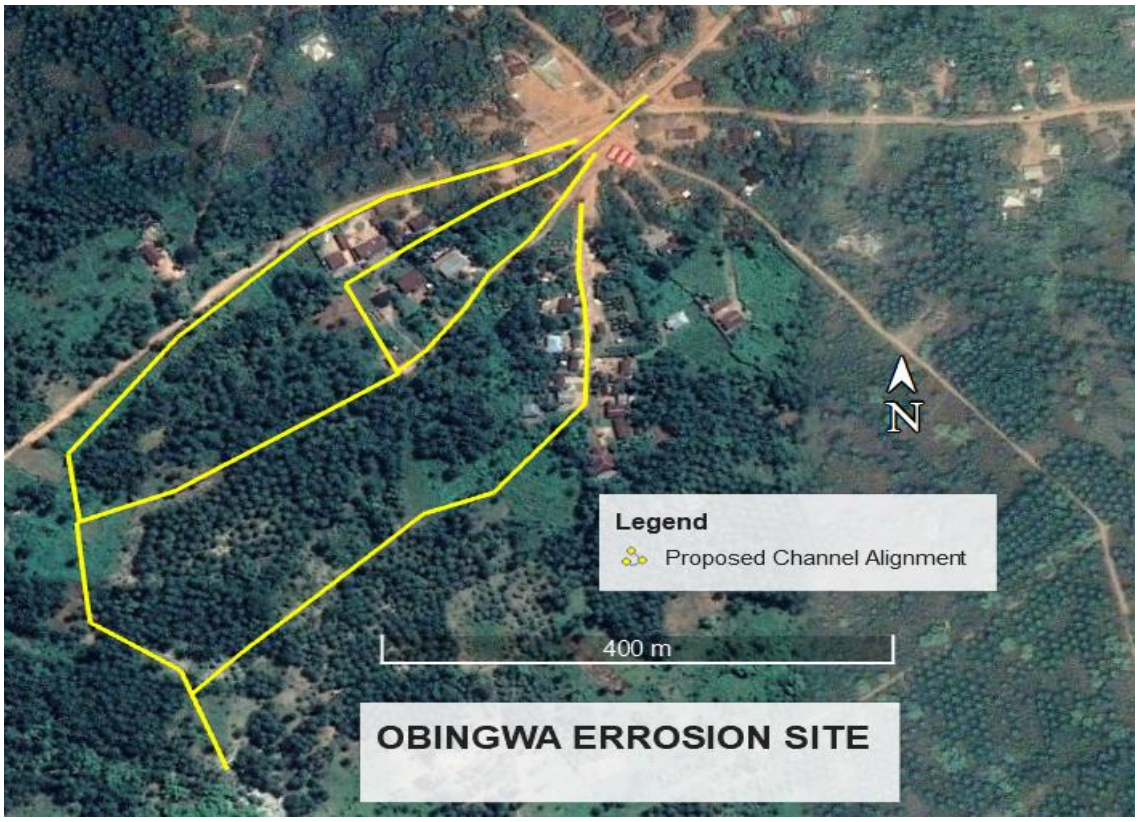


Fig. 3: Obingwa Gullies Plan

The Obingwa MG has a total length of 0.915 km and based on the amount of flow, different sections are proposed for the channel section. The first part of the upstream side of the gully is a concrete channel. A concrete channel has been proposed since the channel passes close to the road and houses. Otherwise, a wider area will be required to affect the existing structures. The channel has been designed with an average velocity of 3.4 m/s, which a natural channel cannot carry such erosive velocity. After it passes the village, it is proposed with gabion channel. Downstream of MG, no settlement or structures exist nearby the drain. Therefore, has no impact on the downstream part of the project. In addition to MG, a small length of Field Drains are also designed that joins to MG at the upstream section of MG

The design drainage discharge varies along the gully since it depends on the contributing catchment area. The peak flow is 16.32 m3/s. All the gully/Channel sections were designed based on the peak flows. The Design has considered climate change effect as well as further expansion of urban. Accordingly, 20% is adapted for an increase in the design flood for hydraulic analysis. For economic hydraulic structures, different design floods have been determined for each of the significant drain inlets and drain canals appurtenant hydraulic structures. The channels were designed for a 25-year return period and checked for a 50years return period. The threshold velocity for a concrete-lined canal is considered 5.0 m/s.

Construction materials such as fine aggregates and crushed stone aggregates shall be purchased and stockpiled from existing quarries in the famous construction market at Amasiri Ebonyi State.

ABSIIDP activities involve support on-the-ground interventions to prevent and reverse further land degradation through community centered medium-sized civil engineering construction and rehabilitation works; bio-engineering control works, watershed management activities and livelihood improvement measures to stabilize and forestall further land degradation.

ES 3.2 Project Site condition

The proposed Aba gully erosion site is situated at coordinates 575055N, 333214E in Itungwa Agburukwe community in Obingwa LGA, Abia State, Nigeria (Figure 6). The main gully (MG) starts at coordinates 575085.949N, 333252.619 E and ends at coordinates 574468.758N, 332922.630 at a distance (gully length) of 0.915km. The gully has three fingers (Finger Gullies (FG)), with two to the left LFG and one to the right (RFG). LFG1 starts at coordinates 574987.002N, 333201.656E and ends at 574537.610N, 332894.506E with a length of 0.593km. The LFG-2 starts at 575032.705N, 333212.283E and ends at 574831.791N, 333044.409E at 0.255km. The RFG-1 starts at coordinates 575045.471N, 333198.709E and ends at coordinates 614595.852N, 331016.420E with a length of 0.567km.

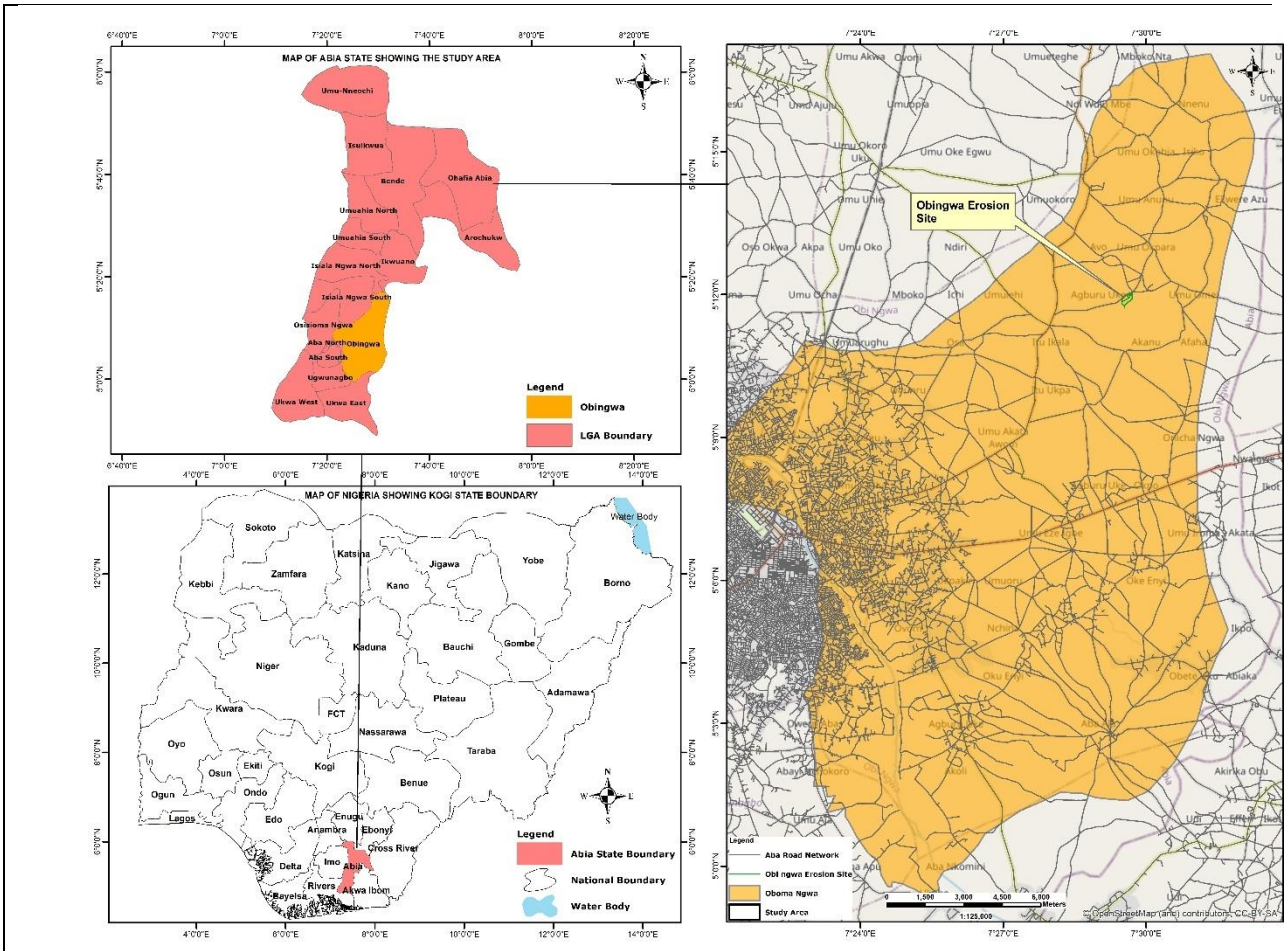


Figure 6: Map of Itungwa Agburukwe community, Obingwa LGA in Abia State and Nigeria

Project area of influence
The immediate project area of influence includes the nearby communities/persons who conduct businesses along the gully corridor to be treated and the entire watershed (the dividing ridge between the drainage area, which includes the upland areas of the collections of all the waters through the gully erosion channel downstream). It also consists of the people affected either by continuous and unchecked gully erosion or by concerted efforts at rehabilitating the gullies.

ES 3.3 Project Phases and Activities

Planning Phase and Pre and Construction Phases
This is the design phase of the project that inevitably passed through the conceptual design right through to the final design, specified to carry out the eroison control works. The responsibility of obtaining any consents relating to the design, construction, engineering, technical and installation specifications such as any record decision regarding this ESIA is borne by the executing agency of the State government.

Pre and Construction Phases
The pre-construction is a preparation stage for all the necessary items/activities that must be carried out before construction proper starts. This includes, for instance, movement of equipment to the site, removal of the scanty vegetation from the site, etc.
The construction involves the main civil works. These include activities such as digging and paving for foundation for the proposed building facilities as well as other ancillary works associated with constructions.

The main civil works will involve excavation of earth and the constructions of: Foundation and paving, Fencing, Drainage lines, Buildings of offices, control room, warehouse,
The details of the proposed engineering and civil works are yet to be provided. Suffice it to say however, the core activities to be carried out shall include the following:
The construction activities will involve:

a) ***Excavation and Earthworks (***Site clearing, Topsoil removal to maximum dept of 150mm, Excavation and disposal of spoil to a distance of 500m from site for reuse, Sand filling and compaction, Backfilling, shaping and compaction with approved laterite material).
b) ***Concrete works (***concrete mixing, reinforcement to concrete channel, box culvert, chute and stilling basin, treatment of construction joints with bituminous sealant, fencing around the chute structure on the Drain canal, etc.
c) ***Bio-engineering Works*** (provision and maintenance of structured vegetation, planting of vetiver grass, elephant grass etc., on the slopes, site preparation with topsoil and manure, etc.)

The Construction Phase shall include:

1. **On site-** that include removal of vegetation as required, strip topsoil and unsuitable materials and stockpile (separately) on designated stockpile areas, earthworks, filling and compacting (with drying when required) all fill areas with cut volumes, install essential services such as stormwater infrastructure, and culverts etc; forming inlet/outlet structures and diffuse discharge devices or energy dissipaters (detailed design to be completed), ;re-spread topsoil across cut/fill and disturbed areas not designated for hard stand; grass all batters and exposed surfaces, as appropriate).
2. **Offsite-** that include movement of soil from elsewhere to the site for filling and compacting)

Staging shall be carried out before construction work. Staging reduces the time exposed ground is prone to erosion and breaks down earthworks into smaller work packages. This will assist to reduce the area and time from stripping topsoil to permanent stabilization.

Operational Phase
The phase includes the utilization to the gully erosion control measure put in place. The control measures will be regularly monitored during operations and after any significant rain event should this occur during construction.
This phase will include maintenance of all structures including silt fences, decanting earth bunds, diversion drains and/or bunds throughout the course of site earthworks and restoration and use. Exposed surfaces should be stabilised with grass by reinstating as soon as practicable based on the outcome of schedule or emergency maintenance.

Decommissioning Phase
Decommissioning phases refer to the period when it has been determined that all surface soils have been suitably stabilized through consultation and inspection by the contractor, council and design engineer. Decommissioning shall include the following:

a) Respread any topsoil stockpiled and decommission the topsoil stockpiling area
b) Backfill any temporary collection drains and/or remove any diversion bunds and turf or sow grass seed as appropriate
c) Removing all silt fences, and any accumulated silt/sediment and reinstating the ground surface in those areas by turfing, sowing grass or planting as appropriate
d) Remove the embankments, bunds and decant structure. Reinstate the areas by grassing
e) Remove the construction entrance once earthworks are complete and mulch or sow grass seed as appropriate
f) Remove any temporary sediment control devices on stormwater inlets
g) `Integration with wetland planting contractor.

ES 3.4 Design standards/criteria
The design standards/criteria are based on national engineering state-of-the-practice for stormwater management, modified to suit the specific needs. The criteria are intended to establish guidelines, standards, and methods for effective planning and design. The criteria should be revised and updated as necessary to reflect advances in the field of urban drainage engineering and urban water resources management.

The design of drainage systems needs to fulfil two basic criteria:
a) The need to provide a satisfactory discharge of runoff within the project area
b) Minimising the impact on the environment.
When designing surface drainage, the following factors need to be addressed:
a) The nature of the catchment
b) Size of the catchment
c) Rainfall characteristics pertinent to the catchment
d) Determination of the climatic zone
e) Determination of runoff
f) The consequences of the exceedance of the design flow of the drainage system
g) The design average recurrence interval, for both major and minor drainage system
h) Consideration of environmental impacts.
The following Technical Policy/Standard Guidelines were considered:

- BritishStandardBS540
- BritishStandardBS810
- Structure Scoping Inspection Report, Structural Report
- Current Geotechnical and Hydraulic reports, memorandums, and investigations
- Other relevant structural Manuals accepted by the Client.

Hydraulic structures to be designed to mitigate the erosion at the gully site used methods applicable and accepted in Nigeria and in the international practice for 5-, 10-, 20-, 25-, 50-, and 100-years return periods.

ES 3.5 Materials

Availability of naturally occurring construction materials such as water, fine aggregates and crushed stone aggregates were also investigated in various locations (Table 3.6). The locations presented sources of various materials such as **Quarry Stone for asphalt, cement concrete and base coarse.** Aggregates of these shall be purchased and stockpiled from existing quarries from popular construction market, at Amasiri Ebonyi State the aggregates meets requirements for use in asphalt, cement concrete, base coarse and masonry works

During earthworks, it is estimated that topsoil will be stripped from the bulk earthwork areas. In addition, it is expected there will be some material unsuitable for engineered fill, imported material and material due to relocated as part of cut to fill bulk earthworks. All stockpiles will be located within the bulk earthwork areas or just outside, but within the catchment of the erosion and sediment control devices.

Prior to earthworks activities commencing, adequate perimeter and open channel drain controls must be installed to prevent sediment from entering the permanent and intermittent streams running through the site. Principal perimeter controls for this site include the installation of two construction entrances, silt fences and diversion drains/bunds.

A temporary water supply will be made available to the areas so that vehicle wheels can be washed prior to leaving the site, if necessary. All sediment laden water from wheel washing is to be directed into runoff diversion channels and into one of the decanting earth bunds prior to discharge to the intermittent stream.

ES 3.6 Project Waste Management

The bulk of waste generation is envisaged during construction and decommissioning phases. During operation, the project is not expected to generate significant quantity of waste, other than the routine waste that running water in the drainage lines convey in the course of movement downstream and from the normal maintenance of the project site.

ES 3.7 Project Schedule

Following completion of construction works over a period of three years, the project-life of the project will be about 20 years. The road project construction is expected to start by the end of year 2022 and will be accomplished at the end of 2025. The project, therefore, will be opened for traffic by the middle of 2025. As the service year (design life) of the project is 20 years, the traffic demand is projected to the year 2044.

ES 3.8 Major environmental and social issues and challenges of the project

Gully erosion is mainly due to geomorphic processes when rainfall, topography, vegetation and soil threshold, land use and capability are exceeded. Specifically, in the proposed project area, gully erosion is related to (i) geo-based spatial attributes such as topography, soil, vegetation and land cover, and (ii) factors of rainfall and human interference resulting in future gullies.

ES 4 DESCRIPTION OF THE PROJECT ENVIRONMENT

ES 4.1 Methodology

A strategic approach was adopted in establishing the environmental and social baseline status of the study area. This involved obtaining the environmental characteristics through field data gathering exercise (observation, onsite measurements, and sample collection) as well as laboratory analysis of collected samples. Socioeconomic Environment was also assessed in relation to land tenure, land use, community health, historical and cultural heritage, religion, demographics, income, economic livelihood, culture, education, employment, infrastructure and

social services, community structure/administration, social organizations/institutions. The tools included use of checklists, photography, Geographical Positioning Systems (GPS), structured interview guide/questionnaires, Focus Group Discussion (FGD) among others. All data collected were analyzed for production of the report. Data gathering exercise was carried out from May 2, 2021 to June 28, 2021 using a multidisciplinary approach involving professionals. The field exercise involved field sampling, sample collection and preservation as well as in situ observations and measurements of concerned indicators. Sample preservations were done on site prior to laboratory analysis.

ES 4.2 The Watershed and Catchment Area

The watershed refers to the area of the land that comprises a set of streams or rivers that drain into a larger water body like an ocean or a river. In the context of this project, the watersheds refer to the dividing ridge between drainage areas and comprise upland areas of the collections of all the waters through the gully erosion channel downstream). The watersheds of the gully drain into natural drainage channels and roadside drains. The watersheds with the sub-watersheds form the outlets of natural and artificial drains directing flood to the gullies. The sub-catchments have a mild slope varying in the range from 1.4 to 20%. They can be classified as rolling to steep terrain (Appendix 2). The Obingwa sites have different gullies and flow to the Main Gully (Figure 4). At Obingwa, drainage channels pass through the village but at the downstream sections of the channels (Appendix 3). Generally, the drainage from the village flows from northeast to southwest.

Figure 7: Obingwa Erosion Site

ES 4.3 Climate

The climate of the project area is humid tropics (semi-hot equatorial). Rainfall is significant most of the year, and the short dry season has little effect. The climate is characterized by the rainfall season from March to October, with the highest rainfall recorded in August. From available records, the average annual rainfall of 322 mm and the average annual temperature in Aba is 25.6 °C | 78.2 °F. The climate is essentially controlled by latitudinal locations, and the prevailing (seasonal) winds. The annual rainfall based on the station data at Aba varies from a minimum of 917 mm to 2285 mm.. The wind direction was predominantly South-westerly.

ES 4.4 Air Quality and Noise Level
The project area's significant sources of air pollutants were vehicle emissions and dust from the adjoining untarred road. The air quality parameters, NO2 (0.004 – 0.006 µg/m3), SO2 (0.004-0.006 µg/m3), CO (<0.01 µg/m3), NH3 (<0.01 µg/m3), VOCs (level less than 0.01 µg/m3) showed a general trend of acceptable values against FMEnv standards as most of the pollutants measured were either not detectable or below the regulatory values. The particulate matters (PM2.5) ranging from 42.2 – 60.2 µg/m3note to be below the set limits of 250 µg/m3,

The noise levels with a range of 46.8 – 54.8 dB(A) and a mean of 51.1 dB(A) were generally found to be below the NESREA prescribed limit of 60 dB(A) during the day and 50 dB(A) in the night for residential areas mixed with small scale production and commercial activities.

ES 4.5 Topography or Terrain
The topography of the project area is generally low-lying in the southern part of the state and moderately high plains with elevations ranging between 55.697 - 121.458m above sea level. The average height in the entire state is about 88.58m above mean sea level.

ES 4.6 Geology
The State has two principal geological formations: Bende-Ameki and the Coastal Plain Sands, otherwise known as the Benin Formation. The Bende-Ameki Formation of the Eocene to Oligocene age consists of medium to coarse-grained white sands. The late Tertiary-Early Quaternary Benin Formation is the most predominant and completely overlies the Bende-Ameki Formation with a South westward dip. The formation is about 200 m thick. The lithology of the project site revealed unconsolidated fine to medium to coarse-grained cross-bedded sands, occasionally pebbly, with localized clay and shale. The overburden along the gully site comprised mainly of dense sands and laterite proved within the depth of 5.1 - 6.6 m. The soil materials are predominantly thick sands and laterite with bearing capacity ranging between 118 – 908 kN/m2. The percentage of fines ranged between 3.85% and 10.3%. Due to the composition of fine particles in the largely lateritic materials encountered, there is a high likelihood of erosion by water along this slope.

ES 4.7 Soil
The project area comprises mainly hydromorphic soils, consisting of reddish brown and pale coloured clayey soil. The soil material from the gully site could be classed as silty sand derived from weathered sandstone and limestone in the area. The soil material is graded from dark brown to reddish yellow with lenses of grey sandy silt of moderately void ratio. These parameters make the soil in the area very erodible. The gradation curve from the soil test clearly shows that more than 79% of the soil content is in the sand range, whereas less than 14% is in the clay range. The soil is highly absorbent and supports different kinds of crops. It is highly susceptible to erosion. The dominant soil types are classified as Ferrasols. The soil texture is coarse, and the soil is moderately drained. The soil texture varies from loamy sand in the surface layer to sandy clay loam down the profile. Chemically, the ground of the project area is deficient in basic cations, with aluminium saturation greater than 83%. The soils are moderately acidic (pH 4.5 – 4.9) and low in organic carbon, total nitrogen and available phosphorus. Total nitrogen and organic carbon are medium and available phosphorus is expected in this soil. The mineralogy of clay-sized particles showed a dominance of kaolinite in both soils with some quantities of montmorillonite that increased down the profile.

ES 4.8 Groundwater and Surface Water Quality
For groundwater, the values of chemical parameters were found to be within the WHO standard for drinking water. There are no traces of metallic ions, and the water is not contaminated. Groundwater had <1 NTU turbidity, low conductivity, and a slightly acidic pH (6.69). The

surface water quality from Aba/Osisioma had relatively high turbidity (38.2 NTU) and alkaline pH (7.85). Other parameters were within the normal range for surface waters in southern Nigeria. The water samples were well oxygenated with dissolved oxygen (DO) values ranging from 5.6 to 7.5 mg/l, which can support aquatic life. The low level of ammonium nitrogen and biochemical oxygen demand (BOD) indicates the low level of biodegradation and organic pollution.

ES 4.9 Flora and Fauna

The project area and its surroundings are in the secondary succession Rainforest with a mix of few forest flora. The site is a community of regenerating secondary plants, which has been left to fallow with some pockets of active and abandoned farmlands, and extensive land being badly eroded. The important cultivated plants around the area are Maize (*Zea mays*), Cassava (*Manihot esculenta*), Beans (*Vigna unguiculata*), white yam (*Dioscorea esculenta*), vegetables, pepper (*Capsicum* spp.) and fruits such as Mango (*Mangifera indica*), Oranges (*Citrus* spp.), and Cashew (*Anacardium occidentale*). The most important naturally occurring useful plants are the locust bean plant (*Parkia biglobosa*), economic timbers such as *Afzelia*sp., respondenter plant (*Gmelina* plant) and *Daniella oliverii* (Butter plant), *Lophira lanceolate*(Ironwood). Economic trees in the cashew include oil palm, oil bean, icheku, banana, and oha.

Fauna animals found include giant rats (*Cricetomys Gambians*), ground squirrel (*Xerus erythropus*) and greater cane rat (*Thryonomys swinderianus*), grass cutters, antelopes and pigs. Smaller animals such as lizards and skinks and larger ones like the monitor lizards were sighted, including several migratory birds, during the field survey, while some were seen foraging. The wildlife in the area is said to be significantly reduced because of the people's excessive hunting and farming activities.

ES 4.10 Conservation Concerns and Land Use/Land Cover

No protected area is marked explicitly for wildlife, and there are no Game Reserves.
The land use in the watersheds is characterized by settlements, shrublands, woodlands, forests, narrow roads, lawns, etc.

ES 4.11 Socioeconomics

Agburukwe Community is located in Obingwa LGA. Obingwa with headquarters are in the town of Mgboko. is part of the indigenous people of Aba known as the Ngwa. Their ethnonym *Ngwa* is used to describe the people, their indigenous territory, ethnic group and their native tongue. Aba is a major urban settlement and commercial centre in a region that is surrounded by small villages and towns.

The Stakeholders are fully aware of the devastating impacts of gullies. Obingwa is a Local Government Area of Abia State, Nigeria. Its headquarters are in the town of Mgboko, which has an area of 395 km². The study estimated the population of the Agburukwe Community in Obingwa LGA to be 33 985.
Trade is an essential aspect of the economy of Obingwa LGA, with the area hosting several markets, where many commodities are bought and sold. Farming is also a vital feature of the economic activities undertaken by the people of Obingwa LGA, with crops such as yam, cassava, cocoyam, and vegetables grown in large quantities within the area.

The socio-economic study conducted in community from 5th – 30th April 2022 as part of the study for the ESIA and RAP revealed that the project is expected to impact 200PAPs, of which nine are female and 191 are male.

ES 4.12 Stakeholders' consultations

The key stakeholders identified and consulted in the area included leaders in the communities, individual people who own asset that will be directly or indirectly affected and business owners. These consultations enabled interested and affected parties to contribute their concerns (views, and opinions on the proposed development).

Stakeholders' engagement meetings were held in October 28, 2021, and June 6, 2022 as well as during the during the census for the RAP which took place between April 5-30 April, 2022. At the meetings, the overview of the proposed project and appreciation of ESMP were presented. Furthermore, the challenges that could impede the implementation of the project and the support needed from all parties to ensure effective project and successful implementation were also discussed with the stakeholders. *Appendix IV contains a list of those consulted and when as well as the summary of the outcomes of the meetings*.

Below the key outcomes/opinions synchronised from the stakeholders' consultations are outlined:

- The project is a welcome development and will assist in alleviating the suffering of the citizenry on the various roads to be rehabilitated
- The communities are ready to give maximum cooperation to the contractor, especially in terms of security;
- The stakeholders are willing to give up their land and property for this development as long as they will be fully compensated. Nevertheless, they also noted that caution should be exercised in land take especially for the detours and campsites adding that land taken for such purposes should not only be compensated but also be rehabilitated and returned to the rightful owners upon completion of the project.
- The youth should be given special consideration in employment and make them useful to help in the provision of security and safety of materials and personnel.
- The project implementation activities should include the stakeholders and ensure a coordinated approach in addressing compensation and resettlement issues as they affect various parties especially the local communities.

These observations and opinions have been noted and are taken care of in the mitigation measures or principle enshrined in the ESMP and RAP, making them to support in efficient project delivery in an environmentally benign, socially acceptable and culturally appropriate way.

ES 5.0 Potential Impacts and Mitigation/Enhancement Measures

Beneficial and adverse impacts of various components of the selected project alternative on the physical, biological and human (social, cultural and economic) environments were identified as due to the proposed project. Based on the Risk Assessment Matrix (RAM) used for identifying significant environmental aspect/impact s which were classified as Low, Medium and High, indicating increasing likelihood of occurrence of such risk in the proposed project the impact results were obtained.

ES 5.1 Summary of Identified impacts

The proposed project is envisaged to have many positive environmental and social impacts. While some of these are a function of the reasons or objectives of the project, others are a function of how the project is designed to meet its goals, as earlier discussed.

Suffice it to say that the significant benefits will occur in the form of improved erosion management and gully reclamation, which will provide for:

- Avoidance of the loss of infrastructure such as the road that is under threat by the upward incision or cut of the gully head
- Farmlands, and economic trees, along the corridor of the gully erosion might eventually be affected if nothing is made to stem the incision by running water.
- Restored vegetation cover with improved environmental conditions and provision of more humid local microclimates with carbon sequestration and shelter for wildlife.
- Improved environmental conditions for the general landscape and biodiversity due to the stabilisation of the site area.

The proposed project activities, unfortunately, are also likely to exert adverse impacts on the social and physical environment within which it is executed. Based on the design of the project, these impacts can be divided into two, namely: short-term construction-related impacts and unavoidable long-term impacts due to the use and maintenance of the reclaimed areas highlighted below.

Short-term construction-related impacts typical of construction activities of six months duration include:

- Increased level of noise beyond the measured range of 48.9 – 59.8 dB(A) with a mean of 55.1 dB(A) at present, which were generally within the NESREA prescribed limits of 60 dB(A) during the day and 50 dB(A) in the night for residential areas mixed with small scale production and commercial activities;
- Poor air quality from dust and emissions around the construction site and material hauling routes, for instance, would make particulate matter (PM2.5) measured at present to range from 47.2 – 64.2 µg/m3, values below the FMEnv set limits of 250 µg/m3 to be higher.
- The project area is mainly comprised of hydro-morphic soils, which consist of reddish brown, gravely and pale coloured, clayey soil susceptible to soil erosion when exposed to rain or other running water.
- The soil study with sieve analysis test results also showed the percentage of fine silt, which ranged between 3.85% and 10.3%, along the slope area of the gully erosion corridor and revealed a high likelihood of erosion or incision by water along this slope.
- Impervious surface areas estimated for the watershed computed ranged from 2% to 5 %, and rainfall on impervious areas exacerbates the erosion condition of the site.
- The study revealed the project area to have endangered species according to the endangered species Act 11 of 1985 which include 2 mammal {*Atherurus africanus* (African brush-tailed porcupine)*, Epixerus ebii* (Western Palm squirrel)} and 2 birds {*Milvus migrans* (Black kite) and *Necrosyrtes monachus* (Hooded vulture)}.
- Contamination of soil and groundwater by stored fuel, lubricants, and paints could result if these are not well handled in the course of use.
- Land scouring could result in scarring and related disturbance at sources of construction materials (sand, aggregates, stones) harvested if these are not carefully managed and reclaimed.

Socio-economically, the project is expected to impact 200 respondents of which 9 are females and 191 are males losing their crops and/or revenues. The asset to be displaced or lost potentially include 20hectares of arable/productive lands, and 1090 number of tree-crops lost

Increase in public and occupational health and safety issues within the vicinity of the site, such as the increased risk of trips, falls, injuries, accidents and spread of diseases such as COVID 19 amongst the contractors, pedestrians, passengers and staff at the project level as well as at the community level. The workers recruited for construction activities will include engineers, operators, surveyors, and drivers with non-skilled workers exposed to occupational health and

safety risks and hazards. Since the construction work will be relatively small and expected to be completed within six months, large numbers of workers are not likely. However, safety and health impacts will also be expected.
Concerning the phases of the project implementation, the construction phases will include one-time activities and not permanent ones of six months. The proposed project activity will not involve any large-scale construction hence impacts associated with the project are mainly rated moderate on severity and minor on duration. Nevertheless, unless good construction management practices are followed, construction activities could cause severe environmental pollution, ecological degradation and health and safety concerns to workers and the public.

For the operational stage, the project design life is anticipated to be about 40 years, with routine maintenance to ensure durability. No impacts are expected. However, where the treated gully erosion site is left unattended in terms of care and allowed, for instance, to accumulate debris such as plastics.

Impacts due to decommissioning will result from the removal of camps, cabins, equipment, etc., after treatment of the gully erosion site, for which the significant impacts have been identified as short-term noise and dust raising. The project area, the land where these activities will take place or be removed from, will be revegetated; thus, no adverse negative impact is anticipated.

Positively, the project is envisaged to have a range of positive environmental and social impacts. Some of these are a function of the objectives of the project, while others are a function of the way in which the project is designed to meet its objectives. The project beneficiaries are the population of poor rural -urban communities lacking all-weather roads currently and severely constrained access to economic opportunities (agricultural inputs, markets, rural-urban linkages) to social services (health and education). This scenario is expected to change for the better with the proposed project.

As a rule of the thumb, conversely, it is anticipated that the road project during rehabilitation would exert some negative impacts on the social and physical environment within which they are implemented. These impacts can be divided into two, namely:

- Short-term construction related impacts such as environmental impacts on air quality, waste generation, disruption of traffic, and health and safety impacts. Unless good construction management practices are followed, construction activities can cause serious environmental pollution, environmental degradation and health and safety concerns to both workers and the public.
- Long-term and permanent activities of the operation phase leading to recurring but avoidable impacts which consist mainly of waste generation, air quality degradation in the event of use of diesel generators and noise.

ES 6.0 Project Potential Impact Mitigation Measures

The measures proposed are specific, measurable, achievable and relevant to the proposed intervention and time based (SMART). The measures also considered the environmental laws in Nigeria, and internationally and the principles of sustainable development and best available technology.

In Table 4 a summary of the potential impacts associated with the project, together with corresponding mitigation measures. The Table outlines mechanism for enhancing the mitigation measures or reducing the major and moderate adverse impacts have been developed. A Mechanism for enhancement of positive impacts and reduction/avoidance of negative impacts has been developed in relation to the Project Concept and design, Construction and Operation, Control of Earthworks and Erosion and Sediment Control Plan, Managing the Treated Gully and

Terminal End of the Spillway, Control of Water Quality, Waste Management, Controlled Gully Maintenance and management, Neighbourhood Effects Management.

Table 4: Identified Impact and Mitigation measures for the proposed erosion control project, Agburukwe Community is located in Obingwa

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
A	**Preconstruction: Planning & Preparatory activities Civil Work Construction**			
	Biophysical			
1	Construction support preparation	• Poor or lack of consideration for environmental and social management in designs • Contract documents missing environmental and social management measures • Absence of environmental and social management budget	• Ensure final designs have plans to minimize environmental impacts. • Prepare applicable E&S instruments in synchronization with the preparation of the feasibility studies and detailed design by ensuring the prepared E&S instrument such as ESMP speaks to the detailed designs • Chose or develop design standards for each facet of construction and related activities in compliance with legal requirements on drainage, greenery, material extraction, transport and storage, construction camps, decommissioning • Include the project ESMP/Safeguard requirements as part of the bidding document • Consider problems in soil stability and local weather and natural phenomena—flooding, heavy rain, • Ensure design brief for components proposed	Part of design Costs
2	Movement of Equipment & materials	• Increase in noise nuisance • Reduction in air quality due to vehicular movement	• Ensure releases are in compliance with NESREA Regulation • Spraying of water during excavation and site preparation works. • Raise public awareness of unusual activity • Plan activities such that Regulatory limits are not exceeded • Select appropriate plant and equipment (consider plants with the acoustic enclosures) • Ensure the use of environmentally friendly technologies that minimize noise and reduce dust generations • Ensure operatives use appropriate Personal Protective Equipment (PPE) • Introduce acoustic screening • Use mufflers on equipment and plant • Employ fuel efficient and well-maintained haulage trucks with proper exhaust system to minimize emissions. • All parked vehicles on the site shall have their engines turned off; • Service vehicles as at when due and stick to manufacturers' specifications in use • Develop and follow a controlled fueling, maintenance and servicing protocol	400,186.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
			• Develop and implement a transport management plan	
3	Staging of equipment and crew camp with stockpile materials	• Energy use and emissions with noise from generators • Soil compaction and soil structure changes due to influx and stationary positioning of equipment and vehicles along with construction materials • Possible soil and surface water contamination	• Deploy solar systems for lighting instead of the use of diesel generators to avoid emissions of gases and noise • Develop a site plan that does not require a significant amount of grade changes–that fits into existing land contours. • Soil that will not be re-distributed for some time should be stabilized to reduce the erosion force and trap stockpiled soil or other materials to be used later to backfill the gullied areas so wind or running water does not carry them away • Carry out earthworks operations such that surfaces have adequate falls, profiling and drainage to control run-off and prevent ponding and flooding. • Control run-off through silt/sediment traps/barriers as appropriate to minimise the turbidity of water in outfall areas.	350,772.00
	Social Issues			
4	Land acquisition for right of way	• Displacement of asset • Negative perception and discontent expressions by community members	• Develop compensation plan for displaced asset in line with the RAP that was prepared	RAP Budget
5	(Local people excluded from activities)	• Conflict due to non-consideration of local people in activities/jobs	• Incorporate methods within the skills of local people. • Contractors to use local labour mandated in the contract documents • Incorporate country systems communicated via Government circular mandating that 100% of unskilled labour from local/host community	400,000.00
6	Traffic	• Impact on mobility and accessibility	• Prepare and implement a traffic management plan	250,000.00
	Subtotal			***1,200,958.00***
B	**Construction**			
a.	**Biophysical Issues**			
1.	Work and camp site	• Soil contamination, Unhygienic work	• Identify suitable camp site in consultation with relevant authorities. • Regular collection and proper disposal of Solid, liquid and humanWaste.	500,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
		environment and disturbance of the neighbourhood • Disaffection in the community	• Ensure and enforce good housekeeping	
2	Site clearing of set-back from edge of gully	• Removal of Flora & fauna Displacement of asset	• Remove flora only when it is absolutely necessary • Develop compensation plan for displaced asset in line with the RAP that was prepared.	RAP budget
3	Earthworks - Excavation, grading, compaction, filling and other civil works	• Disturbance of the natural drainage of site • Increase in the amount of disturbed soil and could in turn increase the amount of erosion which can occur. • Increase sedimentation and runoff Risk of pollution to water courses Destruction of visual Scenery • Damage to abutting land use construction sites	• Develop a site plan that does not require a significant amount of grade changes–that fits into existing land contours. • Site that will not be re-disturbed for a long period should be stabilized to reduce the erosion force of these areas until they are disturbed again. E.g. if soil excavated from a temporary sediment • Trap is stockpiled to be used later to backfill the trap (when the area is stabilized) then the stockpile • Carry out earthworks operations such that surfaces have adequate falls, profiling and drainage to control run-off and prevent ponding and flooding. • Control run-off through silt/sediment traps/barriers as appropriate to minimise the turbidity of water in outfall areas.	6,000,000.00
4.	General Treatment of the gully erosion	• Failure due to poor integration between physical and biological measures. • Failure to complete the treatment works for any reason – tantamount to not getting the required protection and a waste of time and resources.	• Careful planning and attention to detail • Remove the cause of the gullying. Ensure quality work • Do gully filling only after the water flow that caused the gully has been controlled or diverted above the gully head. Otherwise fill placed in the gully is likely to be undermined and washed away. • Avoid filling gullies with rubbish, logs, rocks, car bodies and other foreign material that are not suitable. • Use earthen banks that divert runoff away from the gully head, and convert it to slower, less erosive flow away from the actively eroding area.	500,000.00
5.	Gully Stabilisation/Use of Vegetation	• Failure of lined drainage channels and energy dissipaters after major	• Design structures so that the flow in the gully is reduced to a non-scouring velocity • Plant vegetation between the structures and the gully stabilised	300,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
	as control & buffers Grass-lined Channel (Turf reinforcement mats)	storms/runoffs enters the channel. • Debris/ sediment accumulation in outlets and points where concentrated flow enters the channels, bank instability, and scour holes developing	• Locations of the structures must be placed so that as much sediment is collected as possible, while still ensuring that the structures are stable. • Sites should also be relatively smooth at the gully floor, and have a gentle slope between the gully floor and sides. • Choose the right time to do it. From late Dry season to early onset of rainy season before heavy rains is generally a suitable time as there is less chance of high volumes of run-off, yet there is sufficient soil moisture and warmth to promote the growth of vegetation.	
6.	Structural Erosion and Sediment Control Practices - Structural practices used in sediment and erosion control to divert storm water flows away from exposed areas, convey runoff, prevent sediments from moving offsite, and can also reduce the erosive forces	• Drainage lines and ephemeral waterways may have areas that could be 'erosion starters'. • Degrade water quality • Alteration of local hydrology • Damage of valuable ecosystems and habitats • The release of fine sediments and turbid water into water body can adversely affect the health and biodiversity of aquatic life in water body downstream, increase in the concentration of nutrients and metals, reduce light penetration into the water	• Remove and dispose of surfacing material if necessary and loosen soil of previous track to accelerate regeneration of vegetation • Reshape eroded or culled surfaces with out-sloping, re-vegetate as needed.	350,000.00
7	Climate Risks	• Proposed activities will ensure adaptation measures against the usual and/or anticipated extreme precipitation events that	• Use minimum and efficient use of wood products for construction. • Do appropriate greenery with local species of plants • Landscape all disturbed areas using native species of flora that can withstand the weather phenomena. • Use Renewable sources of energy as much as possible	500,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
		cause flooding when downpours exceed the capacity of urban drainage systems		
8	Use of heavy equipment on site and transport vehicles on the public roads	• Vibration generates lateral waves to the surrounding structure and could lead to failure of the treated gully corridor • Contamination of ground or surface water when hydraulic oil, motor oil or other harmful mechanical fluids are spilled • Noise generation and air quality degradation, especially dust • Sediment transport from the site onto public roads or adjacent properties via the wheels, chassis and side of vehicles. • Disruption of visual scenery	• As much as possible avoid use of heavy-duty equipment like bulldozers, pay loaders and trucks used in excavation and loading at the control site, • Work schedule to minimize disturbance. • Alert the public when loud noise will be generated • Sound-proofed machines shall be employed • Ensure construction vehicle, machinery and equipment movement or stationed always in the designated area only and do not carry activities beyond land hired/given	440,000.00
9.	Storing Materials	• Loss of the stockpiled soild material • Damage to valuable ecosystems and habitats • Leaks of hazardous materials from equipment or storage	• Stockpiles should not be located within an overland flow path. • In order to mitigate the flow of water away from stockpiled material, flow diversion banks can be constructed up-slope of the stockpile to divert run-off. • install a sediment fence (or heightened bund wall) on the downhill side	200,000.00
B	Social Issues			
1	Social interactions	• Conflicts	• Incorporate methods within the skills of local people. • Contractors encouraged using local labour wherever possible.	400,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
			• Follow the grievance redress mechanism designed for the project	
2	Off-site risky behavior of construction workers such as patronage of night clubs, potentially subjects the communities to high rates of social vices and security challenge	• Gender Based violence • Induced influx of criminals (burglars, rapists etc) into the community. •	• For adequate mitigation efforts, identify and address the specific issue when they occur since there are diverse forms of Gender Based violence • Ensure personnel of contractors to project maintain proper decorum • Give community youth special consideration in employment and make them useful to help in the provision of security and safety of materials and personnel.	200,000.00
3	Waste/Spoil disposal	• High volume of waste/spoil • Spoil tipped away from designated areas	• As part of contract requirements, contractor will be required to develop, implement and maintain a Waste Management Plan during the construction works with emphasise to minimise waste and segregate waste • Protection of neighbourhood from debris due to construction • Minimize spoil by balancing cut and fill wherever possible • Safe tipping areas identified and enforced. • Spoil traps constructed. • Dispose in approved sites	645,814.00
4	Local culture and society	• Socio-cultural values may be altered and the stability of communities adversely affected by presence of construction workers in the area • Exposure to rapid social change or tourism.	• Ensure the workers do not interfere with the culture of the people • In the event of that previously unknown heritage resource is encountered during project construction stop work and do not disturb it until an assessment by a competent specialist is made and actions consistent with the requirements are implemented. Follow a	500,000.00
5	Assets displacement	• Displacement of assets or means of livelihood	• Use the compensation plan for displaced asset in line with the RAP that was prepared for the project	RAP budget costing
6	Utility	• Road barred from being	• Notify local communities and road users in advance of and for the duration	150,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
	Disruptions	used temporally due construction activities	of proposed changes to local traffic access arising from Project works	
7	Quarry for fill materials	• Use of agricultural land • Exposure of other erosion prone sites	• Avoidance of agriculture lands and other sensitive areas as borrow areas • Redevelopment of borrow areas • Redevelopment of quarries in case new quarries are setup for the Project	
C	• **Occupational & Public Safety and Health**			
1	Occupational & Public Safety and Health	• Health and safety risk due to construction activities	• All project activities shall be properly managed through careful planning and the application of relevant safety policies including the following: • Job hazard analysis (JHA) before embarking on a job, Use of appropriate Personal Protective Equipment (PPE), Prohibition of alcohol in the project area, Prohibition of smoking in designated areas, Proper journey management, contractor' Handbook of safety rules and regulation. Contractors shall provide adequate health and safety services as well as onsite First-aid services for its workforce. The First-aid services shall be extended to all visiting personnel. • Follow extant policies through Enhance safety planning and activities executed within the confines of relevant legislation and stakeholders' interests.	1,500,000.00
2	Site Work –	• Excavation exposes inhabitants and crew to risk of falls and injuries in excavation pits • Use of equipment and movement of vehicles includes accident rates/ traffic hazards. • Burrow Areas for fill materials could lead to accidents and/or breeding site for mosquitoes • Exposure to atmospheric emissions from	• Only well-maintained plant should be operated on-site and plant shall be serviced regularly during the decommissioning program • Plan activities so as to minimize disturbances to residents, utilities and services • Develop and use a formal Health and Safety Plan for work akin to this EMP with the specified mitigation measures and more in terms of training, traffic management, speed control, warning signs, provision and use of personal protective equipment emergency action plan and monitoring/reporting. • Train workers and other staff engaged in the proposed constructions on health and safety • Ensure Penalties in case of non-compliance with the agreed standards • Ensure all reasonable steps are taken to protect any person on the site from health and safety risks • Ensure machineries and equipment are safe through the provision of	700,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
		construction equipment • Exposure to excessive and • continuous noise and vibration from construction activities • Risk of water source pollution • Dust emission • Communicable diseases (Covid 19 and HIV/AIDS) transmission	security personnel • Provide adequate supervision of safe work system • Ensure means of access to and egress from the site are without risk to health and safety. • Ensure all workers are equipped with, and use PPE • Follow the Government guideline on COVID-19 management • Provide sufficient signage giving occupational health and safety warnings and information disclosure within the construction and around the site. • Carry out hazard identification and risk assessment routinely • Develop Safety plan, including emergency action plan. • Provide weekly/monthly toolbox meetings (safety briefings)	
		Subtotal		**11,285,814.00**
	Operation and Maintenance			
1	Maintenance and utilization of erosion gully control site	• Poor maintenance creates threshold for more erosional force and standing pools of water • Breed disease vectors in settling basins and retention ponds • Unsustainable use of reclaimed area areas crossing different land uses owned by different land users/Conflict Disharmony in Poor maintenance of vegetated area	• Monitor and maintain intervention work for continued stability and quality • Shortcomings in the control structures should be corrected before they develop into serious problems. • Any grass, shrub/bush and tree planted which dies should be replaced • Treated gullies should be checked regularly and the healing process monitored closely. Structures built in • the gully for stabilization purpose should be observed for damage especially during rainy seasons and after heavy storms. Damaged check-dams should be repaired immediately to avoid further damage and the eventual collapse. • Conduct gender study to assess the challenges and opportunities for the mainstreaming of gender concerns in the use of, access to and maintenance of the gullies • Avoid delay repair even in small damage or break of control structure	12,000,000.00
	Subtotal			**12,000,000.00**
	Decommissioning			
	Removal of	• Soil erosion, Dust	• Absence of soil erosion, noise raising and dust generation	4,500.000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
	equipment and camp, etc.	generation, Disruption of the secondary/ newly emerged flora		
		Subtotal		**4,500.000.00**
	Grand Total			**28,986,772.00**

ES 7.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

A project specific E&S management and monitoring plan has been designed as indicated in Table 5. This plan establishes E&S action plans with well-defined desired outcomes and actions to address all potential impacts identified for the project. The plan also includes elements such as parameters to be measured, methods of measurement, location of measurement, performance indicators (targets or acceptance criteria) that can be tracked over defined time periods, and with estimates of the resources and responsibilities for monitoring.

The method of implementation of the monitoring programme shall be carried at two layers based on the intensity and specificity expected.

Layer 1: Monitoring (Control) mission from the AfDB which will be looking at the validity of claims and conclusions and effectiveness of mitigation measures among other things. This layer of monitoring will be done along with FME in Abuja with the support of NESREA.

Layer 2: Monitoring of site activities which will be done regularly by the Monitoring Team (SPIU) guided by the stipulations of the national and district level environmental standards as contained the relevant laws of Nigeria.

The Layer 1 mission will carry out the following roles: (i) to review the contractor's detailed worksite ESMP and its specific procedures; (ii) to appraise the adverse effects determined; (iii) monitoring if the proposed measures to mitigate the negative impacts were actually carried out in the implementation phase (iv) to determine how effective the mitigation measures are in addressing the adverse effect; (iv) to ascertain the extent of reach and sustainability of the achievements recorded from the mitigation measures applied; (v); monitoring the recommended measures; (vii) proposing remedies in the event of occurrence of major impacts; and (viii) conducting environmental compliance and assessment at the end of the project.

ES 7.1 ESMP implementation

The ESMP is instituted for the proposed project to ensure that impact mitigation; control and recovery measures are well implemented. The ESMP is designed to commit SPIU to operate with little or no long-term negative impacts on the project. This ESMP shall be updated and revised on a regular basis throughout the project's life cycle. It should be noted that for effectiveness, specific plans have been designed to ensure mitigation measures prescribed and others that might not have been foreseen now are implemented as summarised in Table 5.

Since contractors will implement the project on behalf of the SPIU, the Contractor (s) will be required to develop a Construction ESMP (CESMP) to ensure compliance with the requirement of the ESMP, the country system and AfDB ISS before construction works begin. The range of contractors' responsibilities in this regard include managing their direct, indirect and cumulative impacts of their activities from construction as well as impacts of their workforce and compliance with health, safety and labour requirements. In addition they will be expected to comply with specific Project HSE policies, regulations and standards through a self-verification programme by: undertaking Pre-construction Surveys and HSE assessments to identify and manage HSE risks and impacts; performing Contractor HSE inspections and audits; performing Contractor HSE Monitoring and reporting; and putting to put in place corrective and remedial measures for non-conformance and have an incident notification and Emergency and Risk Response Management Plan.

For the ESMP to be implemented as envisaged by the contractors, relevant aspects shall be integrated into the project design and tender documents. Using this approach, the mitigation measures will automatically become part of the project construction and operation phase. By

including in the contract or in specific items in the Bill of Quantities, the cost of implementation should be covered under the normal engineering supervision provisions of the contract.
Examples of clauses that should be incorporated into contracts with construction companies include:
1. Construction contracts should:
    - Select or develop guidelines and procedures to be applied to each facet of road construction or rehabilitation—site clearing, bed and surface construction, drainage, fuel and material usage, quarry site management, construction camp and work site operating procedures, including worker safety.
2. Maintenance agreements should ensure:
    - Finalization of maintenance agreements with local communities before beginning construction.

Maintenance contracts that are performance-based with penalties in case of non-compliance with the agreed standards (e.g., flouting safety rules, number of potholes per km of roads). All parties must clearly understand and be committed to terms of the agreement, such as who will do what work, when, how frequently, for what compensation, and within what limits

ES 7.2 Site Inspection and Maintenance
To continually achieve the benefits of the gully treatments, site inspection and monitoring programme shall be ensured with the following objectives:

- The gully erosion treatment and control plan (getcp) are appropriate for the site and is implemented effectively;
- The gully erosion treatments are appropriately maintained; and
- Identify any works at the site that may be contributing to environmental harm.

Once the gully treatment/remediation work has been completed, a monthly walk through or site inspection should be conducted to ascertain the following:

- All measures have been implemented in the field and erosion controlled adequately;
- Sediment and other pollutants such as plastics are not being transported off-site or into critical areas on-site;
- Any improper installation or any repairs necessary to complete the job is noted at this time and work completed;
- Critical points such as disturbed areas of the site are identified and repairs effected;
- Control measures are in good operating condition until the area they protect has been completely stabilized and the construction activity is completed;
- Crews are to immediately repair the erosion and sediment control measures;
- Appropriate materials and equipment should be kept on hand to enable a quick and rapid response; and
- Exposed areas must be stabilized and inspected before a site is left in an inactive state.

Maintenance Problems
The most frequent cause of failure is lack of preventative practices and poor maintenance of treatments administered. Erosion prevention and sediment control must be inspected regularly and operated and maintained using specific procedures to perform properly. Installation mistakes can also impair the performance of the measures. Inspectors should pay particular attention to maintenance problems and installation mistakes during inspections.

ES 7.3 Vegetation Establishment Monitoring
Monitoring for vegetation establishment should be conducted in accordance with local requirements. Vegetation should be monitored monthly to evaluate the following type of vegetation

that is growing (as compared to the type of vegetation that was planted), the density of vegetation that is growing, including the percent of ground that is covered.
Based on regular evaluations of established vegetation, recommendations should be made as to whether the vegetation is growing well, or whether additional measures should be taken, such as over seeding, fertilizing, irrigation, etc. Vegetation monitoring should continue until the vegetation reaches maturity and is providing the anticipated erosion control effectiveness.

ES 7.4 Inspections Responsibility and Frequency
Inspections oversight rest with the SPIU supported by the Ministry of Works with local knowledge, policies and procedures.
All measures must be inspected by the SPIU/contractor in accordance with any schedule required by the SPIU and Ministry of Works and before any predicted, significant rainfall.
During gully treatment, contractor's inspector must have the ability to call out worker after rainfall events. The inspector should record any damages or deficiencies in the control measures on an inspection report form. The damage or deficiencies should be corrected as soon as practicable after the inspection but in no case later than 7 days after the inspection. Any changes that may be required to correct deficiencies should also be made as soon as practicable after the inspection but in no case later than 7 days after the inspection.

Inspections of erosion control works should be conducted by a person clearly identified as responsible for this role and may be the project manager, site supervisor or principal contractor representative etc. All inspection details should be formally documented, filed and made available for inspection as required by PMU and relevant authorities.
It is recommended that during the gully erosion treatment inspection should be carried out in the following manner:

- At least daily during rainfall events;
- At least weekly, even if the works are not being conducted;
- Within 24 hours of a forecasted rainfall or storm event; and
- Once every six months after implementation.

The project specific E&S management and monitoring plan has been designed as indicated in Table 6.6. Overall monitoring for the ESMP shall be conducted by trained individuals who can carry out the monitoring and record-keeping effectively using properly calibrated and maintained equipment on behalf of the SPIU and/or contractor. External monitoring will be carried out by the Federal and State Ministry of Environment.

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Table 5: Environmental and Social Monitoring Plan								
S/N	Activities Envisaged	Potential Impact	Mitigation measures	Monitoring Indicators	Frequency	Responsibility		Cost of mitigation measures
						Implementation	Monitoring	
	Mobilisation/ Preparatory activities							
1	Movement of Equipment & Materials	• Rise in fugitive dusts • Loss of topsoil • Leakage of oil from stacked equipment • Increase above permissible noise level • Displacement of soil fauna and damage to flora • Predisposing of soils to erosion • Indiscriminate disposal of waste •	• Routine wetting • Installing impermeable surface at designated areas for stacks • Alternative equipment design options • Minimized vegetation clearing • Campsite located on brownfield • Movement of crews and equipment within the rights-of-way and over routes provided for access to the work shall be performed in a manner to minimize damage to vegetation and fauna within the project area. • Provision of adequate waste management facility in camps	• Air monitoring log book • Presence of impermeable surface e.g. tarpaulin • Noise measurements • Clearing confined to site • Location of site • Movement of equipment and crew confined to designated access. • Water wetting chart • Waste management plan and facility •	Daily One-off	Contractor,	SPIU Environmental and Social Safeguard officer	100,000.00
2	Movement of Equipment & Materials	• Traffic congestion • Social stress due to land acquisition and involuntary displacement • Community discontent which may delay project execution • Risk of out of school children being food vendors	• Adequate and timely project awareness • Use of traffic control measures • Apply lane configuration changes to affected roads and streets. • Campsite situated on brownfield. • Liaise with local authority for proper land acquisition options.	• Awareness creation programmes • Traffic direction signs and traffic wardens • Project layout plan • Campsite located on a brown field. • Construction site located at designated space. • Grievances	When necessary One-off Weekly	Contractor,	SPIU Environmental and Social Safeguard officer	

			• Establishment and operation of an effective GRM. • Address the issue of mobile vendors during community engagement meetings and with the community leaders •	received and resolved. •				
3.	Movement of Equipment & Materials -Health & Safety Issues -	• Road accidents • Theft and vandalization of equipment • Insecurity of workers • Work-related accidents	• Traffic safety measures • Perimeter fencing of campsite • ID tags and uniform for workers • Health and safety trainings for workers. • Provision and use of PPEs	• Traffic warning signs and traffic wardens • Secure, adequate fencing and access control • Safety training reports/records • Availability of PPEs and first aid boxes	Daily Weekly	Contractor,	SPIU Environmental and Social Safeguard officer	
						Sub-total	**100,000.00**	
B	• **Construction**							
	• BIOPHYSICAL ISSUES							
1	Site clearing of set-back from edge of gully	Removal of Flora &fauna Displacement of asset	• Perform clearance in stages • Develop compensation plan for displaced asset in line with the RAP that was prepared where only the LG was identified as the only respondent	• Absence of land degradation due to avoidable vegetation clearance/no scar, absence of complaint from respondent/communities	Once during site clearance	SPIU Contractor,	ABSIIDP	As Part of RAP mitigation measure
2.	General Treatment of the gully erosion,	Failure due to poor integration between physical and biological measures. Failure to complete the treatment works for any reason – tantamount to not getting the required protection	• Careful planning and attention to detail • Remove the cause of the gullying. Ensure quality work • Do gully filling only after the water flow that caused the gully has been controlled or diverted above the gully head.	• Absence of failure due to poor integration between physical and biological measures	During Constructio n n -weekly	SPIU Contractor,	ABSIIDP AFDB	

		and waste of time and resources.	Otherwise fill placed in the gully is likely to be undermined and washed away. • Avoid filling gullies with rubbish, logs, rocks, car bodies and other foreign material that are not suitable. • Use earthen banks that divert runoff away from the gully head, and convert it to slower, less erosive flow away from the actively eroding area.					
3.	Gully Stabilisation, Use of Vegetation as control & buffers - Grass-lined Channel (Turf reinforcement mats)	Accumulation of debris, sediment accumulation, died grasses, shrub/bush and tree planted, lack of integrity	• Design structures so that the flow in the gully is reduced to a non-scouring velocity • Plant vegetation between the structures and the gully stabilised Locations of the structures must be placed so that as much sediment is collected as possible, while still ensuring that the structures are stable. • Sites should also be relatively smooth at the gully floor, and have a gentle slope between the gully floor and sides. • Choose the right time to do it. From late Dry season to early onset of rainy season before heavy rains is generally a suitable time as there is less chance of high volumes of run-off, yet there is sufficient soil moisture and warmth to	• Absence of debris accumulation • No of debris remove and repairs made on outlets and points where concentrated flow enters channels, structures. • No of inspection made on lined drainage channels and energy dissipaters after major storms/rainfall .	During Construction, especially after heavy downpour of rain-weekly	SPIU ESSO, Contractor,	ABSIIDP	

			promote the growth of vegetation.					
4.	Earthworks - Excavation, grading, compaction, filling and other civil works	Disturb the natural drainage of site, Increase the amount of disturbed soil and could in turn increases the amount of erosion which can occur. Increase sedimentation and runoff Risk of pollution to watercourses	• Develop a site plan that does not require a significant amount of grade changes–that fits into existing land contours. • Site that will not be re-disturbed for a long period should be stabilized to reduce the erosion force • These areas until they are disturbed again. E.g. if soil excavated from a temporary sediment • Trap is stockpiled to be used later to backfill the trap (when the area is stabilized) then the stockpile • Carry out earthworks operations such that surfaces have adequate falls, profiling and drainage to control run-off and prevent ponding and flooding. • Control surface water run-off through silt/sediment traps/barriers as appropriate to minimise the turbidity of water in outfall areas	• Number of drainage lines and ephemeral waterways that could be 'erosion starters'. • No of Complaint from the community due to poor water quality/sedimentation	During Construction, especially after heavy downpour of rain	SPIU Contractor,	ABSIIDP	
5	Use of heavy Equipment on site and transport vehicles on the public roads	Vibration generate lateral waves to the surrounding structure and could lead to failure Contaminate ground soil or surface water when hydraulic oil, motor oil or other	• As much as possible avoid use of heavy duty equipment like bulldozers, pay loaders and trucks used in excavation and loading at the control site, • Work schedule to minimize disturbance.	• Absence/number of oil leakage/spill, absence of impact on structures/cracks/ Absence/number of damage to abutting construction • site Absence/number of	During Construction	SPIU Contractor,	ABSIIDP	

		harmful mechanical fluids are spilled or dumped Spills, leaks or injuries from any type of hazardous material (e.g. bitumen, cement, paint, explosives, fuels, lubricants)	• Alert the public when loud noise will be generated • Sound-proofed machines shall be employed • Construction vehicle, machinery and equipment move or station always in the designated area only and do not carry activities beyond land hired/given	complaint due to noise & dust generation Absence of sediment transport from the site onto public roads or adjacent properties via the wheels, chassis and side of vehicles.				
6.	Camp site	Soil contamination, Unhygienic work environment and disturbance of the surrounding neighbourhood Dis-affection in the community	• Identify suitable camp site in consultation with relevant authorities • Regular collection and proper disposal of Solid, liquid and humanWaste. • Ensure and enforce good housekeeping	• Wholesome environment • Absence of conflict with community members • Provision of adequate waste management facility.	Daily/All through during Construction	SPIU Contractor,	ABSIIDP	350,000.00
7.	Storing Materials/	loss of the stockpiled material Damage valuable ecosystems and habitats Leaks of hazardous materials from equipment or storage	• Stockpiles should not be located within an overland flow path. • In order to mitigate the flow of water away from stockpiled material, flow diversion banks can be constructed up-slope of the stockpile to divert run-off. • install a sediment fence (or heightened bund wall) on the downhill side	• Presence/absence of moved stored material by rain/wind Presence/absence of leaks from substance stored	Daily/All through during Construction	SPIU Contractor,	ABSIIDP	
	• **Social Issues**							
			•	•				
			•	•				
1	Waste/Spoil generation & management	Waste generation volume of waste/spoil Spoil tipped away from designated areas	• As part of contract requirements, contractor will be required to develop, implement and maintain a Waste Management Plan during the construction	• Volume of waste generated and disposal method. Good waste management plan in place-acceptable in light of best practice	Daily/All through during Construction	SPIU Contractor,	ABSIIDP Waste Management authority	100,000.00

			works with emphasis to minimise waste and segregate waste Protection of neighborhood from debris due to construction • Minimize spoil by balancing cut and fill wherever possible • Safe tipping areas identified and enforced. • Spoil traps constructed. Dispose in approved sites					
2	Local people excluded from activities	Conflict	• Incorporate methods within the skills of local people. • Contractors encouraged using local labour wherever possible. • Incorporate country systems communicated via Government circular mandating that 100% of unskilled labour from local/host community	• Number of community members involved in construction	Twice during construction	SPIU Contractor,	ABSIIDP	
3	Quarry for fill materials	Use of agricultural land	• Avoidance of agriculture lands as borrow areas and other sensitive areas • Redevelopment of borrow areas Redevelopment of quarries in case new quarries are setup for the Project	• Presence/absence of scouring, erosion, damage to property, water supply disruption. Complaints from local people	During construction	SPIU, Contractor	ABSIIDP	450,00.00.00
	• **Sub-total**							**900,000.00**
C	• **Operation and Maintenance**							
	Operation - Maintenance and Utilization of Rehabilitated Gully	Collapse of structure/failure of measures	• Monitor and maintain intervention work for continued stability and quality • Shortcomings in the control structures should be corrected before they	• Number of failure of structure	Once in three months during dry periods and immediately after	Community, Site committee, SPIU	Environmental and Social Safeguard Officer, MoE MoW, FPMU,	1,000,000.00

			develop into serious problems. • Any grass, shrub/bush and tree planted which dies should be replaced • Treated gullies should be checked regularly and the healing process monitored closely. Structures built in • the gully for stabilization purpose should be observed for damage especially during rainy seasons and after heavy storms. Damaged check-dams should be repaired immediately to avoid further damage and the eventual collapse. • Conduct gender study to assess the challenges and opportunities for the mainstreaming of gender concerns in the use of, access to and maintenance of the gullies • Avoid delay repair even in small damage or break of control structure		heavy down pour during rainy season		AFDB	
	Operation - Maintenance and Utilization of Rehabilitated Gully	Unsustainable use of rehabilitated gully areas crossing different land uses owned by different land users/ Conflict Disharmony in	• Identification of users and development of a use concept or management plan. • Before treatment of gullies, the users should be identified and the boundaries should be clearly demarcated, the gully rehabilitation process should be objective oriented and	• Number of agreement signed with Sustainable users of rehabilitated gully areas • Presence/absence of land users/ Conflict Disharmony in	Once every six months	, Community members,	SPIU, FPMU AFDB	600,000.00

			responsibilities of owners in managing, maintaining and utilizing the gully should be agreed upon.					
	Operation - Maintenance and Utilization of Rehabilitated Gully	Poor maintenance of vegetated area,	• Maintain healthy pasture swards on slope to reduce bare ground. • Minimum or no tillage techniques that protect soil structure as fine soil particles erode more readily • Regular inspection.	• Presence/absence of Healthy vegetation	Once every six months	Community, Site committee, SPIU	Environmental and Social Safeguard Officer, MoE MoW, FPMU, AFDB	
	Sub-total 1,600,000.00							
	Decommissioning	Cause soil erosion, Degrade water quality, Dust generation, Damage valuable ecosystems and habitat	• Break up old surface and soil. Remove and dispose of surfacing material if necessary and loosen soil of previous track to accelerate regeneration of vegetation • Reshape eroded or culled surfaces with out-sloping, re-vegetate as needed.	• Absence of soil erosion, water quality degradation and dust generation	All through the decommissioning and equipment/ material period	Contractor, SPIU	Environmental and Social Safeguard Officer, Local Government/ Site Committee	
	• **Sub-total**							**450,000.00**
	Grand Total							**3,050,000.00**

ES 7.5 Environmental Hazards Management (EHM)

EHM involves formulation of strategies for preventing, minimizing, or controlling these hazards. The EHM formulated is to be utilized by the ABSIIDP /State Project Implementation Unit (SPIU) and the contractors commissioned by the Client for the project and will complement the site-specific Environmental management and Monitoring plan.

In the execution of the proposed projects across the various phases (construction, operation and maintenance), it is likely that there will be exposure to activities/ materials considered to be hazardous to personnel and the environment will occur. The contractor should have its own documented Hazards Management Program (HMP) that outlines a framework for human and environmental safety for all its operational units and ensuring compliance with regulations. Suffice it to say however that the following general practices will followed:

- Developing Hazard material Inventory that contains list of hazardous material used by employees or in store with their manufacturer's name. Hazardous material in store should be categorized according to their compatibility group (acids, bases, compressed materilas, aerosols, inorganic peroxides and heavy metals etc)
- Develop a database for personnel and the type of hazardous operations that encounter in their different work units
- Develop a waste management plan and ensure adherence. The waste management plan should indicate the following; waste handling method, guidelines for waste minimization and segregation and waste disposal guidelines. Method of waste disposal should be attached to their containers, if possible with codes.
- Hazardous equipment inventory which should have the list of such equipment and approved personnel to manage them
- Identify required safety trainings for applicable employees based on the exposure to hazard and the regularity of such training
- Regular review of job operations according to work units and indicate the necessity for PPE

In addition, the hazardous operations shall have written procedures and the following taken into account:

- Handling of emergency
- Notification of authorities
- Safety and environment
- Repair methods and procedures
- Emergency repair material

The site safety officer will be responsible for the implementation of the EHM plan and training.

ES 7.6 Climate Risk Management

The contextual site physical factors of the geographical location shows that hydrology, soil, slopes, etc and artificial factors such as land use, urban development, etc are of relevance. The climate factors likely to affect the road infrastructure is extreme weather event relating to rain, majorly. This is an intrinsic risk source for soil erosions. This could also be enhanced through artificial changes (e.g. soil waterproofing due to urban development or deforestation).

To reduce climate-related risks the is need to mitigate vulnerabilities and minimise consequences with adaption measures. For the road adaptation measures are considered more vital and so the following have been suggested:

- Alter maintenance regimes to target vulnerable sections
- Retrofit existing stormwater infrastructure (e.g. culvert crossings, bridges) to accommodate increasing flow patterns)
- Harden or stabilize slopes subject to increased run off from extreme weather events
- Elevate mechanical and electrical equipment in operations or maintenance facilities (e.g. traffic signals)
- Use waterproof materials
- Utilize permeable pavements for heavy traffic areas, the use of permeable pavement shoulder can be beneficial, especially in highly urbanized areas as provides an alternative for areas that cannot integrate bioretention areas or temporary water storage and serves as a durable and ecological solution to minimize the risk of flooding

ES 7.7 Managing the Treated Gully and Terminal End of the Spillway

- All structural measures used in gully control must be accompanied by vegetative measures to obtain a sound result.
- All structural measures should be completed in the dry season and the accompanying vegetative measures undertaken during the following rainy season.
- Suitable tree seedlings and cuttings must be planted just behind the structural measures.
- Shrub and grass cuttings must be planted between the structural measures.
- Tree and grass seeds should be sown between the structural measures, and on gentle, bare slopes *which* have sufficient soil.
- Gentle slopes which do not need any structural measures should be planted with tree seedlings, and grass and shrub cuttings.
- The stones, which must be hard enough to withstand abrasion, non-disintegrating, and resistant to weathering, are packed inside the boxes. The bigger stones should be put along the sides of the box gabions while the smaller ones are filled in the middle.
- Gabion check dams combined with gabion retaining walls can be used to stabilize landslides
- Since a water body is not less than 1.5 km from the end of the spillway, it should be terminated with dam dug or a weir constructed from a permeable material designed to let the runoff pass through, but trap sediment to provide a seedbed for establishing a stabilising cover on a gully floor/bed; consist of brush, logs, wire netting with straw, or similar material
- At the terminal end of the spillway loose stone check dams made of relatively small rocks could be placed across the gully to control channel erosion along the gully bed, and to stop waterfall erosion by stabilizing gully heads.

ES 7.8 Controlled Gully Maintenance and management

Maintenance for structural measures must be continued for at least two years after the treatment year.

Treated areas must be inspected at least once a year.

The trees and grass established in gully catchment areas must be protected against fire, illegal wood cutting, grazing and encroachment. If the revegetated areas are properly managed for several years after the treatment, some fuelwood can be produced from tree plantations and fodder can be obtained from grass and fodder tree plantations.

ES 7.9 Construction and Control of Earthworks

During construction, earthwork is the most critical stage and the problems of soil erosion and wash off loosen soil materials which will need to be addressed. So, plan the earthworks and implement control measures at the earliest stage and schedule to avoid rainy season and detailed earthworks plan should be endorsed by a professional engineer.

ES 7.10 Neighbourhood Effects Management

The main neighbourhood effects associated with earthworks are noise and dust. Dust from site earthworks and associated activities is major during dry season and minor during rainy. These will be minimised by several measures, including wetting and mulching, to mitigate potential negative effects on neighbours.

Water spraying facilities should be used during construction and wheels of vehicles or machinery used for transportation of construction materials shall be cleaned before leaving the construction site so as not to litter the roads with mud and soil.

Noise from the construction site shall be generated by different activities during construction such as: earth moving vehicles and vehicle movements. Vibration from piling operation not only can cause annoyance but can also cause structural failure risk to nearby buildings.

Noise control can be done by either engineering means, separation of source and receptors or through limiting the hours of operation of the noise source. Engineering methods could be the installation of quiet machines, insulating the machines or providing screens and noise barriers. Generally, noise in the boundary of the construction site shall be controlled so as not to exceed 55 dB(A) at night and 65 dB(A) during the day.

It should be noted that there are no sensitive areas such as hospital, schools, residential and places of worship within the vicinity of the proposed site.

ES 7.11 Mainstreaming Women, Youth and People With Disability Issues

Women, youth and People With Disabilities (PWDs) are at times marginalized in most activities but constitute a very important segment of society. Women are key to ensuring the sensibility and sustainability of the overall project management. Plan to increase sustainable programmes targeted at youths and women as special groups, greater empowerment opportunities.

ES 7.12 Waste Management Plan

During the construction, it is inevitable that discharges of materials to the environment will occur. If these are not controlled, they may act as a source of environmental disturbance or nuisance. The construction activities could yield a variety of waste in the form of construction materials, scrap metal, municipal wastes, etc.

For effective management, contractor should develop a waste management plan approved by SPIU to be used during construction to ensure that all the wastes must be properly identified, minimized, segregated, properly stored, re-used, tracked, monitored and audited. All the wastes that cannot be re-used will be safely managed and disposed off in a manner that meets regulatory requirements. Suffice it to say that solid waste management steps can take the form of:

- Reusable materials sorted and prepared for recycling as much as possible; and
- Small waste streams of residues and specific hazardous waste dealt

with in a sustainable way with good practices.

ES 7.13 Social Integration and Participation

In a human-dominated world, ecosystem services are not generated by ecosystems alone, but by social–ecological systems. In line with their suggestion, it is also recommended that adaptive governance for ecosystem management which employs a social–ecological systems approach be adopted.

Adaptive governance refers to flexible and learning-based collaborations and decision-making processes involving both state and non-state actors, often at multiple levels, with the aim to adaptively negotiate and coordinate management of social–ecological systems and ecosystem services across landscapes. The collaboration should involve:

- building knowledge and understanding of the ecosystem dynamics and services,
- feeding such knowledge into adaptive management practices, and
- dealing with external perturbations, uncertainty, and surprise.

Adaptive governance expands the measures available and provides the coordination and the context for choosing between tools, monitoring their effect, and adjusting them as the social–ecological system evolves.

ES 7.14 Communication, Information and Monitoring

It is important that good relations be maintained with potentially affected local community throughout the duration of project.

Community members should be informed of the intended scope and duration of the project and associated activities well in advance and this has been started and reinforced in the course of this ESIA preparation. They should be kept informed of any changes to scheduling throughout the duration of the different aspect of the phases of the project.

All site contractors, including sub-contractors shall be made familiar with this plan prior to the commencement of any site works.

ES 4.13 Stakeholder engagement plan

In order to ensure a continual engagement with the relevant stakeholders, a Stakeholder Engagement Plan (SEP) has been developed geared towards a robust stakeholder's involvement in the development and implementation of the project throughout the life cycle. A summary of the key element of sustaining stakeholders' support in any project execution embedded in the SEP ABSIIDP is provided in Table 2.

Table 2: Summary of the of Stakeholder Engagement Plan (SEP)

Activity	Stakeholders / Community	Frequency/ Timeline
Prior to Project Commencement		
1. Project email, postal address and phone contact details	All stakeholders	Once-off establishment
2. Briefings on project and environmental (E) and social (S) risks and impacts	State Government, Local Government, Bank	As required, subject to the approval process
3. Site tours	Regulators, Site Committee, community, Bank, etc	As required
4. Personal meetings on project and E and S risks	Targeted stakeholders	As required
5. Community Sessions on	Residents of affected areas/	As required, subject

Table 2: Summary of the of Stakeholder Engagement Plan (SEP)

Activity	Stakeholders / Community	Frequency/ Timeline
project and E and S risks and impacts	Community and interest groups	to approvals route and feedback from the community
6. Develop and disseminate Feedback and Complaints Mechanism and communications procedures	All stakeholders	As required, subject to any updates on the Project
7. Briefings, Site Tours and Community Sessions - for development of the Rehabilitation and Closure Plan	Government authorities, Local communities, • Additional relevant stakeholders	Prior to Work Plan approval
8. Disclosure of Safeguard Reports (RAP and ESIA)	Area of project influence	As required by Federal Ministry of Environment
9. Review of ESIA and RAP Report		As required by Federal Ministry of Environment
Construction and operations		
10. Ongoing community liaison	Local community	Ongoing
11. Project updates and E and S risks	All stakeholders	Monthly
12. Responding to issues and inquiries as per Feedback and Complaints Mechanism	All stakeholders	Ongoing / as required
13. Safeguard reporting	All stakeholders	Monthly reporting during construction and annual reporting duration operation

ES 4.14 Grievance redress mechanism

The Grievance Redress Mechanism (GRM) is designed to address situations of conflicts or disagreements about some of the project activities during construction and operation in the following order:

- All complaints will go to the contractor directly in the first instance.
- Where issues are not addressed, complaints shall be scaled to the Project Manager.
- Where it is perceived that no satisfactory attention was given, then the complainant be given opportunity to provide the grievances to the Project Environmental and Social Safeguard Officer who will relay it to the SPIU if he could not resolve the complaints.
- If, it is considered that issues are not satisfactorily addressed by the Project Environmental and Social Safeguard Officer, the complainant shall be free to approach SPIU Management.
- Informing the relevant government authorities is considered the next step if SPIU Management is seen not to have resolved the arising issues satisfactorily.
- The last but undesirable is reaching the court by settlement of any issues that are not addressed at the previous levels.

- This grievance redress process shall be provided to any person who has complaints or grievances during any phase of the project.

All complaints received should be investigated and a response (even if pending further investigation) is to be given to the complainant within 5 days.

The following information must be provided:

- Time, date and nature of the incident/report.
- Type of communication (e.g., telephone, personal meeting).
- Name, house location and contact telephone number of person making the complaint. If this person wishes to remain anonymous then "not identified" is to be recorded.
- Details of response and investigation undertaken as a result of the incident/complaint.
- Name of person undertaking investigation of the incident/complaint.
- Corrective action taken as a result of the incident/complaint.

The report shall be rendered for both internal (in-house) uses for all phases of the project for internal and external (public) consumption through the regulators.

For a *more detailed grievance procedure based on community grievance committees, it should be noted that the RAP prepared for the project has established resolution mechanism for disputes and complaints, especially in relation to resettlement issues. Kindly refer to this in the RAP.*

ES 7.15 Institutional capacity strengthening plan

Roles and responsibilities

To achieve the success of this ESMP and indeed the overall project outcome, the SPIU) is the implementing body, supervised by the Abia State Ministry of Works, with the mandate to co-ordinate the project programmes and actions; plan, coordinate, manage and develop the various project activities; prepare plans for project management and development. To achieve this mandate, the SPIU shall liaise with the various levels of government and other identified stakeholders with their institutional roles and responsibilities as spelt out in Table below.

Roles and responsibilities

To achieve the success of this ESMP and indeed the overall project outcome, the SPIU) is the implementing body, supervised by the Abia State Ministry of Works, with the mandate to co-ordinate the project programmes and actions; plan, coordinate, manage and develop the various project activities; prepare plans for project management and development. To achieve this mandate, the SPIU shall liaise with the various levels of government and other identified stakeholders with their institutional roles and responsibilities in Table 6.

Table 6: Institutional Responsibilities		
S/No	**Category**	**Roles & Responsibilities**
1.	SPIU	• Implementing authority • Ensure all environmental and social commitments are implemented during the life cycle of the project • Ensure adequate implementation and compliance of the ESMP by all parties • Appoint Environmental and Social Safeguard officer who have the responsibility to ensure compliance with the ESMP and other safeguard documents and provides training schedule on environmental and social matters.
2.	State Ministry of Works and ABSIIDP	• Co-ordinate all policies, programmes, and actions relating to the project • Ensure that the project is carried out in a sustainable manner.
3.	Federal Ministry of Environment (FMEnv)	• Provides lead role on review of draft ESIA report (in liaison with Abia State Ministry of Environment), receiving comments from stakeholders, public hearing of the project proposals and social liability investigations, monitoring and evaluation process and criteria.
4.	Abia State Ministry of Environment	• Review of draft ESIA report (in liaison with Federal Ministry of Environment) • Receiving comments from the public on ESIA report following disclosure • Site assessment and monitoring of ESIA implementation. • Environmental monitoring and compliance overseer at the State level
5.	Other MDAs	• Come in as and when relevant areas or resources under their jurisdiction or management are likely to be affected by or implicated projects such as utility. • Participate in the processes and in project decision-making that helps prevent or minimize impacts and to mitigate them. • Provide consent or approval for an aspect of the project as may be required of.
6.	AfDB	• Assess implementation • Provide implementation support and guidance that ensures sustainability • Recommend additional measures for strengthening the ESMP implementation
7.	Contractor	• Implementation of mitigation measures outlined in the ESMP • Develop a Construction Environmental Management Plan (CEMP) with sub management plans before construction works starts e.g., Oil spill and control management plan, health and safety management plan, risk management and emergency response plan, waste management plan, erosion control management plan • Be responsible for ensuring that all site staff, including sub-contractors and sub-contracted activities comply with the projects ESMP. • Appoint HSE Officer primarily responsible for daily inspection and monitoring of this ESMP and CEMP implementation. • Receive complaints and redress as the first level of redress • Ensure that there are sufficient resources (time, money and people) to manage the environmental issues of the works.
8.	Site Engineers/Supervisors	• Provide oversight function during construction to ensure adherence to good practice and the ESMP
9.	Trade Association/CDAs/CSOs	• Assisting in their respective ways to ensure effective response actions, • Ensure members participation by mobilizing, sensitizing community members;

Table 6: Institutional Responsibilities		
S/No	**Category**	**Roles & Responsibilities**
10.	Direct and Other Stakeholder/Groups	• Ensure social values are not interfered with. • Identify issues that could derail the project • Could complain about project execution manner. • Support project impacts and mitigation measures, Awareness campaigns
11.	Local Community	• Support project implementation by ensuring safety and security of construction workers and materials • Assist and liaise with other stakeholders to ensure works are carried out without hinderance • Participate in practical awareness campaign for the proposed projects, amongst the various relevant grass roots interest groups • Support in monitoring project execution within their domains to ensure compliance with this ESMP and other relevant requirements • Recommend youths from the community that could support the contractor in security matters
12.	Local Government	• Support in monitoring project execution within their domains to ensure compliance with this ESMP and other relevant requirements • Engaged and encouraged to carry out a comprehensive and practical awareness campaign for the project, amongst the various relevant grass roots interest groups.

ES 7.16 Capacity building and institutional strengthening

Based on the interaction with the relevant stakeholders, assessment and determination of the characteristics of all the relevant stakeholders with key roles in the project as well as the assessment of the institutional capacities of the different parties involved in the ESMP implementation, areas of awareness creation and training/capacity building/strengthening have been identified as outlined in Table 7.

Table 7: Capacity Building Activity for institutional Strengthening					
Modules	**Proposed Topics**	**Objectives**	**Target Audience**	**Duration**	**Estimated Budget (N)**
Module 1: Training on the implementation of the ESIA	Overview of Environmental Impact Assessment Overview of Potential Impacts of Project Environmental Pollution & Control Environmental and Social Management Plan Basic Environmental Management Environmental Performance Monitoring – Monitoring Mitigation Measures Environmental Reporting	To enhance competence in environmental sustainability and regulatory practice	SPIU, State Ministries of Agriculture, Environment and Works with contractors and other relevant MDAs	4 days	4.450,000.00
Module 2: Training on Construction HSE	Introduction to Construction HSE Overview of Health and Safety Hazards in Construction Incidents: Causation, Investigation & Reporting Excavation Safety 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 as well as the health of workers and those that will be involved in monitoring.	SPIU, Ministries of Agric, Environment and Works with contractors and other relevant MDAs	4days	3,587,000.00
	TOTAL				**8,037,000.00**

ES 7.17 ESMP implementation Schedule and Budget

In order to effectively implement the environmental and social management measures of the ESIA, an ESMP Implementation Schedule has been provided (Table 8). There are also budgetary provisions for the ESMP components implementation (Table 9).

Table 8: ESMP Implementation Schedule

S/N	Activity Description	Responsible	Pre-Construction	Construction	Post Construction (Operation)
			2-man month	6- man month	Operation life of treated gully
1.	Disclosure of Environmental and Social Assessment Report	ABSIID			
2.	Allocating Budget for ESMP	ABSIID			
3.	Appointing Support Staff for ESMP	ABSIID			
4.	Review and Approval of Contractor's ESMP and Safety Plan	ABSIID			
5.	Finalizing site and layout plan of construction plan	ABSIID			
6.	Implementation of Mitigation Measures	ABSIID, Environmental Consultant & FMEnv			
7.	Supervising ESMP Implementation	ABSIID & Environmental consultant			
8.	Environmental and Social Auditing	ABSIID, Environmental Consultant & FMEnv			
9.	Monitoring & Reporting on ESMP Implementation	ABSIID, Environmental Consultant & FMEnv			
10.	Environmental and Social Training	ABSIID, & Environmental Consultant			

Table 9: Projected costs for implementation of the mitigation measures and monitoring

Item	Responsibility	Cost Estimate in Nigerian Naira (₦)	Cost Estimate in US (US$)
1. Mitigation			
i. Pre-construction Phase		1,200,958.00	1,937.03
ii. Construction Phase		11,285,814.00	18,202.93
iii. Operation and Maintenance Phase		12,000,000.00^	19,354.84^
iv. Decommissioning		4,500.000.00	7,258.06
Total for Mitigation	**SPIU**	**28,986,772.00**	**46,752.86**
2. Monitoring	SPIU	3,050,000.00	4,919.35
3. Training/ Capacity Building	SPIU/Contractor	8,037,000.00	12,963.00
Sub- Total		**40,073,772.00**	**64,635.12**
4. Contingency (10%)		4,007,377.20	6,463.51
Total		**44,080,449.20**	**72,296.50**
5. Involuntary Resettlement*	SPIU	As capture in the RAP	
Exchange rate @620 to $1			

*Please, refer to the RAP prepared for the project ^first year budget

ES 7.18 Record keeping

The type of records from the various management and monitoring programmes shall include completed forms, checklists and maintenance logs, identified problems and corrective actions undertaken and Monitoring data / result. Some other types of records will also be valuable for assisting with the implementation and review such as: Incident forms (especially pollution incidents and response, accidents, etc.), Internal and external communications regarding the implementation of the mitigation measures, Results of internal or external assessments and compliance visits and Quarterly reports on the ESMP implementation submitted to the AfDB.

ES 7.19 Disclosure

All reasonable efforts will be made to disclose the ESIA report with approval from the FMEnv and then AfDB with consideration given to the concerns and inputs of all relevant stakeholders regarding the design, development, and implementation of the project. Indeed an approval has been obtained from the Federal Ministry of Environment Authority to disclose the ESIA.

ES 10 CONCLUSION

This Environmental and Social Impact Assessment (ESIA) report covers the proposed gully erosion control site situated at Itungwa Agburukwe community in Obingwa LGA, Aba City, Abia State.

The ESIA identified significant environmental and social impacts for which the ESMP has been developed. Suffice it to say that the assessment revealed that the proposed project is most desirable because of the obvious environmental, health cum socio-economic benefits, which far outweigh the negative impacts that could arise during and after project implementation. The potential negative implications of sufficient magnitude that could stop the execution of the project are not envisaged. Mitigation measures have been suggested for the identified adverse impacts that could occur due to the activities associated with the proposed project. Mitigation measures and management plans have been offered and developed for the adverse effects as provided in ESMP.

The ESMP is a 'living document' as it is amenable to updates and revisions in the light of current information on the environment and social risk that might be thrown up during the project implementation, as may be necessary. It is imminent that certain factors that would have been overlooked or not considered due to the preparation of the ESMP upstream in the project cycle could crop up during project implementation. Hence the need to review and update based on current field realities.

A third-party Environmental and Social Consultant shall be needed and retained annually to ensure adequate implementation of the ESMP.

Generally, the study has indicated that the proposed project will not severely impact negatively on the existing environmental, social and health as well as safe conditions of the people, locally, nationally or internationally. This inference is further made strong, owing to the fact that a number of the equipment that would be used at the location would be modern equipment and technologies that have the potentials not to constitute further environmental burdens in relation to the present existing environmental conditions.

The adequate implementation of the ESMP will ensure compliance with the country systems and AfDB's ISS and keep with international best practices that will provide environmentally benign, socially acceptable, and culturally appropriate project delivery.

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CHAPTER ONE
GENERAL INTRODUCTION

1.0 Project Background

Gully erosion is an enormous type of environmental degradation which leads to loss of valuable land used for agricultural, domestic, industrial, and aesthetic purposes, as well as loss of property and even human lives. There is no doubt that the menace of gully erosion and flooding has assumed a serious dimension in Nigeria, especial in lowlands, areas below sea level and areas with poor drainage systems and flood management.

The menace has taken its toll on the socioeconomic wellbeing of the people living in the affected area and the state at large such that lands used for aesthetic, agricultural and industrial purposes, ancestral homes, crops, livestock and other infrastructure are everyday lost to the hazard at alarming rate.

In Abia State, the government has been making tremendous efforts to stabilize or prevent gully erosion which is one of the common features of the landscape in the State. To achieve greater efforts in this the Abia State Government, through the Federal Ministry of Finance, representing the Federal Republic of Nigeria, has applied for financing from the **African Development Bank (AfDB)** towards the cost of implementing an **Integrated Infrastructure Development Project** targeted at investments in erosion control, establishment of an integrated waste management and reconstruction/rehabilitation of roads across the states.

1.1 Development Objectives of the Proposed Integrated Infrastructure Development Project

The overall development objectives of the targeted investments supported by AfDB along the three lines of the projects (establishment of an integrated waste management, reconstruction/rehabilitation of roads and erosion controls) include:

- One erosion control site in Umuahia and One erosion control site in Aba and enhance quality of land and accessibility.
- 19 priority roads in Umuahia, covering 92 km and 31 priority roads in Aba, covering 199.69 km to all-weather standard to enhance accessibility and ensure reduction of transport costs, which includes travel time and vehicle operating costs between markets and areas of production; and
- One waste transfer station in Umuahia; and One waste management facility in Aba based on the principle of integrated Waste Management that maximizes efficiency in the use of resources and improvement in sanitation through proper collection and disposal of solid waste

The intervention involves some civil works such as construction of infrastructure and/or stabilization or rehabilitation in and around the gully area. This civil work could result in displacement of farming activities or public infrastructure,

1.2 Proposed Project Location

This Environmental and Social Impact Assessment (ESIA) report covers the proposed gully erosion control project site at Itungwa Agburukwe community in Obingwa Local Government Area, Abia state, Nigeria. Abia State lies between Latitudes 06° 00’ and 04° 45' East and Longitudes 07° 00' and 8° 09' North of the Greenwich Meridian (Figure 1). The State which occupies a landmass of 5,833.77 square kilometres, is about 596 kilometres from Lagos and about 498 kilometres from Abuja.

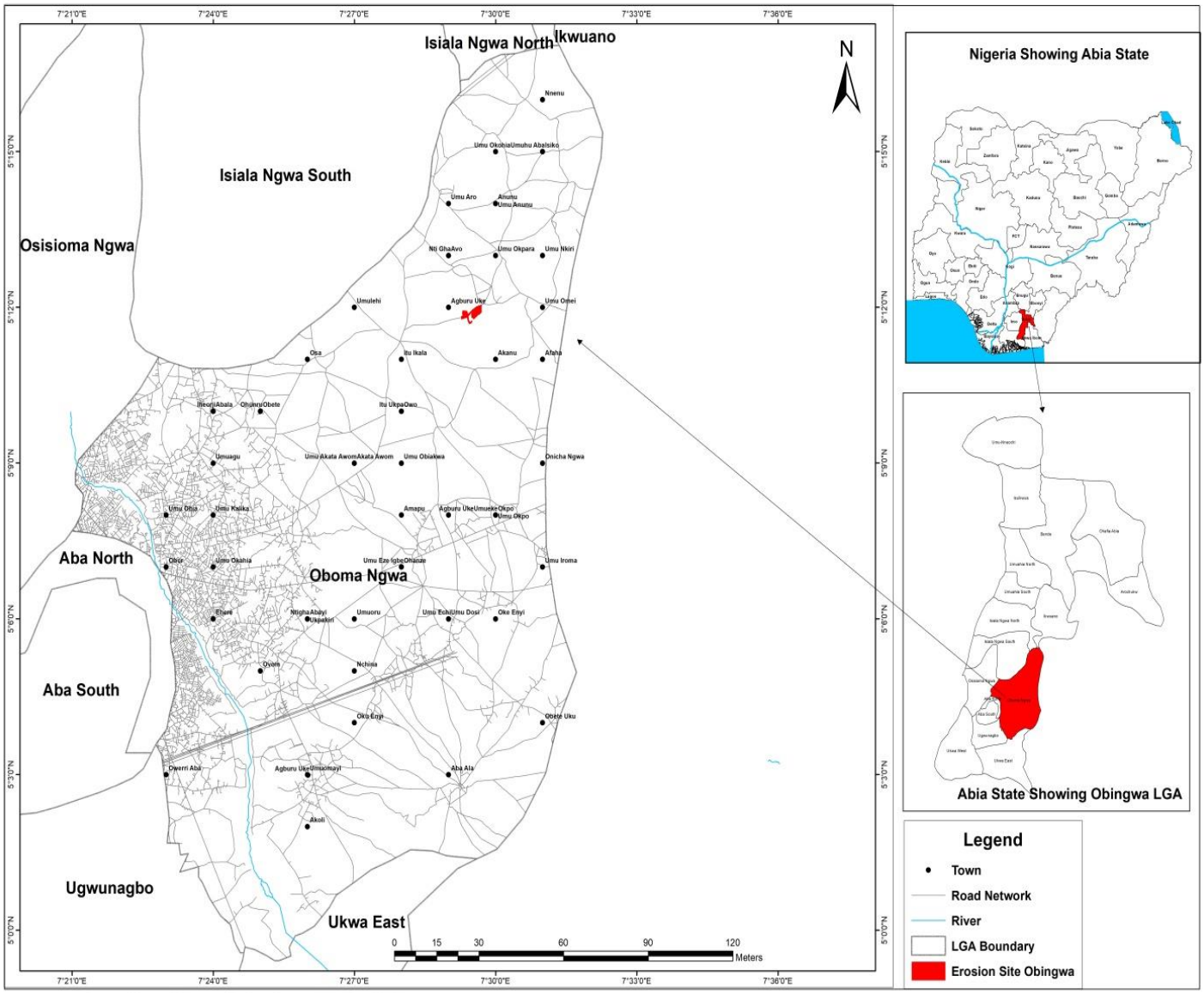


Figure 1.1: Map of Erosion Site in Obingwa L.G.A

1.3 The Project Proponent

The Project proponent is the Abia State Integrated Infrastructure Development Project (ABSIIDP), on behalf of the Abia State Government. with the support of the African Development Bank (AfDB). Under the supervision of the ABSIIDP which is also the State Project Implementation Unit (SPIU), the Abia State Ministry of Works shall undertake the implementation of the project in the State. The Ministry of Works has the responsibilities to

ensure wholesome development of all government infrastructure on behalf of the State Government.

1.4 The Need for ESIA

By design, the proposed erosion control project works shall involve small-sized civil works and use of vegetation for the gully's stabilization, reclamation, protection and reinforcement to stop scouring action of flow water velocity on the exposed soil surface. To this end, the proposed project activities are likely to induce environmental and social impacts that could be positive and/or negative. To provide the framework for gathering and documenting information and views on the environmental and social consequences of the proposed activities so that the importance of the impacts and the scope of enhancing, modifying and mitigating them can be properly evaluated and beneficial decisions made, this Environmental and Social Impact Assessment (ESIA) (also known as Environmental Impact Assessment (EIA)) has been prepared. The ESIA, *inter alia*, is consisted of mitigation, monitoring, and institutional measures to be undertaken during implementation and maintenance of the intervention work to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels.

It should be noted that parallel to preparation of this ESIA, a standalone yet complementary Resettlement Action Plan (RAP), has been prepared to manage issues of involuntary resettlement or displacement that could result from implementation of the intervention work. *The RAP will* ensure the distribution of benefits and opportunities in the communities and among respondents or groups through differentiated measures specially designed to cater to their needs and that of ensuring sustainability. It is advised for further information on the RAP cross-references could be made.

T this ESIA has been prepared to meet the terms of the Environmental Impact Assessment (EIA) Act No 86 (1992) of Nigeria (Act CAP E12 LFN 2004) and fulfil the requirements of Integrated Safeguards System (ISS) of the AfDB before financing of the proposed Project. With these the necessary approvals prior to the implementation of the project are expected to be obtained as it guarantee that the potential environmental and social impacts associated with the development and implementation of the proposed project are identified, assessed and managed properly with a view to ensuring the sustainability.

1.5 Objectives of the ESIA

The aim of the ESIA study is to proactively evaluate the associated, potential and cumulative environmental (including beneficial and adverse) impacts of the proposed project. This is to ensure that the planned activities exert minimal impacts on the environment and the stakeholder communities.

The specific objectives are outlined below:

- Establishment of the existing state of the physical and social environment.
- Identification of the project-sensitive components of the existing physical and social environment within the project area and area of influence.

- Appraisal of the project activities including construction (site preparation and installation), operations and decommissioning that may result in significant modification of any human or natural environmental resources.
- Determination of existing environmental risk of the site/effect of the proposed operational activities on the environment.
- Identification of any impacts that cannot be avoided, and outline ways of enhancing the beneficial ones.
- Recommendation of measures to avoid, ameliorate, or mitigate the identified impacts.
- Establishment of an appropriate Environmental Management Plan (the "EMP") or Environmental and Social Management Plan (the "ESMP") to verify and improve the accuracy of the EIA predictions, control levels for the life of the project; and
- Preparation of a detailed EIA report, presenting clear and concise and information on the environmental impact of the proposed project activities.

1.6 Scope of the ESIA

ESIAs include environmental, social, and consultation elements which are integrated into the planning and decision-making process to avoid, reduce, or mitigate adverse impacts and to maximize the benefits of a proposed Project. The emphasis of the EIA is to produce robust environmental and social management plans which are able to effectively implement the recommended mitigation measures identified in the ESIA, during the life of the Project and at the time of project decommissioning.

Thus, the study includes the identification of valued environmental components (the "VECs") which include elements of the physical, biological or socio-economic environment, including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use that may be affected by a proposed project.

It should be noted that the proposed project includes a phenomenon that involves geomorphic process that occurs only when the threshold in terms of flow hydraulics, rainfall, topography, nature of vegetation, nature of soil/pedology and land use and capability has been exceeded. So only parameters relating to the critical thresholds for the initiation, development and infilling of gullies in the proposed environments were considered.

To develop the baseline status of the Project Site for the proposed project, the study consisted of a series of specific and interrelated tasks, which include:

- Extensive literature review to acquire background information on the environmental characterization and components within the study area;
- Fieldwork and laboratory analysis for the season that shall be approved by the Regulators to cover a number of subjects such as: Noise, Air quality, Water resources, Soil, Climatic and Meteorological conditions of the proposed project area, Socio economic and health impact studies, Waste Management studies, visual impacts, traffic risks, archaeology, biodiversity, etc.
- Identification of Associated and Potential Impact;
- Development of Mitigation Measures;
- Development of Environmental and Social Management Plans; and

- Report preparation and submission.

1.7 The ESIA Preparation Approaches

This ESIA was prepared in accordance with Federal Ministry of Environment ("FMEnv") standard procedures for environmental assessment including the applicable AfDB ISS. The main approach/activity for preparing the ESIA include the following:

a. Screening and Scoping Exercise

As part of the project preparation, a feasibility report had been prepared. This provided the opportunity to understand the need for an ESIA based on the screening that had been carried out and the scope for the ESIA in consultation with the relevant stakeholders. Suffice it to say that the scoping process enabled a preliminary assessment of the potential environmental and social impacts to be considered which have been further elaborated in the various Chapters of this report.

b Literature Review

Review of the existing baseline information and literature material was undertaken and gave deeper understanding of the project and the environmental and social conditions that exist in the proposed Project environment. Among the documents that were reviewed in order to familiarize and deeply understand the project included: Nigeria's National laws and/or regulations on environmental assessments, feasibility report**,** AfDB ISS, Project document, etc.

c. Stakeholder Consultation and Engagement

A wide range of stakeholders which included local communities, CBAs, and statutory bodies as well as other relevant organizations with social, environmental or economic responsibilities and varying interest were engaged through different methods of communications in order to appreciate their concerns, appreciation and support for the proposed project.

The consultation process with different stakeholders' public meetings, leaders in the communities, Focus Group Discussions, etc, latched onto the ongoing process earlier established by the state government with the stakeholders. These were invited or reached through direct contacts, electronic or print media.

At the various gatherings, suffice it to say that overview of the proposed project and appreciation of ESIA were presented. Furthermore, the challenges that could impede the implementation of the project and the support needed from all parties to ensure effective project and successful implementation were also told to the stakeholders.

d. Field Studies

Field Studies were carried out to gather relevant information on the baseline environmental and social conditions, in relation to the project environment. The field work informed the preparation of the existing conditions and any anticipated changes before the start of the project. Attention was paid to the physical environment; biological environment and socio-economic and cultural environment, such as population, land use, planned development activities, community structure, employment and Labour market, sources and distribution of income and cultural properties.

e. Identification of Potential Impacts and Mitigation Measures

The potential impacts were identified through generic and specific assessment of the proposed project site for anticipated changes that could result in the light of the socio-environmental conditions (project-environment interactions).

Mitigation measures are proffered to either eliminate or minimize adverse environmental and social impacts of specific actions, projects or programs while also enhancing positive effects. The approach to mitigation is primarily based on preventive principles of anticipated impacts based on well-known negative outcomes of project-environment interactions.

f. **Environmental and Social Management Plan**

To ensure that environmental and social management objectives and actions are integrated into the Project planning and design based on identified impacts, an Environmental and Social Management Plan was developed. It provides specific description of the impacts identified, mitigation measures as well as the institutional arrangements, i.e., who is responsible for carrying out the mitigating and monitoring measures (for operation, supervision, enforcement, monitoring of implementation, remedial action, reporting) and staff training, Stakeholder Management Plan and Grievance Redress Mechanism, Budget and Schedule of Work, etc.

1.8 Policy, Legal and Administrative Framework

This section concerns the policy, legal and administrative framework within which the ESIA is carried out. It presents the relevant environmental and social policies of Nigeria and AfDB (the Bank). It presents, also, the national legal requirements and related constraints (e.g. practices that may discriminate or exclude any stakeholder group) relevant to the project. It provides information on relevant international environmental/social agreements to which the country is a signatory.

Upfront, it should be noted that the purpose of this is to demonstrate that Abia State Government gives high premium to the legal instruments and is committed to joining other stakeholders towards the path of a sustainable development.

The following provides a summary of the Nigeria governmental entities with responsibility for environmental and social aspects of the project. Other government and administrative entities have environmental and social requirement, but these generally follow from EIA process. An analysis of government stakeholder has been conducted as part of the EIA.

Primary authority for regulation and enforcement of environmental laws rests with the FMENV. In 1999, the FMEnv took over FEPAs function. Today, the FMEnv is the primary authority for regulation and enforcement of environmental laws, specifically the National Environmental Policy (NEP), as revised in 1999, which remains the overarching legislative framework for environmental management in Nigeria.

The National Policy on Environment, 1989 (revised 1999), provides for "*a viable national mechanism for cooperation, coordination and regular consultation, as well as harmonious management of the policy formulation and implementation process which requires the establishment of effective institutions and linkages within and among the various tiers of government – Federal, State and Local Government*".

1.8.1 Federal Institutions

i. National Council on Environment

This is the apex policy-making organ on environment.

The Council:

- Consists of the Minister of Environment, Minister of State for Environment, and State Commissioners of Environment
- Participates in the formulation, coordination, harmonization and implementation of national sustainable development policies and measures or broad national development.

Meets regularly to

- Consider and receive States' reports on environmental management.
- Consider national environmental priorities and action plans as it affects Federal and State governments; and
- Exchange ideas and information where necessary with Federal Government on environmental issues.

ii. Federal Ministry of Environment (FMEnv)

Set up by Presidential Directive No. Ref. No. SGF.6/S.221 of October 12, 1999, and empowered with regulation of all environmental matters protecting, enhancing and preserving the Nigerian environment

In line with her mandate, developed far reaching legal instruments for achieving environmentally sound management of resources and sustainable development across all major sectors of the economy.

Regulatory instruments are enforced through the activities of the following agencies:

- National Oil Spill Detection and Response Agency (NOSDRA) established under Act of 2006 as lead agency on oil spillage matter with clear mandate to administer the National Oil Spill Contingency Plan (NOSCP).
- National Environmental Standards and Regulations Enforcement Agency (NESREA) [with Gazette No. 92, Vol. 94 of 31st July, 2007 with responsibility for the protection and development of the environment, biodiversity conservation and sustainable development of Nigeria's natural resources in general and environmental technology, including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws, policies and guidelines.
- National Park Service of Nigeria is responsible for preserving, enhancing, protecting and managing vegetation and wild animals in the national parks of Nigeria.
- Forestry Research Institute of Nigeria (FRIN) established to develop the nation's manpower, education, training for forestry and agricultural practices.

Developed the procedures for Environmental Impact Assessments (EIA) of all development projects in accordance with the provisions of the Environment Impact Assessment (EIA) Act. No. 86 of 1992 and managed by the Environmental Assessment (EA) Department with the following functions:

- Implementation of the provisions of the Environmental Impact Assessment (EIA) Act of 1992 on development projects.

- Ensure environmental sustainability of development projects through regulation of activities within the oil and gas, mining, infrastructure, agriculture, manufacturing sectors, etc.
- Development of guidelines and standards for environmental quality monitoring, eco-labelling, etc; and Accreditation of environmental laboratories. Implementation of Environmental Audit and Environmental Management System (EMS) in Nigeria.

1.8.2 State Institutions

The State has a number of Ministries, Departments and Agencies (MDAs) relevant to the Project and these include the followings:

i. Abia State Ministry of Environment and Solid Minerals Development

The Ministry of Environment as it was earlier known from inception had the mandate to keep Abia State and its environs clean for healthy living and habitation. It had a VISION to serve as the primary vehicle for the execution of Government plans and programmes towards the rapid environmental transformation of Abia State for sustainable development and a MISSION to formulate policies and co-ordinate action on environmental protection and conservation of natural resources for sustainable development.

The statutory functions and responsibilities of the Ministry of Environment and Solid Minerals Development as it is known today are as follows:

- Environmental Conservation.
- Solid Waste Management
- Environmental Assessment.
- Erosion/ Flood and Coastal Zone Management.
- Afforestation and wildlife Preservation.
- Pollution control and Environmental Health.
- Monitoring of Exploration and exploitation of Solid mineral deposits

The Ministry has an agency named the **Abia State Environmental Protection Agency (ASEPA).** The Abia State Environmental Protection Agency (ASEPA) has the mandate to put measures aimed at enhancing the cleanliness of the State and ensures the enforcement of the relevant laws including the use of mobile courts to prosecute defaulters.

ii. Ministry of Works

The related responsibilities assigned to the Ministry are as follows:

- State roads and bridges (construction and maintenance);
- Regulation of traffic on State roads and bridges.
- Road safety measures and control.
- Infrastructural levies on transport, haulage and franchise;
- Registration of contractors, auctioneers and renewal of licenses;
- Construction and repair of sewage and drainage systems;
- Road Transport Policy;

- Storage of explosives for road construction;

iii. Ministry of Lands Survey and Urban Planning

The related responsibilities assigned to the Ministry are as follows-

- Development and Maintenance of Open Spaces;
- Acquisition of lands for public purposes;
- Registration of title to lands;
- Mapping and Surveying
- Administration of Land Use Decree;
- Town and Country Planning;

iv. Ministry of Public Utilities And Water Supply

The related responsibilities assigned to the Ministry are as follows:

- Water supply in the State;
- Electricity Supply in the State;
- Hydrological Surveys within the competence of the State;

v. Ministry of Works

The related responsibilities assigned to the Ministry are as follows:

- State roads and bridges (construction and maintenance);
- Regulation of traffic on State roads and bridges;
- Road safety measures and control;
- Vehicle Inspection;
- Infrastructural levies on transport, haulage and franchise;
- Registration of contractors, auctioneers and renewal of licenses;
- Construction and repair of sewage and drainage systems;
- Road Transport Policy;
- Storage of explosives for road construction.

vi. Ministry of Local Government and Chieftaincy Affairs

The related responsibilities assigned to the Ministry are as follows:

- Co-ordinate Local Government Matters.
- Appraisal and monitoring Capital Projects of Local Governments;

1.8.3 Local Government

Like the State Government, the Local Government liaise and cooperate with the Federal and State Ministries of Environment to achieve a healthy or better management of the environment within their domains with the relevant byelaws. This is true of the host Local Government Area (Obingwa), where the proposed project is located.

1.8.4 Policy, Legal and Administrative Framework

Environmental protection and management as it relate to projects in various sectors of Nigerian economy are based on provisions of various relevant legal instruments and administrative frameworks. They include:

- Relevant laws, rules, regulations, guidelines and standards at National, State and Local Governments level.
- International Environmental agreements, treaties and conventions ratified by the Federal Republic of Nigeria.
- Development Partners policies such as that of the African Development Bank (AfDB) and/or International Finance Corporation.

These are highlighted below. Meanwhile, suffice it to say that the purpose of this is to demonstrate that the Project Proponent gives high recognition to the legal instruments and is committed to joining other stakeholders towards the path of a sustainable development. Specifically, the Project Proponent understands that environmental, social and economic are the three pillars of sustainable development and thus a review of the relevant polices and legal instruments will provide proper guidance in meeting the relevant tenets in the execution of the proposed project as regards environmental and social risks as well as health and safety risks of the Project.

Thus, is appropriate to say upfront that the Proponent is committed to ensuring the best practice with regard to Environmental and social as well as health and safety risk management of all persons likely to be affected by the project activities, including employees, contractors working on sites, and visitors to the site and the environment itself.

The major national and international regulatory instruments relevant to the proposed project are outline below:

1.8.4.1 Federal Policy/Legislations

i. Constitution of the Federal Republic of Nigeria (1999)

This serves as the national legal order, which recognizes the importance of improving and protecting the environment and makes provision for it.

Section 17 (1) CFRN 1999 says "exploitation of human or natural resources in any form whatsoever for reasons, other than the good of the community, shall be prevented."

Section 20 makes it an objective of the Nigerian State to improve and protect the air, land, water, forest and wildlife of Nigeria.

Section 12 establishes, though impliedly, that international treaties (including environmental treaties) ratified by the National Assembly should be implemented as laws in Nigeria.

Section 33 and 34, which guarantee fundamental human rights to life and human dignity respectively, have also being argued to be linked to the need for a healthy and safe environment to give these rights effect.

ii. National Policy on Environment

The National Policy on Environment, 1989 (revised 1999), provides for "a viable national mechanism for cooperation, coordination and regular consultation, as well as harmonious management of the policy formulation and implementation process which requires the

establishment of effective institutions and linkages within and among the various tiers of government – federal, state and local government". Prior to the launching of this policy, there was no unified coordination of activities of the 3 tiers of government responsible for the environment.

The thrust of the policy is the achievement of sustainable development in Nigeria. Guidelines and strategies are therefore defined for:

- Securing for all Nigerians a quality of environment adequate for their health and well-being.
- Conserving and using the natural resources for the benefit of present and future generations.
- Restoring, maintaining and enhancing the ecosystem and ecological processes essential for the preservation of biological diversity.
- Raising public awareness and promoting understanding of the essential linkages between the environment, resources and development; and
- Cooperation with other countries, international organizations and agencies to achieve optimal use of trans-boundary in order to prevent environmental recourses.

Further, the defined guidelines and strategies provide for the effective management of the environment in the following 14 major areas: Human population; Land use and soil conservation; Water resources management; Forestry, wildlife and protected areas; Marine and coastal area resources; Toxic and hazardous substances; Energy production and use; Air pollution; Noise pollution; Working environment (occupational health and safety); and Settlements, recreational space, greenbelts monuments and cultural property.

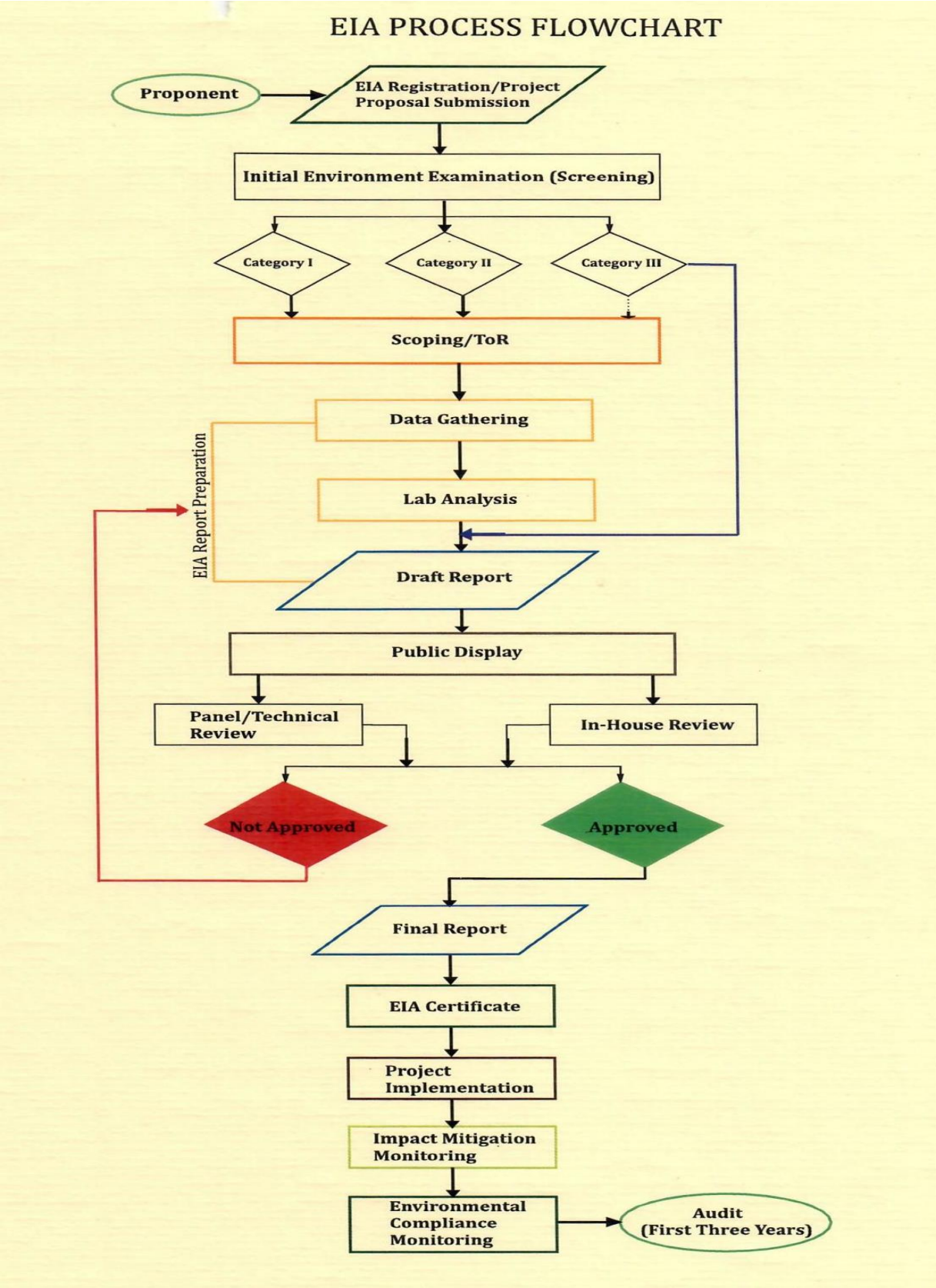
iii. Environmental Impact Assessment (EIA) Act No. 86 of 1992 (now EIA Act CAP E12 LFN 2004) This act stipulates that the public or private sector of the economy shall not undertake or embark or authorize projects or activities without prior consideration, at an early stage of their environmental effects. The Act set out the procedures to follow in the execution of EIA in Nigeria (Fig. 1.5). Procedurally, before commencement of an ESIA, the FMEnv issues a letter of intent on notification by the proponent, to approve the terms of reference and ensure public participation.

The ESIA Act requires that development projects be screened taking cognizance of the nature, size, and sensitivity of the proposed project environment as well as the potential impacts of the Project.

Based on the screening, a full, partial, or no ESIA may then be required, according to the following categories:

- Category I: projects that require a full ESIA.
- Category II: projects that may require only a partial ESIA, which will focus on mitigation and Environmental planning measures, but if located near an environmentally sensitive area then a full ESIA is required; or,
- Category III: projects considered having "essentially beneficial impacts" on the environment, thus only an Environmental Impact Statement is prepared.

This categorization is based on the environmental and social risks and impacts of a proposed in relation to the magnitude of the risks and impacts.
The proposed project has been assessed as Category I by the FMEnv based on the site visit/verification conducted by the representatives of Regulators.
Supplement to the EIA Act exist in the form of Sectoral Guidelines



Source: Adopted from FMEnv, 2021

Figure 1.2: Overview of the Nigeria EIA Process

iv. National Environmental Standards and Regulations Enforcement Agency

The Federal Government in line with Section 20 of the 1999 constitution of the Federal Republic of Nigeria established the National Environmental Standards and Regulations Enforcement Agency {NESREA} as a parastatal of the Federal Ministry of Environment.

The bill for an act establishing the agency was signed and published in the Federal Republic of Nigeria Official Gazette No.92, Vol. 94 of 31st July 2007, By the NESREA Act; the Federal Environmental Protection Agency Act Cap F 10 LFN 2004 was repealed. NESREA has responsibility for the protection and development of the environment, biodiversity conservation and sustainable development of Nigeria's natural resources in general and environmental technology including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws policies and guidelines.

NESREA has the mandate to enforce compliance with laws, guidelines, policies and standards on environmental matters.

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

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

Section 27 prohibits, without lawful authority, the discharge of hazardous substances into the environment.

The Act also enables the Agency also:

Prohibit process and use of equipment or technology that undermine environmental quality.

Conduct field follow-up of compliance with set standards and take procedures prescribed by law against any violator.

Environmental Impact Assessment (EIA) Decree No. 86 of 1992
The National Guidelines and Standards for Environmental Pollution Control in Nigeria (March 1991), which is the basic instrument for monitoring and controlling industrial and urban pollution.
In a notice in the Federal Government Official Gazette No. 92, Vol. 94 of 31st July 2007, the establishment of this Agency was published. The Agency, a parastatal under the supervision of the Federal Ministry of Environment was established by an Act of the National Assembly, National Environmental Standards and Regulations Enforcement Agency (Establishment) Act, 2007. The Agency has responsibility for the protection and development of the environment, biodiversity conservation and sustainable development of Nigeria's natural resources in general and environmental technology, including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws, policies and guidelines.
Some NESREA regulations include:

National Environmental (**Sanitation and Wastes Control)** Regulations, 2009. S. I. No. 28. The purpose of this Regulation is to provides the legal framework for the adoption of sustainable and environment friendly practices in environmental sanitation and waste management to minimize pollution.
National Environmental **(Ozone Layer Protection)** Regulations, 2009. S. I. No. 32. These provisions seek to prohibit the import, manufacture, sale and the use of ozone-depleting substances.
National Environmental **(Noise Standards and Control)** Regulations, 2009. S. I. No. 35. The main objective of the provisions of this Regulation is to ensure tranquility of the human environment or surrounding and their psychological well-being by regulating noise levels.
National Environmental (**Coastal and Marine Area Protection**) Regulations, 2010. S. I. No 18. This Regulation provides for the regulatory framework for the application of preventive, precautionary and anticipatory approaches so as to avoid degradation of the coastal and marine environment
National Environmental (**Construction Sector)** Regulations, 2010. S. I. No. 19. The purpose of these Regulations is to prevent and minimize pollution from Construction, Decommissioning and Demolition Activities to the Nigerian Environment.
National Environmental **(Control of Vehicular Emissions from Petrol and Diesel Engines)** Regulations, 2010. S. I. No. 20. The purpose of these regulations is to restore, preserve and improve the quality of air. The standards contained herein provide for the protection of the air from pollutants from vehicular emission.
National Environmental (**Surface and Groundwater Quality Control)** Regulations, 2010. S. I. No. 22. The purpose of this Regulation is to restore, enhance and preserve the physical, chemical and biological integrity of the nation's surface waters, and to maintain existing water uses.

Box 1.1 Some National Legal Instruments on Environment

v. Nigeria Climate Act, 2021

In 2021, Nigeria got a new Climate Change Act. This is the first legislation in the country's history dedicated to tackling climate change, and one of the first in Africa. The new Act establishes a powerful National Council on Climate Change, that will be a corporate entity, and make policies, regulations, guidelines, institute penalties (including fines).

The new Council, which will be chaired by the President, with the Vice President as Vice Chair, will also administer the new Climate Change Fund as well as oversee, working with relevant partners, the implementation of Carbon Emission Trading and a Carbon Tax in Nigeria.

It will also produce and revise Nigeria's National Climate Change Action Plan, every five years. Under the Act, the Federal Ministry of Environment, working with the Federal Ministry of Budget and National Planning, is mandated to set a 'Carbon Budget' for Nigeria, which is basically the allowable/acceptable quantity of greenhouse gases in the country, per time. In addition, it will have a responsibility to conduct public communications and engagement on Climate Change and related matters in Nigeria.

The new Climate Change Act, 2021 requires private entity with at least 50employees to put in place a plan that will support in carbon reduction annually (Part VI, Section 24). It should be noted that Nigeria submitted its Third National Communication in 2020 and Nationally Determined Contribution (NDC) to the UNFCCC in 2016 and its Updated NDC in 2021. These outline the country's efforts to promote adaptation and mitigation actions which are economically efficient and socially desirable as it achieves climate change benefits

vi. 2050 Long-Term Vision for Nigeria (LTV-2050)

Towards the Development of Nigeria's Long-Term Low Emissions Development Strategy (LT-LEDS, Nigeria developed the Long-Term Low Emission Vision to 2050. (FINAL NIGERIA LT VISION_2050_Nov2021.pdf (unfccc.int)). This vision which was developed by Natural Eco Capital Limited (a sister company of MDS), is designed to promote sustainable development and guarantee climate-proofed economic development. The LTV is in tandem with medium-term (2021-2025) and long-term (Agenda 2050) national development plans.
Nigeria's 2050 Long-Term Low Emission Vision document is a demonstration of the nation's commitment to play a leading role in the implementation of the Paris Agreement.

1.8.4.2 Nigerian Social Legislation
In the consideration of Nigerian social legislation, the acts and/or policies considered to be relevant to the proposed Project include:

1. Labour Act Cap L1, LFN 2004: The Labour Act is the primary law protecting the employment rights of individual workers. The Act covers protection of wages, contracts, employment terms and conditions, and recruitment; and classifies types of workers and special workers.
2. Violence Against Persons (Prohibition) Act, 2005: The Violence Against Persons (Prohibition) Act (VAPP) was passed into law in May, 2015. The Act was necessitated as a result of agitations for protection of persons against different forms of violence. The Act has strengthened advocacy against rape, female genital mutilation, partner battery, stalking, harmful widowhood practices while prohibiting all forms of violence, including physical, sexual, psychological, domestic, harmful traditional practices and discrimination against persons. It also provides maximum protection and effective remedies for victims and punishment of offenders.

3. National Gender Policy, 2006

Nigeria put together the National Gender Policy in 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:

- 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;
- 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.

4. Land Use Act of 1978, CAP 202, LFN 2004

The Land Use Act places the ownership, management and control of land in each state of the federation in the Governor. Land is therefore allocated with his authority for commercial, agricultural and other purposes. The Land Use Act of 1978 states that'… It is also in the public interest that the rights of all Nigerians to use and enjoy land in Nigeria and the Natural fruits thereof in sufficient quality to enable them to provide for the sustenance of themselves and their families should be assured, protected and preserved'. This implies that acts that could result in the pollution of the land, air, and waters of Nigeria negates this decree, and is therefore unacceptable.

5. Nigerian Urban and Regional Planning Act, CAP N138, LFN 2004

Aimed at overseeing a realistic, purposeful planning of the country to avoid overcrowding and poor environmental conditions

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

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

Section 72 provides for the preservation and planting of trees for environmental conservation.

1.8.4.3 Some Specific Regulatory Framework and Agencies on Disaster Management

In Nigeria, the primary, legal framework for the management of disaster in Nigeria is based on the provisions of the Constitution of the Federal Republic of Nigeria, 1999. Section 20 of the 1999 Constitution of the Federal Republic of Nigeria provides for the protection improvement of the environment, safeguarding the water, air, land, forest and wildlife in Nigeria. Some of the relevant regulations have been outlined in Box 2.

Meanwhile, it is relevant to note the following agencies:

The National Disaster Management Framework (NDMF)

This provides the mechanism that serves as a regulatory guideline for effective and efficient disaster management in Nigeria. The framework defines measurable, flexible and adaptable coordinating structures, and aligns key roles and responsibilities of disaster management stakeholders across the nation. It describes specific authorities and best practices for managing disasters, and explains a paradigm shift in disaster management beyond mere response and recovery. The NDMF offers a holistic approach to disaster management. It serves as a legal instrument to address the need for consistency among multiple stakeholders. It is a coherent, transparent and inclusive policy for disaster management in Nigeria.

Ecological Fund

The Ecological fund is an intervention Fund by the Federal Government of Nigeria to address the multifarious ecological challenges in various communities across the Country.

This special fund was established in 1981 through the Federation Account Act 1981 with Decree 36 of 1984 and 106 of 1992 as well as the allocation of Federation Account modification order of 2002 subsequently modified the act. The Fund which was originally constituted one percent (1%) of the Federation account was reviewed to 2% in 1992, and later 1% of the derivation allocation was added, thus bringing the total percentage to three percent (3%).

The prime objective of this initiative was to have a pool of fund that would be solely devoted to the funding of ecological projects to ameliorate serious ecological problems nationwide

Nigeria Meteorological Agency (NiMET)

The Nigerian Meteorological Agency (NIMET) came into existence by an Act of the National Assembly- NIMET (Establishment) ACT 2003, enacted on 21st May 2003, and became effective on 19th June 2003 following Presidential assent.

The agency has the mandate of observing, analyzing, timely and accurate reporting of weather and climate information for socio-economic development and safety of lives and property.

Nigeria Hydrological Services Agency (NIHSA)

The Nigeria Hydrological Services Agency (NIHSA) is a governmental Agency established under the Federal Ministry of Water Resources. The Act for the establishment of the Nigeria Hydrological Services Agency was signed into law by the President on the 27th day of August, 2010. The mandate of the organisation include:

To provide services required for assessment of the nation's surface and groundwater resources in terms of quantity, quality, distribution and availability in time and space; for efficient and sustainable management of the resources.

To operate and maintain hydrological stations nationwide and carryout groundwater exploration and monitoring using various scientific techniques in order to provide hydrological and

hydrogeological data needed for planning, design, execution and management of water resources and allied projects.

Nigeria's National Emergency Management Agency (NEMA)

This is the federal body responsible for overseeing disaster response and management with state level counterparts

Other Concerned Government Agencies

In addition to the corresponding federal level institutions, a number of key state institutions involved in soil erosion and watershed management include:

(i) the State Ministry of Works;
(ii) the State Ministry of Water Resources (SMWR), with the River Basin Development Authorities (RMDAs), the State Integrated Water Resources Management Commission, the State Hydrological Services Agency, and the State Water Resources Institute;
(iii) the State Ministry of Agriculture and Rural Development (SMARD), with the multi-sector State Sustainable Land Management Committee;
(iv) the State Emergency Management Agency; and
(v) State Ministry of Environment.

1.8.4.3 State Policies, Legislations and Standards

Abia State has a number of policies and pieces of legislations designed to promote a safe and clean environment as outlined in Table 1.1

Table 1.1: Abia State Environmental Policies, Legislations and Standards

Instrument	Year	Focus
Abia State Basic Environmental Law No. 1.	2004 amended in 2013	This law creates the Abia State Environmental Protection Agency (ASEPA) and establishes the basic environmental sanitation practice for the State
Abia State Policy on Environment.	2010	This policy encourages community participation in environmental issues and ensures sustainable management of the Abia environment through cooperation with the Federal government of Nigeria.
Abia State Flood and Erosion Control and Soil Conservation	2010	This promotes sustainable land use management by minimizing soil erosion and flooding hazards
Abia Riverine Area Management Policy	2010	This policy is set to minimize riverine erosion and other forms of riverine degradation
Abia State Watershed Management Policy	2010	This policy enables the commencement of co-ordinated/holistic/integrated management of natural resources

Table 1.1: Abia State Environmental Policies, Legislations and Standards		
Instrument	**Year**	**Focus**
Abia State Flood and Erosion Control Management Support System	2010	The policy supports a reliable up-to-date database and integrated management system as tools to support all erosion and control programs
Abia State Flood Control and Water Conservation	2010	This policy ensures the forecast, prevention, monitoring and flood management
Abia State Waste Management Law and Waste Management (Enforcement and Offences) Provisions Regulations	2002	Enforces the relevant Regulations
Abia State Environmental Protection Agency Law, Cap50, Vol. 2, Laws of Abia State	2006	ensures the compliance of any development project with Environmental Impact Statement (EIS), State planning permits and regulations guiding development;
Abia state Ministry of Physical Planning and Urban Development law	1999	guides planning principles and practice in the state
Abia State Environmental Protection Agency Law Cap 14 of 27th July, 1994	1994	contains Solid Waste Management regulation with provisions on environmental standards and penalties for violation.

1.8.4.4 Local Government Regulations

The Local Government, without any specific laws on environmental management, is charged with the following responsibilities, inter alia:

- Coordinating the activities of Local Government Council.
- Maintenance of Law and Order in collaboration with Law Enforcement Agencies.
- Collection of taxes and fees.
- Establishment and maintenance of cemeteries, burial grounds and homes for the destitute or infirm
- Establishment, maintenance and regulation of markets, motor parks and public conveniences.
- Construction and maintenance of roads, streets, drains and other public highways, parks, and open spaces.
- Naming of roads and streets and numbering of houses.
- Provision and maintenance of public transportation and refuse disposal.
- Registration of births, deaths and marriages.

1.8.5 Multilateral Environmental Agreements

Nigeria is a signatory to a number of conventions on sustainable development and is a member of various bilateral and multilateral organizations. Some of the relevant development partners in

this project are African Development Bank, the World Bank and a number of United Nations agencies.

(i) United Nations Guiding Principles on the Human Environment

The United Nations (UN) published the concept of Guiding Principles on the Human Environment in 1972. Ten of these Guiding Principles were defined as formal declarations that express the basis on which an environmental policy can be built, and which provide a foundation for action.

(ii) The Rio Declaration on Environment and Development

The UN Conference on Environment and Development met at Rio de Janeiro in June 1992, at which time it reaffirmed the 1972 declaration on the Human Environment and sought to build upon it. This was done with the goal of establishing a new and equitable global partnership through the creation of new levels of cooperation among states, key sectors of societies and people. It was also to aid work towards international agreements, which respect the interests of all, protect the integrity of the global environmental development system, and recognize the integral and interdependent nature of the earth.

The UN Conference on Environment and Development 1992, Principle 17 of the Final Declaration is dedicated to ESIA and states: *"Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority."*

The consequence of this is that the United Nations agencies concerned in various ways with people and the environment adopted impact assessment as a central tool to support decision-making.

(iii) Agenda 21 – United Nations Conference on Environment and Development

The United Nations Conference on the Environment and Development (UNCED) in 1992 led to the adoption of Agenda 21, which recommends a set of measures for waste management.

The recommendations may be summarized as follows:

Prevent and minimize waste production.

Reuse or recycle the waste to the extent possible.

Treat waste by safe and environmentally sound methods.

Dispose of the final residues by landfill in confined and carefully designed sites.

Agenda 21 also stresses that any waste producer is responsible for the treatment and final disposal of its own waste; where possible; each community should dispose of its waste within its own boundaries.

(iv) Some Relevant Principles

The precautionary principle is a key principle governing health and safety protection. When the magnitude of a particular risk is uncertain, it should be assumed that this risk is significant, and measures to protect health and safety should be designed accordingly.

The duty of care principle stipulates that any person handling or managing hazardous substances or related equipment is ethically responsible for using the utmost care in that task.

(v) Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts (WIM)

The Warsaw International Mechanism for Loss and Damage promotes the implementation of approaches to address loss and damage associated with climate change impacts, in a comprehensive, integrated and coherent manner (See decision 2/CP.19 for the details). The mechanism is established under the United Nations Framework Convention on Climate Change to assist developing countries that are particularly vulnerable to the adverse effects of climate change by:

Enhancing knowledge and understanding of comprehensive risk management approaches to address loss and damage

Strengthening dialogue, coordination, coherence and synergies among relevant stakeholders

Enhancing action and support, including finance, technology and capacity-building

Through these functions, the mechanism implements Article 8 of the Paris Agreement.

Article 8 of the Paris Agreement notes that "Parties recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage."

The Paris Agreement in Paragraphs 48–52 (Loss and Damage) of Decision -/CP.21reaffirmed the Warsaw International Mechanism for Loss and Damage as the main vehicle under the UNFCCC process to avert, minimize and address loss and damage associated with climate change impacts, including extreme weather events and slow onset events.

(vi) Paris Climate Change Agreement

The Paris Climate Agreement represent that the climate deal or host communityt sponsored by the United Nations to bring the world's countries together in the fight against climate change. Participating nations made a historic host community on Dec. 12, 2015, in Paris, France, to adopt green energy sources, cut down on greenhouse gas emissions and limit the rise of global temperatures (as mentioned in the overall mission).

Under the Paris Agreement, which went into effect on Nov. 4, 2016, every country has an individual plan (or "Nationally Determined Contributions (NDC)") to tackle its greenhouse gas emissions

Nigeria's initial NDC captured five key sectors, namely: Energy(power), Transport, Industries, Oil and Gas, and Agriculture submitted to UNFCCC in 2015. Nigeria revised her NDC and submitted to UNFCCC in 2021 with two additional sectors (water and waste). This raised Nigeria's ambition by including emissions reductions from the waste sector (alongside water sector) for the first time and increasing its conditional contribution to 47% on international support with unconditional contribution still remain ing20% below business-as-usual by 2030.

(vii) UN Sustainable Development Goals

The Sustainable Development Goals (SDGs) (or Global Goals for Sustainable Development) are a collection of 17 global goals set by the United Nations Development Programme (Box 1.6). The formal name for the SDGs is: "Transforming our World: the 2030 Agenda for Sustainable Development," shortened to "2030 Agenda." The goals are broad and interdependent, yet each has a separate list of targets to achieve. Achieving all 169 targets would signal accomplishing all 17 goals. The SDGs cover social and economic development issues including poverty, hunger, health, education, global warming, gender equality, water, sanitation, energy, urbanization, environment and social justice.

1.8.6 International Best Practice Standard and Guidelines

International institutions provide guidance on their requirement for the EIA/ESIA process and place particular emphasis on achieving sustainable environmental social and health outcomes, such international institutions also provide environmental standard and limits for emission and discharges. The overall project design and its EIA are based on relevant guidelines published by World Bank and therefore are expected to meet the environmental requirement of international institutions.

A. Voluntary international standards

Voluntary international standards provide the frameworks and guidelines to improve governance and transparency of companies and governments. This is aimed at ensuring sustainable development for communities impacted, especially by the extractives industry. The main organizations which lead in the development of voluntary international standards include International Organization for Standardization (ISO), United Nations (UN), International Labor Organization (ILO), Organization for Economic Cooperation and Development (OECD) and Global Reporting Initiative (GRI).

International standards can be largely grouped into the following four categories: Certification Schemes, Codes, Standards and Guidelines, Initiatives, and International Frameworks. Examples include the Equator Principle and the Environmental Management System (ISO 14001) or Social Responsibility (ISO 26000) to which project could potentially voluntarily subscribe. Further information on these is awash on the internet. Thus, only EQ is further discussed below as the proposed project sees this as one of such standards to adhere.

b. ISO26000, Guidance on Social Responsibility

The International Organization for Standard's ISO 26000 specifies standards for social responsibility. The guidance is broad in that it can be applied to any sector. Like other ISO standards, the guideline does not replace technical requirements.

c. International Labour Standards on Occupational Safety and Health

The ILO Constitution sets forth the principle that workers must be protected from sickness, disease and injury arising from their employment. The ILO has adopted more than 40 standards specifically dealing with occupational safety and health, as well as over 40 Codes of Practice. Nearly half of ILO instruments deal directly or indirectly with occupational safety and health issues.

Some of the Key instruments on occupational safety and health include the following:
Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)
Occupational Safety and Health Convention, 1981 (No. 155) and its Protocol of 2002
Occupational Health Services Convention, 1985 (No. 161)
Working Environment (Air Pollution, Noise and Vibration) Convention, 1977 (No. 148)

1.8.7 AfDB'S Integrated Safeguards System - Policy Statement and Operational Safeguards

In December 2013 the Bank unanimously adopted the Integrated Safeguards System (ISS), which is the cornerstone of its strategy to promote growth that is socially inclusive and environmentally sustainable. This, in turn, fully supports the Bank's Ten-Year Strategy 2013-2022.

The ISS promotes best practices and also encourages greater transparency and accountability. It provides a process for the people, especially the most vulnerable communities, to express their views by providing project-level grievance and redress mechanisms. The Bank's ISS has been developed through extensive consultations. In particular, five regional workshops—in Nairobi, Lusaka, Libreville, Abuja and Rabat—provided the Bank with an opportunity to listen to and address concerns raised by various stakeholders, including civil society. *It should be understood the ISS is currently undergoing stakeholders review processes across the continent.*

The AfDB has adopted a series of five Operational Safeguards (OS), outlined here below:
OS1 sets out the Bank's overarching requirements for borrowers or clients to identify, assess, and manage the potential environmental and social risks and impacts of a project, including climate change issues.
OSs 2-5 support the implementation of OS1 and set out specific requirements relating to different environmental and social issues, including gender and vulnerability issues, that are triggered if the assessment process reveals that the project may present certain risks.

The environmental and social assessment covers all relevant direct and indirect cumulative and associated facility impacts identified during the scoping phase, including any specifically covered in OSs 2-5, for which there are specific requirements:
OS 2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation
OS 3: Biodiversity and Ecosystem Services
OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency
OS 5: Labour Conditions, Health and Safety

More broadly, these operational safeguards which have been triggered by the proposed project activities are outlined in Table 1.2.

Table 1.2: AfDB Operational Safeguards (OS) and Proposed Project Activities	
AfDB OS	Proposed Project Activities
i. Operational Safeguard 1 (OS 1)	

Table 1.2: AfDB Operational Safeguards (OS) and Proposed Project Activities	
AfDB OS	Proposed Project Activities
This is the main safeguard that guides environment and social assessment as well as climate issues. The safeguard governs the process of determining a projects environment and social assessment requirement. OS is designed to identify, access and manage potential environment and social risks and impacts including climate change issues. More specifically, OS1: i) Identify and assess risks and impacts, (ii) Avoid and/or minimize, risks and impact, (iii) Provide for stakeholders participation, (iv) Ensure effective management of risks and impacts, and (v) Contribute to capacity building elements.	The nature of the proposed project activities require that this ESIA be undertaken with an ESMP to be implemented.
ii. Operational Safeguard 2 (OS 2)	
The safeguard focuses on involuntary resettlements, land acquisition, population displacements and requirements and compensation. It consolidates the policy commitment and requirements on involuntary resettlements and incorporates improvements operational effectiveness.	Means of livelihoods (crops) are considered to be downstream of the gully. Suffice it to say the project activities could impact this and this considered relevant hence a RAP was prepared alongside the ESIA
iii. Operational Safeguards 3 (OS 3)	
This safeguard is designed to govern biodiversity and ecosystem services for the conservation and promotion of sustainable use of natural resources. Among the focus is on the integrated water resources management where commitments translated into operational requirements.	The proposed work will require vegetation removal and revegetation, either by natural processes or by critical area planting. Thus this is also interfered with and the The ESIA has developed measures to deal with arising impacts.
iv. Operational Safeguard 4(OS 4)	
OS4 governs pollution prevention and control, hazardous materials, and resource efficiently. It covers a wide range of impacts arising from pollution, wastes, and hazardous materials and particularly those under international conventions and regional standards. This also includes greenhouse accounting. The OS4 principles also support OS1 described above.	Since this support OS1 and waste are likely to be generated by the intervention work, aspects of OS4 in relation pollution prevention and waste management are considered relevant in the course of works. The ESIA has developed measures to deal with arising impacts.
v. Operational Safeguard 5 (OS 5)	
Labour conditions, health and safety are a major concern in projects. The Bank therefore, has established OS 5 to address requirements concerning works conditions, rights and protection from abuse and/or exploitation.	The use of labour requires that this OS5 be taken into cognisance in the course of work. The ESIA has developed measures to deal with arising impacts.

1.8.8 Making the EIA Responsive to Good Practice

In order to make the EIA responsive to the objectives of good practice, the Nigeria's EIA requirements and the AfDB ISS on ESIA **were** harmonized as far as possible (Table 2.3).

The principles inherent in the environmental and social standards of the DP Safeguard System on Environmental Assessment are in tandem with the FMEnv EIA procedures and processes. For instance, AfDB/IFC categorization of EA as A, B, & C corresponds in principle with the Nigeria EIA requirements of Category I, II and III, which in actual practice is done with regard to the level of impacts associated with a given project.

However, in the event of divergence between the two, FMEnv, on one hand, and the development safeguard system on the other hand, the more stringent, environmentally and socially speaking, shall take precedence in the execution of the project and utilization of the ESIA instrument for project implementation

Table 1.3: A Summary of the Procedure of Nigeria ESIA & AfDB ESIA

EIA/ESIA* Stages	NIGERIA EIA	AfDB ESIA	Remarks
EIA/ESIA	Environment Impact Assessment	Environmental and Social Impact Assessment	Mean but the same thing in this report
Notification/ Project proposal	Required	Required	TOR for concurrence/approval
Screening/ Categorisation	Category I, II, &III	1, 2, &3	Does the project require an ESIA? Corresponds in principle - done with regard to the level of impacts associated with a given project
Scoping (ToR)	Required	Required	What issues and impacts should the ESIA address?
Environmental baseline studies	Required	Required	Data gathering, Laboratory Analysis. Etc.
Assessment of Project Alternatives	Required with project justification	Required	Required for "A"; discussions of alternative for project sites; "do nothing" scenario
Description of Impact Assessment and Mitigation Measures	Required	Required	Ensures socio-environmental factors are carefully managed throughout the project cycle via mitigation, monitoring and institutional measures
Public consultation	Required	Required	All relevant information and the consultation findings considered in reaching a decision on the proposed project
Review/Disclosure	Required	Required	EIA/ESIA Report displayed at appropriate locations for relevant public members'

Table 1.3: A Summary of the Procedure of Nigeria ESIA & AfDB ESIA			
EIA/ESIA* Stages	**NIGERIA EIA**	**AfDB ESIA**	**Remarks**
			comments. FMEnv may call for public session and display by the Bank
Environmental & Social Management Plans (ESMP)	Required	Required	
Monitoring and Auditing	Required	Required	feedback to the ESIA - Project situation versus after the project situation - Monitoring plan with specific indicators, frequency of measurements, estimated costs, institutional responsibilities

**EIA/ESIA in this report mean but the same thing in application*

1.8.9 Proposed Project and Applicable Environmental Standards

Primarily, the proposed project is anticipated to generate emissions, noise and effluent during construction and the operation phases. The limits in relation to the amount and nature of the relevant parameters of these environmental components that must go into the environment have been set by various national government agencies (such as NESREA in Nigeria) and international bodies (such as IFC and WHO). These limits which are summarised in Appendix 1 will form the touchstone upon which the proposed project activities shall be judged.

The national standard shall take precedence over the international standards. However, where that of international standards are more stringent these shall prevail over the national standards. Also, where there are no technology-specific limits available locally/nationally, then generally, the IFC/WHO guideline limits shall be applied.

1.8.10 Summary of the Institutional Analysis

The analysis of the applicable policies and regulatory framework with regard to this ESIA and waste management generally reveals that there is no dearth of regulatory instruments for environmental and social management in the state and of the proposed project management. In summary, the following were revealed:

1.The FMEnv and the State Ministries of Environment provide overarching guidance which include policies, legal and regulatory framework for waste management, national/state guidelines and plans, etc

2.The State have good governance framework and laws to back up and manage the environmental and social safeguard issues. The State has considerable experiences in the ESIA process and safeguard issues. In addition to the EIA Act, there exist important environmental laws and guidelines in the state that would support monitoring and enforcement.

3.Statutorily the Local Government Authorities are charged with direct responsibility for the management of refuse within their domains. However, they presently lack the technical, financial and personnel capacity to fulfil this obligation effectively. Hence the State government support in the provision of the proposed project.
4.There are existing Policies, Legislations, Regulations, Acts, By-laws and Guidelines in the country that apply to environmental issues, sanitation and categories of solid and hazardous wastes. There are also statements supporting reuse, recycling and recovery.
5.The inclusiveness clause in the national waste management policy places the onus for compliance on all persons, public or private, who are involved in, cooperate with or utilise waste services functions that take place within the boundaries of Nigeria.

Without doubt, there will be need to continually strengthen the capacity of project staff and that of the State Ministry of Environment and other relevant actors charged with implementing this EIA and other attendant safeguards instruments through in-depth training courses in environmental and social management risk.

1.9 Structure of the Report

This report is presented in nine Chapters, namely:

- Chapter One Introduction and Legal Framework
- Chapter Two Project Justification
- Chapter Three Project Description
- Chapter Four Description of Project Environment
- Chapter Five Associated and Potential Impacts
- Chapter Six Mitigation Measures and Alternatives
- Chapter Seven Environmental Management Plan
- Chapter Eight Decommissioning/Abandonment
- Chapter Nine Conclusions
- References
- Appendices

CHAPTER TWO
PROJECT JUSTIFICATION AND ANALYSIS OF PROJECT ALTERNATIVES

2.1 Project Justification

Gully erosion is a severe threat to Abia State, and Abia NEWMAP (2017) identified 279 gullies across the State's LGAs. Gully erosion is an essential signature of land degradation with many consequences such as damaged infrastructure, altered transportation corridors, damaged agricultural fields, detrimental sediment, and degraded surface water quality. Gullies are caused by runoff water cutting, or collecting in, surface depressions and flowing at a velocity sufficient to detach and carry away soil particles. The power to erode increases in size, speed, and duration. If the depression or drainage way is not protected, this widens. Continuous land degradation results in the loss of fertile topsoil leading to low agricultural productivity.

The soil in the proposed project site is highly susceptible to water erosion, and once the gully starts, it expands rapidly towards the head and requires urgent control. Otherwise, it impacts the populace's economic growth by inhibiting communities from accessing essential products and public services, such as education, healthcare, water, and markets to sell crops and goods.

The project site gully resulted from human activities such as the construction of buildings and roads with no proper drainage channel. At Obingwa, there is no existing drainage system in town. On the other hand, a significant amount of flow is coming from the upland of the town. Hence proper drainage system is required so that the community will not be affected. Therefore, to solve this problem drainage system is proposed that will collect the flow and safely discharge it out of the town. While doing so, the channels cross the bush and outfall in a place where there are no downstream settlements.

In the 2021 Climate Risk Profile for Nigeria (2021) by The World Bank Group, Climate change trends are expected to increase the risk and intensity of flooding through increased frequency and intensity of heavy rainfall events. The Project site area is part of the State that wishes to continue to be the hotspot of gully erosion and other geomorphic processes. If nothing is done, it will continue to result in significant economic losses, damage to agricultural lands and infrastructure, and human casualties. Thus, the climate risk dimension is anticipated to worsen the scenario as the link between heavy rainfall and the speed at which gullies expand are closely linked. Climate projections recognise extreme precipitation events likely to happen in Nigeria with the proposed project area included. This extreme precipitation event is expected to cause more flooding when downpours exceed the capacity of a river or urban drainage system. This could have severe consequences in populated areas as it would not only have a detrimental effect on agriculture and water quality but could also entail problems such as muddy floods and the destruction of roads and other infrastructure. All these justify the need for the proposed project as it is envisaged to stop the following negative impacts:

- Increase flooding that affects farms, roads, culverts, etc.
- Increase in the rate of erosion by exposing subsoil.
- Sediment generation and wash into waterways and water supplies.
- Reduction in land available for purposeful use; and
- Difficulties in accessing affected land

The drainages from the villages have no close natural drainage outlet. Unless there is proper channelization that joins the these and the natural drainage system, the downstream villagers in the village will face flooding. In addition, the road passes beside the town also will face similar problem of flooding. Thus, the intervention activity will immediately stop the gully erosion from widening with head cuts moving upstream because of concentrated flow from upload, especially on the road. This will prevent the threat to the road, which is already partially impacted by the erosion. It will also reduce the erosion and climate vulnerability in the area with the potential impact of fostering transportation/communication and sustainable development in the local communities, specifically and statewide.

2.2 Need for the Project

The geographical setting of the gully erosion site enhances the development and progressions of erosion in the community as runoff from residential buildings that are indiscriminately channeled lead to incision on the ground creating irregular channels with attendant sidewalls collapse and developing into gullies in several sections along the several interconnecting roads in the Community. At the proposed project site, the intervention activity will immediately stop the gully erosion from widening with headcuts moving upstream because of concentrated-flow from upload, especially the paved road. This will stop the threat to the road which is already partially impacted by the erosion. It will also reduce the erosion and climate vulnerability in the area with potential impact of fostering transportation/communication and sustainable development in the local communities specifically and state wide.

The proposed project will save Abia State from rapidly expanding gully complexes that have resulted in extensive impacts including loss of human life and loss of both built and natural assets. Damage to infrastructure includes highways, rural and urban roads, and pipelines severed by large gullies; houses and buildings; and silted waterways, reservoirs and ports. Losses to natural assets include loss of productive farmland and forest. It will be a great relief to the people of Abia State.

For AfDB, the project stands to demonstrate a model that the Bank can showcase for a complete integrated urban infrastructure development. This is even more so as the project is in line with the Bank's Ten-Year Strategy (TYS) as it supports infrastructure development. The project particularly supports the Bank's High 5 priority areas of Industrialize Africa and Improve the quality of life of the people of Africa.

There were no drainages when the threatened road, (Umuda -Isingwu road, Isikota) was constructed. This has given rise to the force of gully erosion setting in and threatening to tear the road apart with upstream head cuts moving upstream (Plate 3.1). A section at the erosion

head is barricaded due to erosion threat. Largely, the gully is covered by a deep vegetation which in itself poses very great threat to any person moving close to the site.

Many large gullies have formed because simple steps were not taken to stop them in the beginning. In the event that nothing is done at this site, the road corridor will be impaired and impacted. It should be noted that the project the gully erosion developed mainly due to an improper roadside drainage system of the road. The runoff has already eroded the asphalt of the first part of the road which could eventually affect the entire corridor and cut off communities using the road. The proposed project site is one of such locations that requires urgent intervention in the State for gully erosion controls.

2.3 Benefits of the Project

Gully erosion contributes to environmental problems and causes damage estimated at over $100 million annually in most parts of Nigeria (NEWMAP, 2018). This stands to undermine the sustainable growth of the affected communities (NEWMAP, 2018). In the eastern part of the country alone, it is estimated that if the trend continues without abatement and managed adequately, it may lead to irreversible socio-economic damage of up to $100 million every year, with an agricultural yield loss of 30 – 90% in some areas (Climate Home News, 2020).

At the proposed project site, the intervention activity will immediately stop the gully erosion from widening with head cuts moving upstream because of concentrated-flow from upland, especially the paved road. This will stop the threat to the road which is already partially impacted by the erosion. It will also reduce the erosion and climate vulnerability in the area with potential impact of fostering transportation/communication and sustainable development in the local communities specifically and state-wide.

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2.4 Value of the Project

The estimated cost of the integrated urban infrastructure development model is currently put at $200 m, borrowed from the African Development Bank AfDB. This cost includes the rehabilitation, basic and detailed engineering, civil and mechanical works, and operational cost. The estimated construction cost for Obingwa is N 2,213,145,142.11 (US$4,426,290.00)

The evaluation of the economic returns and environmental, socio-economic cum health benefits has shown that in the long-term the project is desirable with good returns, especially considering the gully erosion situation is a result of the interaction of land use, climate change and slope.

2.5 Project Sustainability

The sustainability of the project can be assessed and discussed in terms of the environmental, economic and social aspects of the proposed development. The ESIA is the key component of the efforts designed to increase the sustainability of the project and includes an analysis of the potential project alternative which includes meeting and /or exceeding the requirement of the Nigeria FMENV and the AfDB ISS regarding minimizing the environmental and social impact of the proposed project work and operation. The implementation of the recommendations provided as a result of this ESIA will aid in achieving environmental, economic and social sustainability.

The general sustainability principles that serve to guide the execution of the proposed project are presented below:

2.5.1 Political Support and Institutional Arrangement Sustainability

The following serves to ensure political will and support for the project:

- The personal commitment and interest of the Executive Governor and indeed the State Government to solving the erosion challenges in the State;
- The support and interest of the AfDB and the Federal Republic of Nigeria through the Federal Ministry of Finance; and
- The creation of the Abia State Integrated Infrastructure Development Project to ensure a world class ecosystem in Infrastructure Development working with other relevant state MDAs.

2.5.2 Environmental Sustainability

- The project principles are based on cost reduction, minimization of negative environmental, social impacts and utilization of local skilled labour;
- Environmental, public safety and health considerations will be given adequate attention while appropriate mitigation measures and Environmental and Social Management Plan shall be carefully implemented;
- The State will enforce its policy of compliance with statutory regulations and its own guidelines on HSE as well as that of the Federal Government and AfDB. All facets of the work shall be designed and implemented to keep environmental and social impacts at minimal and acceptable limits; and
- All operations shall be carried out to conform to all relevant international, national and state regulations and Standards on the environment. Handling, storage and disposal of solid and liquid wastes shall be in accordance with the regulatory requirements and the company's relevant Standard Operational Procedures.

2.5.3 Technical Sustainability

- The State, with the support of AfDB can boast of an assemblage of a team of professionals with impressive relevant experience that would be involved in the implementation of the project and would where necessarily source for technical expertise to ensure the sustainability of the project;
- Thus, it is expected that Best Available Technology (BAT) shall be deployed in the implementation of the project and adhere strictly to all relevant engineering codes and standards.

2.5.4 Economic Sustainability

- For economic sustainability, the project is proposed to ensure continual interconnectedness of the surrounding communities, building value and networks which address common challenges and support in pursuing common opportunities. In other words, infrastructure facilities that provide conducive environment for addressing various issues are assured. Reference should be made to the costs considered in the economic analysis report of the feasibility study.

2.5.5 Social Sustainability

Figure 2.1 provides the Spatial Analysis of Socioeconomic Impact of Gullies in the State. And the stakeholders are fully aware of the devastating impacts of gullies. Thus, a detailed stakeholder consultation process has been implemented throughout the ESIA process to assist in ensuring that all stakeholders have had the opportunity to provide input into the project planning process. This has also assisted in laying a sound foundation for building relationships with stakeholders for the ongoing engagement that will continue throughout the lifecycle of the Project.

- In order to ensure that the persons in these areas do not get adversely impacted, the project has conducted a Resettlement Action Plan (RAP), which ensured that all persons doing business or living within the setback of the intervention corridor were all captured and documented.
- Also, project specific social and environmental management activities to ensure social sustainability of the proposed project has been developed as part of the overall project management plan.

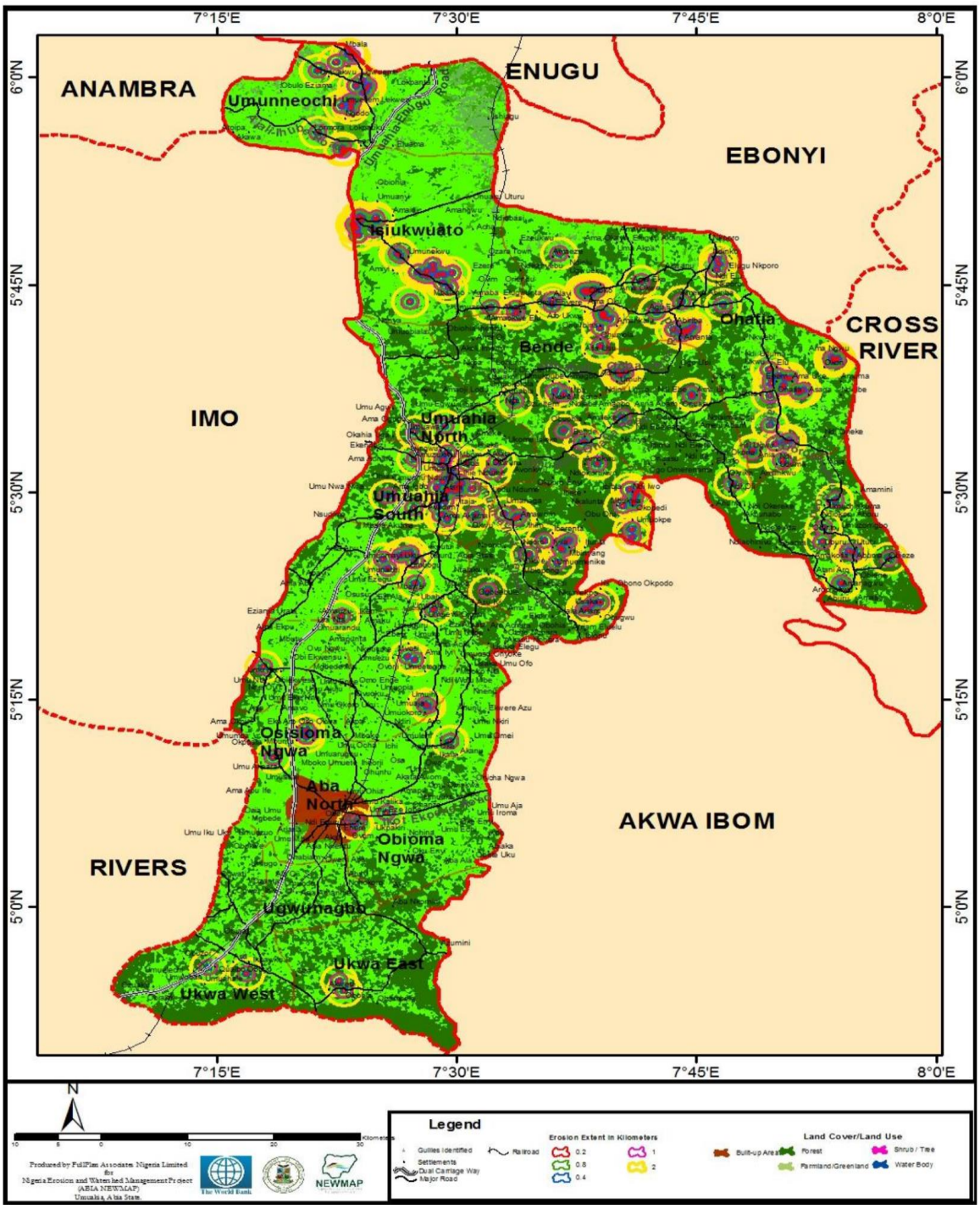


Figure 2.1: Spatial Analysis of Socioeconomic Impact of Gullies

2.6 Analysis of Project Alternatives

Gully erosion is a result of the interaction of land use, climate and slope. In the context of this report, analysis of project alternatives refers to the performance of the natural and socio-economic resources with or without the project or with or without the implementation of the measures outlined in this report and/or other safeguard instrument considered appropriate.

For adequate coverage a number of options were considered, and these include: the no project option; delayed project; alternative site/location and project execution options and these are discussed below:

2.6.1 No Project Option

The 'no project option' implies that the gully erosion control work will not be carried out; hence there is even no need to have carried out this study. This implies that the gully erosion site will remain in its current state and perhaps widen due to natural forces without even any interference from man. Without doubt, this "no project option' will worsen the current situation which could eventually lead to the damage of amenities close to the site such as the road networks.

The 'no project option' is therefore not considered a viable option as it will worsen environmental degradation and impact negatively on the means of livelihood of people.

2.6.2 Delayed Project Option

The 'delayed project option' implies that the planned gully erosion treatment work should be delayed until a much later date. Such option is usually taken when conditions are unfavourable to project implementation such as in heavy rainfall, war situation, or where the host community is deeply resentful to it. Also, if the prevailing economic climate is not quite favourable, then the delayed project option may be feasible. None of these conditions is applicable at present. Further delay will mean the onset of heavy rainfall that is not favourable for the proposed treatment method. At present, both the economic and the political environment and natural environmental phenomena are most favourably disposed towards it. Therefore, the implication of delayed project option will mean that all the preliminary work and associated efforts/ costs incurred would have come to nothing. Also, because of inflationary trends, such a delay may result in unanticipated increase in project costs, which may affect the final target from the project. These, and other related problems make adopting the delayed option impracticable.

2.6.3 Project site/location

In Abia State, it is said that there are "over 400 communities with active gully erosion problems." Of these, only about 10 erosion ravaged communities in Abia State have been rescued by the State Government through the Nigeria Erosion and Watershed Management Project (NEWMAP). The proposed project site is one of the rapidly expanding gully erosion sites threatening the loss of human life and natural assets in the State. Damage to infrastructure could occur if no attention is given urgently at the proposed site. While other sites of erosion manifestations have been considered, the current site was chosen since it can urgently be salvaged. Otherwise, communities along the highways will be severed by the large gully that could result. This will have untold hardship on the socioeconomic activities of the State and citizenry.

2.6.4 Go Ahead Option

The 'go ahead option' means going ahead to implement the proposed gully erosion control work. This also entails incorporating professional advice on the most practicable option such as are spelt out in this ESIA report and other relevant safeguard instruments and/or best practices relating to the execution of the proposed work. This will reassure the public of their safety and the environment. The environmental threats from the gully erosion will be reduced drastically, if not totally solved in that area. The devastation by erosion that is threathening to make the existing road impassable will be addressed and solved. This 'go ahead option' is therefore considered the most viable and recommended for implementation.

However, in going ahead, appropriate measures for the gully treatment must be adopted and applied.

2.6.5 Gully Treatment Options

Gully treatment is the stabilization of active gullies by vegetative or structural measures or a combination thereof. **Treatment of gullies depends on a range of factors including:** the size of the gully, whether it is actively eroding or not, the soil type, the size and frequency of water flow, the gradient of the area and the desired use of the land after rehabilitation.

The situation of the proposed intervention area shows that the best option or combination of the following options should be employed:

Table 2.1: Gully Treatment Options

S/No	Treatment Option	Scenario	For Proposed Erosion control
1	No Project Option	Applicable when assets are not at risk from erosion This option can result in downstream significant sedimentation problems. Generally, the slowest option to achieve a stable gully	Not applicable
2	Treatment of the watershed draining into the gully and the gully itself	Gully control that considers the treatment of the watershed draining into the gully and treatment of the gully itself. A conservation plan for, or the conservation treatment of, any piece of land is considered needed and feasible for gully stabilization work. Plan may include such practices as critical area plantings, grassed waterways or outlets, grade stabilization structures, diversions, and debris basins and used singly or in combination with other practices	Applicable
3	Backfilling the gully and forming a stable drainage state	Generally, only viable for small gullies. This option requires only cheap supplies of materials for gully/earth filling Generally, the quickest Option to achieve a stable gully.	Applicable

Table 2.1: Gully Treatment Options			
S/No	**Treatment Option**	**Scenario**	**For Proposed Erosion control**
4	Partially backfilling the gullies using natural sedimentation processes	This is usually the cheapest option in the long run. This option relies on the on-going supply of sediments from the upstream gully erosion. If the upstream gully is stabilized as part of the overall gully rehabilitation, then there may be insufficient sediments to backfill the weirs. This option is often adopted, when the gully extends upstream of a given property.	Not applicable
5	Partially backfilling using local or imported materials	This option requires heavy machinery. High safety risks are often associated with such project and Earth works. Battering the gully bank to provide a source of fill usually accelerate the rehabilitation of the gull bank.	Applicable
6	Stabilization of gully without partial backfilling of the beds	This option can result in a long-drawn-out process, requiring planting and replanting. Significant sediment loss can occur before the gully bank reach a stable form	Applicable

Source: Adapted from Catchment & Creeks Pty Ltd, 2010: https://www.catchmentsandcreeks.com.au/docs/Gully2-1.pdf

CHAPTER THREE
DESCRIPTION OF THE PROJECT

3.0 Introduction

This chapter describes the details of the proposed project such as the philosophy, phases, key equipment, key facilities, civil works, technical processes, anticipated waste streams and handling approach, raw material requirements, HSE considerations, personnel requirements and schedule.

The Abia State Government through the State Ministry of Works and Abia State Integrated Infrastructure Development Project (ABSIIDP) seeks a loan from the African Development Bank (AfDB) towards funding the proposed integrated infrastructure development in six investment subprojects, namely:

- 19 priority roads in Umuahia, covering 92 km;
- 31 priority roads in Aba, covering 199.69 km;
- One gully erosion control site in Umuahia;
- **One erosion control site in Aba;**
- One waste transfer station in Umuahia; and
- One waste management facility in Aba.

ABSIIDP seeks to rehabilitate degraded site and reduce longer-term erosion vulnerability in targeted areas. The intervention involves some civil works such as construction of infrastructure and/or stabilization or rehabilitation in and around the gully area.

3.1 Project Location

The proposed Aba gully erosion site is situated at coordinates 575055N, 333214E in Itungwa Agburukwe community in Obingwa LGA, Abia State, Nigeria (Figure 2).

The main gully (MG) starts at coordinates 575085.949N, 333252.619 E and ends at coordinates 574468.758N, 332922.630 at a distance (gully length) of 0.915km. The gully has three fingers (Finger Gullies (FG)), with two to the left LFG and one to the right (RFG). LFG1 starts at coordinates 574987.002N, 333201.656E and ends at 574537.610N, 332894.506E with a length of 0.593km. The LFG-2 starts at 575032.705N, 333212.283E and ends at 574831.791N, 333044.409E at 0.255km. The RFG-1 starts at coordinates 575045.471N, 333198.709E and ends at coordinates 614595.852N, 331016.420E with a length of 0.567km.

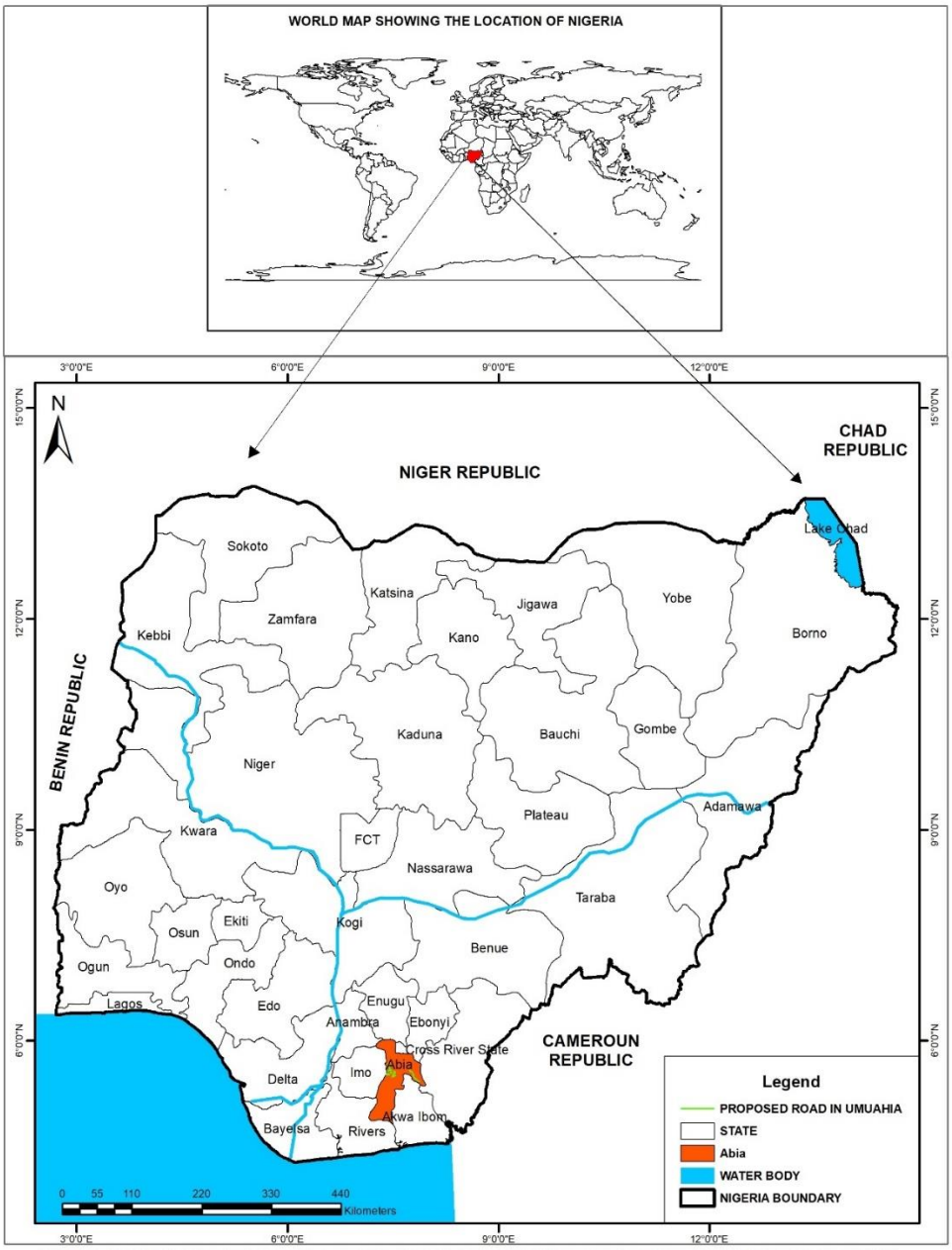


Figure 3.1: Map of Nigeria showing Abia State

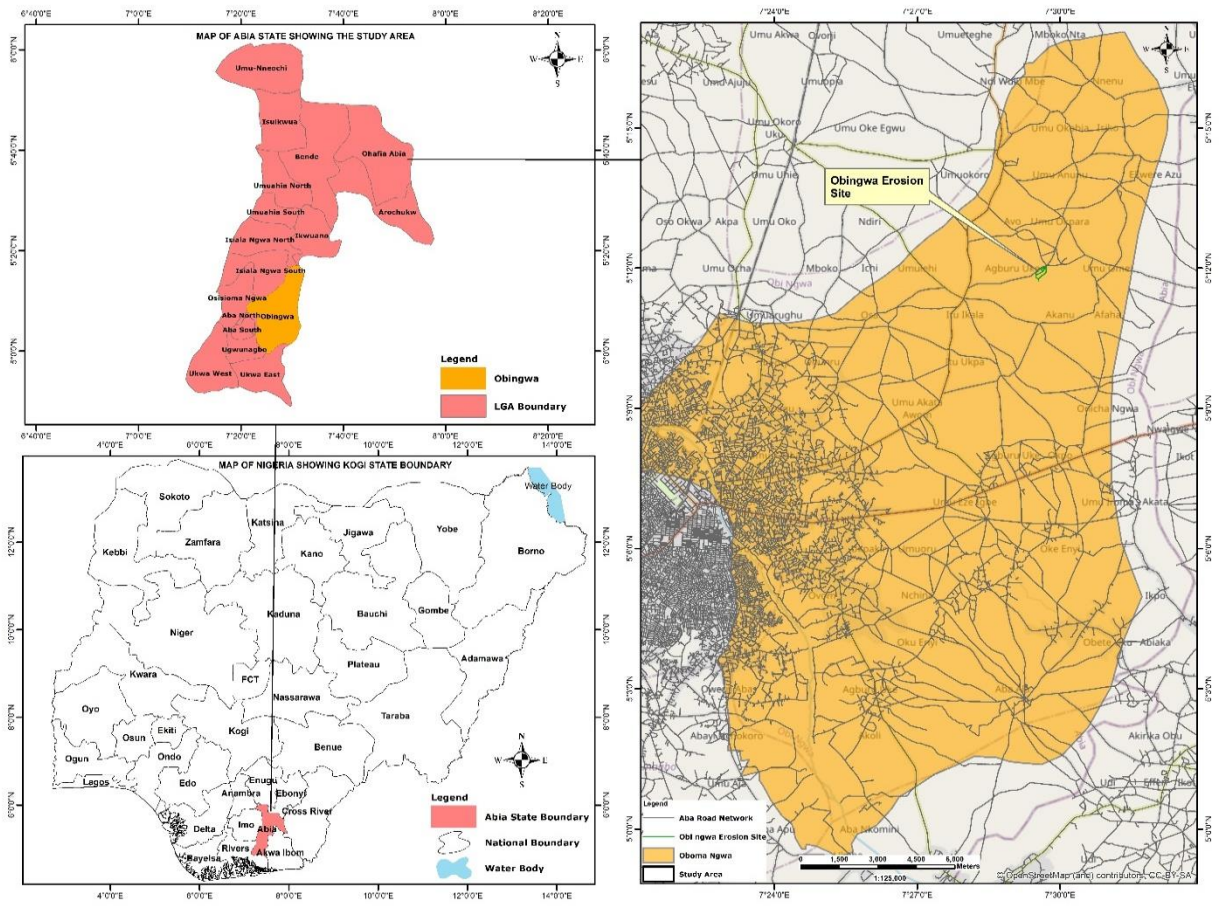


Figure 3.2: Map of Itungwa Agburukwe community, Obingwa LGA in Abia State and Nigeria

Figure 3.3: Satellite view of the Aba gully erosion site

3.2 Proposed Project Intervention Work

Gully erosion removes soil along drainage lines by surface water runoff. It is proposed to stem gully erosion so it does not continue to move headward. By design, the proposed intervention works shall involve civil works and use of vegetation for the stabilization of gullies, reclamation, protection and reinforcement to stop scouring action of flow velocity due to exposed soil surface. Essentially, the intervention work shall consider the treatment of the watershed draining into the gully, as well as treatment of the gully itself. The treatment is anticipated to include the civil engineering measures (feasible gully stabilization work) combined with vegetation land management measures. In other words, a bio-engineering design that seeks to provide a more holistic and permanent solution to the gully erosion problem by recognizing three major contending variables, namely: man, earth and rainwater is proposed.

Specifically, the gully control measures shall be used singly or in combination with other practices to accomplish the following:

- Interception of runoff water above the gully area with a diversion or terraces;
- Retention of runoff water on the drainage area by tillage practices, vegetation and structures;
- Elimination of the gully by filling and shaping the drainageway with earth-moving equipment for critical area planting or grassed waterway development;
- Revegetation, either by natural processes or by critical area planting and grassed waterway development;
- Construction of grade stabilization structures to control the grade of the gully and detain or impound water;
- Control of sediment from active gullies with debris basins; and
- Drainage of seep areas where gully banks are unstable.

Plate 3.1: Agburuike Road Erosion site existing condition

3.3 Project Components

Treatment of gullies depends on a range of factors including: the size of the gully, whether it is actively eroding or not, the soil type, the size and frequency of water flow, the gradient of the area and the desired use of the land after rehabilitation. The situation of the proposed control works at the gully site/area shows that the best option to be employed, especially at the gully head which will require filling and compaction with imported materials.

The project components include:

- grassed and paved waterways;
- buried pipe outlets;
- diversion terraces;
- benches;
- grade control structures;
- chutes;
- inlets and de- bris basins.

Ancillary facilities

- Lay-bys or service areas;
- Temporary construction facilities (e.g. workshops, laydown areas, and workers' accommodation);
- Security posts; and
- Access roads between the temporary facilities and the erosion site.

3.4 Project Phases and Activities

3.4.1 Planning Phase and Pre and Construction Phases

This is the design phase of the project that inevitably passed through the conceptual design right through to the final design, specified to carry out the eroison control works. The responsibility of obtaining any consents relating to the design, construction, engineering, technical and installation specifications such as any record decision regarding this ESIA is borne by the executing agency of the State government.

The pre-construction is a preparation stage for all the necessary items/activities that must be carried out before construction proper starts. This includes, for instance, movement of equipment to the site, removal of the scanty vegetation from the site, etc.
The construction activities will involve:

- ***Excavation and Earthworks (***Site clearing, Topsoil removal to maximum dept of 150mm, Excavation and disposal of spoil to a distance of 500 m from site for reuse, Sand filling and compaction, Backfilling, shaping and compaction with approved laterite material);
- ***Concrete works (***concrete mixing, reinforcement to concrete channel, box culvert, chute and stilling basin, treatment of construction joints with bituminous sealant, fencing around the chute structure on the Drain canal, etc; and
- ***Bio-engineering Works*** (provision and maintenance of structured vegetation, planting of vetiver grass, elephant grass etc., on the slopes, site preparation with topsoil and manure, etc.)

The Construction Phase shall include:
On site- that include removal of vegetation as required, strip topsoil and unsuitable materials and stockpile (separately) on designated stockpile areas, earthworks, filling and compacting (with drying when required) all fill areas with cut volumes, install essential services such as stormwater infrastructure, and culverts etc; forming inlet/outlet structures and diffuse discharge devices or energy dissipaters (detailed design to be completed), ;re-spread topsoil across cut/fill and disturbed areas not designated for hard stand; grass all batters and exposed surfaces, as appropriate).

Offsite- that include movement of soil from elsewhere to the site for filling and compacting. Staging shall be carried out before construction work. Staging reduces the time exposed ground is prone to erosion and breaks down earthworks into smaller work host communitykages. This will assist to reduce the area and time from stripping topsoil to permanent stabilization.

3.4.2 Operational Phase

The Operational phase includes the utilization to the gully erosion control measure put in place. The control measures will be regularly monitored during operations and after any significant rain event should this occur during construction.
This phase will include maintenance of all structures including silt fences, decanting earth bunds, diversion drains and/or bunds throughout the course of site earthworks and restoration and use. Exposed surfaces should be stabilised with grass by reinstating as soon as practicable based on the outcome of schedule or emergency maintenance.

3.4.3 Decommissioning Phase

Decommissioning phases refer to the period when it has been determined that all surface soils have been suitably stabilized through consultation and inspection by the contractor, council and design engineer. Decommissioning shall include the following:

- Respread any topsoil stockpiled and decommission the topsoil stockpiling area;
- Backfill any temporary collection drains and/or remove any diversion bunds and turf or sow grass seed as appropriate;

- Removing all silt fences, and any accumulated silt/sediment and reinstating the ground surface in those areas by turfing, sowing grass or planting as appropriate;
- Remove the embankments, bunds and decant structure. Reinstate the areas by grassing;
- Remove the construction entrance once earthworks are complete and mulch or sow grass seed as appropriate;
- Remove any temporary sediment control devices on stormwater inlets; and
- `Integration with wetland planting contractor.

3.5 Design Options

The formation and development of the gullies is more associated with lack of appropriate drain system connection with the existing road. Therefore, provision of proper drainage system is essential. The design standards/criteria for the civil & associated works are based on national engineering state-of-the-practice for stormwater management, modified to suit the specific needs. The criteria ensure that established guidelines, standards, and methods for effective planning and design are met. Please, refer to the engineering designs for further information.
and in the international practice for 5-, 10-, 20-, 25-, 50-, and 100- years return periods.

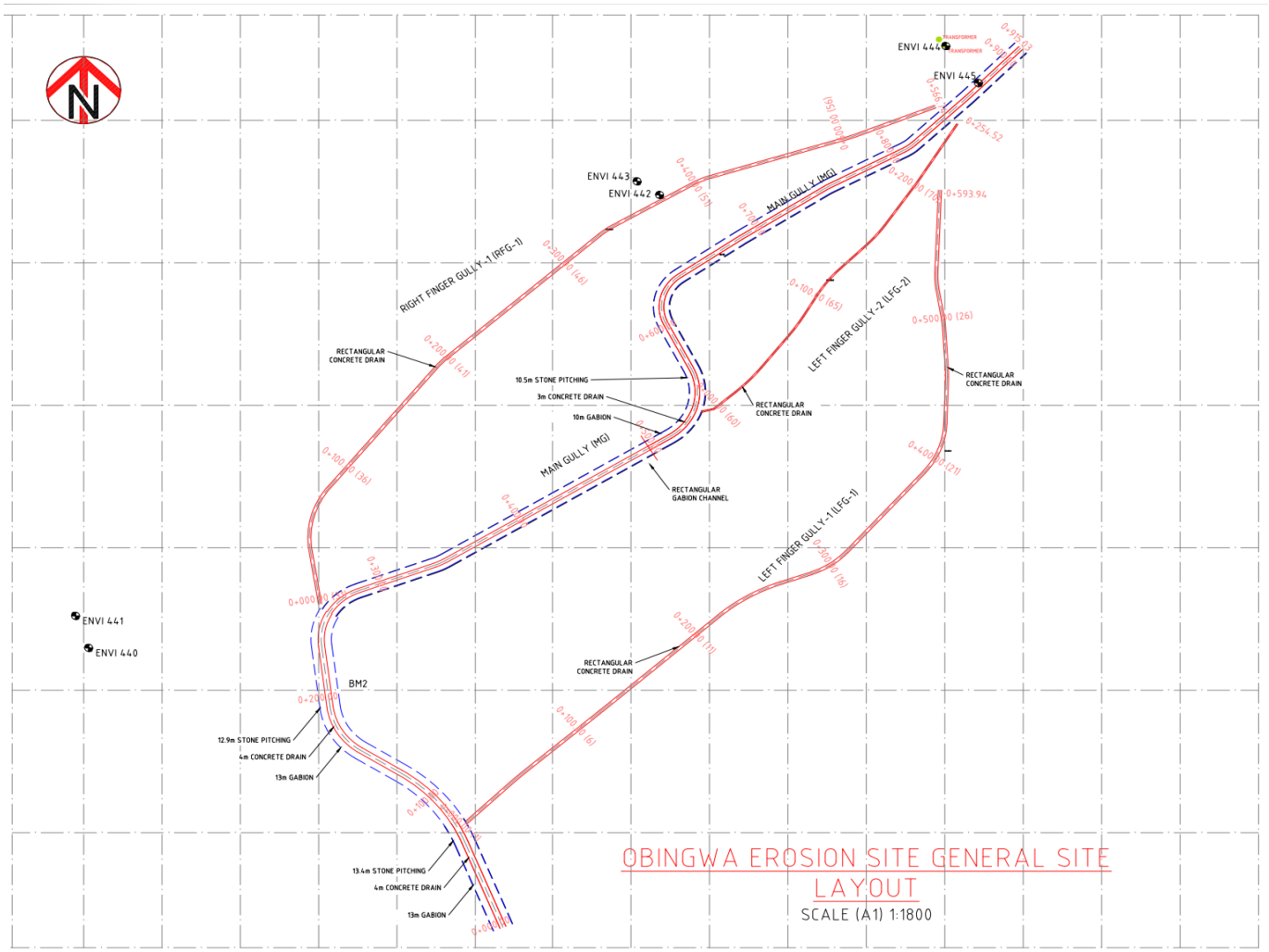


Figure 3.4: Layout of the Gully Site.

The design of drainage systems fulfil two basic criteria: \

a) The need to provide a satisfactory discharge of runoff within the project area

b) Minimising the impact on the environment.

In the surface drainage design, the following factors need to be addressed:

a) The nature of the catchment
b) Size of the catchment
c) Rainfall characteristics pertinent to the catchment d) Determination of the climatic zone
d) Determination of runoff
e) The consequences of the exceedance of the design flow of the drainage system
f) The design average recurrence interval, for both major and minor drainage system
g) Consideration of environmental impacts.

Technical Policy/Standard /Guidelines

- British Standard BS 5400
- British Standard BS 8100
- Structure Scoping Inspection Report, Structural Report
- Current Geotechnical and Hydraulic reports, memorandums, and investigations
- Other relevant structural Manuals accepted by the Client.

Hydrology and Hydraulic Design Criteria

a. Design Frequency

Frequency of the storm event represents the number of occurrences of that event within a specified period of time. The frequency of the storm event reflects the degree of risk of flooding, since high frequency represents low risk. The design frequency depends on the importance and the location of the drainage system. The design frequency for the different components of the drainage system is as follows:

The design frequency for the different components of the drainage system is as follows:

- Tertiary Drainage network 2 years
- Primary and secondary drainage system 25 years
- Natural Water Courses 25 years checked 50 years overtopping
- Box culverts 25 years checked 50 years overtopping

b. Roughness Coefficient

The roughness coefficient depends mainly on the type of the channel. The values of Manning roughness coefficients as proposed the US Bureau of Reclamation and by the US Federal Highway Administration. The following roughness coefficients will be adopted:

- Concrete lined channels and conduits 0.015
- Earth channels 0.035
- Concrete pipe culverts 0.015
- Renomatress 0.032

- Gabion 0.033

c. Velocity Limitations

The design velocities in the channels and conduits shall be kept within a permissible range between maximum and minimum limits. The minimum allowable velocity is set to attain self-cleansing in the design channels while the maximum allowable velocity will keep the velocity below the scouring limit. The slope of the concrete channels/conduits will be set to provide a minimum velocity of 0.75 meters per second to maintain self-cleansing action. The maximum allowable velocity for concrete lined channels will be set at 5.0 meters per second. For earth channels a maximum velocity of 0.9 to 1.0 meter per second will be adopted in the design.

d. Freeboard

Freeboard is the vertical distance between the design water level and the top edge of the channel or conduit. The freeboard is a safety margin for carrying either higher frequency storms or to cater for the change of water.

e. Cross Section

The principal options considered in the design of the channels or conduits are basically as follows:

• Earth open channel
• Concrete open channel
• Box conduits

The choice of the type of the proposed section depends on many factors, like the estimated design flow at each design section, available corridor, value of land, land use, and natural slope of the terrain which affects the flow velocity in the channel or conduit.

f. Culvert Hydraulic

Design Criteria For the design of small drainage structures, i.e. culverts less than 2 m, the use of inlet control with a ratio of upstream head and the height of culvert of 1.2 has been used, which is lower than the 1.5 recommended. This yields approximately the optimum hydraulic section and was used for determining the height of embankment over the culvert taking the norms for freeboard into account.

The following design limitations are required for the culverts:

⧫ Allowable Headwater is the depth of water that can be pounded at the upstream end of the culvert that will be limited by one or more of the following:

✓ Non-damaging to upstream property;

✓ No higher than the shoulder or 0.3 m below the edge of shoulder;

✓ Equal to an HW/D not greater than 1.5;

✓ Not higher than the low point in the road grade; and/or

✓ Equal to the elevation where flow diverts around the culvert.

⧫ The Headwater is the flood depth that:

✓ Does not exceed 0.5 cm increase over the existing 100-year flood in the vicinity of buildings or dwellings, and
✓ Has a level of inundation that is tolerable to upstream property.

3.6 Materials

During earthworks, it is estimated that topsoil will be stripped from the bulk earthwork areas. In addition, it is expected there will be some material unsuitable for engineered fill, imported material and material due to relocated as part of cut to fill bulk earthworks. All stockpiles will be located within the bulk earthwork areas or just outside, but within the catchment of the erosion and sediment control devices.

Prior to earthworks activities commencing, adequate perimeter and open channel drain controls must be installed to prevent sediment from entering the permanent and intermittent streams running through the site. Principal perimeter controls for this site include the installation of two construction entrances, silt fences and diversion drains/bunds.

A temporary water supply will be made available to the areas so that vehicle wheels can be washed prior to leaving the site, if necessary. All sediment laden water from wheel washing is to be directed into runoff diversion channels and into one of the decanting earth bunds prior to discharge to the intermittent stream.

3.7 Environmental, Health and Safety Management

- **Sediment And Erosion**

Sediment will be removed by the various sediment control measures proposed for the site, primarily silt fences, sediment retention ponds, decanting earth bunds and proprietary devices where required.

- **Runoff Control**

Runoff volumes are likely to increase during earthworks due to a change in the ground surface from grass and vegetation to bare soil. Earthworks will be monitored on site by the supervising engineer, who will review sediment control performance. Overall, given the application of the aforementioned measures, the associated potential negative environmental effects are considered manageable. However additional mitigation measures for runoff control are able to be installed where deemed necessary.

- **Neighbourhood Effects- Noise and Dust**

The main neighbourhood effects associated with earthworks are noise and dust.
Dust from site earthworks and associated activities is considered to be minor and will be minimised by a number of measures, including wetting and mulching, to mitigate potential negative effects on neighbours.
Appropriate dust control measures will be implemented at the site where necessary, such as the use of water carts to dampen exposed areas or mulching. Dust control measures will be implemented in accordance with health & safety requirements and conditions of consent.

Noise will be generated by construction machinery and equipment during normal working hours over the earthworks period. Construction noise shall meet the limits in and be measured and assessed in accordance with NESREA requirements. Work shall not continue on the site if compliance with the above standard is not achieved. Mitigation measures to reduce noise levels will be implemented, if required.

- **Landscaping and Green Cover or Vegetation**

Vegetation removal shall be limited as much as practicable to within the bulk earthwork areas. Any vegetation removal outside earthwork areas shall occur prior to commencement of bulk earthworks.

Best practise, site sediment controls to prevent degradation of the natural environment shall apply. Adequate measures shall be taken to minimise the potential for silt/sediment to enter the downstream receiving environments, while the proposed maintenance regime will check that these measures are functioning properly. Hence, it is considered that the potential negative effects of earthworks on any ecosystems in the receiving environment will be avoided or mitigated by these means provided the measures are correctly constructed and maintained.

- **Solid Waste**

The bulk of waste generation is envisaged during construction and decommissioning phases. During operation, the project is not expected to generate significant quantity of waste, other than the routine waste that running water in the drainage lines convey in the course of movement downstream and from the normal maintenance of the project site.

For the various phases, the expected waste to be generated and manner of management are outlined in Table 3.1.

Table 3.1: Anticipated Waste to be Generate and Management

S/No	Phase	Estimated Waste Quantity (tons/month)	Management
A	**Mobilisation and Construction phase**		
1	Asphalt and Concrete	2tonnes	Concrete/asphalt debris can be sized and recycled on-site as pipe bedding or project base
2	Plastic, nylon and scrap metals	1ton	Recover scrap metal for recycling off-site
3	Wood	0.5kg	Chip leftover wood for reuse
4	Debris/ Landscape Materials	5ton	recycled on-site as pipe bedding or project base
5	Paper, Garbage/Trash	0.7kg	Recover for recycling/compositing
6	Spent/used oil Caterpillar Dump Truck	12litres	collect and stored temporarily in a safe place and give recycling depots.

	Crane		
B	**Operation**		
	Plastic, nylon and scrap metals with debris	0.7kg	Recover for recycling offsite

3.8 Manpower Requirements

Both skilled and unskilled personnel will be hired for construction activities and maintenance of the treated erosion gully site. Local employees will be recruited from the communities nearby and will be trained to perform specific tasks as necessary. The specific number of work force that would be involved in the construction phase of the Project is yet to be finalized. However, it is envisaged that labour force with reasonable local content will be engaged during the Project execution. For the various phases of the project, the manpower identified are outlined in Table 3.2.

Table 3.2: Manpower Requirement

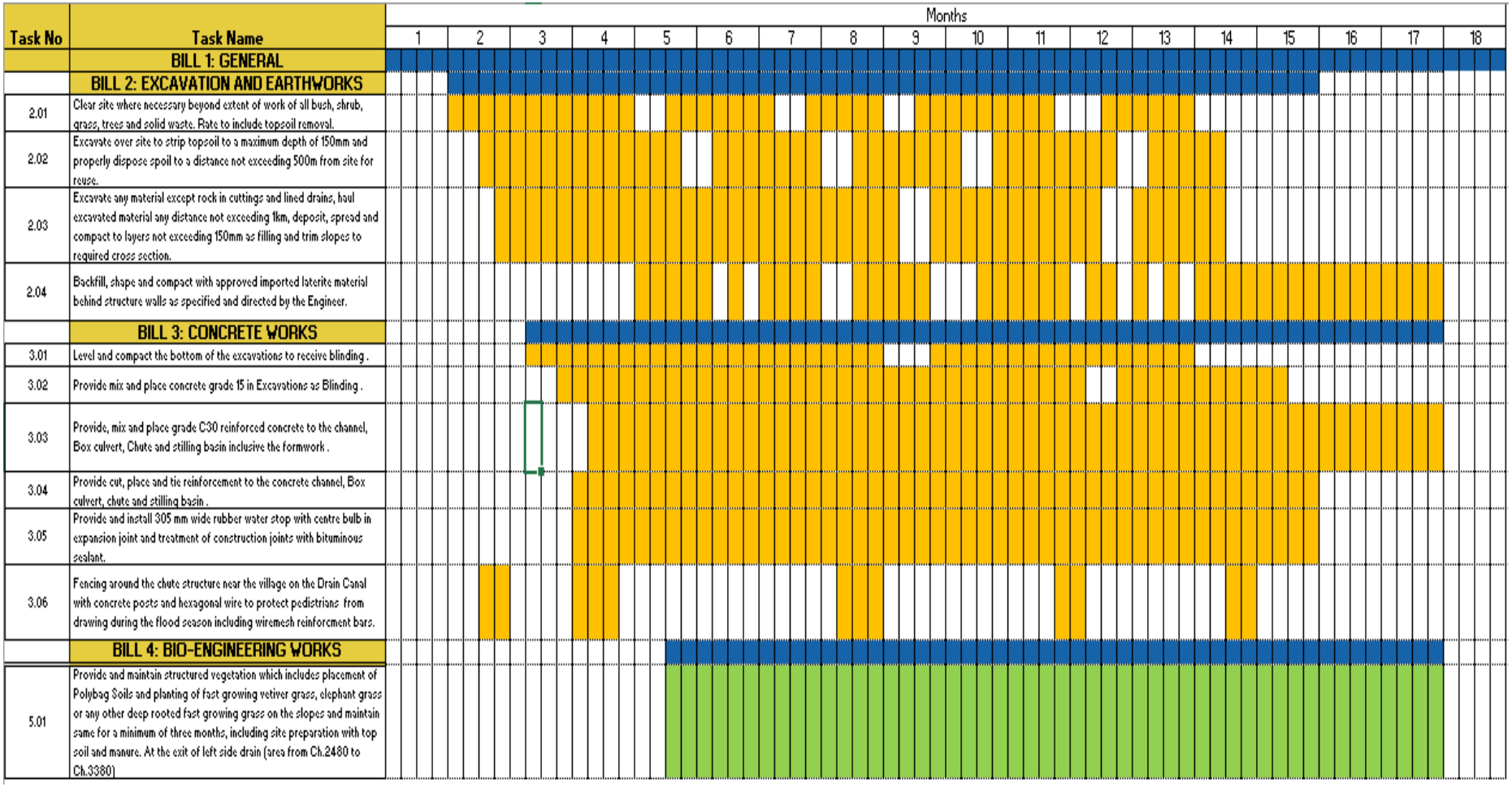
Phase	Manpower Needed*	
	Senior Management	Other staff Categories
Pre and Construction	5	20
Operation phase	2	8
Decommissioning phase	1	5
Total		

***** *The specific number of work force that would be involved in the construction phase of the Project is yet to be finalized*

3.9 Project Implementation Schedule (Estimated)

The project construction/rehabilitation including commissioning will be concurrent and is expected to last for 12 months.

Table 3. 3: Proposed construction schedule for Aba erosion site in Abia State



Task No	Task Name	Months 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	BILL 1: GENERAL																		
	BILL 2: EXCAVATION AND EARTHWORKS																		
2.01	Clear site where necessary beyond extent of work of all bush, shrub, grass, trees and solid waste. Rate to include topsoil removal.																		
2.02	Excavate over site to strip topsoil to a maximum depth of 150mm and properly dispose spoil to a distance not exceeding 500m from site for reuse.																		
2.03	Excavate any material except rock in cuttings and lined drains, haul excavated material any distance not exceeding 1km, deposit, spread and compact to layers not exceeding 150mm as filling and trim slopes to required cross section.																		
2.04	Backfill, shape and compact with approved imported laterite material behind structure walls as specified and directed by the Engineer.																		
	BILL 3: CONCRETE WORKS																		
3.01	Level and compact the bottom of the excavations to receive blinding .																		
3.02	Provide mix and place concrete grade 15 in Excavations as Blinding .																		
3.03	Provide, mix and place grade C30 reinforced concrete to the channel, Box culvert, Chute and stilling basin inclusive the formwork .																		
3.04	Provide cut, place and tie reinforcement to the concrete channel, Box culvert, chute and stilling basin .																		
3.05	Provide and install 305 mm wide rubber water stop with centre bulb in expansion joint and treatment of construction joints with bituminous sealant.																		
3.06	Fencing around the chute structure near the village on the Drain Canal with concrete posts and hexagonal wire to protect pedistrians from drawing during the flood season including wiremesh reinforcement bars.																		
	BILL 4: BIO-ENGINEERING WORKS																		
5.01	Provide and maintain structured vegetation which includes placement of Polybag Soils and planting of fast growing vetiver grass, elephant grass or any other deep rooted fast growing grass on the slopes and maintain same for a minimum of three months, including site preparation with top soil and manure. At the exit of left side drain (area from Ch.2480 to Ch.3380)																		

CHAPTER FOUR
DESCRIPTION OF THE PROJECT ENVIRONMENT

4.0 Introduction

This chapter provides an overview of the baseline conditions around the project area; defines the project's area of influence, primary data collection methods, sources of secondary data, the biophysical and social such as health characteristics of the project environment; describes the sensitive environmental resources and the attendant natural or manmade hazards in the area; and provides fieldwork and laboratory results of the air quality, noise level, water quality and soil quality. It captures the efforts of consultation and stakeholders' engagements carried out during the ESIA Project; capturing the socioeconomic characteristics of the host communities and study area.

4.1 Baseline Data Acquisition

The Baseline Data Acquisition were based on primary data collected through field investigations for certain specific physical and environmental parameters and social and health impact characteristics and secondary data sourced from extensive review of relevant literature which included: existing EIA reports, journals, research reports and information available through websites. Also, extensive consultations with stakeholders that included the host community of the proposed project location provided essential inputs to both data requirements and impact identification.

The field exercise was conducted during the wet season from Oct 2- 16, 2021. The multi-disciplinary field study involved data acquisition on meteorology, air quality and noise, soil and land use, vegetation and wildlife, surface water, groundwater and geology as well as the socio-economic aspect which addressed the issues of involuntary resettlement and the health status of the affected communities. Each of these components of the environment was sampled in accordance with Federal Ministry of Environment Guidelines and other internationally recognized Standards for sampling and handling of samples.

Field Sampling and Laboratory Analysis were carried out by staff/consultants of Tobejay Technologies Limited (Federal Ministry of Environment and DPR accredited Environmental Company) and Quality Analytical Laboratory Services Ltd (QALS), a duly accredited and standard laboratory located in Benin City, Edo State with IPAN Certificate No. 0028 (ISO 17025 Laboratory Quality Management). Floral and faunal species were identified in the field while some vegetation samples were collected for further herbarium studies. The quality assurance programme encompasses all aspects of the ESIA study, including Sample collection, handling, laboratory analyses, data coding and manipulation, statistical analysis, presenting and communicating results.

For Socio-Economic studies, in line with project sustainability objectives, wide consultations were held, and communities' aspirations were also recorded. The study was conducted through an integrated participatory approach that also involved literature review. The study assessed the prevailing socio-economic, cultural and health situation under the prevailing road conditions and the impacts of the project. The socio-economic impacts assessment focused on evaluation of the impacts of the project on community social and economic health, opportunities creation and prevention of adverse outcomes on social, gender, health and cultural attributes of the communities.

The socio-economic baseline survey was conducted concomitantly during the update of the enumeration of crops, economic trees and structures from 5^{th} – 30^{th} April 2022 seeks to determine the socio-cultural, demographic, and quality of life of the respondents. The questionnaire used in obtaining socio-economic data employed a combination of "open-ended" and "closed" questionnaire format. Qualitative data were generated through informed meetings and also observation in small groups of stakeholders in the various project-affected communities with homogeneous socio-economic backgrounds and interests. Additionally, the study discusses the perceptions, concerns, and expectations of members and residents of these communities, and establishes the project's potential impacts, positive impact enhancement, and mitigation measures.

The socio-economic baseline data collection methodologies are summarised in Table 4.1. The study was conducted in Agburuike community in Obingwa LGA, Abia State. The project is expected to impact 200 respondents of which 9 are females and 191 are males who constituted the respondents, primarily for the survey instruments. The skew was influenced by those who had assets that will be impacted by the project.

Table 4.1: Socio-Economic Baseline Data Collection Methodologies

Objectives	**Methods Used**						**Remarks**
	Secondary data	**Survey***	**Interview**	**Direct observation**	**FGD**	**CT**	
Socio=economic profile	✓	✓	✓		✓		
Determined livelihood strategies (farming, hunting etc)	✓	✓	✓		✓		
Assess level of infrastructure development		✓	✓	✓	✓	✓	✓
Social institution							
Gender analysis of livelihood		✓		✓			
Population etc.							

4.2 Project Location and Extent

The proposed Aba gully erosion site is situated at coordinates 575055N, 333214E in Itungwa Agburukwe community in Obingwa LGA, Abia State. The Agburuke Isiugwu proposed work site is located at 575055N, 333214E with the specific the main (head) gully (MG) channel and finger (tail) gully channels geographically described in Figure 4.1 At the Obingwa site, the formation and development of gully erosion is associated with lack of appropriate drain system connection. Generally, there is no existing drainage system in the town. On the other hand, significant amount of water due to rains and other human induced activities occasion water flow from upland part of the town.

Gullies at Obingwa flows from northeast towards southwest. The geographical setting enhances the development and progressions of gully erosion sites in the Community as runoff from residential buildings that are indiscriminately channeled lead to incision on the ground creating irregular channels with attendant sidewalls collapse and developing into gullies in several sections along the several interconnecting roads in the Community.

Generally, the drainage from the village flows from northeast to southwest. The drainages from the villages have no close natural drainage outlet. Unless there is proper channelization that joins the towns and the natural drainage system, the downstream villagers in the village will face flooding. In addition, the road passes beside the town also will face similar problem of flooding.
From upstream of the village flood is coming to the village and some portion flood passes the existing gully. There is no proper channel designed or constructed and therefore, there is no proper drainage outlet.

4.3 The Watershed and Catchment Area

The watershed refers to the area of the land that comprises a set of streams or rivers that drain into a larger water body like an ocean or a river. In the context of this project, the watersheds refers to the dividing ridge between drainage areas and comprises upland areas of the collections all the waters through the gully erosion channel downstream (Figure 4.1).
The watershed area for the gully erosion site has the main gully (MG) starts at coordinates 575085.949N, 333252.619 E and ends at coordinates 574468.758N, 332922.630 at a distance (gully l**ength) of** 0.915km. The gully has three fingers (Finger Gullies (FG)) with two to the left LFG and one to the right (RFG). LFG1 starts at coordinates 574987.002N, 333201.656E and ends at 574537.610N, 332894.506E with a length of 0.593km. The LFG-2 starts at 575032.705N, 333212.283E and ends 574831.791N, 333044.409E at a distance of 0.255km. The RFG-1 starts at coordinates 575045.471N, 333198.709E and ends at coordinates 614595.852N, 331016.420E with a length of 0.567km.

Figure 4. 1: Obingwa Erosion Site Watershed Delineation

The watersheds, divided into sub-watersheds and identified with the initials “CAT”, form the outlets of natural and artificial drains redirecting floodwater to the gullies and captures the segment of longitudinal drain to which the catchments drain (Figure 4.2). The sub-catchments have a mild slope varying in slope from 1.4 to 20%. They can be classified as a rolling to steep terrain. The watersheds of the gully drain to natural drainage channels and ends in the forest, at a plain lowland.

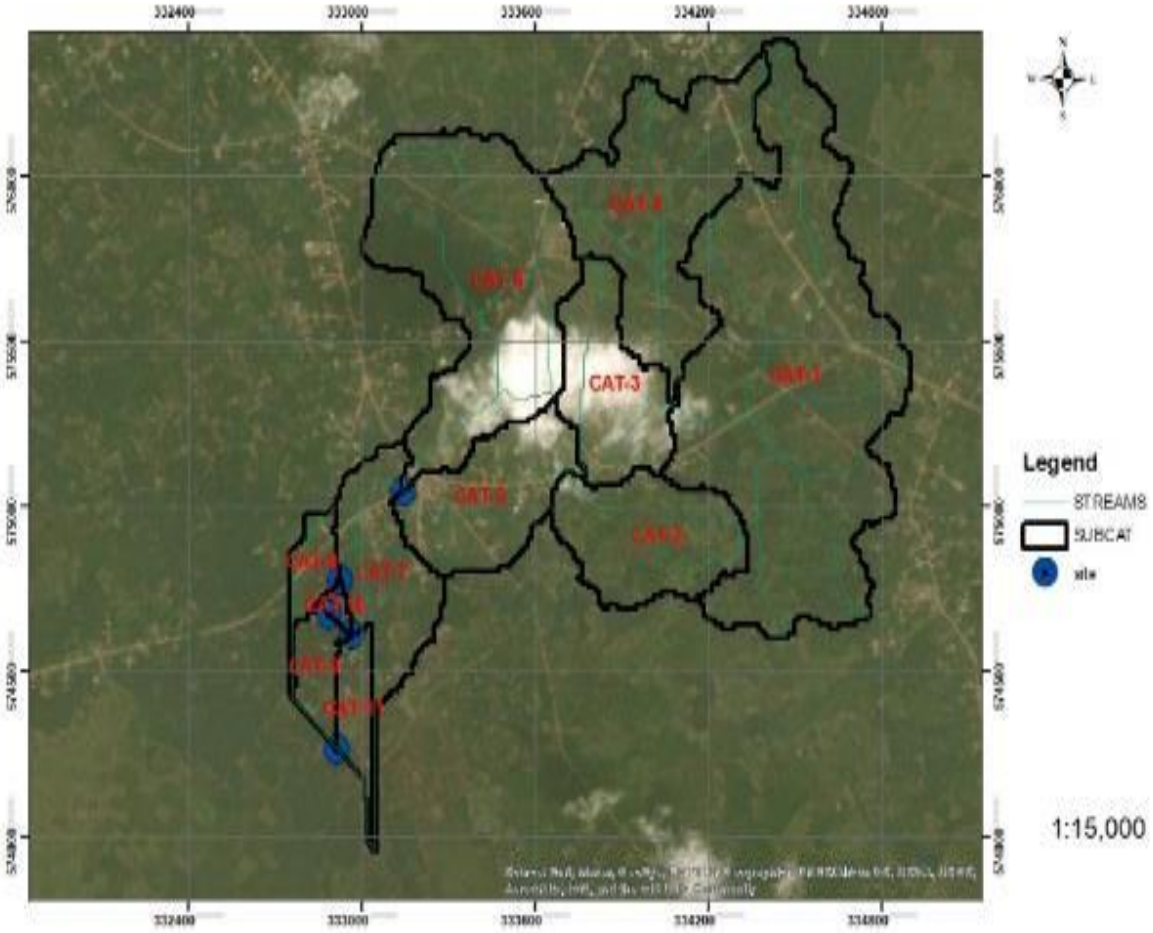


Figure 4.2: **Sub Watersheds Area for the Gully Erosion Site**

4.4 Biophysical Environment

4.4.1 Climate and Meteorology of the Study Area

The climate of the project area is humid tropics (i.e. semi-hot equatorial). It is controlled by latitudinal locations, prevailing (seasonal) winds and nearness to the Atlantic Ocean. There are two dominant air masses, namely:

(i) The dry Northeasterly Tropical Continental (cT) from across the Sahara, North of the West African region; and

(ii) The wet Southwesterly Tropical Maritime (mT) from across the Atlantic Ocean in the South. Separating the two air masses is an Inter Tropical Convergence Zone (ITCZ), often referred to as *Inter-tropical Discontinuity (ITD)* or *Inter-tropical Front (ITF).*

The front oscillates with the apparent location of the sun towards the North and South of the equator thereby accounting for the dominant seasons of the area. Marginal alterations are also recorded due to other landform characteristics, especially the dominant ocean currents, configuration of surrounding shoreline and the generally flat topography of the region**.**

Rainfall (i.e. amount and distribution) is the single most important element for defining

the climatic seasons in the tropics where the project corridor is located characterized by two dominant seasons; *the wet and the dry seasons*. Other significant climatic elements in the area are sunshine (hours), atmospheric pressure, wind (direction and speed), and relative humidity. The pattern of some of these elements for the past nineteen years (2002 - 2021) is highlighted.

4.4.2 Rainfall

Rain falls in many months of the year. However, the characteristics vary indirectly with latitudinal location but directly with the location of the ITD and monsoon-initiated winds. Traditionally, onset of rains in the project area actually starts around April, while cessation is about November. Figure 4.3 shows the trend of rainfall in the area over a period of 10 years with the lowest of about 0 mm recorded in February and December, while the highest peaked at 431 mm in August.

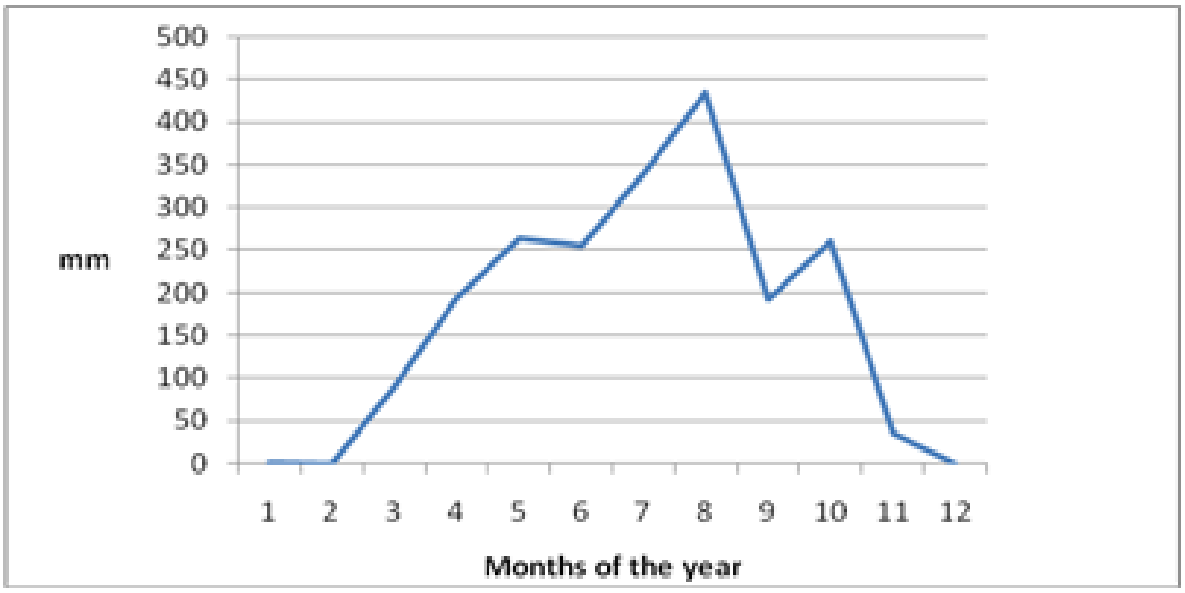


Figure 4.3 Rainfall Pattern in the Study Area (2002 – 2021) (Source: NIMET)

The annual rainfall based on the station data varies from a minimum of 1375 mm to 2924 mm. The annual rainfall data is important in estimating the rate of gully erosion, in addition to the catchment area. As the annual rainfall increases, the rate of erosion increases proportionally.

The annual maximum rainfall depth for each duration were subjected to frequency analysis. The frequency analysis results for the station are shown in Table 4.2.

Table 4.2 Depth-duration-Frequency Table

Return Period, years	Depth, mm
2	103.2
5	133.3
10	153.2
25	178.4
50	197.1
100	215.6

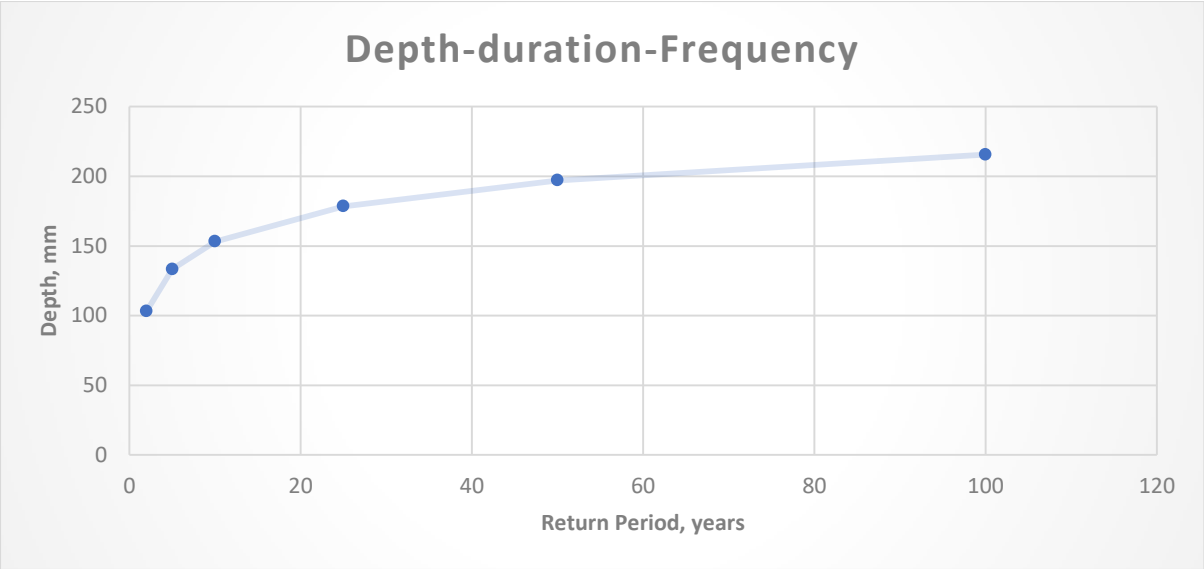


Figure 4.4: Depth-duration-Frequency

4.4.3 Temperature

Temperature values are high throughout the year over the project environment as shown in Figure 4.5. Mean maximum ambient temperature values range between 32^{O}C in February and 28^{O}C in July and September, while minimum temperatures range between 29^{O}C in March and 27^{O}C in August. A quick overview of the data indicates that higher temperatures were recorded at the peak of the dry season, between November and May, while lower temperatures were recorded in the rainy season, between June and October. It is obvious that the rains appear to have a moderating influence on temperatures.

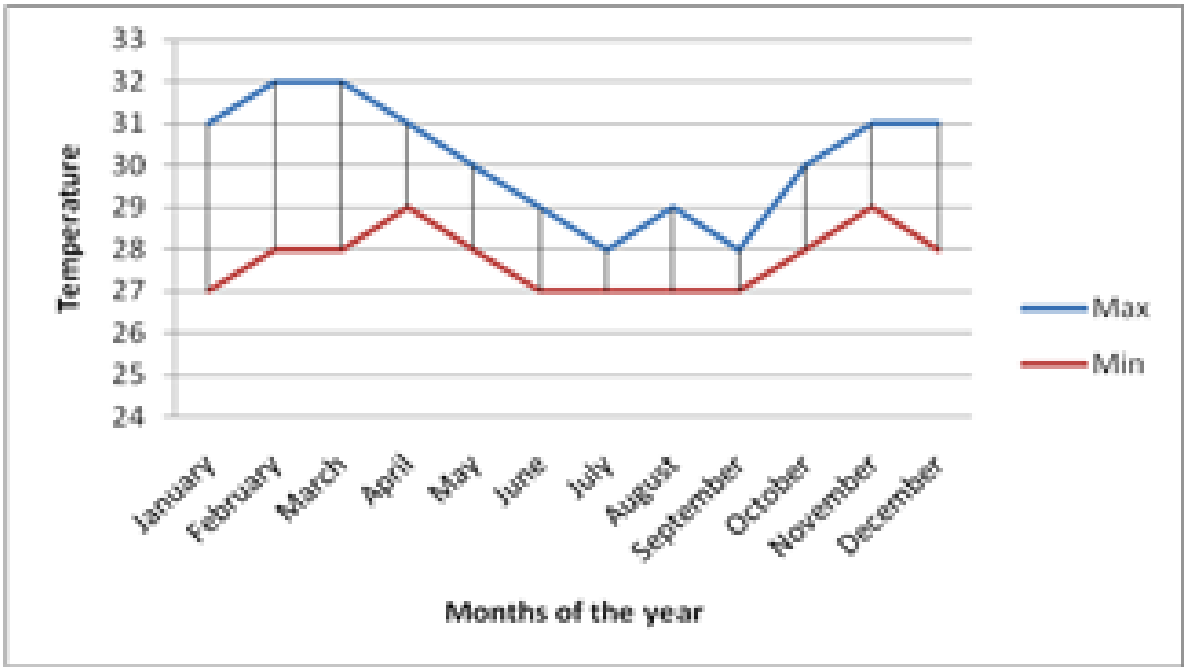


Figure 4.5: Average Temperature in the Project Area for the Period 2002 – 2021

4.4.4 Wind Speed and Directions

The mean annual wind speed varies between a narrow range of 4.0 and 6.2 m/s. Speeds are higher between July and August, the period of August break. Conversely, at the peak of the rainy season in September and October, wind speeds are lowest, measuring between 4.1 and 4.2 m/s. From December, wind speeds begin to rise steadily till March, just before the rain begins and later rises during the August break.

There are slightly lower speeds in October/February while high wind speeds are obtained from March to September. The wind pattern follows the migratory ITD. According to the statistics available for the last ten years the prevalent wind directions is South-westerly. Often, the South-westerlies dominate the wetter period of the year in the area while North-easterlies dominate the drier season. Depending on the shifts in the pressure belts in the neighbouring Gulf of Guinea, they are interspersed respectively by South-easterlies and North-westerlies.

4.4.5 Humidity (RH)

RH is usually in excess of 70%, especially during the peak of the wet season. This is understandable given the geographical location and the fact that rain falls almost all the year round. Highest values of 78% occur in June to October and the lowest value of 57% was recorded in February.

4.6 Climate Projections

Nigeria has experienced major flooding events, with the most recent and most significant occurring in 2012. Severe flooding in 2012 affected seven million people and caused economic damages estimated at $500 million. Severe flooding in 2015 affected one million people and resulted in damages of approximately $25 million.

According to a 2009 DFID study, if no adaptation action is taken, between 2–11% of Nigeria's GDP could be lost by 2020. The Post Disaster Needs Assessment (PDNA) Report following the 2012 flood revealed that the total damage caused by the disaster amounted to $16.9 billion, representing 1.4% of real GDP growth in that year.

In the 2021 Climate Risk Profile for Nigeria (2021) by The World Bank Group, Climate change trends are expected to increase the risk and intensity of flooding through increased frequency and intensity of heavy rainfall events. Additionally, the country's eastern (which the proposed project site belongs) and western areas are expected to experience increased aridity and drought, with significant impact on livelihoods.

Nigeria submitted its Third National Communication in 2020 its Nationally-Determined Contribution (NDC) to the UNFCCC in 2016 and its Updated NDC in 2021. These outline the country's efforts to promote its sustainable development goals. Efforts include adaptation and mitigation actions which are economically efficient and socially desirable and which achieves climate change benefits

Changes in rainfall with increased temperature and increases in floods and droughts will impact food security and water availability. Increased incidence of extreme rainfall may also result in soil erosion and water logging of crops, thus decreasing yields and increasing food insecurity.

Given projected climate change trends, Aba and indeed other parts of the State are expected to continue to be hotspots of gully erosion and other geomorphic processes. If nothing is doing it will continue to result in significant economic losses, damage to agricultural lands and infrastructure as well as human casualties.

Land degradation and soil erosion, exacerbated by recurrent flood adversely impacts agricultural production, disproportionately affecting the livelihoods of the rural poor. Food security will be influenced because of the vulnerability of some crops to increasing temperatures and/or water stress. As captured in the Some of the projected weather events are provided in Climate Change Knowledge Portal (worldbank.org) are given in Figures 4.6-4.10

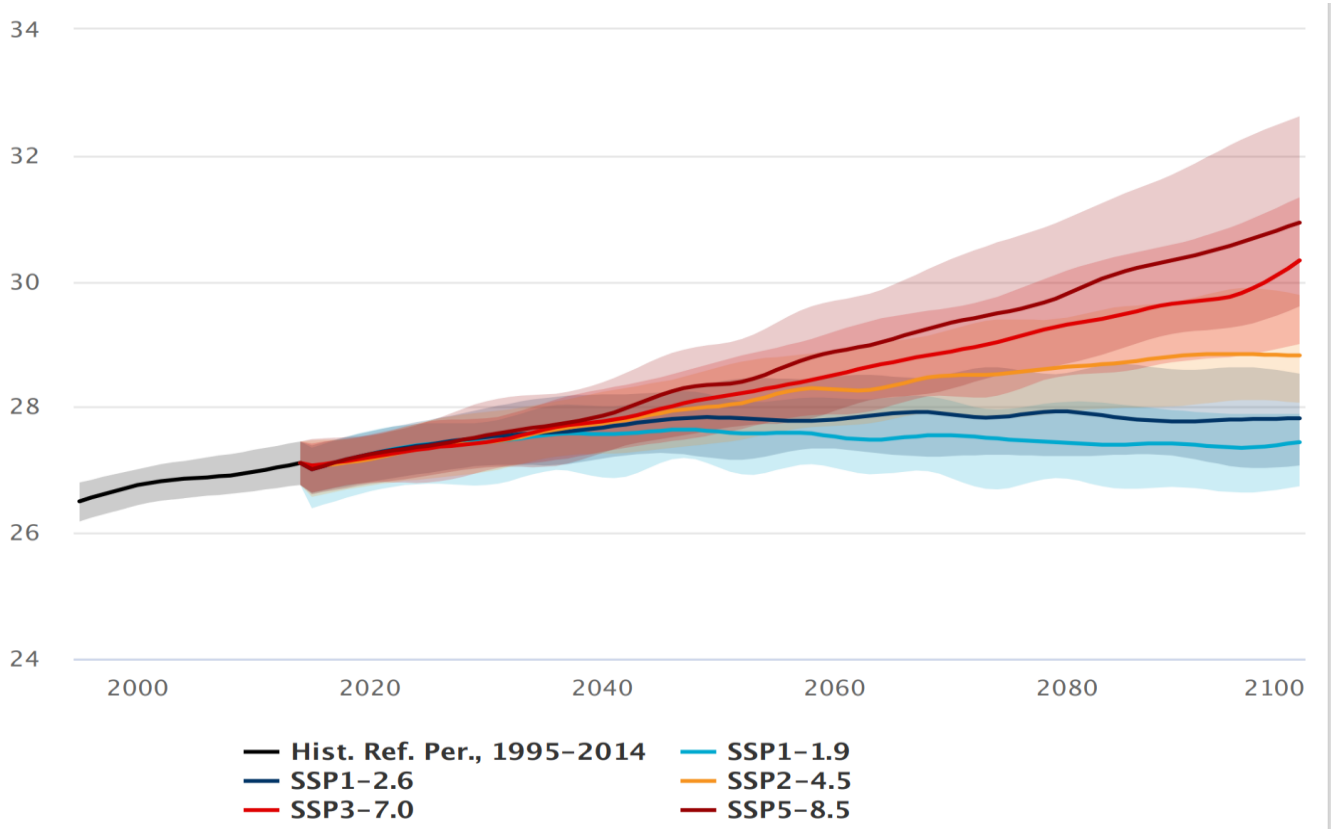


Figure 4.6: Projected Mean-Temperature Abia, Nigeria; (Ref. Period: 1995-2014), Multi-Model Ensemble

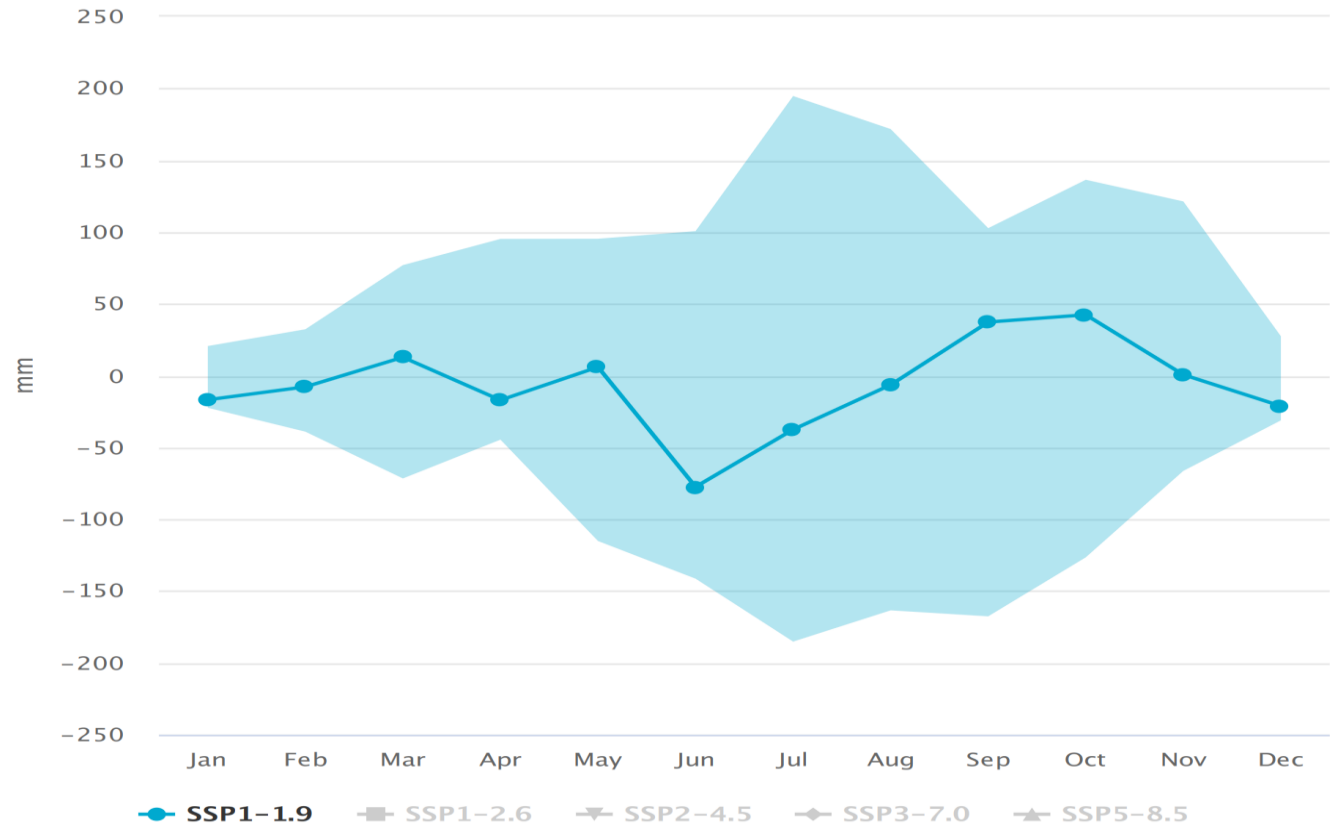


Figure 4.7: Projected Precipitation Anomaly for 2020-2039 Abia, Nigeria; (Reference Period: 1995-2014), SSP1-1.9, MultiModel Ensemble

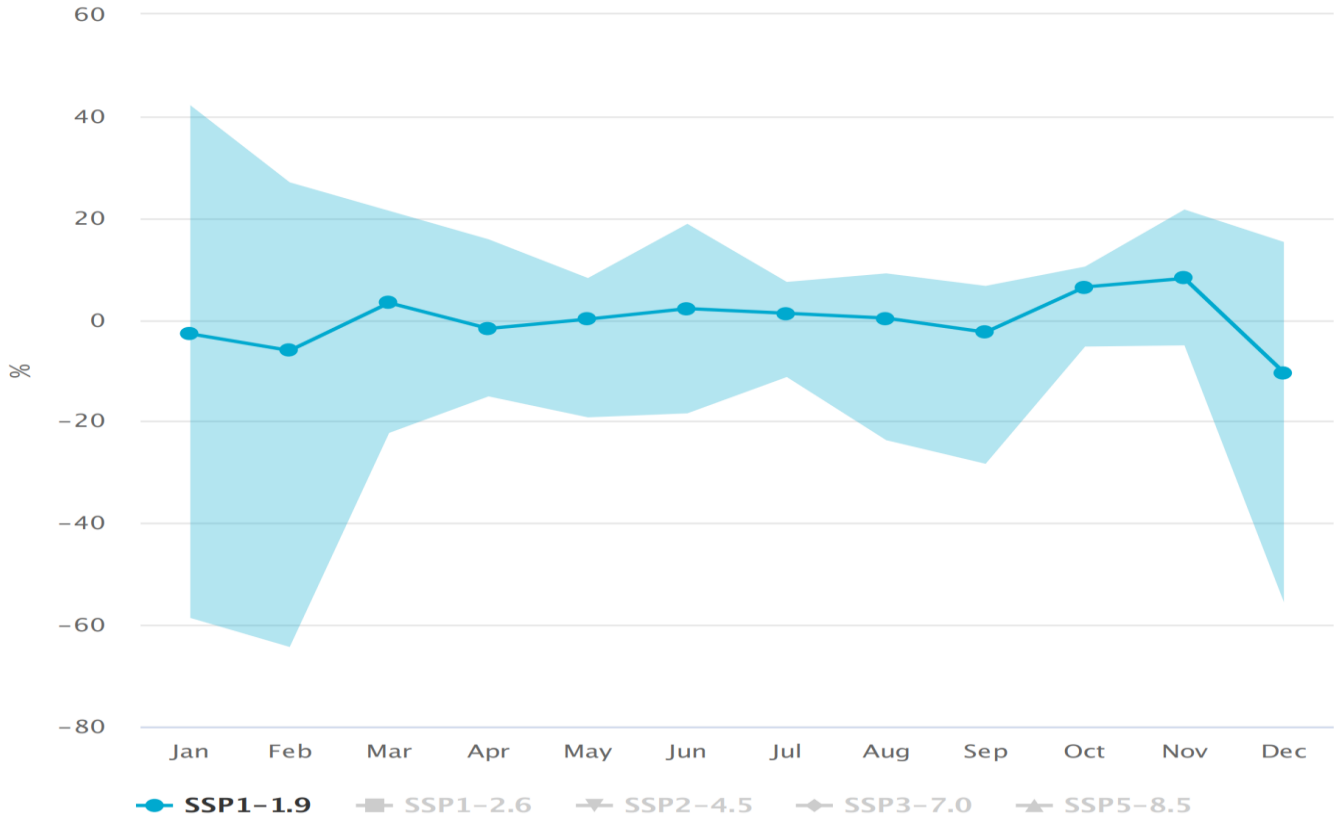


Figure 4.8: Projected Precipitation Percent Change Anomaly for 2020-2039 Abia, Nigeria; (Reference Period: 1995-2014), SSP1-1.9, MultiModel Ensemble

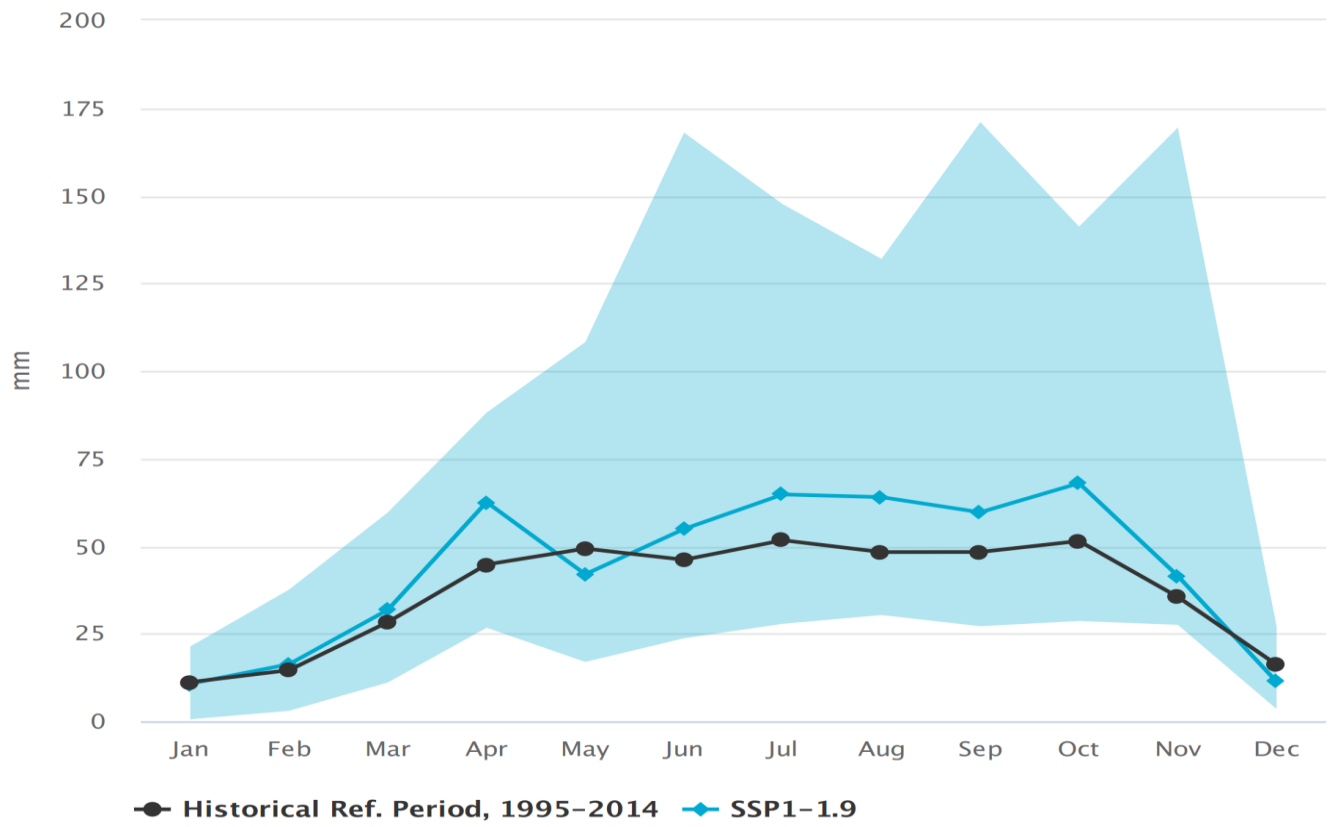


Figure 4.9: Projected Climatology of Average largest 1-Day Precipitation for 2020-2039 Abia, Nigeria; (Reference Period: 1995-2014), SSP1-1.9, MultiModel Ensemble

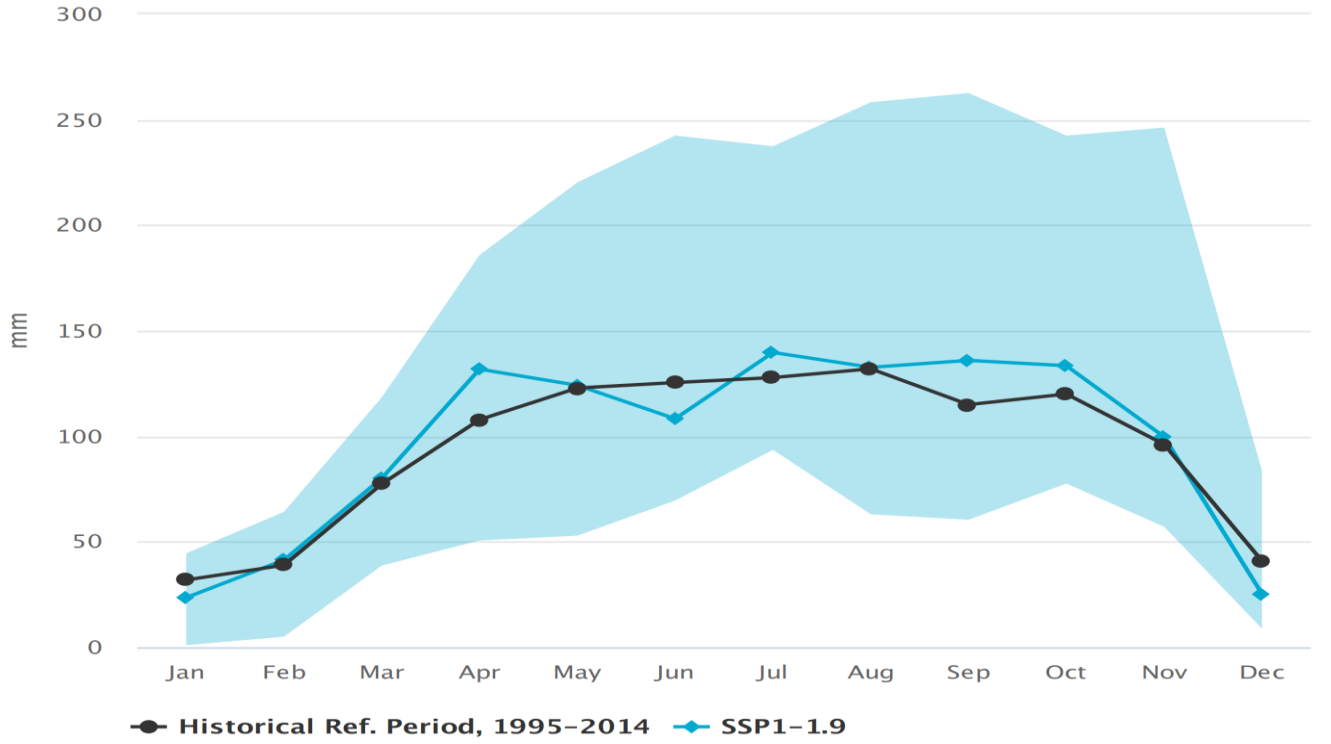


Figure 4.10: Projected Climatology of Average largest 5-day cumulative rainfall for 2020-2039 Abia, Nigeria; (Reference Period: 1995-2014), SSP1-1.9, MultiModel Ensemble

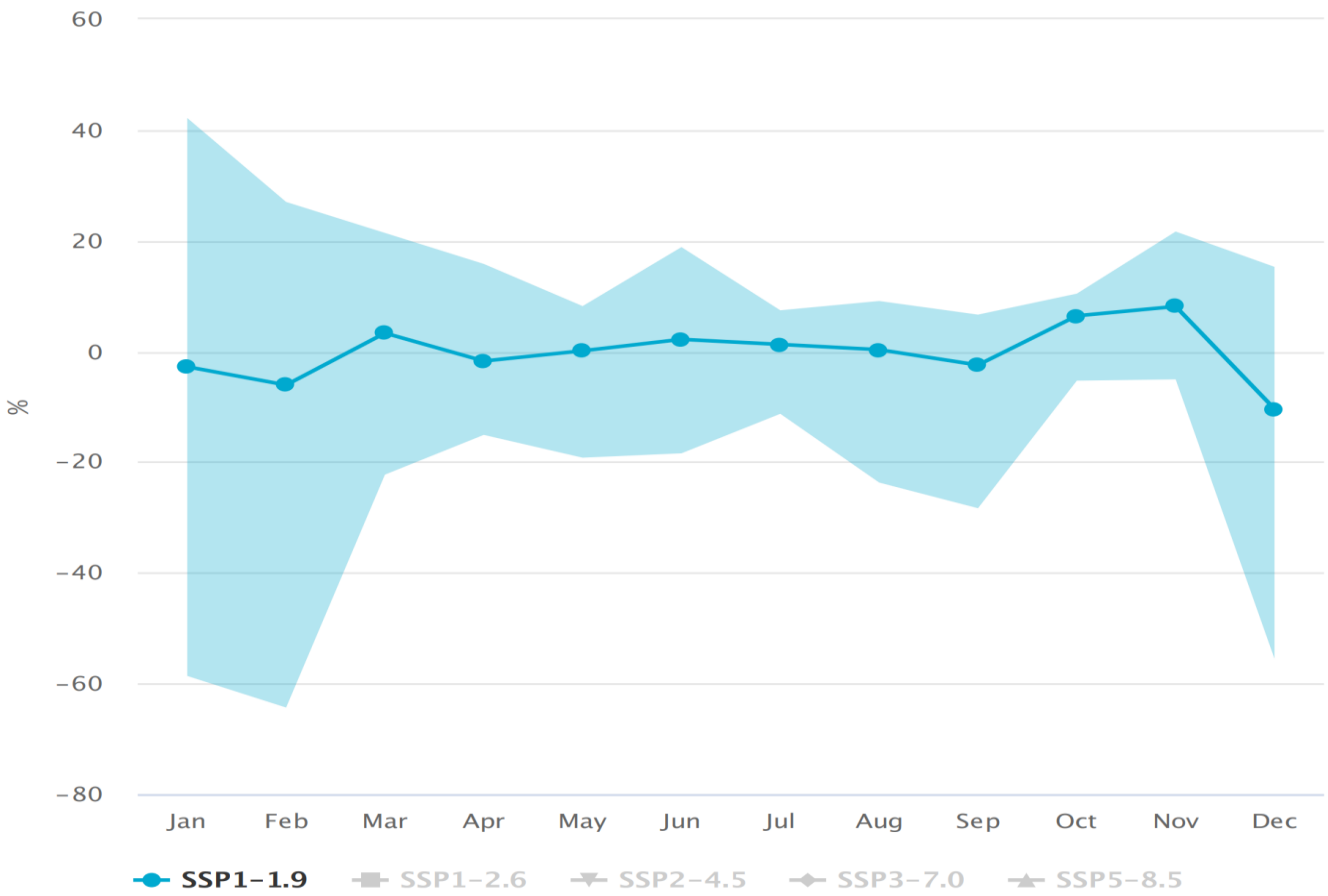


Figure 4.11 Projected Precipitation Percent Change Anomaly for 2020-2039 Abia, Nigeria; (Reference Period: 1995-2014), SSP1-1.9, MultiModel Ensemble

4.7 Air Quality and Noise

The project area's significant sources of air pollutants were vehicle emissions and dust from the adjoining untarred road. The air quality parameters, NO2 (0.004 – 0.006 µg/m3), SO2 (0.004-0.006 µg/m3), CO (<0.01 µg/m3), NH3 (<0.01 µg/m3), VOCs (level less than 0.01 µg/m3) showed a general trend of acceptable values against FMEnv standards as most of the pollutants measured were either not detectable or below the regulatory values. The particulate matters (PM2.5) ranging from 42.2 – 60.2 µg/m3note to be below the set limits of 250 µg/m3,

Noise level

The noise levels with a range of 46.8 – 54.8 dB(A) and a mean of 51.1 dB(A) were generally found to be below the NESREA prescribed limit of 60 dB(A) during the day and 50 dB(A) in the night for residential areas mixed with small scale production and commercial activities.

Appendix 4.1 contains the results of in situ air quality and noise level analysis.

4.8 Geomorphology and Topography

The general geomorphological setting of the study area is composed of fairly thick extensive layers of dense sands and laterite. The erosion sites are located on a steep undulating terrain covered with thick vegetation.

A variety of landforms exist dominated by flat and lowlying land, generally less than 120m above sea-level. The rock system is divided into three namely, Upper Coal Measure, False-Bedded Sand Stones, and Lower Coal Measure. The Upper Coal Measure formation is the largest geological formation in this region and is comprised mainly of coarse grains, alternating sediments of grey sands, dark shale which contains sands of impure coal in place of vertical horizon.

4.8.1 Topography

Generally, the topography of the southern part of the State is low- lying while the other parts of the State have moderately high plains with elevations ranging between 20 and 200 meters above sea level. Thus, the average elevation in the entire State is about 152 m above mean sea level.

The sub-catchments have a mild slope varying from 1.4 to 20%. They can be classified as a rolling to steep terrain. The watersheds of the gully drain to natural drainage channels and roadside drains. The survey reveals spot heights of between 15 m and 25 m intervals, depicting a relatively flat terrain and gentle undulating terrain. Figures 4.12 present the project Site Layout overlaid on Satellite imagery and Figure 4.13 presents the contour maps of the project sites.

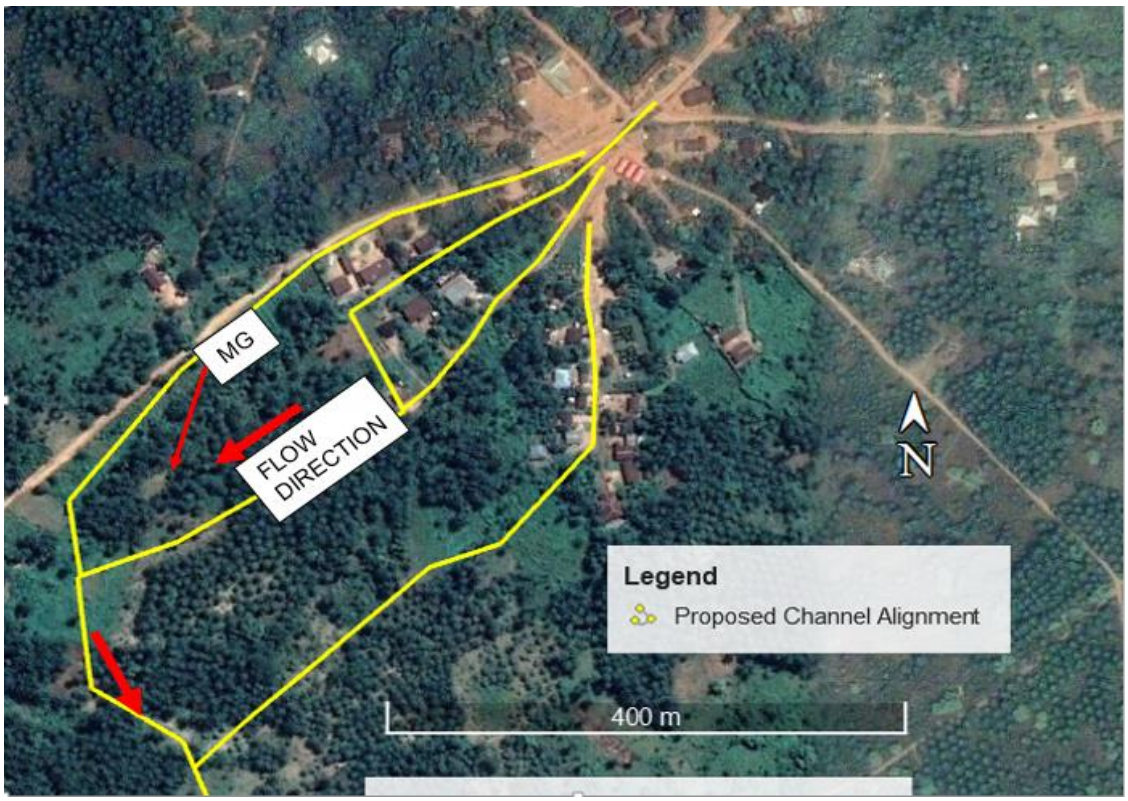


Figure 4.12: The Flow Direction of the Watershed Area

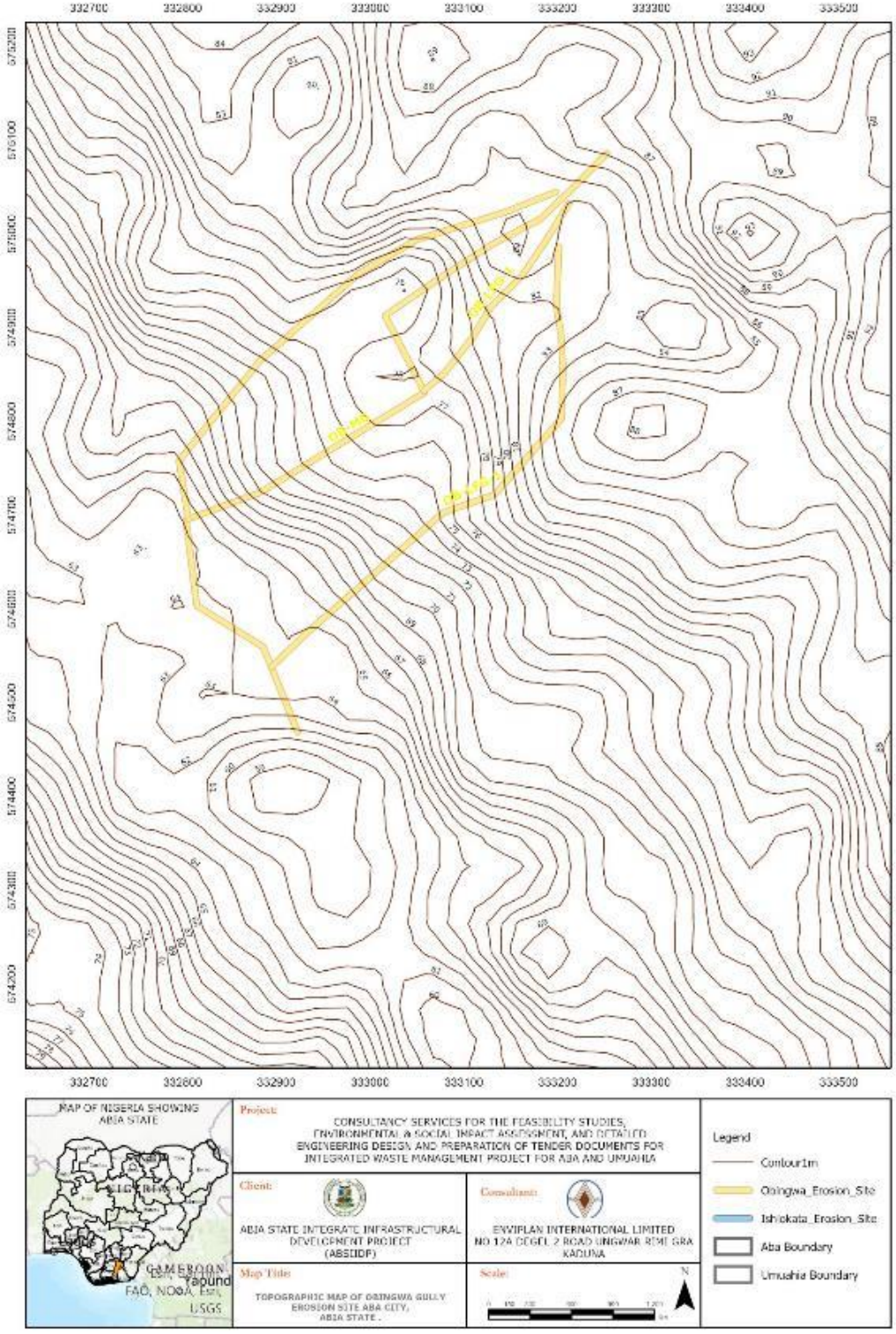


Figure 4.13: Topography of the Project Site

4.9 Geology

There are two principal geological formations in the state namely; Bende-Ameki and the Coastal Plain Sands, otherwise known as Benin Formation (Figure 4.14). The Bende-Ameki Formation of Eocene to Oligocene age consists of medium to coarse grained white stones. The Late Tertiary to Early Quaternary Benin Formation is the most predominant and completely overlies the Bende-Ameki Formation with a Southwest ward dip. The formation is about 200 m thick. The lithology is unconsolidated fine to medium coarse-grained cross-bedded sands, occasionally pebbly with localized clay and shale beds.

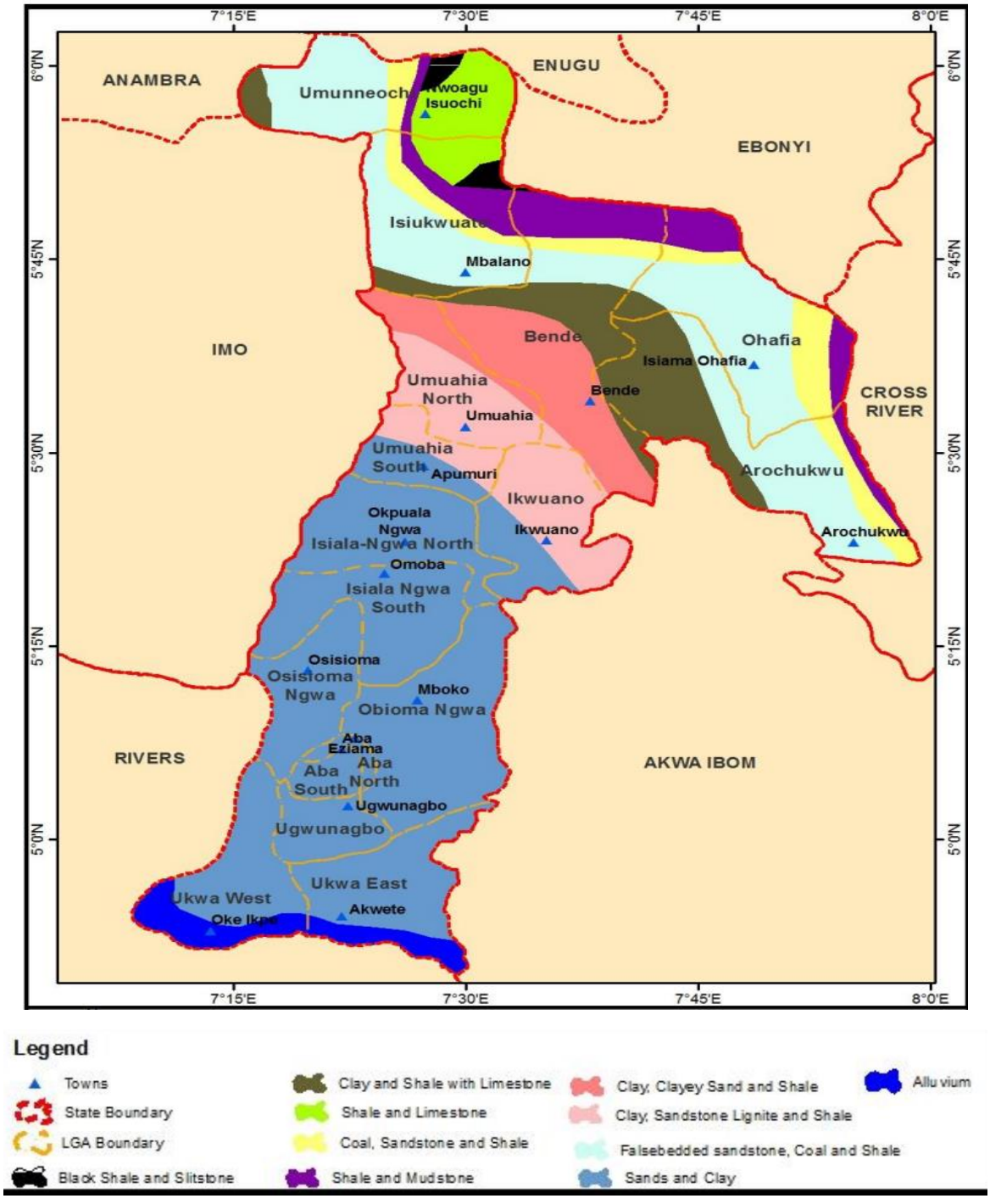


Figure 4.14. The Geology of Abia State - Source NEWMAP, 2017

4.10 Geotechnical Investigations and Soil Study

The geotechnical investigations entailed boring of six (6 Nos) boreholes to the depth of 5.1 to 6.6 m with percussion drilling machine along the gully location (Table 4.3). All field tests and sampling were done with the aim of complementing laboratory tests on the recovered samples to deduce the relevant indices and engineering parameters that are required. Table 4.4 shows the General Lithology of the site.

Table 4.3 Coordinates of Boreholes Location

Project	Sample No	Easting	Northing	Zone
Obingwa	BH1	575056	333212	32
	BH2	575051	333213	32
	BH3	575036	333196	32
	BH5	575073	333258	32
	BH6	575070	333257	32
	BH7	574236	333073	32

Table 4.4 General Lithology of the site

Depth (m)	General Lithology
0.0 – 0.6	Dense sand, laterite
1.5 – 2.1	Laterite
3.0 – 3.6	Laterite
4.5 – 5.1	Laterite

The soil materials in the area, based on the analyses carried out, are predominantly dense sands and laterite (Table 4.19 above). These were proved in six (6Nos) test bores along the gully site, with bearing capacity ranging between 118 to 908 kN/m^2.

Appendix 4.2 contains the results of in soil quality of the soil sample analysis of the project site.

The soil texture varies from loamy sand in the surface layer to sandy-clay loam down the profile. Chemically, the soil of the project area is deficient in basic cations with aluminum saturation being greater than 83%. The soils are moderately acidic (pH 4.5 – 4.9) and low in organic carbon, total nitrogen and available phosphorus. Total nitrogen and organic carbon are medium and available phosphorus is low in this soil. The mineralogy of clay sized particles showed a dominance of kaolinite in both soils with some quantities of montmorillonite that increased down the profile.

The soils of Obingwa fall within the broad group of ferrallitic soils of the Coastal Plain Sands and escarpment. Other soil types include alluvial soils found along the low terrace of the Cross River and other rivers. The soils are not particularly fertile and are prone to much leaching because of heavy rainfall. The main ecological problems in the Aba area are sheet and gully erosion.

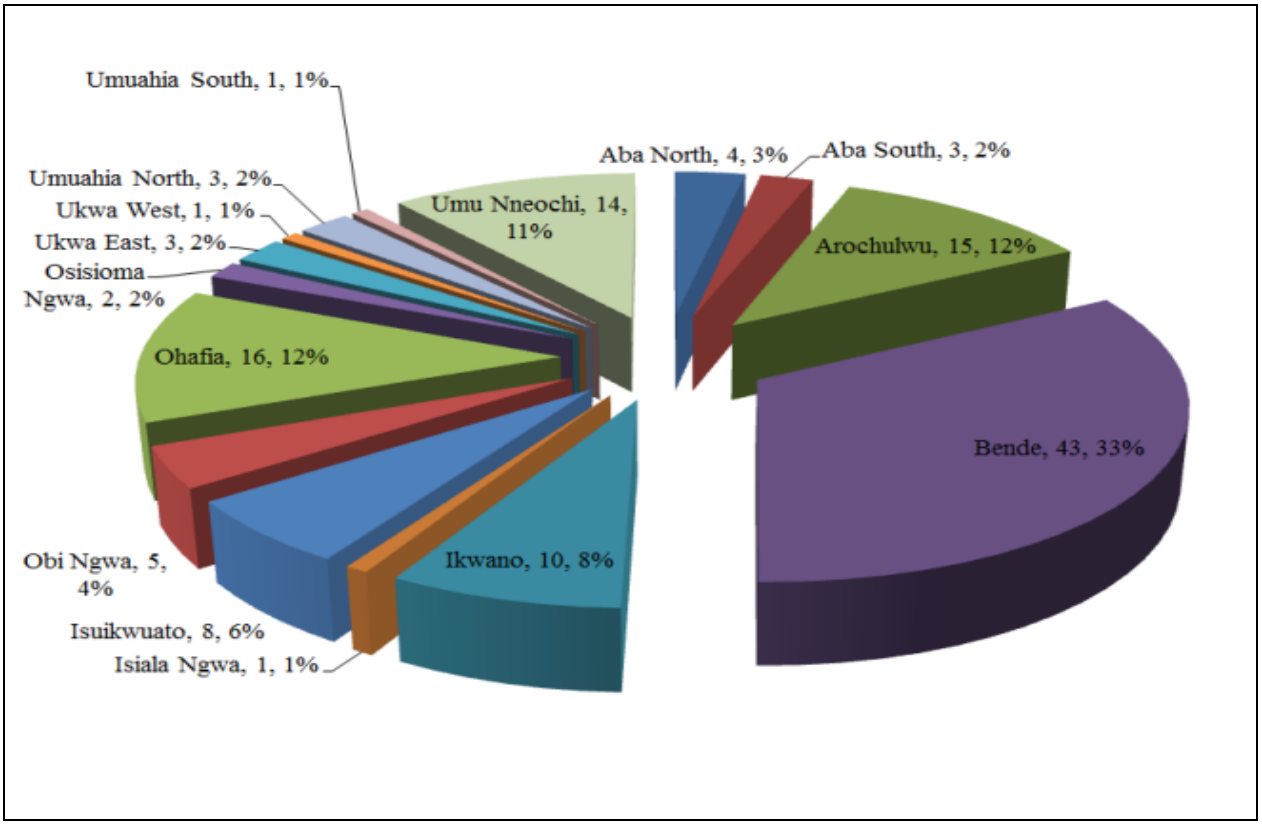
The Obingwa, Aba area is made up mainly of hydromorphic soils which consist of reddish brown, gravely and pale coloured, clayey soil. The soil is rich for agriculture, and it supports the growth of yam, cassava, maize, rice, etc. The soil material from the gully site could be classified as silty sand derived from weathered sandstone and limestone in the area. The soil material graded from dark brown to reddish yellow with lenses of grey, sandy silt of moderate void ratio. These parameters make the soil in the area very erodible.

In a study of erodibility, i.e the inherent yielding or non-resistance of soils and rocks to erosion, Abia NEWMAP (2017) pointed out that the local government area is amenable to gullies development due to groundwater and runoff.

The proportion of Sand in Soils Samples collected from project area revealed

(i)Soils containing more than 50% sand (S50%+), (ii) Soils containing 80% and more (S80%+) and less 80% (S80%-) sand of (S50%+) (Figure 4.15).

Figure 4.15 shows the percentage distribution of soils in Abia State Nigeria containing (a) 80% and more sands (S80%+) of S50%, (b) less 80% sand (S80%-) of (S50%+)



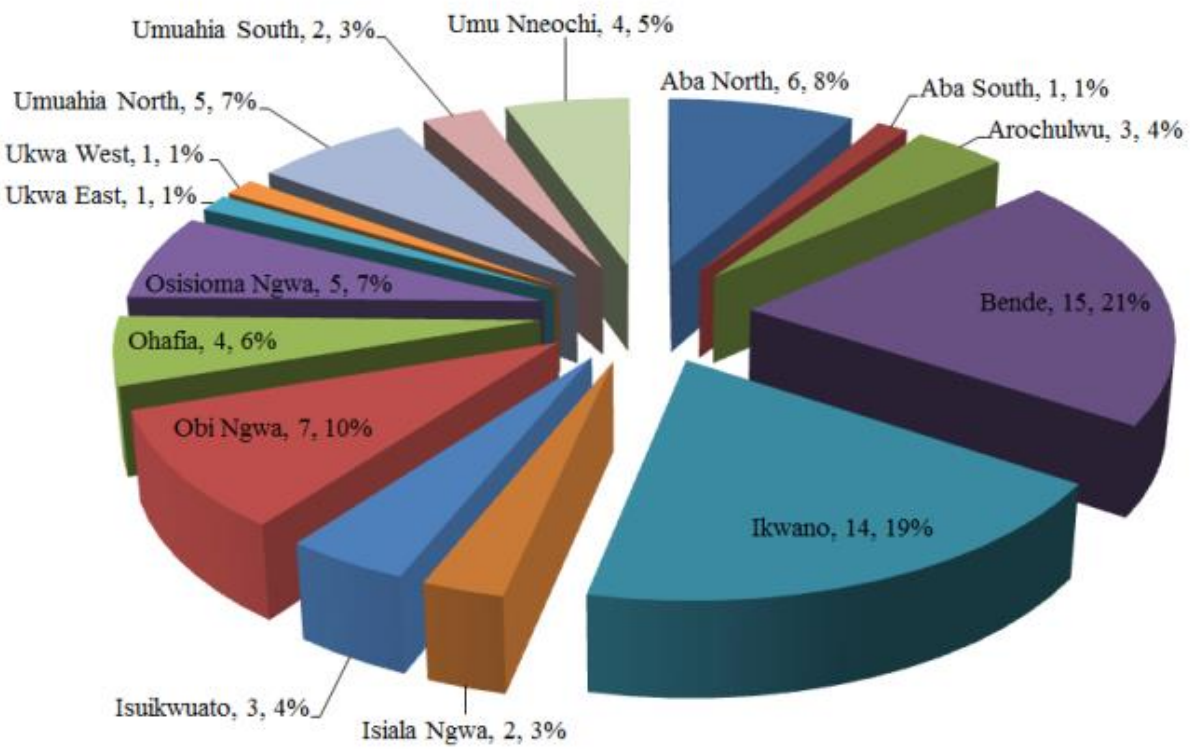


Figure 4.15: Percentage distribution of soils in Abia State Nigeria

4.11 Hydrogeology and Hydrology

The two principal geological formations have a comparative groundwater regime. They both have reliable groundwater that can sustain regional borehole production. The Bende-Ameki Formation has less groundwater when compared to the Benin Formation. The numerous lenticular sand bodies within the Bende-Ameki Formation are not extensive and constitute minor aquifer with narrow zones of sub-artesian condition. Specific capacities are in the range of 3 - 6 m^3/m/h. On the other hand, the high permeability of Benin Formation, the overlying lateritic earth, and the weathered top of this formation as well as the underlying clay shale member of Bende-Ameki Formation serve provide the hydrogeological condition favouring the aquifer conditions in the area.

The main objective of the hydrological investigation for the site was to provide design flood estimates for the hydraulic structures to be designed to mitigate the erosion at the gully site. Design floods were computed for Aba site using methods applicable and accepted in Nigeria and in the international practice for 5-, 10-, 20-, 25-, 50-, and 100-year return periods.

Accordingly, during peak flow for 25- year return period, it shows overtopping at different locations. In addition, at different locations it shows high velocity which can cause erosion. Therefore, channel modification with proper design and construction is vital.

Time of concentration or gathering time is the longest time taken for water to travel by surface flow

from any point in the catchment to the outlet. This is usually the time for water to flow from the most distant part to the watershed outlet. However, in some circumstances this may not be the case, especially if the natural drainage system is less well developed or there are various barriers in that section of the catchment.

The Bransby-Williams Equation (shown below) is suitable for watershed in rural-setting and estimation of the total time of concentration.

$$T = 58.5 \frac{L}{(A^{0.1} S^{0.2})}$$

The watershed slope was estimated based on the slope grid generated from the DEM. The flow lengths were determined from the streams generated during the DEM processing (Drainage Vector computed from stream grid raster).

In the formulae given above, the symbols are defined as follows:

L - Length of watercourse or stream (km),

S - Slope in (m/km),

A - watershed area (km^2),

Tc - Time of Concentration (minutes).

The computation of time of concentration (Tc) is shown in Table 4.5. The lag time (Tlag) is computed to be 0.6 Tc.

Table 4.5: Computation of Time of Concentration and Lag time (Aba)

Sr. No.	Drain Feature	CAT-ID	Area	EL UP	ELDS	LSTREAM	Slope	Tc	Tlag
			Km2	Masl	Masl	Km	m/km	Min	min
1		CAT-1	0.010	185	164	0.21	100.00	7.7	4.66
2		CAT-6	0.035	172	119	0.45	117.78	14.1	8.51
3		CAT-2	0.005	184	167	0.15	113.33	5.8	3.49
4		CAT-3	0.013	176	161	0.25	60.00	9.9	5.97
5		CAT-8	0.141	137	109	0.67	41.79	22.6	13.56
6		CAT-5	0.074	135	129	0.27	22.22	11.0	6.61
7		CAT-7	0.145	171	136	0.81	43.21	27.0	16.23
8		CAT-4	0.024	175	132	0.22	195.45	6.5	3.90
9		CAT-8	0.026	122	119	0.16	18.75	7.5	4.50

4.12 Groundwater and Surface Water Quality

The experimental investigation of the extent of the groundwater quality of Obingwa local government area of Abia State, Nigeria (Table 4.13), has shown (judging from the Physico-chemical variables measured) that groundwater in the vicinity is safe for drinking and other uses. Thus, the study has helped to allay people's fear that the water here is sub-standard for drinking and domestic purposes. Groundwater is an important natural resource which is next alternative to the surface supply sources that are prone to easy contamination.

In a related study, the groundwater analyses show that physical and chemical parameters are within acceptable limits for either drinking water or general domestic use. However, all samples did not

meet the pH standard of 6.5–8.5 stipulated for drinking water. This is normal for most groundwater qualities in Nigeria.
The dominant chemical ion in the groundwater of the study area is Sodium bicarbonate except at Umuika where Calcium chloride dominated. The results of surface water quality were generally acceptable as most of the parameters measured were within FMEnv acceptable values.

Appendix 4.3 contains the results of groundwater quality of the project site.

4.13 Flora and Fauna

The Flora of the project area is a mixture of eastern prototypes comprising of semi-savannah grassland with forests and swamps. Being in an agrarian area, the people of Abia State are predominantly farmers. The major characteristic of the vegetation of the intervention area is the abundant combination of varied plant groups whose branches intertwine to form a continuous canopy of leaves within the basin. The predominant vegetation visible along these zones is the grasslands, with scattered forests and woodland areas, as well as tropical rainforest which comprise tall trees with thick undergrowth and less branches.

The project area and its surroundings are in the secondary succession Rainforest with a mix of few forest flora. The area is a community of regenerating secondary plants, which has been left to fallow with some pockets of functional and abandoned farmlands, and extensive land being badly eroded. The important cultivated plants around the area are Maize (*Zea mays*), Cassava (*Manihot esculenta*), Beans (*Vigna unguiculata*), white yam (*Dioscorea esculenta*), vegetables, pepper (*Capsicum* spp.) and fruits such as Mango (*Mangifera indica*), Oranges (*Citrus* spp.), and Cashew (*Anarcardium occidentale*). The most important naturally occurring useful plants are locust bean plant (*Parkia biglobosa*), economic timbers such as *Afzelia*sp., respondenter plant (*Gmelina* plant) and *Daniella oliverii* (Butter plant), *Lophira lanceolata*(Iron wood). Economic trees in the cashew, oil-palm, oil bean, icheku trees, banana and oha trees.

Based on interviews with the communities' members, the fauna animals found in the area giant rat (*Cricetomys gambianus*), ground squirrel (*Xerus erythropus*) and greater cane rat (*Thryonomys swinderianus*), grass cutters, antelopes and pigs. Smaller animals such as lizards and skinks, as well as the larger ones like the monitor lizards were sighted including and a number of migratory birds during the field survey while some were seen foraging. The wildlife in the area is said to be greatly reduced because of excessive hunting and farming activities by the people.

4.14 Land Use

The land use/land cover of the watersheds (Figures 4.16) has been prepared based on GLCC database and local available land use GIS layers. The land use varies significantly between the upstream and downstream parts of the watersheds. The land use in the watersheds is characterised by settlements, shrublands, woodlands, forests and limited roads and lawns etc. For modelling purpose, dominant land use types are selected. Impervious surface areas estimated for the watershed computed ranged from 2% to 5 %. Rainfall on impervious areas is converted wholly into runoff. Impervious areas include roofs, paved roads etc.

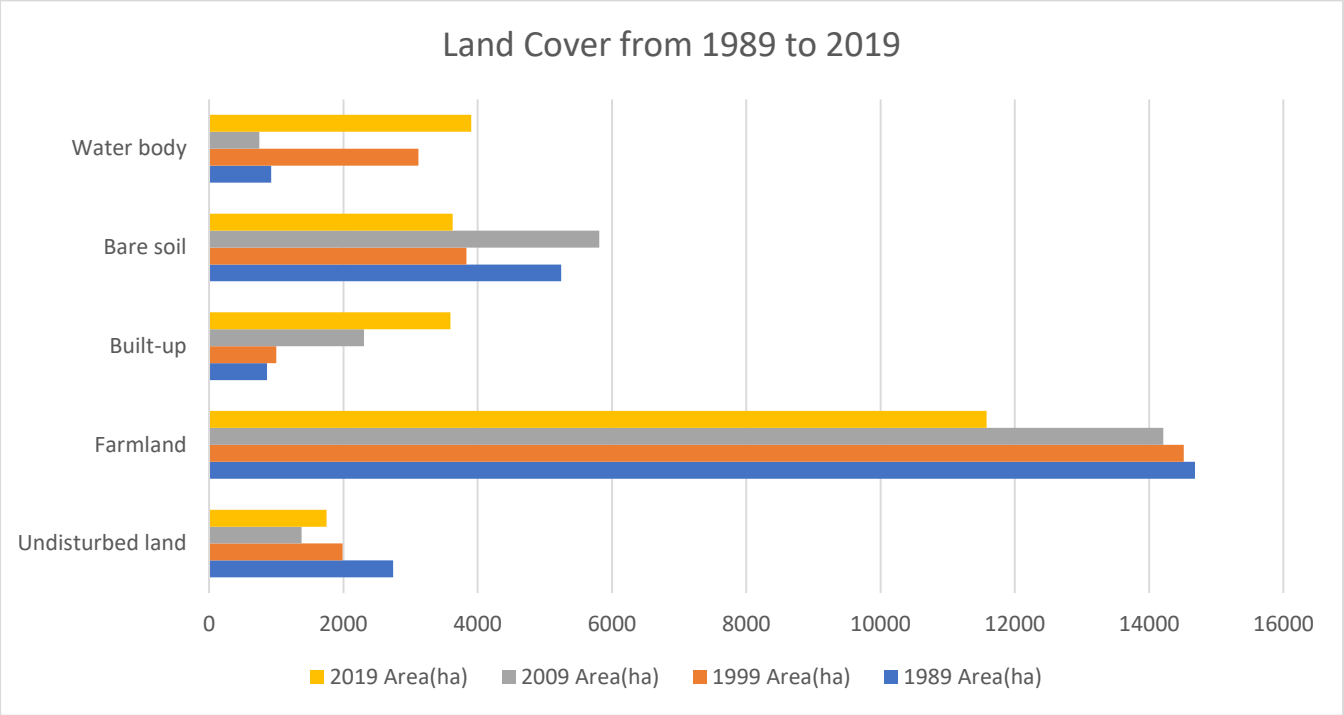


Figure 4.16: Land use/land cover of study area

4.14.1 Land Ownership

Land in the project affected community is primarily owned by male heads of the family (97.3%). Ownership rights over lands are handed down from one generation to another within the extended family. Such inherited land is put to any use as desired by the owner(s). These are the lands on which family members build their houses and are allocated farmlands for cropping. Land could be bought from owners who were willing to sell. Apart from the family, the project-affected community also owned some land.

4.15 Public Consultations

This section summarises the actions undertaken to consult the groups that would be potentially affected by the project, as well as other concerned key stakeholders. The consultation/stakeholders' engagement latched on that already established at the inception of the project preparation by the State Government. This is because it was recognised that the more direct involvement of the local stakeholders in the planning and management processes, the greater the likelihood of their support which will result to resource efficiency and a balanced way to ensure a broader benefit to community in the project area.

To strengthen the consultation process, meetings were held with the vendors along the corridor, and other relevant stakeholders between March 2021 and September 24 2021. Stakeholders met include the market women association, National Union of Road Transport Workers, Local Government officials, Ministry of Environments in both states, individuals, community leaders, and other Government officials, Different methods of communication to reach the stakeholders included face to face meeting, telephones and emails.

The Objectives of Community Consultations

The objectives included:

- Canvass the inputs, views and concerns; and take account of the information and views of the public in the project design and in decision making;
- Obtain local and traditional knowledge that may be useful for decision-making;
- Facilitate consideration of alternatives, mitigation measures and trade-offs and ensure that important impacts are not overlooked and benefits maximized;
- Reduce conflict through the early identification of contentious issues;
- Provide an opportunity for the public to influence the designs and implementation in a positive manner; and
- Improve transparency and accountability in decision-making; and
- Increase public confidence in the project.

The Stakeholders Consulted and their Concerns

The key stakeholders identified and consulted in the area include leaders in the communities, individual people who own properties that will be directly or indirectly affected, and business owners, etc. A list of those that had been met is shown in Appendix iv and the issues discussed. At the meeting, the overview of the proposed project and appreciation of ESMP were presented. Furthermore, the challenges that could impede the implementation of the project and the support needed from all parties to ensure effective project and successful implementation were also discussed with the stakeholders.

In Appendix 4.4, the highlights of the meetings with those consulted are presented.

Plate 4.1: A Cross of the Stakeholders Consulted

4.16 Socioeconomic Environment

Overview of the study area

Abia State is in the southeastern part of Nigeria. The capital is Umuahia, and the major commercial city is Aba. Abia State was created in 1991 from part of Imo State.

Obingwa LGA covers a total area of 395 square kilometers and has an average temperature of 27 degrees centigrade. The LGA experiences two distinct seasons which are the rainy and the dry seasons. The average humidity level in Obingwa LGA is put at 60 percent.

Population

National Census of Nigeria carried out in 1991 puts the population of Abia State at 1,976,805 consisting of 920,268 males and 956,434 females. In 2006, total population was 2,845,380 consisting of 1,430,298 males and 1,415,082 females. Projected to 2017, the population would be 3,766,150 consisting of 1,875,503 males and 1,890,647 females.

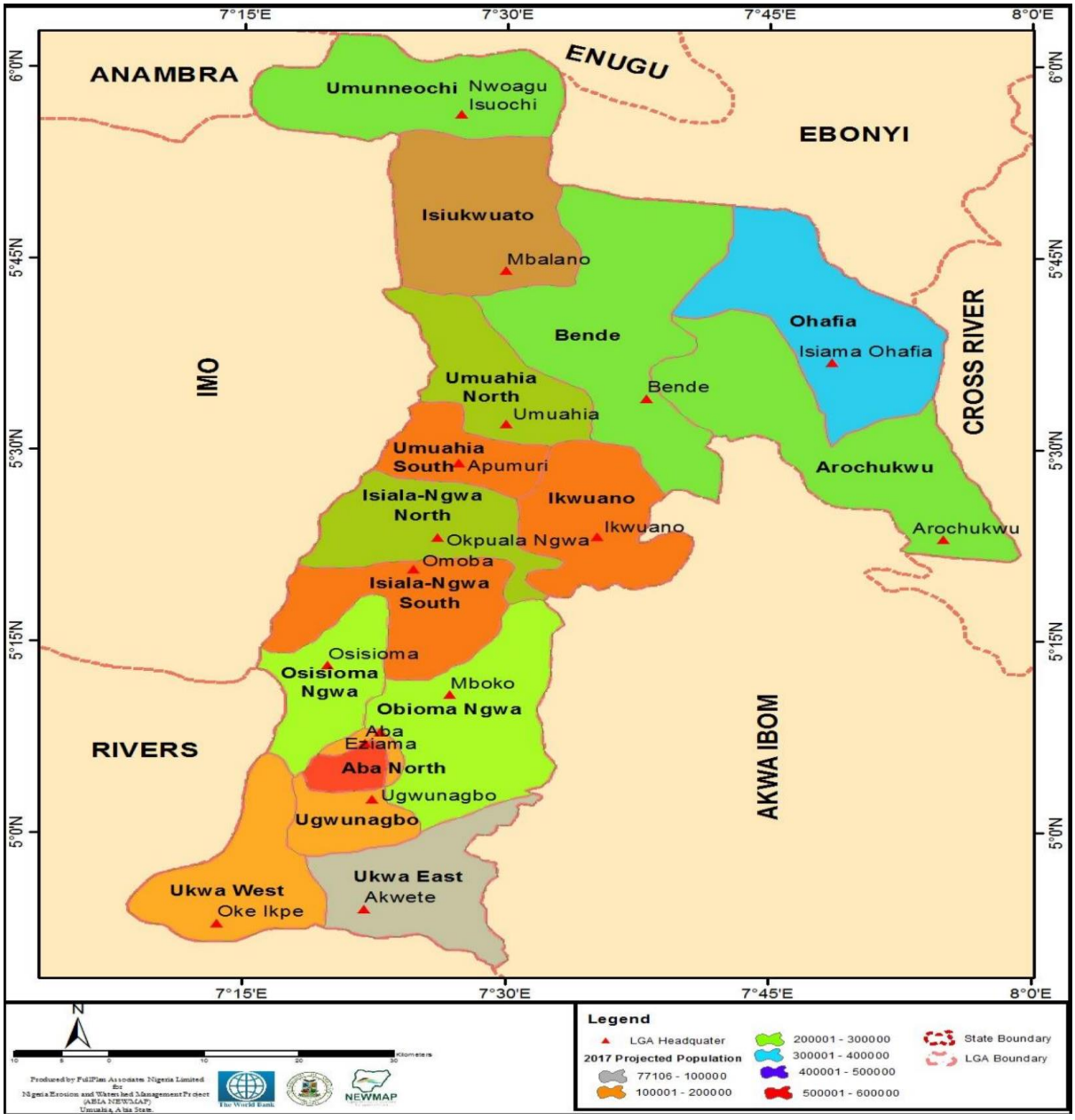


Figure 4.16: Population Map of the study area (Population Distribution 2016)

Means of Livelihoods

The Means of Livelihoods of the majority of the people is agriculture with activities primarily in farming, fishing, palm wine tapping, hunting and palm oil production by the people. Other forms of economic activities include sand dredging from the local river, employment in public services (teachers, nurses, etc), engagement in crafts and informal activities (trading, hawking, motorcycle transportation (okada riding). The major agricultural products include cassava, yams, cocoyams, vegetables, melon, and fish. Other natural resources found in the area include lead, iron ore, gypsum, limestone, kaolin, laterite, zinc, and copper.

Trade is an important aspect of the economy of Obingwa LGA with the area hosting several markets such as the Ehere Modern market where a plethora of commodities are bought and sold. Farming is also a key feature of the economic activities undertaken by the people of Obingwa LGA with crops such as yam, cassava, cocoyam, and vegetables grown in large quantities within the area.

Household Composition, Structure, and Size

A household is a person or group of related or unrelated persons who live together in the same dwelling unit(s), who acknowledge one adult male or female as the head of the household, who share the same housekeeping arrangements, and who are considered a single unit. The typical household unit in the project affected area has a head and several members. In many cases, the head is the father and members include his wife, children, and wards. The wards are often children of relations and, in some cases, friends. These are usually fed and generally catered for from the resources of the household. The household could also be composed of memberswho are not related but have agreed to live together under a common household head. This latter type of household group is not common in the study area

Literacy and Education

Education is a chief aspect of social and economic development. It improves capabilities and is strongly related with various socioeconomic variables such as lifestyle, income, and fertility for both individuals and societies. Education is a chief factor influencing a person's behaviour and opportunities. Data for the educational attainment of the respondents shows that about 99% of the respondents have formal education and this will make respondents' training and technology transfer quite easy. Table 4.6 shows the educational attainment of respondents.

Table 4.6: Educational attainment of respondents

SN	PAPs	Educational Attainment of respondents			
		No formal Edu (%)	Prim-Sec Edu (%)	Tertiary (%)	Total
1	Male	1	53.3	43	97.3
2	Female	0	1.5	1.2	2.7

Source: Fieldwork 2022

Age distribution and Marital status of the respondents

Data from the social census indicates that there are more respondents within the ages of 35-44 (68 respondents), followed by the respondents within 45-54 age bracket (54 respondents) and no respondent is underage (<15 years). Table 3.3 shows the age distribution of the respondents.

Table 4.7: Age distribution of the respondents

SN	PAPs	**Age of respondents**							
		<15	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**>65**	**Total**
1	Male	0	5	29	67	53	21	1	176
2	Female	0	0	1	1	1	2	0	5

Source: Fieldwork 2022

In terms of marital status of the respondents, data obtained from the project affected area indicate 96%, 1.7%, are married and widowed respectively. Table 4.8 shows the marital status of the respondents in the project area.

Table 4.8: Marital status of the respondents

SN	PAPs	Marital status of the respondents			
		Married (%)	Single (%)	Divorced/ separated (%)	Widowed
1	Male	94	2.3	0	1
2	Female	2	0	0	0.7

Source: Field work 2022

Traditional Governance

The host communities has distinct but similar traditional administrative structures too. The structure comprises the traditional ruler assisted by chiefs and a CDU executive with the youths and women groups. The traditional rulers (Eze) are elected from eligible males. Eligibility is determined by age (minimum of 35 years) and standing/integrity. Occupants hold office for life except where they are deposed by the community or the government. The Eze can be deposed by the community or the government if they are believed to be working against the community's interest or when they committed a heinous crime or became incapacitated by ill health. The affairs of the community are managed by a group of elderly male members of the community each representing related lineages. The Chiefs are appointed by their respective clan and family to oversee the affairs of the community and represent them in community matters. They also have the role of advising the Eze.

Vulnerable Groups

The socio-economic survey conducted as part of the ESIA and RAP assessed several indicators of socioeconomic vulnerability, including household ownership of moveable assets, social support networks, food security, and perceived needs and challenges. The statistics generated for these indicators show that many households in the local study area may indeed be regarded as socio-economically vulnerable. For instance, most households have suffered food insecurity in the year

before the survey and lack of employment was one of the most frequently-cited challenges in the area.

Some groups in the community have also been identified as potentially vulnerable to the likely impacts of the project. Their vulnerability derives from several factors, including the inability to cope with certain envisaged changes in the society and economy. A key vulnerable group is adolescents and youths. Within this group, it is also possible to differentiate between the adolescent male and the adolescent female. For the male adolescent, there is a tendency to abscond or drop out of school to seek casual employment during the construction of the gully erosion control or other businesses that will be attracted by the project.

The teenage girl on the other hand is faced with managing her sexuality in an environment where there will be considerable exposure to sexual excesses and the continuous advances by older and more experienced working-class males whose income would be an effective instrument to lure the girls. Again, with this group, there will be the likelihood of school dropout and teenage pregnancy. Many of the teenage mothers may not be able to return to complete their schooling or embark on any academic pursuits, even after they would have given birth to their babies.

Another vulnerable group is the elderly and physically challenged persons. In any economy, the elderly and the physically challenged persons usually require special attention which includes health care and welfare, but the required facilities for the provision of these social services are inadequate in the project host community. Additionally, widows and single mothers will have an uphill task providing for their households in an environment where some contractors and workers earn salaries higher than what is generally obtained in the community.

Lifestyle and Social Indulgent Practices

Lifestyle and practices raised and discussed during FGDs and interviews included, drinking of alcohol, cigarette smoking, and use of hard drugs, prostitution, teenage pregnancy, and child labour. Residents confirmed that the use of spirits and alcoholic beverages is rampant among them. About 59%, of the residents, of both genders, had been drinking since their teenage in the project host community. Cigarette smoking is also quite common among teenage and adult males in the project host community. About 90% of the residents also believe that some of the youth smoke hemps, though nobody admits to smoking Indian hemp may be due to the implication of admitting the same. Child labour, another of the social vices, is not common. Children usually assist their parents in farming and running their shops. The girl child in the study area is also made to go round the streets of their community to sell merchandise for the parents. This type of work does not attract any salaries or wages. Residents expressed fears that the proposed project would further encourage some of these vices if construction workers and camp followers take up residence among them during the construction phase. Drinking, smoking, use of hard drugs, teenage pregnancies, and prostitution were particularly mentioned by the respondents.

Belief Systems and Practices

Residents of the affected community are mostly Christians. There are various Christian denominations with worship places spread across the project host community. Christian denominations in the surveyed community include Anglican, Living Faith Church, Assemblies of God Church, Catholic Church, Cherubim and Seraphim, Redeemed Christian Church of God, The Apostolic Church, Deeper Life Bible Church, Greater Evangelism Worldwide Crusade, among

others. Christian worship places are generally present in the area and they are revered among residents. The main Christian festivals of Christmas and Easter are celebrated in the project host community.

Traditional worship practices are carried out by a few adherents in project host community as many have converted to the Christian faith and abandoned traditional religious practices. Results from interactions in the surveyed community show that the people still have deity called various names and it is believed to be responsible for the protection of lives and properties in the area. Traditional festivals in the project host community can be in the context of a holiday, often marked by merriment and high-spirited cultural fulfillment as a successful celebration featuring elaborate theatrical presentation, honouring a member or marking a collective festive period of a given community, as title taking, marriage ceremony, and fertility rites of passage. These festivals and carnivals feature music, dances, fashion, and food, allowing visitors to join in and have a first-hand experience of their culture.

Traditional Igbo religion includes a belief in a creator god (Chukwu or Chineke), an earth goddess (Ala), and numerous other deities and spirits as well as a belief in ancestors who protect their living descendants. The revelation of the will of the deities is sought by divination and oracles. Many respondents are now Christians; though some are practicing a syncretic version of Christianity intermingled with traditional beliefs. There are celebrations such as the New yam festival (Igbo: Iri Ji) which are held for the harvesting of the yam. The new yam festival (Igbo: Iri ji) is celebrated annually to secure a good harvest of the staple crop.

Conflict Management and Security

The surveyed community like any other human community is not without human conflicts, which may arise from time to time due to individual differences occasioned by different socialization and orientation. Reported sources of conflict in the study community are disputes over land, and politics. The most frequent sources of these disputes as reported by the respondents are land ownership and boundary. The principal medium of conflict resolution in the project host community is traditional leadership. There are unwritten rules that govern the dispensation of justice in the area. Resort to formal judiciary (court) process is very rare in adjudicating civil disputes.

The youth will be a group to watch and also dialogue with in the course of the project construction in the project-affected community. Conflicts do not always have violent outcomes; in fact, many conflict situations are resolved daily. In the study area, such non-violent conflicts also arise and there are traditional ways of resolving them. The project host community has various organs of society traditionally involved in resolving conflicts. These organs include the social organizations to which household members belong, like the women organizations, the compound chiefs, and the Community Development Union (CDU). However, at the apex of the traditional conflict resolution process in the community is the traditional leadership. Their decisions on intra-communal conflict issues are usually binding on all parties. People found guilty are punished with penalties ranging from payment of fine, a public apology, and expulsion from the community, depending on the gravity of the crime committed. Formal law enforcement agencies are rarely contacted to adjudicate contentious communal issues. They are only called in when traditional conflict resolution mechanisms do not

achieve the desired effects. Law enforcement officials would rarely storm a community to arrest alleged offence perpetrators, without at least, informing the village head. The active role of the community-based vigilantes in the provision of security for lives and properties is also observed in the project host community.

Settlement Pattern and Housing Conditions

The project host community has the characteristics of both linear and nuclear settlements. The linear characteristics derive from the concentration of houses along the main streets and lanes in the settlements. Their nuclear characteristics derive from the clustering of houses. Houses are built in clusters which in some cases may identify family lineages and kindred groups. Spacing between houses is not definite and could range from three or four meters to about ten meters. Figure 3.2 shows housing types in the project host community.

Local Economy

The project-affected community is endowed with a lot of natural resources. These resources have been exploited by generations z of residents, and have kept and sustained the continuous human settlements in the entire area.

The forests in the host community have various economic trees that are exploited for their products. Notable among these are 'bush mango' (from where 'ogbono' is obtained), oil palm that produces palm oil, and raffia palm which produces palm wine and local gin. Additionally, the forests are home to various animals that residents hunt for food. The land provides for the physical development of the community including housing and infrastructure. It also supports the growth of a variety of crops like plantain, cassava, and vegetables in the project host community.

Livelihood Activities

Livelihood activities in the host community are commerce and provision of services like trading, artisanship practices, and employment in the civil/public services. Artisanship practices inclusive of electrical repairs, boat building, tailoring, etc are significant in the host community. Civil/public service employees in the community are mostly State, and Local Government workers, teachers, and health workers. Others are inclusive of a few residents who are involved in contracting. Farming is also a major activity, and many residents are engaged in both crop farming, fish farming, and raising some livestock for subsistence. The usual crops are cassava, plantain, cocoa yam, and vegetables. Although incomes from these farming and allied livelihood activities vary depending on the scale of operations, local sources estimate that an average farmer earns between N200, 000 and N300, 000 annually from an investment of between N30, 000 and N50, 000.

Significant quantities of palm oil are produced and sold at major markets like Ubani market. The production of palm wine and palm oil is common in all the host community. The markets apart, there is considerable daily sales of goods in the project-affected community along major roads. Some are petty traders who can only afford to sell a few things like sweets, biscuits, bread, fruits, etc from table tops usually located in the front of their houses. Some others can afford to rent proper shops and sell from such places. This latter group usually has larger shop space and also stocks more goods. Some traders tend to sell a wide variety of items like clothing, shoes and bags, electrical fittings, alcoholic and non-alcoholic beverages, and stationery, among others. Traders deal with a wide

variety of goods and also operate on different scales and so their incomes are also very varied. The indications from their responses during interviews are that their monthly income varies between N30, 000 to N60, 000. Residents commonly engage in more than one livelihood activity. Engaging in multiple livelihood activities provides household members with complementary sources of income. In many cases, it is an indication that each of these activities only provides a subsistence income and may be seasonal. For this study, the livelihood activity with the highest annual return was considered as the respondent's occupation. Table 4.9 shows the occupation of the respondents in the project affected community.

Table 4.9: Occupation of the respondents

SN		Trader	Farmer	Civil/public service	Others
1	Male	33	44	41	58
2	Female	2	1	1	1

Source: Fieldwork 2022

Table 4.9 above indicates that more respondents are involved in artisan and business (58).

Household Income Levels and Expenditure Patterns

The major items of expenditure in the households surveyed in the host community are food, health care, purchase of household items including utilities (kerosene, petrol, etc), transportation and clothing. The major food items are mainly those that are not grown locally. Expenditure on health care by households is quite significant because most households take their sick members to private hospitals to access functional modern health care services. Apart from this, household members also spend considerable sums of money on drug purchases from drug stores (‘chemists’) in their community. Data from the field shows that transportation costs are incurred mainly in accessing health and other social amenities outside the project-affected community. Households also spend considerably on the purchase of kerosene for their lanterns and cooking stoves, and petrol for their private electricity generators. Expenditure on food and health accounts for 58% of total household expenditure. Community sources in the study area generally affirmed that for most households, expenditure on food, accessing higher education services outside their community, obtaining health care, purchase of household items, transportation, and clothing account for between 70% and 80% of their monthly earnings. Table 4.9 shows the items of expenditure in the project affected community.

Table 4.9: Items of expenditure

Items of expenditure	**Percentages (%)**
Clothing	4
Transportation	13
Health	21
Household Items	7
Food	37
Housing	17
Communication	1

Source: Fieldwork, 2022

Available Infrastructure and their functional status

Public access to the host community is by dilapidated and poorly maintained tarred roads. Additionally, telecommunication services from GSM service providers are received in all parts of the host community, although these services fluctuate in some of the host community.

Education facilities in the host community consist mainly of public primary, junior and senior secondary schools. The infrastructures in many of the schools are inadequate. The students' desks and chairs are broken and insufficient, classrooms are also insufficient, and some of their ceilings, windows, doors, and floors are broken. The schools do not have decent utilities like toilets and they also do not have equipped libraries and laboratories. The student to teacher ratio in the public primary schools is high, as much as 60:1. Teachers in the secondary schools are not enough to cover all the subject areas, and subjects like Mathematics, Physics, Introductory Technology, Agricultural Science, English Language, and Home Economics are often taught by teachers who did not study these core subjects in the tertiary institutions. The cumulative effect of these inadequacies is a lack of interest in schooling among many children in the area despite the free education policy of the state government. Parents who are interested in their children being properly educated and who can afford the cost send their children to private schools.

There is generally a dearth of functional government health facilities in the entire study area. The basic problems of the hospitals are inadequate staffing, broken down and unmaintained equipment, and lack of drugs. The situation is such that most households generally do not have confidence in them and would rather 'consult' drug stores or take their members requiring medical attention to the various private hospitals. Public water and electrification are very much dysfunctional in the project-affected community. Several water boreholes have been constructed in the project-affected community but most of them are not working largely because of poor maintenance culture. Similarly, most of the community have electricity facilities and are linked to the national grid. The power output is however so poor and erratic that a fair number of residents, especially those involved in various economic enterprises, also possess electricity generating sets to ameliorate the effect of poor power supply and power outages. In terms of trading opportunities, the surveyed community can boast of small, functional but poorly infrastructures marketing facility which deals with foodstuff basically from which the people may procure their essential needs.

Health baseline information

Sanitation and Waste Management

Refuse and sewage is mostly disposed of in the surrounding farmlands and community dump sites. Similarly, two methods of sewage disposal practiced are the use of pier system toilets and water closet toilets. About 41% of households in the study community dump their refuse in nearby farmlands, while 19% use the pit toilets. Improper disposal of refuse generated by the households, apart from being aesthetically displeasing, can constitute health risks to human life which is in other words referred to as unsafe sanitation. The common refuse and sewage disposal practices in the study area are not modern, hygienic, or safe. Most of these wastes eventually end up in the water bodies around the area or are carried downstream and deposited in other communities. Although those that are easily biodegradable (including sewage), decompose and also provide nutrients for plants and fishes, they are still sources of pollution and constitute a health hazard. Those that are not easily

degradable (especially metals and plastics) are always visible pollutants and litter around the environment. To ensure cleanliness of the state, the government initiated monthly sanitation in the state. This is done every Saturday of the month between the hours of 9am and 11am.

HIV/AIDS and social pathologies

Despite the measures for maximizing local employment, a large proportion of the construction workforce for the erosion control will originate from outside the local area. This means that it will be necessary for workers to find accommodation near the project sites. However, as has been well-documented from other infrastructure projects, the presence of non-local workers may have a variety of social consequences:

- Workers and camp followers, being a principally young, male, mobile population, are often associated with promiscuous sexual activities. Long-distance truck drivers needed to transport construction materials and equipment from the warehouse are similarly associated with cash for sex. Such behaviour could increase the prevalence of HIV/AIDS, tuberculosis, and other communicable diseases in the local study area during the construction phase. The fact that the current HIV/AIDS prevalence in Nigeria is comparatively low does not completely obviate this risk. Other social pathologies frequently associated with a transitory population with disposable income (such as drug/ alcohol abuse, etc.) may also increase.
- An influx of construction workers and terminal followers may also be accompanied by an increase in crime such as petty theft, vandalism, and poaching of domestic livestock. Even if particular instances of crime are not a result of newcomers, they may still be attributed to them by the local community and landowners.

The risk of HIV/AIDs and social pathologies is assessed as being of moderate negative significance without mitigation, which remains moderate negative with mitigation. Acquired immunodeficiency syndrome (AIDS) is one of the most serious public health and development challenges facing the world today. AIDS is caused by the human immunodeficiency virus (HIV). HIV weakens the immune system, making the body susceptible to secondary infections and opportunistic diseases. Without treatment, HIV infection leads to AIDS, which is invariably fatal.

It is noted however that a good amount of awareness education and advocacy on the disease and its prevention is ongoing and from interviews, these are beginning to yield the desired results. About 96% of the respondents are aware of HIV/Aids and its means of prevention in the project affected area. The most important tool in the prevention and control of STIs is health education which undoubtedly the study area can largely benefit from. Collaborating this, drug vendors locally referred to as chemists in the Aba metropolis said there is an increase in the number of condoms sold daily. This project is likely to have a double-pronged effect on the study area. On one hand, it will improve the socio-economic status of the people thereby riveting their attention from sexual activities. On the other hand, however, improved economic status could precipitate a change in lifestyle leading to a high intake of alcohol and increased sexual encounters.

Respondents Vulnerability Status

The survey revealed that there was one widowed respondent and one aged respondent who were above 65 years old. These are the vulnerable ones amongst the Respondents and will require special attention in the mitigation management measures for these in the RAP.

There were no under aged, orphans and the physically/mentally challenged Persons amongst the Respondents.

Awareness and impact of proposed project/activities

Majority of the community members claims to be aware of the proposed project as they were informed by officials from the government who visited the community for stakeholders' consultations. They also perceived the project as excellent and welcomed based on the explanations given to them during the visit of the State Government officials. From the FGD, opportunities were given to express thoughts of possible impacts.

Desirability of the Project and Willingness to Support

All the respondents believe the project is a desirable one and that even if there will be impact on their means of livelihoods that they will be willing to support and provide what is needed. This include even if they are displaced, they will yield for the project to succeed as holds a positive impact for everyone

CHAPTER FIVE
ASSOCIATED AND POTENTIAL IMPACTS

5.1 Introduction

This Chapter contains a summary of the environmental and social impacts that are likely to result from the proposed intervention work because of the interaction between the project components and the environmental elements, within a qualitative and quantitative assessment of the project-environment interactions. It also discusses the impact assessment methodology used for the analysis of the project environment interactions and the identified and ranked (in terms of significance), associated and potential environmental, health and social impacts of the proposed
Project.

5.2 Impact Assessment

5.2.1 Impact Identification and Evaluation

The Impact Identification and Evaluation process flow adopted for the project are depicted in Figure 5.1. The identification and management of impacts associated with the project activities were based on a risk assessment method which involves: Identification of project activities that may interact with the site environment, development of implementing controls to reduce the risk of impacts and development of Monitoring the effectiveness of the controls.

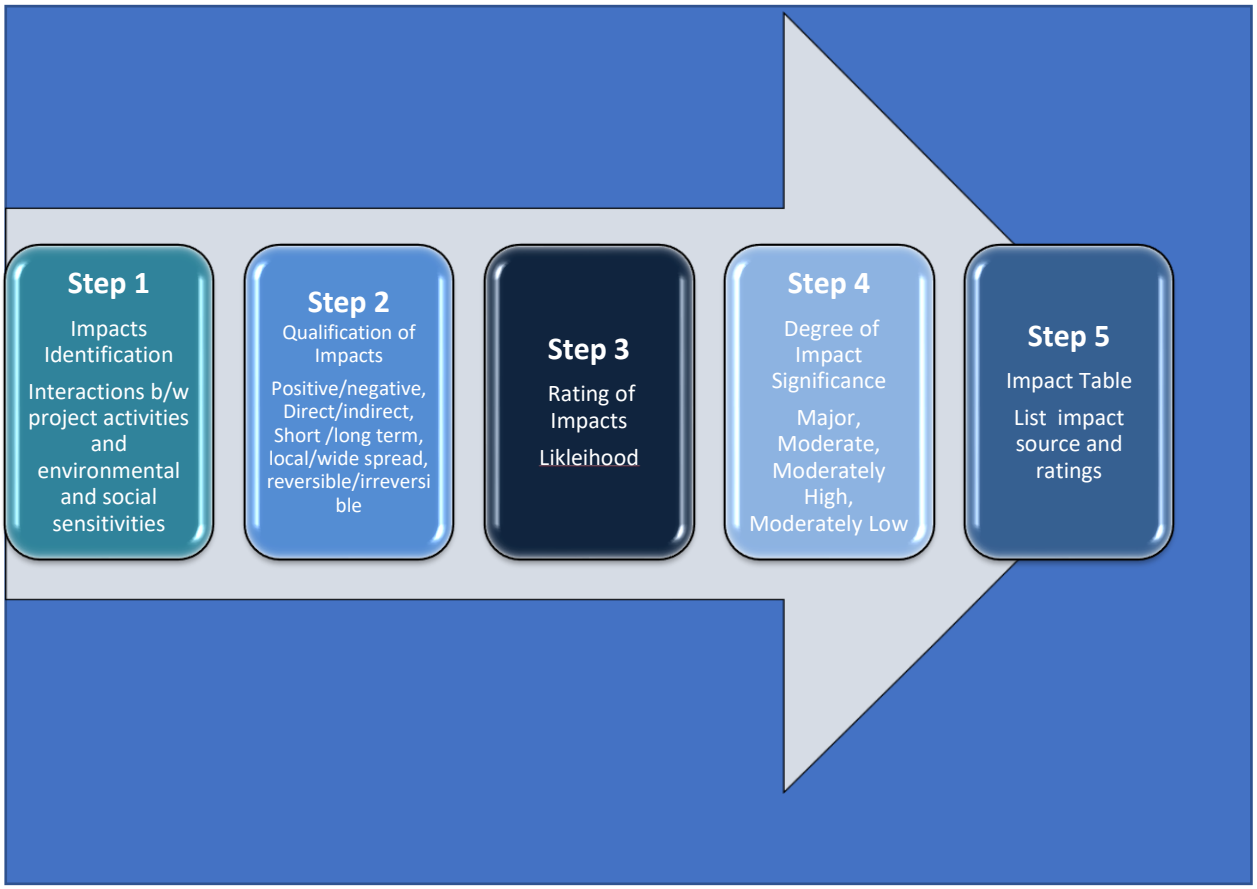


Figure 5.1: Impact Identification and Evaluation Process Flow

5.3 Environmental Components and Impact Indicators

In Table 5.1, some main components of the environment and potential impact indicators were identified. The components are those that the project activities are most likely to impact upon, while the indicators are the easily observable parameters that will indicate change/deviation, which could be used to monitor the various environmental components during the various phases of the project.

Table 5.1: Environmental Components and Impact Indicators

S/No	Environmental Components	Potential Impact Indicators
1.	Climate	Relative humidity, rainfall, temperature, wind speed and direction
2.	Air Quality	Particulate matters, , CO,CO_2, H_2S,NO_X, NO_2, SO_X,
3.	Noise & Vibration	On-site & Off-site disturbance, noise related health problems, communication interference.
4	Flora and Fauna	Changes in original types and deviation from normal characteristics
5.	Water Quality	Solids, pH, nitrate, chloride, turbidity, salinity, chemical toxicity, and microbiological characteristics.
6	Ecological setting	Erosion, flooding, etc.
7.	Socio-economics	Traffic, population, security, income, settlement pattern, and infrastructure change. Access to communication facilities, aesthetic value, Level of income and financial flows, Opportunities for contracting and procurement, Opportunities for local and national employment, Access to transport, Respect for human rights, Promoting equal opportunities
8.	Health and Safety	Accidents, Exposure to nuisance (dust, noise etc.), Level of disease vectors, Exposure to STIs/HIV/AIDS, Mortality rate, Morbidity rate, Physical activity, Hygiene, Exposure to commercial sex workers, Access to primary health care, Access to secondary health care, Access to traditional medicine, Access to emergency services.

5.4 Impact Identification and Evaluation

The identification and evaluation of impacts associated with the proposed Gully project activities were based on a risk assessment process. This involved the identification of project activities that may interact with the project environment, controls to reduce risk of impacts and monitoring the effectiveness of controls.

The key project activities of the proposed development were identified. The pathways (or events) that may cause impacts to the environment were determined, and their associated potential impacts listed. The risk of the impacts occurring was analyzed by determining the consequence severity of the impacts and the likelihood of the consequences occurring. The severity of the consequences was determined using a Consequence Severity Table and the likelihood of an impact resulting from a

pathway was determined with a Likelihood Ranking Table and then the level of risk was determined using a Risk Matrix (Table 5.3).

To prevent or minimize the impacts, controls were placed on the pathways in this order of priority:

- Elimination of the activity,
- Substitution with a lower risk activity,
- Engineering solutions to reduce the impact of the event,
- Implementation of administrative procedures to control the activity and
- Clean up or remediation measures to mitigate impacts after an event.

Table 5.2: Consequence Severity, Likelihood Ranking & Risk Matrix Tables

Consequence Severity Table		
Level		Consequence (Hazard Effect)
1	Insignificant	No detectable impact to the existing environment, Minor Injury (e.g. bruising, abrasion)
2	Minor	Short term of localized impact, Injury requiring Medical attention or first aid
3	Moderate	Prolonged but recoverable impact on the environment and commercial industries, 3 Day Injury/Temporary Disability
4	Major	Prolonged impact to the environment which may not be recoverable and threatens an ecological community, the conservation of species, Major Injury/Long Term Absence
5	Catastrophic	Non-recoverable change to existing environment leading to loss of endangered Species or creation of human health risk, Fatality/Permanent Disability
Likelihood Ranking Table		
Level		Likelihood (Probability)
5	Almost certain	The incident is expected to occur most of the time (i.e. every time), Will invariably happen - could occur repeatedly
4	Likely	The incident will probably occur in most circumstances (i.e. regularly, weekly), Highly probable - could occur several times
3	Moderate	The incident should occur at some time (i.e. quarterly), Possible: Feasible - could occur sometime
2	Unlikely	The incident could occur at some time during the life of the project, Possible: Might Happen - unlikely though conceivable .
1	Rare	The incident may occur only in exceptional circumstances and may never happen, Remote Possibility/Negligible

Table 5.3: Risk Assessment Matrix Table

Likelihood		Severity				
		Minor Injury/Not detectable	First Aid Injury/Short term	3 day Injury Temporary Disability/Prolonged but recoverable impact	Major Injury/Long Term Absence/ Prolong Impact	Fatality/ Catastrophic
Probability	Remote Possibility/Rare	1	2	3	4	5
	Might Happen/Unlikely	2	4	6	8	10
	Feasible/Moderate	3	6	9	12	15
	Highly Probable/Likely	4	8	12	16	20
	Invariably Happen/Almost certain	5	10	15	20	25

Scale

+	0	Low	Moderate	High

Decisions and nature of Actions

Rating		Definition
11-25	H	Unacceptable risk - immediate action required, Risk reduction required - high priority, High impact - Senior management involvement and planning needed
6-10	M	Medium risk - action required so far as is reasonably practical, Moderate Impact - Management responsibility must be specified.
1-5	L	Low risk - no further action required, Low impact - Managed by routine procedures
0	0	No Impact-neutral
+	+	Positive Impact

To ensure a comprehensive evaluation, a variety of measures to identify and weigh likely impacts were considered. These include:

- Overlaying project components on maps of existing conditions to identify potential impact areas and issues;
- Experience from similar projects;
- Published and unpublished documents that provided guidance on performing impact analysis, and the EIA provisions of Nigerian's Environmental laws and regulations.
- The sensitivity / vulnerability of the ecosystem component;
- Knowledge of the possible interactions between the proposed project and the environment;
- Envisaged sustainability of the project environment;
- The economic value of the proposed project;
- Projected duration of the impact of each project activity on various environmental components.
- Knowledge of the proposed project activities, equipment types, layout of the project facilities;

- Peculiar observations and results of baseline studies of the study area;

5.4.1 Project Benefits

The proposed project is envisaged to have many positive environmental and social impacts. While some of these are a function of the reasons or objectives of the project, others are a function of how the project is designed to meet its goals, as earlier discussed.

Suffice it to say that the significant benefits will occur in the form of improved erosion management and gully reclamation, which will provide for:

- Avoidance of the loss of infrastructure such as the road that is under threat by the upward incision or cut of the gully head
- Farmlands, and economic trees, along the corridor of the gully erosion might eventually be affected if nothing is made to stem the incision by running water.
- Restored vegetation cover with improved environmental conditions and provision of more humid local microclimates with carbon sequestration and shelter for wildlife.
- Improved environmental conditions for the general landscape and biodiversity due to the stabilisation of the site area.

5.4.2 Negative Impacts

The proposed project activities, unfortunately, are also likely to exert adverse impacts on the social and physical environment within which it is executed. Based on the design of the project, these impacts can be divided into two, namely: short-term construction-related impacts and unavoidable long-term impacts due to the use and maintenance of the reclaimed areas highlighted below.

Short-term construction-related impacts typical of construction activities of six months duration include:

- Increased level of noise beyond the measured range of 48.9 – 59.8 dB(A) with a mean of 55.1 dB(A) at present, which were generally within the NESREA prescribed limits of 60 dB(A) during the day and 50 dB(A) in the night for residential areas mixed with small scale production and commercial activities;
- Poor air quality from dust and emissions around the construction site and material hauling routes, for instance, would make particulate matter (PM2.5) measured at present to range from 47.2 – 64.2 µg/m3, values below the FMEnv set limits of 250 µg/m3 to be higher.
- The project area is mainly comprised of hydro-morphic soils, which consist of reddish brown, gravely and pale coloured, clayey soil susceptible to soil erosion when exposed to rain or other running water.
- The soil study with sieve analysis test results also showed the percentage of fine silt, which ranged between 3.85% and 10.3%, along the slope area of the gully erosion corridor and revealed a high likelihood of erosion or incision by water along this slope.
- Impervious surface areas estimated for the watershed computed ranged from 2% to 5 %, and rainfall on impervious areas exacerbates the erosion condition of the site.
- The study revealed the project area to have endangered species according to the endangered species Act 11 of 1985 which include 2 mammal {*Atherurus africanus* (African brush-tailed

porcupine), *Epixerus ebii* (Western Palm squirrel)} and 2 birds {*Milvus migrans* (Black kite) and *Necrosyrtes monachus* (Hooded vulture)}.

- Contamination of soil and groundwater by stored fuel, lubricants, and paints could result if these are not well handled in the course of use.
- Land scouring could result in scarring and related disturbance at sources of construction materials (sand, aggregates, stones) harvested if these are not carefully managed and reclaimed.

Socio-economically, the project is expected to impact 200 respondents of which 9 are females and 191 are males losing their crops and/or revenues. The asset to be displaced or lost potentially include 20hectares of arable/productive lands, and 1090 number of tree-crops lost

Increase in public and occupational health and safety issues within the vicinity of the site, such as the increased risk of trips, falls, injuries, accidents and spread of diseases such as COVID 19 amongst the contractors, pedestrians, passengers and staff at the project level as well as at the community level. The workers recruited for construction activities will include engineers, operators, surveyors, and drivers with non-skilled workers exposed to occupational health and safety risks and hazards. Since the construction work will be relatively small and expected to be completed within six months, large numbers of workers are not likely. However, safety and health impacts will also be expected.
Concerning the phases of the project implementation, the construction phases will include one-time activities and not permanent ones of six months. The proposed project activity will not involve any large-scale construction hence impacts associated with the project are mainly rated moderate on severity and minor on duration. Nevertheless, unless good construction management practices are followed, construction activities could cause severe environmental pollution, ecological degradation and health and safety concerns to workers and the public.

For the operational stage, the project design life is anticipated to be about 40 years, with routine maintenance to ensure durability. No impacts are expected. However, where the treated gully erosion site is left unattended in terms of care and allowed, for instance, to accumulate debris such as plastics.

Impacts due to decommissioning will result from the removal of camps, cabins, equipment, etc., after treatment of the gully erosion site, for which the significant impacts have been identified as short-term noise and dust raising. The project area, the land where these activities will take place or be removed from, will be revegetated; thus, no adverse negative impact is anticipated.

Positively, the project is envisaged to have a range of positive environmental and social impacts. Some of these are a function of the objectives of the project, while others are a function of the way in which the project is designed to meet its objectives. The project beneficiaries are the population of poor rural -urban communities lacking all-weather roads currently and severely constrained access to economic opportunities (agricultural inputs, markets, rural-urban linkages) to social services (health and education). This scenario is expected to change for the better with the proposed project.

As a rule of the thumb, conversely, it is anticipated that the road project during rehabilitation would exert some negative impacts on the social and physical environment within which they are implemented. These impacts can be divided into two, namely:

- Short-term construction related impacts such as environmental impacts on air quality, waste generation, disruption of traffic, and health and safety impacts. Unless good construction management practices are followed, construction activities can cause serious environmental pollution, environmental degradation and health and safety concerns to both workers and the public.
- Long-term and permanent activities of the operation phase leading to recurring but avoidable impacts which consist mainly of waste generation, air quality degradation in the event of use of diesel generators and noise.

Table 5.4 contains more specific potential negative impacts and the level of impacts that could emanate from the project in some fields.

Table 5.4: Potential Impacts Identification, Qualification and Rating

Project Phase	Project Activity	Description of Impact	Impact Qualification							Overall Rating
			Beneficial	Neutral	Negative	Short term < 3 months	Long term > 3 months	Reversible	Irreversible	
Preconstruction • Construction support preparation	• Construction support preparation	Poor or lack of consideration for environmental management in designs Contract documents missing environmental management measures Absence of environmental management budget	-	0	-		L	R		H
	• Movement of Equipment & materials	Dust raising and noise generation Increase in noise nuisance Reduction in air quality due to vehicular movement			-	S	-	R		L
	• Staging of equipment and crew camp	Soil compaction and soil structure changes due to influx and stationary positioning of heavy-duty equipment and vehicles	-		-		L	R		L
	• Social Issues (Local people excluded from activities)	Conflict due to non-consideration of local people in activities/jobs			-	S		R		H
	• Land acquisition for right of way	Displacement of asset (farmlands, properties, houses) Negative perception and discontent expressions by community members	-				L	R		H
	• Traffic	Travel delay/disruption of access route to places of work, residence and business due to blocked road for equipment movement or discharge	-			S		R		L

Project Phase	Project Activity	Description of Impact	Impact Qualification							Overall Rating
			Beneficial	Neutral	Negative	Short term < 3 months	Long term > 3 months	Reversible	Irreversible	
Construction	Construction camp and crew	Soil contamination, Unhygienic work environment and disturbance of the neighbourhood Disaffection in the community			-	S		R		L
	Construction activities of Camp site and staging areas	Soil excavation, Noise generation			-	S		R		L
	Site clearing of set-back from edge of gully	Removal of Flora & fauna Displacement of asset			-	S		R		M
	Earthworks - Excavation, grading, compaction, filling and other civil works	Disturbance of the natural drainage of site Increase in the amount of disturbed soil and could in turn increase the amount of erosion which can occur. Increase sedimentation and runoff Risk of pollution to water courses Destruction of visual Scenery Damage to abutting landuse construction sites			-	S		R		H
	General Treatment of the gully erosion	Failure due to poor integration between physical and biological measures. Failure to complete the treatment works for any reason – tantamount to not getting the required protection and a waste of time and resources.		0		S		R		H

Project Phase	Project Activity	Description of Impact	Impact Qualification							Overall Rating
			Beneficial	Neutral	Negative	Short term < 3 months	Long term > 3 months	Reversible	Irreversible	
	Gully Stabilisation/Use of Vegetation as control & buffers Grass-lined Channel (Turf reinforcement mats)	Failure of lined drainage channels and energy dissipaters after major storms/runoffs enters the channel. Debris/ sediment accumulation in outlets and points where concentrated flow enters the channels, bank instability, and scour holes developing	+	0	-	S	L	R		H
	Structural Erosion and Sediment Control Practices - Structural practices used in sediment and erosion control to divert storm water flows away from exposed areas, convey runoff, prevent sediments from moving offsite, and can also reduce the erosive forces	Drainage lines and ephemeral waterways may have areas that could be 'erosion starters'. Degrade water quality Alteration of local hydrology Damage of valuable ecosystems and habitats The release of fine sediments and turbid water into water body can adversely affect the health and biodiversity of aquatic life in water body downstream, increase in the concentration of nutrients and metals, reduce light penetration into the water	-	0		S	L	R	I	M
	Climate Risks	Proposed activities will ensure adaptation measures against the usual and/or anticipated extreme precipitation events that cause flooding when downpours exceed the capacity of urban drainage systems	-				L	R	I	H

Project Phase	Project Activity	Description of Impact	Impact Qualification							Overall Rating
			Beneficial	Neutral	Negative	Short term < 3 months	Long term > 3 months	Reversible	Irreversible	
	Use of heavy Equipment on site and transport vehicles on the public roads	Vibration generate lateral waves to the surrounding structure and could lead to failure Contaminate ground or surface water when hydraulic oil, motor oil or other harmful mechanical fluids are spilled Noise generation and air quality degradation, especially dust Sediment transport from the site onto public roads or adjacent properties via the wheels, chassis and side of vehicles. Disruption of visual scenery	-	0		S	L	R	I	L
	Storing Materials	Loss of the stockpiled material Damage to valuable ecosystems and habitats Leaks of hazardous materials from equipment or storage	-	0		S	L	R		H
	Social Issues	Conflicts	-	0	-		L	R		H
	Social Impacts Off-site risky behavior of construction workers such as patronage of night clubs, potentially subjects the communities to high rates of social vices.	Gender Based violence Induced influx of criminals (burglars, rapists etc) into the community.			-	S	-	R		H
	Waste/Spoil disposal	High volume of waste/spoil Spoil tipped away from designated areas	-		-		L	R		L

Project Phase	Project Activity	Description of Impact	Impact Qualification							Overall Rating
			Beneficial	Neutral	Negative	Short term < 3 months	Long term > 3 months	Reversible	Irreversible	
	Local culture and society	Socio-cultural values may be altered and the stability of communities adversely affected by presence of construction workers in the area Exposure to rapid social change or tourism.	-	0	-		L	R		L
	Land use	Displacement of assets or means of livelihood	-	0	-		L	R		M
	Utility Disruptions	Road barred from being used temporally due construction activities			-	S	-	R		M
	Quarry for fill materials	Use of agricultural land Exposure of other erosion prone sites	-		-		L	R		M

Project Phase	Project Activity	Description of Impact	Impact Qualification							Overall Rating
			Beneficial	Neutral	Negative	Short term < 3 months	Long term > 3 months	Reversible	Irreversible	
	Site Work – occupational & Public Safety and Health	Excavation exposes inhabitants and crew to risk of falls and injuries in excavation pits Use of equipment and movement of vehicles includes accident rates/ traffic hazards. Burrow Areas for fill materials could lead to accidents Exposure to atmospheric emissions from construction equipment Exposure to excessive and continuous noise and vibration from construction activities Risk of water source pollution Dust emission Communicable diseases (Covid 19 and HIV/AIDS) transmission	-	0	-		L	R		
Operation and Maintenance	Maintenance and utilization of erosion gully control site	Poor maintenance creates threshold for more erosional force and standing pools of water Breed disease vectors in settling basins and retention ponds Unsustainable use of reclaimed area areas crossing different land uses owned by different land users/Conflict Disharmony in Poor maintenance of vegetated area	-	0	-		L	R		M

Project Phase	Project Activity	Description of Impact	Impact Qualification							Overall Rating
			Beneficial	Neutral	Negative	Short term < 3 months	Long term > 3 months	Reversible	Irreversible	
Decommissioning	Break up old surface and soil, etc.	Soil erosion Dust generation Disruption of the secondary/ newly emerged flora			-	S	-	R		M

5.5 Some Specific Impacts

5.5.1 Summary of Impact Due to Project Phases

a. Construction Phase

The most damaging impact normally occurs during the construction stage. Generally, due to the type, duration and nature of construction activities envisaged, the anticipated environmental impacts are not expected to be significant. Construction activities are one-time activities and not permanent, about six months to one year. Based on the duration of the construction activities, impacts associated with construction activities are rated "Low" on duration.

However, in the absence of good construction management practices, the short-term construction-related impacts could lead to impacts such as increased runoff, air quality, noise and vibration, flooding and solid wastes management.

The key social negative impacts will likely result due to economic displacement of people otherwise known as while traffic interference is expected with occupational health and safety issues.

b. Operation Phase

The operational Phase could be seen as the long-term, permanent activity and thus impacts under this as well as their management issues are considered recurring problems. Therefore, the impacts are expected to be long-term operation and unavoidable impacts. These are likely to consist mainly of waste generation due to inspection, maintenance of the erosion control devices, etc.

c. Decommissioning Phase

This phase is not likely for the project other than the decommissioning of the equipment for the reclamation work whose impacts will be negligible.

5.5.2 Irreversible Environmental Changes

The proposed project site will neither consume nor alter significant land, environmental and socio-cultural resources.

5.5.3 Natural Resources and Cultural Site Impact

The proposed project will not generate significant demands on natural resources of the immediate or surrounding area nor disturb archaeological sites. Thus, no long-term losses of significant resources are anticipated during the intervention works. Moreover, the site will be reclaimed with the use of bio-engineering methods which will also enhance the environment.

The proposed project will not lead to disturbance of archaeological sites within the immediate vicinity or surrounding area. Thus, no long-term losses of significant resources are anticipated during the intervention works.

5.5.4 Cumulative /Secondary Impacts

The envisaged cumulative /secondary impacts arising from the gully erosion control works is considered minimal. This is the situation since the project area is not located close to any environmentally sensitive area and there is no known environmental degrading facility close to the project location. Most importantly, the project is an intervention work to rehabilitate the devastation of the environment due to gully erosion that could eventually impact on a road should the intervention not take place as scheduled. This will enhance public good with no disruption of travels on the road corridor threatened by the erosion. The project plan includes the planting of vegetation which are environmentally supportive.

5.5.5 Environmental justice

The gully erosion control work serves as a remedy to avoid the devastation of a road with the potential to have gullies by erosion which is already causing some anxiety to all members of the communities. Thus, the outcome is not meant for a particular section of the society, irrespective of status. The neighbourhoods within which the intervention will take place will rather be enhanced and not affected negatively by the physical environmental impacts more than other areas.

5.5.6 Climate Risk Impacts

The impacts of climate change due to the project execution would rather be positive as the proposed activities will serve as adaptation measure against the usual and/or anticipated extreme precipitation events that can cause flooding when downpours exceed the capacity of urban drainage systems.

CHAPTER SIX
MITIGATION/ENHANCEMENT MEASURES

6.0 Introduction

Based on the impacts identified, appropriate corresponding mitigation measures have been identified to prevent, minimise, mitigate or compensate for adverse environmental and/or social impacts. In addition, enhancement measures have been developed in order to improve project environmental and social performance. The roles and responsibilities to implement these measures are clearly defined alongside the budget for the measures estimated. Also, the cost for environmental and social capacity building and gender mainstreaming have been included. The residual impacts have also been summarised in this chapter.

6.1 Mitigation Measures Hierarchy

The measures proposed are specific, measurable, achievable and relevant to the proposed intervention and time based (SMART). The measures also considered the environmental laws in Nigeria, and internationally and the principles of sustainable development and best available technology. The principle of mitigation hierarchy outlined below was also considered:

- **Avoid at Source; Reduce at Source:** Avoiding or reducing at source is essentially 'designing' the project so that a feature causing impact is designed out or altered (e.g. reduced working width). This can also be termed minimization.
- **Abate on Site:** This involves adding something to the basic design to abate the impact-pollution controls fall within this category.
- **Abate at Receptor:** If an impact cannot be abated on-site then measures can be implemented off-site. An example of this would be to instruct authorities in affected schools to increase the level of supervision of their students and pupils during the period of civil works.
- **Repair or Remedy:** Some impacts involve unavoidable damage to a resource, e.g. agricultural land during construction. Repair essentially involves restoration and reinstatement type measures.

6.2 Projects Impacts Mitigation Measures

In Table 6.1 a summary of the potential impacts associated with the project, together with corresponding mitigation measures.

Table 6.1: Identified Impact and Mitigation measures for the proposed erosion control project, at Agburukwe Community in Obingwa

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
Preconstruction Phase: Planning & Preparatory activities (Civil Works, Construction)				
Biophysical				
1	Construction support preparation	• Poor or lack of consideration for environmental management in designs • Contract documents missing environmental management measures • Absence of environmental management budget	• Prepare applicable E&S instruments in synchronization with the preparation of the feasibility studies and detailed design by ensuring the prepared E&S instrument such as ESMP speaks to the detailed designs • Ensure final designs have plans to minimize environmental impacts. • Chose or develop design standards for each facet of construction and related activities in compliance with legal requirements on drainage, greenery, material extraction, transport and storage, construction camps, decommissioning • Include the project ESMP/Safeguard requirements as part of the bidding document • Take into account problems in soil stability and local weather and natural phenomena—flooding, heavy rain, • Ensure design brief for components proposed	Part of design Costs
2	Movement of Equipment & materials	• Increase in noise nuisance • Reduction in air quality due to vehicular movement	• Ensure releases are in compliance with NESREA Regulation • Spraying of water during excavation and site preparation works. • Raise public awareness of unusual activity • Plan activities such that Regulatory limits are not exceeded • Select appropriate plant and equipment (consider plants with the acoustic enclosures) • Ensure the use of environmental friendly technologies that minimize noise and reduce dust generations • Ensure operatives use appropriate Personal Protective Equipment (PPE) • Introduce acoustic screening • Use mufflers on equipment and plant • Employ fuel efficient and well-maintained haulage trucks with	400,186.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
			proper exhaust system to minimize emissions. • All parked vehicles on the site shall have their engines turned off; • Service vehicles as at when due and stick to manufacturers' specifications in use • Develop and follow a controlled fueling, maintenance and servicing protocol • Develop and implement a transport management plan	
3	Staging of equipment and crew camp with stockpile materials	• Energy use and emissions with noise from generators • Soil compaction and soil structure changes due to influx and stationary positioning of equipment and vehicles along with construction materials • Possible soil and surface water contamination	• Deploy solar systems for lighting instead of the use of the diesel generators to avoid emissions of gases and noise • Develop a site plan that does not require a significant amount of grade changes–that fits into existing land contours. • Soil that will not be re-disturbed for a long period should be stabilized to reduce the erosion force and Trap stockpiled soil or other materials to be used later to backfill the gullied areas so wind or running water does not carry them away • Carry out earthworks operations such that surfaces have adequate falls, profiling and drainage to control run-off and prevent ponding and flooding. • Control run-off through silt/sediment traps/barriers as appropriate to minimise the turbidity of water in outfall areas.	150,772.00
Social Issues				
4	Land acquisition for right of way	• Displacement of asset • Negative perception and discontent expressions by community members	• Develop compensation plan for displaced asset in line with the RAP that was prepared	RAP Budget
5	(Local people excluded from activities)	• Conflict due to non-consideration of local people in activities/jobs	• Incorporate methods within the skills of local people. • Contractors to use local labour mandated in the contract documents • Incorporate country systems communicated via Government circular mandating that 100% of unskilled labour from local/host community	400,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
6	Traffic	• Impact on mobility and accessibility	• Prepare and implement a traffic management plan	250,000.00
Construction Phase				
Biophysical Issues				
1.	Work and camp site	• Soil contamination, Unhygienic work environment and disturbance of the neighbourhood • Disaffection in the community	• Identify suitable camp site in consultation with relevant authorities. • Regular collection and proper disposal of Solid, liquid and human Waste. • Ensure and enforce good housekeeping	500,000.00
2	Site clearing of set-back from edge of gully	• Removal of Flora & fauna Displacement of asset	• Remove flora only when it is absolutely necessary • Develop compensation plan for displaced asset in line with the RAP that was prepared.	RAP budget
3	Earthworks - Excavation, grading, compaction, filling and other civil works	• Disturbance of the natural drainage of site • Increase in the amount of disturbed soil and could in turn increase the amount of erosion which can occur. • Increase sedimentation and runoff Risk of pollution to water courses Destruction of visual Scenery • Damage to abutting land use construction sites	• Develop a site plan that does not require a significant amount of grade changes–that fits into existing land contours. • Site that will not be re-disturbed for a long period should be stabilized to reduce the erosion force of these areas until they are disturbed again. E.g. if soil excavated from a temporary sediment • Trap is stockpiled to be used later to backfill the trap (when the area is stabilized) then the stockpile • Carry out earthworks operations such that surfaces have adequate falls, profiling and drainage to control run-off and prevent ponding and flooding. • Control run-off through silt/sediment traps/barriers as appropriate to minimise the turbidity of water in outfall areas.	5,000,000.00
4.	General Treatment of the gully erosion	• Failure due to poor integration between physical and biological measures.	• Careful planning and attention to detail • Remove the cause of the gullying. Ensure quality work • Do gully filling only after the water flow that caused the gully has	300,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
		• Failure to complete the treatment works for any reason – tantamount to not getting the required protection and a waste of time and resources.	been controlled or diverted above the gully head. Otherwise fill placed in the gully is likely to be undermined and washed away. • Avoid filling gullies with rubbish, logs, rocks, car bodies and other foreign material that are not suitable. • Use earthen banks that divert runoff away from the gully head, and convert it to slower, less erosive flow away from the actively eroding area.	
5.	Gully Stabilisation/Use of Vegetation as control & buffers Grass-lined Channel (Turf reinforcement mats)	• Failure of lined drainage channels and energy dissipaters after major storms/runoffs enters the channel. • Debris/ sediment accumulation in outlets and points where concentrated flow enters the channels, bank instability, and scour holes developing	• Design structures so that the flow in the gully is reduced to a non-scouring velocity • Plant vegetation between the structures and the gully stabilised • Locations of the structures must be placed so that as much sediment is collected as possible, while still ensuring that the structures are stable. • Sites should also be relatively smooth at the gully floor, and have a gentle slope between the gully floor and sides. • Choose the right time to do it. From late Dry season to early onset of rainy season before heavy rains is generally a suitable time as there is less chance of high volumes of run-off, yet there is sufficient soil moisture and warmth to promote the growth of vegetation.	300,000.00
6.	Structural Erosion and Sediment Control Practices - Structural practices used in sediment and erosion control to divert storm water flows away from exposed areas, convey runoff, prevent sediments from moving offsite, and can also reduce the	• Drainage lines and ephemeral waterways may have areas that could be 'erosion starters'. • Degrade water quality • Alteration of local hydrology • Damage of valuable ecosystems and habitats • The release of fine sediments and turbid water into water body can adversely affect the health and biodiversity of aquatic life in water body	• Remove and dispose of surfacing material if necessary and loosen soil of previous track to accelerate regeneration of vegetation • Reshape eroded or culled surfaces with out-sloping, re-vegetate as needed.	350,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
	erosive forces	downstream, increase in the concentration of nutrients and metals, reduce light penetration into the water		
7	Climate Risks	• Proposed activities will ensure adaptation measures against the usual and/or anticipated extreme precipitation events that cause flooding when downpours exceed the capacity of urban drainage systems	• Use minimum and efficient use of wood products for construction. • Do appropriate greenery with local species of plants • Landscape all disturbed areas using native species of flora that can withstand the weather phenomena. • Use Renewable sources of energy as much as possible	500,000.00
8	Use of heavy equipment on site and transport vehicles on the public roads	• Vibration generates lateral waves to the surrounding structure and could lead to failure of the treated gully corridor • Contamination of ground or surface water when hydraulic oil, motor oil or other harmful mechanical fluids are spilled • Noise generation and air quality degradation, especially dust • Sediment transport from the site onto public roads or adjacent properties via the wheels, chassis and side of vehicles. • Disruption of visual scenery	• As much as possible avoid use of heavy duty equipment like bulldozers, pay loaders and trucks used in excavation and loading at the control site, • Work schedule to minimize disturbance. • Alert the public when loud noise will be generated • Sound-proofed machines shall be employed • Ensure construction vehicle, machinery and equipment movement or stationed always in the designated area only and do not carry activities beyond land hired/given	440,000.00
9.	Storing Materials	• Loss of the stockpiled material • Damage to valuable	• Stockpiles should not be located within an overland flow path. • In order to mitigate the flow of water away from stockpiled material, flow diversion banks can be constructed up-slope of the	200,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
		ecosystems and habitats • Leaks of hazardous materials from equipment or storage	stockpile to divert run-off. • install a sediment fence (or heightened bund wall) on the downhill side	
Social Issues				
10	Conflicts	• Conflicts	• Incorporate methods within the skills of local people. • Contractors encouraged using local labour wherever possible. • Follow the grievance redress mechanism designed for the project	400,000.00
11	Off-site risky behavior of construction workers such as patronage of night clubs, potentially subjects the communities to high rates of social vices and security challenge	• Gender Based violence • Induced influx of criminals (burglars, rapists etc) into the community.	• For adequate mitigation efforts, identify and address the specific issue when they occur since there are diverse forms of Gender Based violence • Ensure personnel of contractors to project maintain proper decorum • Give community youth special consideration in employment and make them useful to help in the provision of security and safety of materials and personnel.	200,000.00
12	Waste/Spoil disposal	• High volume of waste/spoil • Spoil tipped away from designated areas	• As part of contract requirements, contractor will be required to develop, implement and maintain a Waste Management Plan during the construction works with emphasise to minimise waste and segregate waste • Protection of neighbourhood from debris due to construction • Minimize spoil by balancing cut and fill wherever possible • Safe tipping areas identified and enforced. • Spoil traps constructed. • Dispose in approved sites	445,814.00
13	Local culture and society	• Socio-cultural values may be altered and the stability of communities adversely affected by presence of construction workers in the area	• Ensure the workers do not interfere with the culture of the people • In the event of that previously unknown heritage resource is encountered during project construction stop work and do not disturb it until an assessment by a competent specialist is made and actions consistent with the requirements are implemented. Follow a	500,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
		• Exposure to rapid social change or tourism.		
14	Assets displacement	• Displacement of assets or means of livelihood	• Use the compensation plan for displaced asset in line with the RAP that was prepared for the project	RAP budget costing
15	Utility Disruptions	• Road barred from being used temporally due construction activities	• Notify local communities and road users in advance of and for the duration of proposed changes to local traffic access arising from Project works	150,000.00
16	Quarry for fill materials	• Use of agricultural land • Exposure of other erosion prone sites	• Avoidance of agriculture lands and other sensitive areas as borrow areas • Redevelopment of borrow areas • Redevelopment of quarries in case new quarries are setup for the Project	
17	Occupational & Public Safety and Health	• Health and safety risk due to construction activities	• All project activities shall be properly managed through careful planning and the application of relevant safety policies including the following: • Job hazard analysis (JHA) before embarking on a job, Use of appropriate Personal Protective Equipment (PPE), Prohibition of alcohol in the project area, Prohibition of smoking in designated areas, Proper journey management, contractor' Handbook of safety rules and regulation.Contractors shall provide adequate health and safety services as well as onsite First-aid services for its workforce. The First-aid services shall be extended to all visiting personnel. • Follow extant policies through Enhance safety planning and activities executed within the confines of relevant legislation and stakeholders' interests.	
18	Site Work	• Excavation exposes inhabitants and crew to risk of	• Only well-maintained plant should be operated on-site and plant shall be serviced regularly during the decommissioning program	500,000.00

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
		falls and injuries in excavation pits • Use of equipment and movement of vehicles includes accident rates/ traffic hazards. • Burrow Areas for fill materials could lead to accidents and/or breeding site for mosquitoes • Exposure to atmospheric emissions from construction equipment • Exposure to excessive and • continuous noise and vibration from construction activities • Risk of water source pollution • Dust emission • Communicable diseases (Covid 19 and HIV/AIDS) transmission	• Plan activities so as to minimize disturbances to residents, utilities and services • Develop and use a formal Health and Safety Plan for work akin to this EMP with the specified mitigation measures and more in terms of training, traffic management, speed control, warning signs, provision and use of personal protective equipment emergency action plan and monitoring/reporting. • Train workers and other staff engaged in the proposed constructions on health and safety • Ensure Penalties in case of non-compliance with the agreed standards • Ensure all reasonable steps are taken to protect any person on the site from health and safety risks • Ensure machineries and equipment are safe through the provision of security personnel • Provide adequate supervision of safe work system • Ensure means of access to and egress from the site are without risk to health and safety. • Ensure all workers are equipped with, and use PPE • Follow the Government guideline on COVID-19 management • Provide sufficient signage giving occupational health and safety warnings and information disclosure within the construction and around the site. • Carry out hazard identification and risk assessment routinely • Develop Safety plan, including emergency action plan. • Provide weekly/monthly toolbox meetings (safety briefings)	
Operation and Maintenance Phase				
1	Maintenance and utilization of erosion gully control site	• Poor maintenance creates threshold for more erosional force and standing pools of water • Breed disease vectors in	• Monitor and maintain intervention work for continued stability and quality • Shortcomings in the control structures should be corrected before they develop into serious problems. • Any grass, shrub/bush and tree planted which dies should be	10,000.000/annual

S/N	Envisaged Activities	Potential Adverse Impact	Mitigation/enhancement measures	Budget (N)
		settling basins and retention ponds • Unsustainable use of reclaimed area areas crossing different land uses owned by different land users/Conflict Disharmony in Poor maintenance of vegetated area	replaced • Treated gullies should be checked regularly and the healing process monitored closely. Structures built in • the gully for stabilization purpose should be observed for damage especially during rainy seasons and after heavy storms. Damaged check-dams should be repaired immediately to avoid further damage and the eventual collapse. • Conduct gender study to assess the challenges and opportunities for the mainstreaming of gender concerns in the use of, access to and maintenance of the gullies • Avoid delay repair even in small damage or break of control structure	
Decommissioning Phase				
1	Break up old surface and soil, etc.	• Soil erosion • Dust generation • Disruption of the secondary/ newly emerged flora	• Absence of soil erosion, water quality degradation and dust generation	2,500.000

ABSIIDP/SPIU will be responsible for the implementation

6.3 Residual Impacts after Mitigation

Residual Impacts can be considered as those that remain following the application of mitigation measures, although they are likely to have been reduced in magnitude because of the mitigation measure implemented.

Overall, on balance, with the provision of the proposed mitigation measures as outlined in Table 6.1, the positive impacts of the scheme will considerably outweigh the negative impacts. The public will benefit from the completion of the scheme.

6.4 Enhancement Measures for Positive Impacts and Reduction/Avoidance of Negative Impacts

A Mechanism for enhancement of positive impacts and reduction/avoidance of negative impacts has been developed in relation to the Project Concept and design, Construction and Operation, Control of Earthworks and Erosion and Sediment Control Plan, Managing the Treated Gully and Terminal End of the Spillway, Control of Water Quality, Waste Management, Controlled Gully Maintenance and management, Neighbourhood Effects Management. These are described briefly below:

6.4.1 Project Concept

In planning the project, greatest care must be exercised to ensure the natural topography be maintained as far as possible. Development schedule must be clearly defined, and timing of construction carried out in manner that the project starts and keeps within the schedule of completion.

Adopt the innovative concept of design with nature to minimize the impact of the project on the environment, making it more environmentally acceptable and enhancing project visually. Some of the concepts that are impeded in the concept that must be promoted in the final stage include:

- Making use of natural topography where possible.
- Exploiting natural features to blend with the environment
- Minimizing the footprints of any land take
- The use of low-emission materials and sustainable landscaping
- Ensure all waste not avoided are recovered for recycling
- Use alternative energy technologies such as photovoltaics for lighting
- Optimizing utmost savings in carbon and emissions reduction through effective green designs and practices.

6.4.2 Managing the Treated Gully and Terminal End of the Spillway

- All structural measures used in gully control must be accompanied by vegetative measures to obtain a sound result.
- All structural measures should be completed in the dry season and the accompanying vegetative measures undertaken during the following rainy season.
- Suitable tree seedlings and cuttings must be planted just behind the structural measures.

- Shrub and grass cuttings must be planted between the structural measures.
- Tree and grass seeds should be sown between the structural measures, and on gentle, bare slopes *which* have sufficient soil.
- Gentle slopes which do not need any structural measures should be planted with tree seedlings, and grass and shrub cuttings.
- The stones, which must be hard enough to withstand abrasion, non-disintegrating, and resistant to weathering, are host communityked inside the boxes. The bigger stones should be put along the sides of the box gabions while the smaller ones are filled in the middle.
- Gabion check dams combined with gabion retaining walls can be used to stabilize landslides
- Since a water body is not less than 1.5 km from the end of the spillway, it should be terminated with dam dug or a weir constructed from a permeable material designed to let the runoff pass through, but trap sediment to provide a seedbed for establishing a stabilising cover on a gully floor/bed; consist of brush, logs, wire netting with straw, or similar material
- At the terminal end of the spillway loose stone check dams made of relatively small rocks could be placed across the gully to control channel erosion along the gully bed, and to stop waterfall erosion by stabilizing gully heads.

6.4.3 Controlled Gully Maintenance and management

Maintenance for structural measures must be continued for at least two years after the treatment year.

Treated areas must be inspected at least once a year.

The trees and grass established in gully catchment areas must be protected against fire, illegal wood cutting, grazing and encroachment. If the revegetated areas are properly managed for several years after the treatment, some fuelwood can be produced from tree plantations and fodder can be obtained from grass and fodder tree plantations.

6.4.4 Construction and Control of Earthworks

During construction, earthwork is the most critical stage and the problems of soil erosion and wash off loosen soil materials which will need to be addressed. So, plan the earthworks and implement control measures at the earliest stage and schedule to avoid rainy season and detailed earthworks plan should be endorsed by a professional engineer.

6.4.5 Neighbourhood Effects Management

The main neighbourhood effects associated with earthworks are noise and dust. Dust from site earthworks and associated activities is major during dry season and minor during rainy. These will be minimised by several measures, including wetting and mulching, to mitigate potential negative effects on neighbours.

Water spraying facilities should be used during construction and wheels of vehicles or machinery used for transportation of construction materials shall be cleaned before leaving the construction site so as not to litter the roads with mud and soil.

Noise from the construction site shall be generated by different activities during construction such as: earth moving vehicles and vehicle movements. Vibration from piling operation not only can cause annoyance but can also cause structural failure risk to nearby buildings.
Noise control can be done by either engineering means, separation of source and receptors or through limiting the hours of operation of the noise source. Engineering methods could be the installation of quiet machines, insulating the machines or providing screens and noise barriers. Generally, noise in the boundary of the construction site shall be controlled so as not to exceed 55 dB(A) at night and 65 dB(A) during the day.

It should be noted that there are no sensitive areas such as hospital, schools, residential and places of worship within the vicinity of the proposed site.

6.4.6 Mainstreaming Women, Youth and People With Disability Issues

Women, youth and People With Disabilities (PWDs) are at times marginalized in most activities but constitute a very important segment of society. Women are key to ensuring the sensibility and sustainability of the overall project management. Plan to increase sustainable programmes targeted at youths and women as special groups, greater empowerment opportunities.

6.4.7 Waste Management Plan

During the construction, it is inevitable that discharges of materials to the environment will occur. If these are not controlled, they may act as a source of environmental disturbance or nuisance. The construction activities could yield a variety of waste in the form of construction materials, scrap metal, municipal wastes, etc.

For effective management, contractor should develop a waste management plan approved by SPIU to be used during construction to ensure that all the wastes must be properly identified, minimized, segregated, properly stored, re-used, tracked, monitored and audited.
All the wastes that cannot be re-used will be safely managed and disposed off in a manner that meets regulatory requirements. Suffice it to say that solid waste management steps can take the form of:
Reusable materials sorted and prepared for recycling as much as possible; and
Small waste streams of residues and specific hazardous waste dealt with in a sustainable way with good practices.

6.4.8 Social Integration and Participation

In a human-dominated world, ecosystem services are not generated by ecosystems alone, but by social–ecological systems. In line with their suggestion, it is also recommended that adaptive governance for ecosystem management which employs a social–ecological systems approach be adopted.

Adaptive governance refers to flexible and learning-based collaborations and decision-making processes involving both state and non-state actors, often at multiple levels, with the

aim to adaptively negotiate and coordinate management of social–ecological systems and ecosystem services across landscapes. The collaboration should involve:

- building knowledge and understanding of the ecosystem dynamics and services,
- feeding such knowledge into adaptive management practices, and
- dealing with external perturbations, uncertainty, and surprise.

Adaptive governance expands the measures available and provides the coordination and the context for choosing between tools, monitoring their effect, and adjusting them as the social–ecological system evolves.

6.4.9 Communication, Information and Monitoring

It is important that good relations be maintained with potentially affected local community throughout the duration of project.

Community members should be informed of the intended scope and duration of the project and associated activities well in advance and this has been started and reinforced in the course of this ESIA preparation. They should be kept informed of any changes to scheduling throughout the duration of the different aspect of the phases of the project.

All site contractors, including sub-contractors shall be made familiar with this plan prior to the commencement of any site works.

6.4.10 Grievance Redress Mechanism

Grievance Redress Mechanism (GRM) is designed to address situations of conflicts or disagreements about some of the project activities during construction and operation in the following order:

i. All complains will go to the contractor directly at the first instance;
ii. Where issues are not addressed, complaints shall be scaled to the project manager;
iii. Where it is perceived that no satisfactory attention was given then the complainant shall have access to the project owner;
iv. If, it is considered that issues or issues are not satisfactorily addressed by the Site Manager, the complainant shall be free to approach SPIU Management;
v. Informing the relevant government authorities is considered the next step if SPIU Management is seen not to have resolved the arising issues satisfactorily;
vi. The last but undesirable is reaching the court by settlement of any issues that are not addressed at the previous levels; and
vii. This grievance redress process shall be provided to any person who has complaints or grievances during the phases of the project.

All environmental or social incidents shall be documented. The report shall be transmitted to the relevant authority by the proponent, where necessary/applicable. The reporting shall be with a view to taking appropriate mitigation measures. All complaints received should be investigated and a response (even if pending further investigation) is to be given to the complainant within 5 days.

The following information must be provided:

- Time, date and nature of the incident/report;
- Type of communication (e.g. telephone, personal meeting);

- Name, house location and contact telephone number of people making the complaint; If this person wishes to remain anonymous then “not identified” is to be recorded;
- Details of response and investigation undertaken as a result of the incident/complaint;
- Name of person undertaking investigation of the incident/complaint; and
- Corrective action taken as a result of the incident/complaint.

The report shall be rendered for both internal (in-house) uses and for all phases of the project for internal and external (public) consumption through the regulators.

CHAPTER SEVEN
ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.0 Introduction

The first section of this chapter describes the surveillance measures aimed at ensuring that the proposed mitigation and enhancement measures are effectively implemented during the implementation phase. The second section concerns the environmental and social monitoring activities designed to measure and evaluate the project impacts on some key environmental and social components of concern and to implement remedial measures. Indicators, roles and responsibilities have been clearly defined along with the estimated cost of the programme including the cost for environmental and social capacity building.

7.1 ESMP implementation

The ESMP is instituted for the proposed project to ensure that impact mitigation; control and recovery measures are well implemented. The ESMP is designed to commit SPIU to operate with little or no long-term negative impacts on the project. This ESMP shall be updated and revised on a regular basis throughout the project's life cycle. It should be noted that for effectiveness, specific plans have been designed to ensure mitigation measures prescribed and others that might not have been foreseen now are implemented as summarised in Table 6.

7.2 ESMP integration into project implementation

Since contractors will implement the project on behalf of the SPIU, the Contractor (s) will be required to develop a Construction ESMP (CESMP) to ensure compliance with the requirement of the ESMP, the country system and AfDB ISS before construction works begin. The range of contractors' responsibilities in this regard include managing their direct, indirect and cumulative impacts of their activities from construction as well as impacts of their workforce and compliance with health, safety and labour requirements. In addition they will be expected to comply with specific Project HSE policies, regulations and standards through a self-verification programme by: undertaking Pre-construction Surveys and HSE assessments to identify and manage HSE risks and impacts; performing Contractor HSE inspections and audits; performing Contractor HSE Monitoring and reporting; and putting to put in place corrective and remedial measures for non-conformance and have an incident notification and Emergency and Risk Response Management Plan. An Environmental and Social Code of Conduct for road Infrastructure development for contractors is given in Appendix VI.

For the ESMP to be implemented as envisaged by the contractors, relevant aspects shall be integrated into the project design and tender documents. Using this approach, the mitigation measures will automatically become part of the project construction and operation phase. By including in the contract or in specific items in the Bill of Quantities, the cost of implementation should be covered under the normal engineering supervision provisions of the contract. Examples of clauses that should be incorporated into contracts with construction companies include:

1. Construction contracts should:

- Select or develop guidelines and procedures to be applied to each facet of road construction or rehabilitation—site clearing, bed and surface construction, drainage, fuel and material usage, quarry site management, construction camp and work site operating procedures, including worker safety.

2. Maintenance agreements should ensure:

- Finalization of maintenance agreements with local communities before beginning construction.
- Maintenance contracts that are performance-based with penalties in case of non-compliance with the agreed standards (e.g., flouting safety rules, number of potholes per km of roads). All parties must clearly understand and be committed to terms of the agreement, such as who will do what work, when, how frequently, for what compensation, and within what limits.

Table 7.1: Identified Impact and Mitigation measures for the proposed erosion control project				
S/N	**Envisaged Activities**	**Potential Adverse Impact**	**Mitigation/enhancement measures**	**Budget (N)**
A	**Preconstruction: Planning & Preparatory activities Civil Work Construction**			
	Biophysical			
1	Construction support preparation	• Poor or lack of consideration for environmental and social management in designs • Contract documents missing environmental and social management measures • Absence of environmental and social management budget	• Ensure final designs have plans to minimize environmental impacts. • Prepare applicable E&S instruments in synchronization with the preparation of the feasibility studies and detailed design by ensuring the prepared E&S instrument such as ESMP speaks to the detailed designs • Chose or develop design standards for each facet of construction and related activities in compliance with legal requirements on drainage, greenery, material extraction, transport and storage, construction camps, decommissioning • Include the project ESMP/Safeguard requirements as part of the bidding document • Consider problems in soil stability and local weather and natural phenomena—flooding, heavy rain, • Ensure design brief for components proposed	Part of design Costs
2	Movement of Equipment & materials	• Increase in noise nuisance • Reduction in air quality due to vehicular movement	• Ensure releases are in compliance with NESREA Regulation • Spraying of water during excavation and site preparation works. • Raise public awareness of unusual activity • Plan activities such that Regulatory limits are not exceeded • Select appropriate plant and equipment (consider plants with the acoustic enclosures) • Ensure the use of environmentally friendly technologies that minimize noise and reduce dust generations • Ensure operatives use appropriate Personal Protective Equipment (PPE) • Introduce acoustic screening • Use mufflers on equipment and plant • Employ fuel efficient and well-maintained haulage trucks with proper exhaust system to minimize emissions. • All parked vehicles on the site shall have their engines turned off; • Service vehicles as at when due and stick to manufacturers' specifications in use	400,186.00

Table 7.1: Identified Impact and Mitigation measures for the proposed erosion control project				
S/N	**Envisaged Activities**	**Potential Adverse Impact**	**Mitigation/enhancement measures**	**Budget (N)**
			• Develop and follow a controlled fueling, maintenance and servicing protocol • Develop and implement a transport management plan	
3	Staging of equipment and crew camp with stockpile materials	• Energy use and emissions with noise from generators • Soil compaction and soil structure changes due to influx and stationary positioning of equipment and vehicles along with construction materials • Possible soil and surface water contamination	• Deploy solar systems for lighting instead of the use of diesel generators to avoid emissions of gases and noise • Develop a site plan that does not require a significant amount of grade changes–that fits into existing land contours. • Soil that will not be re-distributed for some time should be stabilized to reduce the erosion force and trap stockpiled soil or other materials to be used later to backfill the gullied areas so wind or running water does not carry them away • Carry out earthworks operations such that surfaces have adequate falls, profiling and drainage to control run-off and prevent ponding and flooding. • Control run-off through silt/sediment traps/barriers as appropriate to minimise the turbidity of water in outfall areas.	350,772.00
	Social Issues			
4	Land acquisition for right of way	• Displacement of asset • Negative perception and discontent expressions by community members	• Develop compensation plan for displaced asset in line with the RAP that was prepared	RAP Budget
5	(Local people excluded from activities)	• Conflict due to non-consideration of local people in activities/jobs	• Incorporate methods within the skills of local people. • Contractors to use local labour mandated in the contract documents • Incorporate country systems communicated via Government circular mandating that 100% of unskilled labour from local/host community	400,000.00
6	Traffic	• Impact on mobility and accessibility	• Prepare and implement a traffic management plan	250,000.00
	Subtotal			***1,200,958.00***
B	**Construction**			
a.	**Biophysical**			

Table 7.1: Identified Impact and Mitigation measures for the proposed erosion control project				
S/N	**Envisaged Activities**	**Potential Adverse Impact**	**Mitigation/enhancement measures**	**Budget (N)**
	Issues			
1.	Work and camp site	• Soil contamination, Unhygienic work environment and disturbance of the neighbourhood • Disaffection in the community	• Identify suitable camp site in consultation with relevant authorities. • Regular collection and proper disposal of Solid, liquid and humanWaste. • Ensure and enforce good housekeeping	500,000.00
2	Site clearing of set-back from edge of gully	• Removal of Flora & fauna Displacement of asset	• Remove flora only when it is absolutely necessary • Develop compensation plan for displaced asset in line with the RAP that was prepared.	RAP budget
3	Earthworks - Excavation, grading, compaction, filling and other civil works	• Disturbance of the natural drainage of site • Increase in the amount of disturbed soil and could in turn increase the amount of erosion which can occur. • Increase sedimentation and runoff Risk of pollution to water courses Destruction of visual Scenery • Damage to abutting land use construction sites	• Develop a site plan that does not require a significant amount of grade changes–that fits into existing land contours. • Site that will not be re-disturbed for a long period should be stabilized to reduce the erosion force of these areas until they are disturbed again. E.g. if soil excavated from a temporary sediment • Trap is stockpiled to be used later to backfill the trap (when the area is stabilized) then the stockpile • Carry out earthworks operations such that surfaces have adequate falls, profiling and drainage to control run-off and prevent ponding and flooding. • Control run-off through silt/sediment traps/barriers as appropriate to minimise the turbidity of water in outfall areas.	6,000,000.00
4.	General Treatment of the gully erosion	• Failure due to poor integration between physical and biological measures. • Failure to complete the treatment works for any reason – tantamount to not getting the required protection and a waste of	• Careful planning and attention to detail • Remove the cause of the gullying. Ensure quality work • Do gully filling only after the water flow that caused the gully has been controlled or diverted above the gully head. Otherwise fill placed in the gully is likely to be undermined and washed away. • Avoid filling gullies with rubbish, logs, rocks, car bodies and other foreign material that are not suitable. • Use earthen banks that divert runoff away from the gully head, and convert	500,000.00

Table 7.1: Identified Impact and Mitigation measures for the proposed erosion control project				
S/N	**Envisaged Activities**	**Potential Adverse Impact**	**Mitigation/enhancement measures**	**Budget (N)**
		time and resources.	it to slower, less erosive flow away from the actively eroding area.	
5.	Gully Stabilisation/Use of Vegetation as control & buffers Grass-lined Channel (Turf reinforcement mats)	• Failure of lined drainage channels and energy dissipaters after major storms/runoffs enters the channel. • Debris/ sediment accumulation in outlets and points where concentrated flow enters the channels, bank instability, and scour holes developing	• Design structures so that the flow in the gully is reduced to a non-scouring velocity • Plant vegetation between the structures and the gully stabilised • Locations of the structures must be placed so that as much sediment is collected as possible, while still ensuring that the structures are stable. • Sites should also be relatively smooth at the gully floor, and have a gentle slope between the gully floor and sides. • Choose the right time to do it. From late Dry season to early onset of rainy season before heavy rains is generally a suitable time as there is less chance of high volumes of run-off, yet there is sufficient soil moisture and warmth to promote the growth of vegetation.	300,000.00
6.	Structural Erosion and Sediment Control Practices - Structural practices used in sediment and erosion control to divert storm water flows away from exposed areas, convey runoff, prevent sediments from moving offsite, and can also reduce the erosive forces	• Drainage lines and ephemeral waterways may have areas that could be 'erosion starters'. • Degrade water quality • Alteration of local hydrology • Damage of valuable ecosystems and habitats • The release of fine sediments and turbid water into water body can adversely affect the health and biodiversity of aquatic life in water body downstream, increase in the concentration of nutrients and metals, reduce light penetration into the water	• Remove and dispose of surfacing material if necessary and loosen soil of previous track to accelerate regeneration of vegetation • Reshape eroded or culled surfaces with out-sloping, re-vegetate as needed.	350,000.00

Table 7.1: Identified Impact and Mitigation measures for the proposed erosion control project				
S/N	**Envisaged Activities**	**Potential Adverse Impact**	**Mitigation/enhancement measures**	**Budget (N)**
7	Climate Risks	• Proposed activities will ensure adaptation measures against the usual and/or anticipated extreme precipitation events that cause flooding when downpours exceed the capacity of urban drainage systems	• Use minimum and efficient use of wood products for construction. • Do appropriate greenery with local species of plants • Landscape all disturbed areas using native species of flora that can withstand the weather phenomena. • Use Renewable sources of energy as much as possible	500,000.00
8	Use of heavy equipment on site and transport vehicles on the public roads	• Vibration generates lateral waves to the surrounding structure and could lead to failure of the treated gully corridor • Contamination of ground or surface water when hydraulic oil, motor oil or other harmful mechanical fluids are spilled • Noise generation and air quality degradation, especially dust • Sediment transport from the site onto public roads or adjacent properties via the wheels, chassis and side of vehicles. • Disruption of visual scenery	• As much as possible avoid use of heavy-duty equipment like bulldozers, pay loaders and trucks used in excavation and loading at the control site, • Work schedule to minimize disturbance. • Alert the public when loud noise will be generated • Sound-proofed machines shall be employed • Ensure construction vehicle, machinery and equipment movement or stationed always in the designated area only and do not carry activities beyond land hired/given	440,000.00
9.	Storing Materials	• Loss of the stockpiled soild material • Damage to valuable ecosystems and habitats	• Stockpiles should not be located within an overland flow path. • In order to mitigate the flow of water away from stockpiled material, flow diversion banks can be constructed up-slope of the stockpile to divert run-off.	200,000.00

Table 7.1: Identified Impact and Mitigation measures for the proposed erosion control project				
S/N	**Envisaged Activities**	**Potential Adverse Impact**	**Mitigation/enhancement measures**	**Budget (N)**
		• Leaks of hazardous materials from equipment or storage	• install a sediment fence (or heightened bund wall) on the downhill side	
B	Social Issues			
1	Social interactions	• Conflicts	• Incorporate methods within the skills of local people. • Contractors encouraged using local labour wherever possible. • Follow the grievance redress mechanism designed for the project	400,000.00
2	Off-site risky behavior of construction workers such as patronage of night clubs, potentially subjects the communities to high rates of social vices and security challenge	• Gender Based violence • Induced influx of criminals (burglars, rapists etc) into the community. •	• For adequate mitigation efforts, identify and address the specific issue when they occur since there are diverse forms of Gender Based violence • Ensure personnel of contractors to project maintain proper decorum • Give community youth special consideration in employment and make them useful to help in the provision of security and safety of materials and personnel.	200,000.00
3	Waste/Spoil disposal	• High volume of waste/spoil • Spoil tipped away from designated areas	• As part of contract requirements, contractor will be required to develop, implement and maintain a Waste Management Plan during the construction works with emphasise to minimise waste and segregate waste • Protection of neighbourhood from debris due to construction • Minimize spoil by balancing cut and fill wherever possible • Safe tipping areas identified and enforced. • Spoil traps constructed. • Dispose in approved sites	645,814.00
4	Local culture and society	• Socio-cultural values may be altered and the stability of communities adversely affected by presence of construction workers in the	• Ensure the workers do not interfere with the culture of the people • In the event of that previously unknown heritage resource is encountered during project construction stop work and do not disturb it until an assessment by a competent specialist is made and actions consistent with the requirements are implemented. Follow a	500,000.00

Table 7.1: Identified Impact and Mitigation measures for the proposed erosion control project				
S/N	**Envisaged Activities**	**Potential Adverse Impact**	**Mitigation/enhancement measures**	**Budget (N)**
		area • Exposure to rapid social change or tourism.		
5	Assets displacement	• Displacement of assets or means of livelihood	• Use the compensation plan for displaced asset in line with the RAP that was prepared for the project	RAP budget costing
6	Utility Disruptions	• Road barred from being used temporally due construction activities	• Notify local communities and road users in advance of and for the duration of proposed changes to local traffic access arising from Project works	150,000.00
7	Quarry for fill materials	• Use of agricultural land • Exposure of other erosion prone sites	• Avoidance of agriculture lands and other sensitive areas as borrow areas • Redevelopment of borrow areas • Redevelopment of quarries in case new quarries are setup for the Project	
C	• **Occupational & Public Safety and Health**			
1	Occupational & Public Safety and Health	• Health and safety risk due to construction activities	• All project activities shall be properly managed through careful planning and the application of relevant safety policies including the following: • Job hazard analysis (JHA) before embarking on a job, Use of appropriate Personal Protective Equipment (PPE), Prohibition of alcohol in the project area, Prohibition of smoking in designated areas, Proper journey management, contractor' Handbook of safety rules and regulation. Contractors shall provide adequate health and safety services as well as onsite First-aid services for its workforce. The First-aid services shall be extended to all visiting personnel. • Follow extant policies through Enhance safety planning and activities executed within the confines of relevant legislation and stakeholders' interests.	1,500,000.00
2	Site Work –	• Excavation exposes inhabitants and crew to risk of falls and injuries in excavation pits • Use of equipment and movement of vehicles includes accident rates/	• Only well-maintained plant should be operated on-site and plant shall be serviced regularly during the decommissioning program • Plan activities so as to minimize disturbances to residents, utilities and services • Develop and use a formal Health and Safety Plan for work akin to this EMP with the specified mitigation measures and more in terms of training, traffic management, speed control, warning signs, provision and use of	700,000.00

Table 7.1: Identified Impact and Mitigation measures for the proposed erosion control project				
S/N	**Envisaged Activities**	**Potential Adverse Impact**	**Mitigation/enhancement measures**	**Budget (N)**
		traffic hazards. • Burrow Areas for fill materials could lead to accidents and/or breeding site for mosquitoes • Exposure to atmospheric emissions from construction equipment • Exposure to excessive and • continuous noise and vibration from construction activities • Risk of water source pollution • Dust emission • Communicable diseases (Covid 19 and HIV/AIDS) transmission	personal protective equipment emergency action plan and monitoring/reporting. • Train workers and other staff engaged in the proposed constructions on health and safety • Ensure Penalties in case of non-compliance with the agreed standards • Ensure all reasonable steps are taken to protect any person on the site from health and safety risks • Ensure machineries and equipment are safe through the provision of security personnel • Provide adequate supervision of safe work system • Ensure means of access to and egress from the site are without risk to health and safety. • Ensure all workers are equipped with, and use PPE • Follow the Government guideline on COVID-19 management • Provide sufficient signage giving occupational health and safety warnings and information disclosure within the construction and around the site. • Carry out hazard identification and risk assessment routinely • Develop Safety plan, including emergency action plan. • Provide weekly/monthly toolbox meetings (safety briefings)	
		Subtotal		**11,285,814.00**
	Operation and Maintenance			
1	Maintenance and utilization of erosion gully control site	• Poor maintenance creates threshold for more erosional force and standing pools of water • Breed disease vectors in settling basins and retention ponds • Unsustainable use of reclaimed area areas crossing different land	• Monitor and maintain intervention work for continued stability and quality • Shortcomings in the control structures should be corrected before they develop into serious problems. • Any grass, shrub/bush and tree planted which dies should be replaced • Treated gullies should be checked regularly and the healing process monitored closely. Structures built in • the gully for stabilization purpose should be observed for damage especially during rainy seasons and after heavy storms. Damaged check-dams should be repaired immediately to avoid further damage and the eventual collapse.	12,000,000.00

Table 7.1: Identified Impact and Mitigation measures for the proposed erosion control project				
S/N	**Envisaged Activities**	**Potential Adverse Impact**	**Mitigation/enhancement measures**	**Budget (N)**
		uses owned by different land users/Conflict Disharmony in Poor maintenance of vegetated area	• Conduct gender study to assess the challenges and opportunities for the mainstreaming of gender concerns in the use of, access to and maintenance of the gullies • Avoid delay repair even in small damage or break of control structure	
	Subtotal			**12,000,000.00**
	Decommissioning			
	Removal of equipment and camp, etc.	• Soil erosion, Dust generation, Disruption of the secondary/ newly emerged flora	• Absence of soil erosion, noise raising and dust generation	4,500.000.00
		Subtotal		**4,500.000.00**
	Grand Total			**28,986,772.00**

7.3 Environmental and Social Monitoring Plan

To continually achieve the benefits of the gully treatments, site inspection and monitoring programme shall be ensured with the following objectives:

- The gully erosion treatment and control plan (getcp) are appropriate for the site and is implemented effectively;
- The gully erosion treatments are appropriately maintained; and
- Identify any works at the site that may be contributing to environmental harm.

7.3.1 Site Inspection and Maintenance

Once the gully treatment/remediation work has been completed, a monthly walk through or site inspection should be conducted to ascertain the following:

- All measures have been implemented in the field and erosion controlled adequately;
- Sediment and other pollutants such as plastics are not being transported off-site or into critical areas on-site;
- Any improper installation or any repairs necessary to complete the job is noted at this time and work completed;
- Critical points such as disturbed areas of the site are identified and repairs effected;
- Control measures are in good operating condition until the area they protect has been completely stabilized and the construction activity is completed;
- Crews are to immediately repair the erosion and sediment control measures;
- Appropriate materials and equipment should be kept on hand to enable a quick and rapid response; and
- Exposed areas must be stabilized and inspected before a site is left in an inactive state.

Maintenance Problems

The most frequent cause of failure is lack of preventative practices and poor maintenance of treatments administered. Erosion prevention and sediment control must be inspected regularly and operated and maintained using specific procedures to perform properly. Installation mistakes can also impair the performance of the measures. Inspectors should pay particular attention to maintenance problems and installation mistakes during inspections.

7.3.2 Vegetation Establishment Monitoring

Monitoring for vegetation establishment should be conducted in accordance with local requirements. Vegetation should be monitored monthly to evaluate the following type of vegetation that is growing (as compared to the type of vegetation that was planted), the density of vegetation that is growing, including the percent of ground that is covered.

Based on regular evaluations of established vegetation, recommendations should be made as to whether the vegetation is growing well, or whether additional measures should be taken, such as over seeding, fertilizing, irrigation, etc. Vegetation monitoring should continue until the vegetation reaches maturity and is providing the anticipated erosion control effectiveness.

7.3.3 Inspections Responsibility and Frequency

Inspections oversight rest with the SPIU supported by the Ministry of Works with local knowledge, policies and procedures.

All measures must be inspected by the SPIU/contractor in accordance with any schedule required by the SPIU and Ministry of Works and before any predicted, significant rainfall.

During gully treatment, contractor's inspector must have the ability to call out worker after rainfall events. The inspector should record any damages or deficiencies in the control measures on an inspection report form. The damage or deficiencies should be corrected as soon as practicable after the inspection but in no case later than 7 days after the inspection. Any changes that may be required to correct deficiencies should also be made as soon as practicable after the inspection but in no case later than 7 days after the inspection.

Inspections of erosion control works should be conducted by a person clearly identified as responsible for this role and may be the project manager, site supervisor or principal contractor representative etc. All inspection details should be formally documented, filed and made available for inspection as required by PMU and relevant authorities.

It is recommended that during the gully erosion treatment inspection should be carried out in the following manner:

- At least daily during rainfall events;
- At least weekly, even if the works are not being conducted;
- Within 24 hours of a forecasted rainfall or storm event; and
- Once every six months after implementation.

The project specific E&S management and monitoring plan has been designed as indicated in Table 7.2. Overall monitoring for the ESMP shall be conducted by trained individuals who can carry out the monitoring and record-keeping effectively using properly calibrated and maintained equipment on behalf of the SPIU and/or contractor. External monitoring will be carried out by the Federal and State Ministry of Environment.

Table 7.2: Environmental and Social Monitoring Plan								
S/N	**Activities Envisaged**	**Potential Impact**	**Mitigation measures**	**Monitoring Indicators**	**Frequency**	**Responsibility**		**Cost of mitigation measures**
						Implement ation	Monitoring	
	Mobilisation/ Preparatory activities							
1	Movement of Equipment & Materials	• Rise in fugitive dusts • Loss of topsoil • Leakage of oil from stacked equipment • Increase above permissible noise level • Displacemen t of soil fauna and damage to flora • Predisposing of soils to erosion • Indiscriminat e disposal of waste •	• Routine wetting • Installing impermeable surface at designated areas for stacks • Alternative equipment design options • Minimized vegetation clearing • Campsite located on brownfield • Movement of crews and equipment within the rights-of-way and over routes provided for access to the work shall be performed in a manner to minimize damage to vegetation and fauna within the project area. • Provision of adequate waste management facility in camps	• Air monitoring log book • Presence of impermeable surface e.g. tarpaulin • Noise measurements • Clearing confined to site • Location of site • Movement of equipment and crew confined to designated access. • Water wetting chart • Waste management plan and facility •	Daily One-off	Contractor,	SPIU Environmen tal and Social Safeguard officer	100,000.00
2	Movement of Equipment & Materials	• Traffic congestion • Social stress due to land acquisition and	• Adequate and timely project awareness • Use of traffic control measures • Apply lane configuration changes to affected roads and streets.	• Awareness creation programmes • Traffic direction signs and traffic wardens	When necessary One-off Weekly	Contractor,	SPIU Environmen tal and Social Safeguard officer	

		involuntary displacement • Community discontent which may delay project execution • Risk of out of school children being food vendors	• Campsite situated on brownfield. • Liaise with local authority for proper land acquisition options. • Establishment and operation of an effective GRM. • Address the issue of mobile vendors during community engagement meetings and with the community leaders •	• Project layout plan • Campsite located on a brown field. • Construction site located at designated space. • Grievances received and resolved. •				
3.	Movement of Equipment & Materials -Health & Safety Issues -	• Road accidents • Theft and vandalizatio n of equipment • Insecurity of workers • Work-related accidents	• Traffic safety measures • Perimeter fencing of campsite • ID tags and uniform for workers • Health and safety trainings for workers. • Provision and use of PPEs	• Traffic warning signs and traffic wardens • Secure, adequate fencing and access control • Safety training reports/records • Availability of PPEs and first aid boxes	Daily Weekly	Contractor,	SPIU Environmen tal and Social Safeguard officer	
								Sub-total
				100,000.00				
B	• **Construction**							
	• BIOPHYSICAL ISSUES							
1	Site clearing of set-back from edge of gully	Removal of Flora &fauna Displacement of asset	• Perform clearance in stages • Develop compensation plan for displaced asset in line with the RAP that was prepared where only the LG was identified as the only respondent	• Absence of land degradation due to avoidable vegetation clearance/no scar, absence of complaint from respondent/commun ities	Once during site clearance	SPIU Contractor,	ABSIIDP	As Part of RAP mitigation measure
2.	General Treatment	Failure due to poor	• Careful planning and attention to detail	• Absence of failure due to poor	During Constructio	SPIU Contractor,	ABSIIDP AFDB	

	of the gully erosion,	integration between physical and biological measures. Failure to complete the treatment works for any reason – tantamount to not getting the required protection and waste of time and resources.	• Remove the cause of the gullying. Ensure quality work • Do gully filling only after the water flow that caused the gully has been controlled or diverted above the gully head. Otherwise fill placed in the gully is likely to be undermined and washed away. • Avoid filling gullies with rubbish, logs, rocks, car bodies and other foreign material that are not suitable. • Use earthen banks that divert runoff away from the gully head, and convert it to slower, less erosive flow away from the actively eroding area.	integration between physical and biological measures	n n -weekly			
3.	Gully Stabilisation, Use of Vegetation as control & buffers - Grass-lined Channel (Turf reinforcement mats)	Accumulation of debris, sediment accumulation, died grasses, shrub/bush and tree planted, lack of integrity	• Design structures so that the flow in the gully is reduced to a non-scouring velocity • Plant vegetation between the structures and the gully stabilised Locations of the structures must be placed so that as much sediment is collected as possible, while still ensuring that the structures are stable. • Sites should also be relatively smooth at the gully floor, and have a gentle slope between the gully floor and sides. • Choose the right time to do it. From late Dry season to early onset of rainy season before heavy rains is generally a suitable time as there is less chance of high volumes of run-off, yet there is sufficient soil moisture and warmth to promote the growth of	• Absence of debris accumulation • No of debris remove and repairs made on outlets and points where concentrated flow enters channels, structures. • No of inspection made on lined drainage channels and energy dissipaters after major storms/rainfall .	During Constructio n, especially after heavy downpour of rain-weekly	SPIU ESSO, Contractor,	ABSIIDP	

			vegetation.					
4.	Earthworks - Excavation, grading, compaction, filling and other civil works	Disturb the natural drainage of site, Increase the amount of disturbed soil and could in turn increases the amount of erosion which can occur. Increase sedimentation and runoff Risk of pollution to watercourses	• Develop a site plan that does not require a significant amount of grade changes–that fits into existing land contours. • Site that will not be re-disturbed for a long period should be stabilized to reduce the erosion force • These areas until they are disturbed again. E.g. if soil excavated from a temporary sediment • Trap is stockpiled to be used later to backfill the trap (when the area is stabilized) then the stockpile • Carry out earthworks operations such that surfaces have adequate falls, profiling and drainage to control run-off and prevent ponding and flooding. • Control surface water run-off through silt/sediment traps/barriers as appropriate to minimise the turbidity of water in outfall areas	• Number of drainage lines and ephemeral waterways that could be 'erosion starters'. • No of Complaint from the community due to poor water quality/sedimentation	During Construction, especially after heavy downpour of rain	SPIU Contractor,	ABSIIDP	
5	Use of heavy Equipment on site and transport vehicles on the public roads	Vibration generate lateral waves to the surrounding structure and could lead to failure Contaminate ground soil or surface water when hydraulic oil, motor oil or other harmful mechanical fluids	• As much as possible avoid use of heavy duty equipment like bulldozers, pay loaders and trucks used in excavation and loading at the control site, • Work schedule to minimize disturbance. • Alert the public when loud noise will be generated • Sound-proofed machines shall be employed • Construction vehicle, machinery and equipment move or station	• Absence/number of oil leakage/spill, absence of impact on structures/cracks/ Absence/number of damage to abutting construction • site Absence/number of complaint due to noise & dust generation Absence	During Construction	SPIU Contractor,	ABSIIDP	

		are spilled or dumped Spills, leaks or injuries from any type of hazardous material (e.g. bitumen, cement, paint, explosives, fuels, lubricants)	always in the designated area only and do not carry activities beyond land hired/given	of sediment transport from the site onto public roads or adjacent properties via the wheels, chassis and side of vehicles.				
6.	Camp site	Soil contamination, Unhygienic work environment and disturbance of the surrounding neighbourhood Dis-affection in the community	• Identify suitable camp site in consultation with relevant authorities • Regular collection and proper disposal of Solid, liquid and humanWaste. • Ensure and enforce good housekeeping	• Wholesome environment • Absence of conflict with community members • Provision of adequate waste management facility.	Daily/All through during Constructio n	SPIU Contractor,	ABSIIDP	350,000.00
7.	Storing Materials/	loss of the stockpiled material Damage valuable ecosystems and habitats Leaks of hazardous materials from equipment or storage	• Stockpiles should not be located within an overland flow path. • In order to mitigate the flow of water away from stockpiled material, flow diversion banks can be constructed up-slope of the stockpile to divert run-off. • install a sediment fence (or heightened bund wall) on the downhill side	• Presence/absence of moved stored material by rain/wind Presence/absence of leaks from substance stored	Daily/All through during Constructio n	SPIU Contractor,	ABSIIDP	
	Social Issues							
			•	•				
1	Waste/Spoil generation & managemen t	Waste generation volume of waste/spoil Spoil tipped away from designated areas	• As part of contract requirements, contractor will be required to develop, implement and maintain a Waste Management Plan during the construction works with emphasis to minimise waste and segregate waste Protection of neighborhood from debris due to	• Volume of waste generated and disposal method. Good waste management plan in place-acceptable in light of best practice	Daily/All through during Constructio n	SPIU Contractor,	ABSIIDP Waste Managemen t authority	100,000.00

			construction • Minimize spoil by balancing cut and fill wherever possible • Safe tipping areas identified and enforced. • Spoil traps constructed. Dispose in approved sites					
2	Local people excluded from activities	Conflict	• Incorporate methods within the skills of local people. • Contractors encouraged using local labour wherever possible. • Incorporate country systems communicated via Government circular mandating that 100% of unskilled labour from local/host community	• Number of community members involved in construction	Twice during construction	SPIU Contractor,	ABSIIDP	
3	Quarry for fill materials	Use of agricultural land	• Avoidance of agriculture lands as borrow areas and other sensitive areas • Redevelopment of borrow areas Redevelopment of quarries in case new quarries are setup for the Project	• Presence/absence of scouring, erosion, damage to property, water supply disruption. Complaints from local people	During construction	SPIU, Contractor	ABSIIDP	450,00.00.00
	• **Sub-total**							**900,000.00**
C	• **Operation and Maintenance**							
	Operation - Maintenance and Utilization of Rehabilitated Gully	Collapse of structure/failure of measures	• Monitor and maintain intervention work for continued stability and quality • Shortcomings in the control structures should be corrected before they develop into serious problems. • Any grass, shrub/bush and tree planted which dies should be replaced • Treated gullies should be checked regularly and the healing process monitored closely. Structures built	• Number of failure of structure	Once in three months during dry periods and immediately after heavy down pour during rainy season	Community, Site committee, SPIU	Environmental and Social Safeguard Officer, MoE MoW, FPMU, AFDB	1,000,000.00

			in • the gully for stabilization purpose should be observed for damage especially during rainy seasons and after heavy storms. Damaged check-dams should be repaired immediately to avoid further damage and the eventual collapse. • Conduct gender study to assess the challenges and opportunities for the mainstreaming of gender concerns in the use of, access to and maintenance of the gullies • Avoid delay repair even in small damage or break of control structure					
	Operation - Maintenance and Utilization of Rehabilitated Gully	Unsustainable use of rehabilitated gully areas crossing different land uses owned by different land users/ Conflict Disharmony in	• Identification of users and development of a use concept or management plan. • Before treatment of gullies, the users should be identified and the boundaries should be clearly demarcated, the gully rehabilitation process should be objective oriented and responsibilities of owners in managing, maintaining and utilizing the gully should be agreed upon.	• Number of agreement signed with Sustainable users of rehabilitated gully areas • Presence/absence of land users/ Conflict Disharmony in	Once every six months	, Community members,	SPIU, FPMU AFDB	600,000.00
	Operation - Maintenance and Utilization of Rehabilitated Gully	Poor maintenance of vegetated area,	• Maintain healthy pasture swards on slope to reduce bare ground. • Minimum or no tillage techniques that protect soil structure as fine soil particles erode more readily • Regular inspection.	• Presence/absence of Healthy vegetation	Once every six months	Community, Site committee, SPIU	Environmental and Social Safeguard Officer, MoE MoW, FPMU, AFDB	
	Sub-total 1,600,000.00							

	Decommissioning	Cause soil erosion, Degrade water quality, Dust generation, Damage valuable ecosystems and habitat	• Break up old surface and soil. Remove and dispose of surfacing material if necessary and loosen soil of previous track to accelerate regeneration of vegetation • Reshape eroded or culled surfaces with out-sloping, re-vegetate as needed.	• Absence of soil erosion, water quality degradation and dust generation	All through the decommissioning and equipment/ material period	Contractor, SPIU	Environmental and Social Safeguard Officer, Local Government /Site Committee		***SPIU has the primary responsibility**
	• **Sub-total**							**450,000.00**	
	Grand Total							**3,050,000.00**	

7.4 Environmental Audit

To assist in the examination of management, employee knowledge, programme responsibilities, records & effectiveness of the measures suggested in this report.

Specifically, this will help to:

- Improve environmental and social management practices;
- Check the efficiency and quality of the environmental and social management processes;
- Establish the scientific reliability and credibility of the ESMP for the project; and
- Provide the opportunity to report the results on environmental and social impacts and proposed additional mitigation measures for implementation.

The Environmental audit activities shall be based on direct or indirect indicators of flood, waste, occupational health and safety, complains by members of the public and resource use applicable to the construction works.

During the construction phase, two audits shall be carried out:

- One at the end of the construction works; and
- After the first two years of implementation.
- Thereafter audits shall then be conducted every 5 years.

The Audit shall be conducted by Environmental Consultant engaged by the SPIU. The monitoring data shall provide background and benchmarks compared with the operating standards so that any necessary corrective actions can be taken.

7.5 Record keeping

Good records are the respondenter trail that will prove that this ESMP is working as intended. Keeping records of inspection of maintenance programme for erosion control measures, training programme, etc will be useful to demonstrate that the ESMP is being complied with or not. The type of records from the various management and monitoring programmes include:

- completed forms, checklists and maintenance logs;
- identified problems and corrective actions undertaken;
- monitoring data / results;
- Some other types of records will also be valuable for assisting with the implementation such as:
- Incident forms (especially pollution incidents and response, accidents, etc.);
- Internal and external communications (*e.g.* with waste management); and
- Results of internal or external assessments and compliance visits.

The type of records from the various management and monitoring programmes shall include completed forms, checklists and maintenance logs, identified problems and corrective actions undertaken and Monitoring data / result. Some other types of records will

also be valuable for assisting with the implementation and review such as: Incident forms (especially pollution incidents and response, accidents, etc.), Internal and external communications regarding the implementation of the mitigation measures, Results of internal or external assessments and compliance visits and Quarterly reports on the ESMP implementation submitted to the AfDB.and FMENv

7.5.1 Inspection and Maintenance Reports

Inspection reports should be prepared during each inspection conducted by the contractor or SPIU or Ministry of Works for civil works and Ministry of Agriculture for vegetation aspect. Reports should include information on damages or deficiencies, maintenance or repair activities, monitoring information, and vegetation establishment.

Inspection reports should be kept for a period of five years after completion of final site stabilization.

7.6 Institutional Arrangements for ESMP

To achieve the success of the measures provided in this report and indeed the overall project outcome, ABSIIDP as the executing agency will co-ordinate the project programmes and actions and develop the various project activities and prepare plans for project management and development.

ABSIIDP will

- Train relevant staff and other stakeholders on environmental and social matters in line with their responsibility;
- Maintain and manage budget and funds effectively and efficiently for the safeguard element of the project; and
- Ensure relevant ESMP sections are integrated into the tender documents as a set of environmental specifications.

For effective management of all safeguard activities, including the implementation of this ESMP, ABSIIDP Environmental and Social Safeguards Management Unit shall be set up to oversee the implementation and monitoring as well as reporting on the ESMP and the RAP developed for the project.

The Unit will work with the supervision of the State **Ministry of Environment** with the mandate to:

- Co-ordinate the project programmes and actions on safeguard issues; and
- Plan, coordinate, manage and develop the various project safeguard activities
- Prepare plans for project safeguard management and development.

Nevertheless, to achieve this mandate, the ABSIIDP shall liaise with the various levels of government and other identified stakeholders whose institutional roles and responsibilities regarding the implementation of this ESMP are highlighted in Table 7.3.

Table 7.3: Institutional Responsibilities

S/No	Category	Roles & Responsibilities
13.	SPIU	• Implementing authority • Ensure all environmental and social commitments are implemented during the life cycle of the project • Ensure adequate implementation and compliance of the ESMP by all parties • Appoint Environmental and Social Safeguard officer who have the responsibility to ensure compliance with the ESMP and other safeguard documents and provides training schedule on environmental and social matters.
14.	State Ministry of Works and ABSIIDP	• Co-ordinate all policies, programmes, and actions relating to the project • Ensure that the project is carried out in a sustainable manner.
15.	Federal Ministry of Environment (FMEnv)	• Provides lead role on review of draft ESIA report (in liaison with Abia State Ministry of Environment), receiving comments from stakeholders, public hearing of the project proposals and social liability investigations, monitoring and evaluation process and criteria.
16	Abia State Ministry of Environment	• Review of draft ESIA report (in liaison with Federal Ministry of Environment) • Receiving comments from the public on ESIA report following disclosure • Site assessment and monitoring of ESIA implementation. • Environmental monitoring and compliance overseer at the State level
17	Other MDAs	• Come in as and when relevant areas or resources under their jurisdiction or management are likely to be affected by or implicated projects such as utility. • Participate in the processes and in project decision-making that helps prevent or minimize impacts and to mitigate them. • Provide consent or approval for an aspect of the project as may be required of.
18	AfDB	• Assess implementation • Provide implementation support and guidance that ensures sustainability • Recommend additional measures for strengthening the ESMP implementation
19	Contractor	• Implementation of mitigation measures outlined in the ESMP • Develop a Construction Environmental Management Plan (CEMP) with sub management plans before construction works starts e.g., Oil spill and control management plan, health and safety management plan, risk management and emergency response plan, waste management plan, erosion control management plan • Be responsible for ensuring that all site staff, including sub-contractors and sub-contracted activities comply with the projects ESMP. • Appoint HSE Officer primarily responsible for daily inspection and monitoring of this ESMP and CEMP implementation. • Receive complaints and redress as the first level of redress • Ensure that there are sufficient resources (time, money and people) to manage the environmental issues of the works.
20	Site	• Provide oversight function during construction to ensure

S/No	Category	Roles & Responsibilities
	Engineers/Supervisors	adherence to good practice and the ESMP
21	Trade Association/CDAs/ CSOs	• Assisting in their respective ways to ensure effective response actions, • Ensure members participation by mobilizing, sensitizing community members;
22	Direct and Other Stakeholder/Groups	• Ensure social values are not interfered with. • Identify issues that could derail the project • Could complain about project execution manner. • Support project impacts and mitigation measures, Awareness campaigns
23	Local Community	• Support project implementation by ensuring safety and security of construction workers and materials • Assist and liaise with other stakeholders to ensure works are carried out without hinderance • Participate in practical awareness campaign for the proposed projects, amongst the various relevant grass roots interest groups • Support in monitoring project execution within their domains to ensure compliance with this ESMP and other relevant requirements • Recommend youths from the community that could support the contractor in security matters
24	Local Government	• Support in monitoring project execution within their domains to ensure compliance with this ESMP and other relevant requirements • Engaged and encouraged to carry out a comprehensive and practical awareness campaign for the project, amongst the various relevant grass roots interest groups.

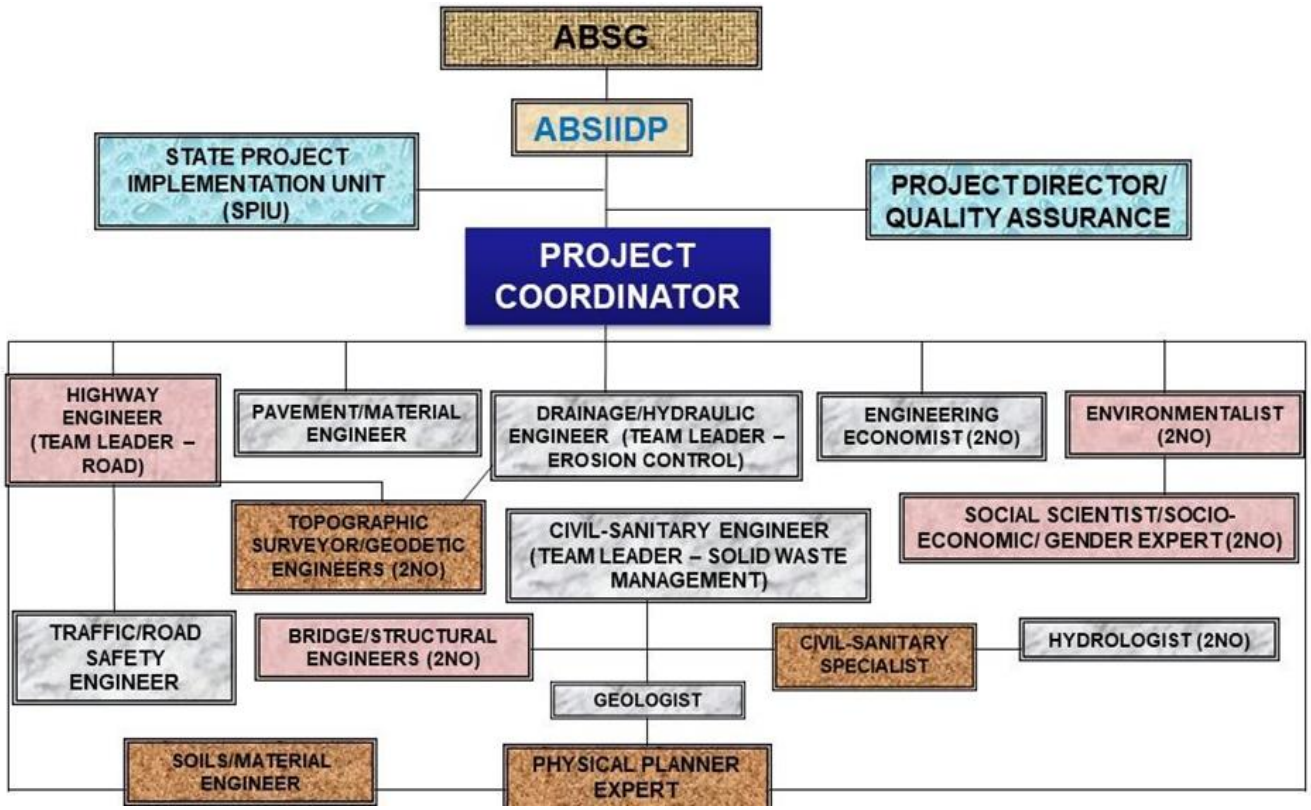


Figure 7.1: Project Organization

7.7 Capacity Building and Training Plan

Training is essential for ensuring that the mitigation measures and monitoring provisions are implemented efficiently and effectively. Based on the assessment of the institutional capacities of the different agencies involved in the implementation, the SPIU shall therefore ensure that all persons that have roles to play in the implementation are competent with appropriate education, training or experience. Similarly, the contractors shall be required to undertake general HSE awareness for their project workforce and specific training for those whose work may significantly have impact on the environment. Based on interaction with the relevant stakeholders, the training modules outlined in Table 7.3 have been identified.

Based on the interaction with the relevant stakeholders, assessment and determination of the characteristics of all the relevant stakeholders with key roles in the project as well as the assessment of the institutional capacities of the different parties involved in the ESMP implementation, areas of awareness creation and training/capacity building/strengthening have been identified as outlined in Table 7.3.

Table 7.3: Capacity Building Activity for institutional Strengthening					
Modules	**Proposed Topics**	**Objectives**	**Target Audience**	**Duration**	**Estimated Budget (N)**
Module 1: Training on the implementation of the ESIA	• Overview of Environmental Impact Assessment • Overview of Potential Impacts of Project • Environmental Pollution & Control • Environmental and Social Management Plan • Basic Environmental Management • Environmental Performance Monitoring – Monitoring Mitigation Measures • Environmental Reporting	To enhance competence in environmental sustainability and regulatory practice	SPIU, State Ministries of Agriculture, Environment and Works with contractors and other relevant MDAs	4 days	4.450,000.00
Module 2: Training on Construction HSE	• Introduction to Construction HSE • Overview of Health and Safety Hazards in Construction • Incidents: Causation, Investigation & Reporting • Excavation Safety • 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 as well as the health of workers and those that will be involved in monitoring.	SPIU, Ministries of Agric, Environment and Works with contractors and other relevant MDAs	4days	3,587,000.00
	TOTAL				**8,037,000.00**

7.8 ESMP implementation Schedule and Budget

The projected costs for implementation of the mitigation measures and monitoring are summarized in Table 7.4. A number of the implementation measures are already part of the Contractor's purview and construction practices as are monitoring activities part of the supervisory activities.

In order to effectively implement the environmental and social management measures of the ESIA, an ESMP Implementation Schedule has been provided (Table 7.4). There are also budgetary provisions for the ESMP components implementation (Table 7.5).

Table 7.4: ESMP Implementation Schedule

S/N	Activity Description	Responsible	Pre-Construction	Construction	Post Construction (Operation)
			2-man month	6- man month	Operation life of treated gully
11.	Disclosure of Environmental and Social Assessment Report	ABSIID			
12.	Allocating Budget for ESMP	ABSIID			
13.	Appointing Support Staff for ESMP	ABSIID			
14.	Review and Approval of Contractor's ESMP and Safety Plan	ABSIID			
15.	Finalizing site and layout plan of construction plan	ABSIID			
16.	Implementation of Mitigation Measures	ABSIID, Environmental Consultant & FMEnv			
17.	Supervising ESMP Implementation	ABSIID & Environmental consultant			
18.	Environmental and Social Auditing	ABSIID, Environmental Consultant & FMEnv			
19.					
20.	Monitoring & Reporting on ESMP Implementation	ABSIID, Environmental Consultant & FMEnv			
21.	Environmental and Social Training	ABSIID, & Environmental Consultant			

Table 7.5: Projected costs for implementation of the mitigation measures and monitoring

Item	Responsibility	Cost Estimate in Nigerian Naira (₦)	Cost Estimate in US (US$)
1. Mitigation			
v. Pre-construction Phase		1,200,958.00	1,937.03
vi. Construction Phase		11,285,814.00	18,202.93
vii. Operation and Maintenance Phase		12,000,000.00^	19,354.84^
viii. Decommissioning		4,500.000.00	7,258.06
Total for Mitigation	**SPIU**	**28,986,772.00**	**46,752.86**
2. Monitoring	SPIU	3,050,000.00	4,919.35
3. Training/ Capacity Building	SPIU/Contractor	8,037,000.00	12,963.00
Sub- Total		**40,073,772.00**	**64,635.12**
4. Contingency (10%)		4,007,377.20	6,463.51
Total		**44,080,449.20**	**72,296.50**
5. Involuntary Resettlement*	SPIU	As captured in the RAP	
Exchange rate @620 to $1			

*Please, refer to the RAP prepared for the project ^first year budget

To sustain the engagement with the stakeholders and thus ensure their support in the execution of the project this plan has been designed as provided in Table 7.6.

Table 7.6: Summary of the of Stakeholder Engagement Plan		
Activity	Target Stakeholders	Frequency / Timeline
Pre-Construction / Prior to Project Commencement		
Disclosure Project email, and contact details	All stakeholders project and safeguard documents preparations	Once-off establishment
Briefings	State Government, Local Government,	As required, subject to the approvals process
Site visits	Regulators, community, Development partner, etc	As required
Personal meetings	Targeted stakeholders	As required
Community Sessions	Residents of affected areas/ Community and interest groups	As required, subject to approvals route and feedback from the community
Develop and disseminate Feedback and Complaints Mechanism and communications procedures	All stakeholders	As required, subject to any updates on the Project
Briefings, and Community Sessions - for development of the Implementation and Closure Plan	Government authorities, Local communities, • Additional relevant stakeholders	Prior to Work Plan approval
Disclosure of Safeguard Reports	Area of project influence	As required by Federal Ministry of Environment
Review of ESIA Report		As required by Federal Ministry of Environment
Construction and operations		
Ongoing community liaison	Local community	Ongoing
Project updates	All stakeholders	Monthly
Responding to issues and inquiries as per Feedback and Complaints Mechanism	All stakeholders	Ongoing / as required
Annual reporting	All stakeholders	Annually

* Budget to be determined based on profile of stakeholders, duration, location and size

7.10 Disclosure

All reasonable efforts will be made to disclose the ESIA report with approval from the FMEnv and then AfDB with consideration given to the concerns and inputs of all relevant stakeholders regarding the design, development, and implementation of the project.

Indeed, an approval has been obtained from the FMEnv Authority to disclose the ESIA. Appendix X contains this alongside other communications from the FMEnv on the project.

CHAPTER EIGHT
CONCLUSION

The ESIA identified significant environmental and social impacts for which the ESMP has been developed. Suffice it to say that the assessment revealed that the proposed project is most desirable because of the obvious environmental, health cum socio-economic benefits, which far outweigh the negative impacts that could arise during and after project implementation. The potential negative implications of sufficient magnitude that could stop the execution of the project are not envisaged. Mitigation measures have been suggested for the identified adverse impacts that could occur due to the activities associated with the proposed project. Mitigation measures and management plans have been offered and developed for the adverse effects as provided in ESMP.

The ESMP is a 'living document' as it is amenable to updates and revisions in the light of current information on the environment and social risk that might be thrown up during the project implementation, as may be necessary. It is imminent that certain factors that would have been overlooked or not considered due to the preparation of the ESMP upstream in the project cycle could crop up during project implementation. Hence the need to review and update based on current field realities.

A third-party Environmental and Social Consultant shall be needed and retained annually to ensure adequate implementation of the ESMP.

The adequate implementation of the ESMP will ensure compliance with the country systems and AfDB's ISS and keep with international best practices that will provide environmentally benign, socially acceptable, and culturally appropriate project delivery.

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APPENDICES

LIST OF APPENDICES

APPENDIX I:

1a: THE RESULTS OF IN SITU AIR QUALITY AND NOISE LEVEL ANALYSIS

		IKOT EKPENE ROAD, ABA		**Project Site area**		**FMEnv. Limit 8-hour**
PARAMETERS	**UNITS**	**AQ 1**	**AQ 2**	**AQ 5**	**AQ 6**	
LATITUDE		N05°06.982’	N05°07.975’	614505.44N	614595.852N	
LONGITUDE		E007°22.845’	E007°22.509’	31004.458E	331016.420E	
NO_2	µg/m3	0.004	0.004	0.005	0.004	0.1
SO_2	µg/m3	0.006	0.005	0.004	0.006	0.06
‘CO	µg/m3	<0.01	<0.01	<0.01	<0.01	10
H_2S	µg/m3	<0.01	<0.01	<0.01	<0.01	NA
NH_3	µg/m3	<0.01	<0.01	<0.01	<0.01	NA
SPM	µg/m3	4.0	4.2	4.0	3.8	250
VOC	µg/m3	<0.01	<0.01	<0.01	<0.01	20
O_2	%	20.9	21	21	20.9	21
O_3	µg/m3	<0.01	<0.01	<0.01	<0.01	NA
Noise	dBA	53.7	50.9	54.8	51.7	90

1b. General Air pollution data of cities in Abia

City	Air quality Index (US AQI)	Main Pollutant (PM2.5) µg/m³	Remark
Aba	153	60.2	Currently 6 times above WHO exposure recommendation
Akwete	153	60.2	Currently 6 times above WHO exposure recommendation
Bende	120	43.2	Currently 4 times above WHO exposure recommendation
Mbalano	122	44.2	Currently 4 times above WHO exposure recommendation
Okpuala-Ngwa	122	44.2	Currently 4 times above WHO exposure recommendation
Omoba	122	44.2	Currently 4 times above WHO exposure recommendation
Osisioma	122	44.2	Currently 4 times above WHO exposure recommendation
Umuahia	122	44.2	Currently 4 times above WHO exposure recommendation
Amaigbo	120	43.2	Currently 4 times above WHO exposure recommendation
Isiala Oboro	120	43.2	Currently 4 times above WHO exposure recommendation
Nkwoagu Isuochi	120	43.2	Currently 4 times above WHO exposure recommendation
Oke-Ikpe	120	43.2	Currently 4 times above WHO exposure recommendation
Arochukwu	117	42.2	Currently 4 times above WHO exposure recommendation
Ebem Ohafia	117	42.2	Currently 4 times above WHO exposure recommendation
Ohafia-Ifigh	117	42.2	Currently 4 times above WHO exposure recommendation

Source: IQAir 2021 (www.iqair.com)

APPENDIX II:

SOIL QUALITY INVESTIGATIONS

Geotechnical Investigations

The purpose of the investigation is to determine important geotechnical properties of the residual soils that may influence slope stability, drainage requirements and the methods of construction suitable for the project.

The geotechnical investigations entailed boring of six (6Nos) boreholes to the depth of 5.1 – 6.6 m with percussion drilling machine along the gully location. All field tests and sampling were done with the aim of complementing with laboratory tests on recovered sample to deduce the relevant index and engineering parameters that are required in the analyses.

Coordinates of Boreholes Location

Project	Sample No	Easting	Northing	Zone
Obingwa	BH1	575056	333212	32
	BH2	575051	333213	32
	BH3	575036	333196	32
	BH5	575073	333258	32
	BH6	575070	333257	32
	BH7	574236	333073	32

Soil Test

Laboratory classification and strength tests were carried out on the samples obtained from the boreholes and trial pits to improve on the field identification and classification tests. The tests carried out include: Moisture Content Determination; Particle Size Distribution Tests; Atterberg limits; Direct Shear Test; Specific Gravity Test; and Bulk Density Test.

The materials are predominantly dense sands and laterite. These were proved in six (6Nos) test bores along the gully site, with bearing capacity ranging between 118 – 908 kN/m^2.

The details of the Soil laboratory results are presented below:

Details of Soil Laboratory Results Obingwa, Aba

Sample	Sample	Description of Sample	USCS CLASSIFICATION	LL (%)	PL (%)	PI (%)	PARTICLES SIZE ANALYSIS						FINE %	DIRECT SHEAR		Specific Gravity	Bulk
No.	Depth (m)						#.5 (5mm)	#.10 (2mm)	#.36 (425mm)	#.72 (212mm)	#.100 (150mm)	#.200 0.075mm)		C kN/m^2	Φ °		Density kn/m^3
BH1	0.6	REDDISH BROWN CLAYEY DENSE SAND	SP-SM	18	Non-plastic		90.63	82.32	19.92	7.71	7.42	6.64	4.39	14	19	2.62	14.25
	2.1	REDDISH BROWN CLAYEY DENSE SAND	SM	19	Non-plastic		-	-	80.95	28.68	26.19	20.89	5.63	13	21	2.61	16.32
	3.6	REDDISH BROWN CLAYEY DENSE SAND	SC	23	11.74	11.26	-	-	68.47	25.63	24.92	21.52	9.41	30	13	2.62	12.83
	5.1	REDDISH BROWN CLAYEY DENSE SAND	SM	18	Non-plastic		-	-	74.88	22.31	20.39	16.75	7.66	14	19	2.62	14.26
BH2	0.6	REDDISH BROWN CLAYEY DENSE SAND	SM	20	Non-plastic		52.91	39.07	26.65	15.02	14.86	13.44	5.27	7	19	2.61	21.46
	2.1	REDDISH BROWN CLAYEY DENSE SAND	SM	20	Non-plastic		89.64	82.48	70.59	41.82	41.56	40.28	9.59	14	23	2.6	14.3

	3.6	REDDISH BROWN CLAYEY DENSE SAND	SM	19	Non-plastic		79.89	61.51	43.81	31.36	31.19	30.76	9.45	11	23	2.62	12.36
	5.1	REDDISH BROWN CLAYEY DENSE SAND	SM	18.5	Non-plastic		74.41	62.64	43.14	29.88	29.72	26.76	6.08	7	19	2.63	16.33
BH3	0.6	REDDISH BROWN CLAYEY DENSE SAND	SC	21	11	10	43.85	32.41	23.83	14.38	14.26	13.28	6.95	30	13	2.62	14.36
	2.1	REDDISH BROWN CLAYEY DENSE SAND	SC	18	8.97	9.03	93.26	82.1	53.59	36.02	35.91	35.69	7.85	14	20	2.61	13.38
	3.6	REDDISH BROWN CLAYEY DENSE SAND	CL	19	9.7	9.3	90.67	84.43	72.47	61.37	61.3	60.97	10.05	16	17	2.61	15.36
	5.1	REDDISH BROWN CLAYEY DENSE SAND	SM	19	Non-plastic		82.75	70.25	64	37.75	37.5	35.5	9	18	20	2.6	13.58
BH4	0.6	REDDISH BROWN CLAYEY DENSE SAND	SM	18	Non-plastic		81.83	72.51	60.99	38.2	37.71	32.12	5.6	18	19	2.62	14.9

	2.1	REDDISH BROWN CLAYEY DENSE SAND	SM	17	Non-plastic	61.14	52.34	43.33	26.96	26.75	23.29	7.79	13	18	2.62	13.86
	3.6	REDDISH BROWN CLAYEY DENSE SAND	SM	16	Non-plastic	80.16	64.55	41.92	32.22	32	29.88	8.36	11	18	2.6	14.02
	5.1	REDDISH BROWN CLAYEY DENSE SAND	SC	19	9.58 9.42	89.25	79.78	61.72	47.74	47.53	45.38	9.46	9	19	2.62	13.75
BH5	0.6	REDDISH BROWN CLAYEY DENSE SAND	SM	17.29	Non-plastic	54.66	40.98	29.24	16.6	16.5	15.51	5.2	10	16	2.61	15.2
	2.1	REDDISH BROWN CLAYEY DENSE SAND	SM	17.11	Non-plastic	81.94	72.52	48.93	36.21	35.83	34.56	8.06	9	18	2.62	12.87
	3.6	REDDISH BROWN CLAYEY DENSE SAND	SM	16.93	Non-plastic	-	-	78.79	22.61	21.16	17.54	6.79	8	19	2.62	13.36
	5.1	REDDISH BROWN CLAYEY DENSE SAND	SP-SM	16.75	Non-plastic	90.36	79.44	56.76	19.04	18.21	9.17	3.41	7	20	2.61	14.03

BH6	0.6	REDDISH BROWN CLAYEY DENSE SAND	SM	16.57	Non-plastic		-	-	74.84	19.47	18.69	15.11	6.31	19	24	2.6	15.9
	2.1	REDDISH BROWN CLAYEY DENSE SAND	SC	24	12.57	11.43	-	-	76.41	35.59	34.66	32.34	6.43	20	23	2.6	15.56
	3.6	REDDISH BROWN CLAYEY DENSE SAND	SM	16	Non-plastic		-	-	72.73	19.42	17.77	14.05	4.34	16	15	2.61	14.12
	5.1	REDDISH BROWN CLAYEY DENSE SAND	SM	19	Non-plastic		-	-	77.4	21.58	20.9	17.7	5.99	19	22	2.62	13.89
BH7	0.6	REDDISH BROWN CLAYEY DENSE SAND	SM	17.29	Non-plastic		-	-	84.08	40.34	39.24	34.33	8.21	13	21	2.62	13.22
	2.1	REDDISH BROWN CLAYEY DENSE SAND	SM	17.12	Non-plastic		-	-	71.92	18.79	17.58	13.66	4.3	14	15	2.61	12.87
	3.6	REDDISH BROWN CLAYEY DENSE SAND	SM	16.93	Non-plastic		-	-	76.67	36.79	22.43	17.85	3.69	14	20	2.6	13.34

	5.1	REDDISH BROWN CLAYEY DENSE SAND	SM	16.57	Non-plastic	-	-	80.8	39.43	37.72	32.38	9.19	15	22	2.62	14.01

Recommendations

The percentage of fine particles in the soil samples obtained has some measure of impact on the erodibility of the site. From the sieve analysis test and resulting particle size curves, the percentage of fines ranged between 3.85% and 10.3%. Due to the composition of fine particles in the largely lateritic materials encountered, there is a high likelihood of erosion by water along this slope.

In the light of the above, some stabilization measures should be adopted on the erosion site. Stone pitching of the erosion slope is one sufficient measure towards improvement of stability. Another effective alternative involves the use of Gabions for enhanced erosion slope stability.

Gabions have the added advantage of being modular and therefore are adaptable to different shapes. They are also resistant to washing away by moving water. Gabions are also preferred over rigid structures because they dissipate energy of moving water and drain freely. They also get reinforced by vegetation with the passage of time. They are therefore a very suitable approach towards stabilization of erosion slopes.

The use of concrete channels along the site is deemed a feasible and acceptable measure as well as temporary structures along the channel to reduce flow and retain sediment hence helps in vegetation growth.

APPENDIX III:

WATER QUALITY RESULTS

The detailed results of analysis of groundwater samples collected from existing boreholes during the fieldwork are provided below.

Table 3a: Results of analysis of groundwater samples from different local governments during the fieldwork in July, 2021

PARAMETERS	**OSISIOMA-UMUOBO WATER SAMPLE, OSISIOMA L.G.A**	**UMUEVO UMUIKEA WATER SAMPLE, ISIALA NGWA SOUTH L.G.A**	**ARUMUIKA II WATER SAMPLE, ISIALA NGWA SOUTH L.G.A**	**AMAISE WATER SAMPLE, ISIALA NGWA SOUTH L.G.A**
APPEARANCE	Clear & Colorless	Clear & Colorless	Clear & Colorless	Clear & Colorless
COLOUR	None	None	None	None
TASTE	Nil	Nil	Nil	Nil
ODOUR	Nil	Nil	Nil	Nil
TEMPERATURE (°C)	29.5	290	290	28.5
TURBIDITY (NTU)	3	3.4	4	2.8
CONDUCTIVITY (µS/L)	138	124	118	136
TDS (Mg/l)	102	142	92	112
B. CHEMICAL ANALYSIS				
PH	6.8	6.6	6.7	6.8
TOTAL HARDNESS (Mg/l)	122	132	118	126
CACO3 (Mg/l)	108	126	101	106
FE total				
Mn	ND	ND	ND	ND
Cu	ND	ND	ND	ND
K (Mg/l)	13.8	21.2	28.2	32.8
Ca (Mg/l)	138	133.6	128	86
Mg (Mg/l)	46	36	24	30
Cd	ND	ND	ND	ND
Pb	ND	ND	ND	ND
S04		30.8	26.7	42.8

PARAMETERS	**OSISIOMA-UMUOBO WATER SAMPLE, OSISIOMA L.G.A**	**UMUEVO UMUIKEA WATER SAMPLE, ISIALA NGWA SOUTH L.G.A**	**ARUMUIKA II WATER SAMPLE, ISIALA NGWA SOUTH L.G.A**	**AMAISE WATER SAMPLE, ISIALA NGWA SOUTH L.G.A**
H.C03 (Mg/l)	0.6	0.8	0.2	0.06
Na (Mg/l)	28	32.2	46	23
Fe	ND	ND	ND	ND
Cl2 total (Mg/l)	58.6	62.6	62.8	86
MICROBIOLOGY				
TOTAL COLIFORM	No Bacterial growth after 48hrs of incubation	No Bacterial growth after 48hrs of incubatio n	No Bacterial growth after 48hrs of incubatio n	No Bacteria growth after 48hrs of incubation
E. COLI	No Bacterial growth after 48hrs of incubation	No Bacterial growth after 48hrs of incubatio n	No Bacterial growth after 48hrs of incubation	No Bacteria growth after 48hrs of incubation

3b: Summary of Groundwater Quality Parameters sampled during the Field investigation, July 2021

PARAMETERS	**MIN**	**MAX**	**MEAN**	**ST.DEV**	WHO Recommendation
A. PHYSICAL PARAMETER					
APPEARANCE					Clear
TEMPERATURE (°C)	28.5	290	203	134.78	-
TURBIDITY (NTU)	2.7	4	3.183	0.48	< 5 NTU
CONDUCTIVITY (µS/L)	118	138	128.33	8.14	< 250 µS/L
TDS (Mg/l)	78	142	104	21.76	
% TRANSMITTANCE	0	0			
B. CHEMICAL ANALYSIS	0	0			
PH	6.6	6.8	6.7	0.09	(6.5-8.5)
TOTAL HARDNESS (Mg/l)	107	156	126.83	16.57	
$CACO_3$ (Mg/l)	86	132	109.83	16.83	
K (Mg/l)	13.8	37.6	24.96667	9.46	
Ca (Mg/l)	86	142	125.9333	20.33	< 250 Mg/l
Mg (Mg/l)	24	46	32.66667	7.66	< 250 Mg/l
$S0_4$	26.7	42.8	33.43	8.37	< 250 Mg/l
$H.C0_3$ (Mg/l)	0.06	0.8	0.443	0.33	
Na (Mg/l)	23	62.5	38.28	14.30	
CL_2 total (Mg/l)	58.6	86	68.3	9.88	500 Mg/l
Dissolved O_2	0	0			> 5 Mg/l
MICROBIOLOGY	0	0			
TOTAL COLIFORM	0	0			
E. COLI	0	0			

The water data/log for Aba/Osisioma determined in June 2021 and provided by Abia State Water and Sewage Corporation (AbSWSC) are presented in Table below. The well logs were composed mainly of sand, clay sand and sand clay with Resistivity ranging between 230nM – 200nM and static level 98ft for Aba, while in Osisioma, it was dominantly sand and clay sand with Resistivity ranging between 2500nM – 2300nM and static level of 60ft.

3c: **Water Data / Log for Aba/Osisioma**

S/N	PARAMETER	ABA/OSISIOMA		REMARKS	
1	WELL LOGS	Sound, Clay Sand & Sand Clay Resistivity ranging between 2500Nm-2300Nm			
2	STATIC LEVEL	Approx. = 60ft			
3	PUMP TEST RESULT	Approx. = 450m^3/hr			
4	WATER RESOURCE AND WATER SUPPLY DEVELOPMENT MAP (PIPELINE)	Soft Copy Available			
5	DRAINAGE AND SANITATION INFRASRUCTURE MAP	NA			
6	POWER TRANSMISSION LINES	NA		NA = Not Available	
7	**STREAM (SURFACE) & GROUND WATER QUALITY DATA**	**GROUND WATER**	**SURFACE WATER**	**GROUND WATER**	
7a	Turbidity (NTU)	0.395	38.2	1.52	
7b	Conductivity (µs/cm)	31.5	32.6	36.3	
7c	Total Dissolved Solid (TDS) [mg/L]	152	152	218	
7d	pH (Power of Hydrogen) - Acidity/Alkaline	6.69	7.14	6.81	
7e	Colilert (Bacteriological) Method (CFU100ml)	0	+8	0	+ (cell count)
7f	Nitrate (NO_3) [mg/L]	0.1	0.28	0.14	
7g	Nitrite (NO_2) [mg/L]	0.4	0.24	0.51	
7h	Aluminum (Al) [mg/L]	0.43	0.723	0.44	
7i	Manganese (Mn) [mg/L]	0.024	0.23	0.011	
7j	Fluoride (FI) [mg/L]	2.94	2.64	2.71	
7k	Iron (Fe) [mg/L]	0.31	2.40	0.38	

At Aba, the surface water quality had relatively high turbidity (23.4 NTU) and alkaline pH (7.85). Other parameters were within normal range for surface waters in southern Nigeria. Groundwater had <1 NTU turbidity and low conductivity and slightly acidic pH (6.69). The surface and groundwater quality results for Aba/Osisioma were not different from the situation at Aba. In general, the quality of groundwater at both locations were potable and fit for drinking.

3d: Physico-chemical qualities of surface waters in Aba, October, 2021.

Parameters	Units	Methods	Aba River	Aba River	Eme River	Eme River
Matrix			**SW1**	**SW2**	**SW3**	**SW4**
			N05°06.982’	N05°07.975’	N05°37.743’	N05°37.515’
			E007°22.845’	E007°22.509’	E007°26.265’	E007°26.229’
Physicochemical Parameters						
pH		ASTM D129318	5.5	5.4	6	6.2
Temp	0C	EPA 1979, 170.1	29.3	31	28.5	28.3
TDS	mg/l	ASTM D1668	23	19	10	9
EC	uS/cm	ASTM D112595	46	38	20	18
Turbidity	NTU	APHA 2130B	1.72	1.95	7	7.1
TSS	mg/l	APHA 2540C	0.08	0.09	0.95	0.96
TS	mg/l	ASTM D1868	23.08	19.09	10.95	9.96
DO	mg/l	ASTM D888-92(1996)	5.6	5.8	7.3	7.4

Parameters	Units	Methods	Aba River	Aba River	Eme River	Eme River
Matrix			**SW1**	**SW2**	**SW3**	**SW4**
BOD	mg/l	APHA 507	2.6	2.2	2.5	2.6
COD	mg/l	ASTM D125295	14.56	22.81	12.54	14.14
Chloride	mg/l	API-RP45	13.8	11.4	5.3	5.4
Bicarbonate	mg/l	ASTM D106792	24.4	18.3	17.4	18.3
Carbonate	mg/l	ASTM D106792	<0.50	<0.50	<0.50	<0.50
Sulphate	mg/l	APHA 427C	0.152	0.101	5.831	5.765
Phosphate	mg/l	ASTM D515-88	0.004	0.024	0.054	0.079
Nitrate	mg/l	ASTM D386990	1.014	2.789	1.059	1.859
Sulphide	mg/l	APHA,	<0.001	<0.001	<0.001	<0.001

		1985				
Ammonium-nitrogen	mg/l	ASTM D142693	0.12	0.12	0.141	0.146
Sodium	mg/l	ASTM D279193	3.74	2.05	0.77	0.67
Potassium	mg/l	ASTM D279193	1.42	0.78	1.42	0.99
Calcium	mg/l	ASTM D1126-96B	5.77	3.85	3.12	2.57
Magnesium	mg/l	ASTM D1126-96B	2.72	3.11	2.54	3.89
Total Hardness	mg/l	ASTM D1126-96B	11.21	12.81	15.21	16.01
METALS						
Iron	mg/l	APHA 3111B	0.07	0.03	1.021	0.992
Lead	mg/l	APHA 3111B	0.042	0.018	0.065	0.058
Copper	mg/l	APHA 3111B	0.062	0.036	0.07	0.056
Cadmium	mg/l	APHA 3111B	<0.05	<0.05	<0.05	<0.05
Zinc	mg/l	APHA 3111B	0.045	0.049	0.051	0.056
Cobalt	mg/l	APHA 3111B	0.024	0.021	0.046	0.049
Nickel	mg/l	APHA 3111B	<0.05	<0.05	<0.05	<0.05
Manganese	mg/l	APHA 3111B	0.047	<0.05	<0.05	<0.05
Chromium	mg/l	APHA 3111B	<0.05	<0.05	<0.05	<0.05
Arsenic	mg/l	APHA 3111B	<0.001	<0.001	<0.001	<0.001
Mercury	mg/l	APHA 3111D	<0.001	<0.001	<0.001	<0.001
ORGANICs						
Parameters	**Units**	**Methods**	**Aba River**	**Aba River**	**Eme River**	**Eme River**
Matrix			**SW1**	**SW2**	**SW3**	**SW4**
Oil & Grease/THC	mg/l	ASTM D3941	<1.0	<1.0	0.46	0.56
PAH	mg/l	USEPA 8270	<0.001	<0.001	<0.001	<0.001

BTEX	mg/l	USEPA 8260	<0.001	<0.001	<0.001	<0.001
MICRO ORGANISMS						
HUB	cfu/ml (10^3)	Vaour Phase Transfer	1.18	1.16	1.52	1.54
HUF	cfu/ml (10^3)	Vapour Phase Transfer	0.68	0.64	0.7	0.72
THB	cfu/ml (10^5)	Pour Plate	3.02	2.76	2.98	2.67
THF	cfu/ml (10^3)	Pour Plate	1.23	1.56	1.44	1.64

3e: Summary of physico-chemical qualities of surface waters in Aba, October, 2021.

Parameters	Units	Min	Max	Mean	SD	FMEnv Limit
Physicochemical Parameters						
pH		5.4	6.2	5.767	0.314	6.5-8.5
Temperature	^{0}C	28.3	32.6	30.350	1.919	
TDS	mg/l	9	23	17.667	6.501	500
Elect Cond	uS/cm	18	48	35.667	13.352	
Turbidity	NTU	1.72	27.52	12.068	12.043	
TSS	mg/l	0.08	1.87	0.962	0.787	<10
TS	mg/l	9.96	23.87	18.468	6.462	
DO	mg/l	5.6	7.4	6.400	0.767	7.5
BOD	mg/l	2.2	2.74	2.528	0.181	0
COD	mg/l	12.54	22.81	15.963	3.582	0
Chloride	mg/l	5.3	13.8	10.367	3.967	250
Bicarbonate	mg/l	17.4	24.4	19.133	2.604	
Carbonate	mg/l	0	0			
Sulphate	mg/l	0.101	11.214	5.673	4.906	(200-400)
Phosphate	mg/l	0.004	0.165	0.077	0.063	
Nitrate	mg/l	1.014	2.789	1.963	0.781	
Sulphide	mg/l	0	0			
Ammonium-nitrogen	mg/l	0.12	0.158	0.140	0.016	<1.0
Sodium	mg/l	0.67	3.74	1.790	1.111	200

Potassium	mg/l	0.78	2.8	1.618	0.779	
Calcium	mg/l	2.57	5.77	4.095	1.162	
Magnesium	mg/l	2.54	5.46	3.813	1.252	
Total Hardness	mg/l	11.21	25.62	17.697	6.259	200
METALS		0	0			
Iron	mg/l	0.03	1.86	0.932	0.762	1
Parameters	**Units**	**Min**	**Max**	**Mean**	**SD**	**FMEnv Limit**
Lead	mg/l	0.018	0.066	0.052	0.019	0.05
Copper	mg/l	0.036	0.077	0.063	0.015	0.1
Cadmium	mg/l	0	0			0.01
Zinc	mg/l	0.045	0.064	0.055	0.008	5
Cobalt	mg/l	0.021	0.056	0.041	0.015	
Nickel	mg/l	0	0			0.05
Manganese	mg/l	0.047	0.047	0.047		(0.05-0.5)
Chromium	mg/l	0	0			0.05
Arsenic	mg/l	0	0			0.2
Mercury	mg/l	0	0			0.001
ORGANICs		0	0			
Oil & Grease/THC	mg/l	0.46	0.64	0.563	0.076	0.05
PAH	mg/l	0	0			
BTEX	mg/l	0	0			
MICRO ORGANISMS		0	0			
HUB	cfu/ml (10^3)	1.16	1.54	1.382	0.169	
HUF	cfu/ml (10^3)	0.64	0.78	0.710	0.049	
THB	cfu/ml (10^5)	2.67	3.02	2.883	0.140	
THF	cfu/ml (10^3)	1.23	2.26	1.692	0.381	

Result Summary

All the values of chemical parameters are within the WHO standard for drinking water. There are no traces of metallic ions and the water is not contaminated. The groundwater is therefore potable and fit for drinking. This corroborated the results of secondary data acquired during the preliminary ESIA report. As part of total survey of water quality in the project area, surface water and sediment samples were collected from the up- and downstream of rivers in Aba at the points of bridge crossings during the fieldwork in October, 2021. The upstream stations serve as controls against future assessment. The detailed results are presented in Table 4.18, while the statistical results of minimum, maximum, mean, standard deviation, and the FMEnv regulatory standards are summarized in Table 4.19.

Results of the water quality analysis reveal that Total Suspended Solids (TSS), Turbidity, Colour and pH were all of normal range for unpolluted waters, with mean values within the regulatory standards. Among the chemical parameters, the water bodies had slightly acidic pH. Low conductivity and salinity which are typical of freshwaters. The waters were well oxygenated with dissolved oxygen (DO) values ranging from 5.6 to 7.5 mg/l which is able to support aquatic life. The low level of ammonium nitrogen and biochemical oxygen demand (BOD) is indicative of low level of biodegradation and organic pollution. The cations were low in concentration, with Ca dominating, a typical phenomenon in tropical freshwater systems (Ogbeibu et al. 2013; 2014a,b; Ogbeibu and Eghaghe 2014; Ogbeibu and Iyorah 2015; Arazu et al. 2015; Arazu and Ogbeibu 2016; Ogbeibu and Ogiesoba 2019). The anions and nutrients were also within normal range.

The other parameters (heavy metals, organics and BTEX) were all very low and within the normal range stipulated by FMEnv. Hg and As were not detected. The low concentrations of heavy metals indicate no serious pollution from petroleum hydrocarbon and other anthropogenic activities.

APPENDIX IV:
CROSS-SECTION OF THE STAKEHOLDERS CONSULTED

Cross section of stakeholders and One of community from host communities in stakeholders commenting after presentation Aba, Abia State, Nigeria

Stakeholders participation in the engagement

ABSIIDP Procurement Officer giving closing remarks

Representative of FMENV addressing the stakeholders

Kolanut breaking by one of the stakeholders from host community

The engagement was well attended with over 90 persons in attendance (see Attendance list attached).

The take-away from the engagement were categorized into the potentials positive and negative impacts from the proposed projects, stakeholders' reactions, possible supports from stakeholders and members of the community represented, and questions. Below are the impacts captured in themes.

Thematic potential negative and positive impacts of ESIA

Potential Impacts	
Negative	**Positive**
• Loss of farmland and land-based livelihood. • Loss of economic trees including medicinal herbs. • Destruction of cultural and historical sites • Grievances and conflicts over land resettlement & compensation. • Noise and vibration disturbances in surrounding communities from the use of machineries and motorized equipment. • Increased security risks due to storage of materials & equipment on site. • Threat to community culture, safety and security associated with presence of construction workers and business opportunists. • Increased demand on existing community health and sanitation infrastructure due to influx of temporary workers and camp followers. • Threat to community culture, safety and security due to Labor Influx • Influx of Additional Population ("Camp Followers") • Increased risk of illicit behavior and crime (including prostitution, theft and substance abuse) • Loss of employment for temporary workers after construction • Fear of projects being abandoned and causing more degeneration of host communities.	• Provision of proper drainage system • Employment of local labour. • Direct and indirect job creation. • Improved livelihood and poverty reduction. • Stimulation of socioeconomic activities arising from employment creation. • Increased revenue generation to government through permits and taxes. • Improved rural accessibility and mobility in the project area; • Stimulation of local and regional economic activities due to improved road network in the region. • Improvement in agricultural productivity, economic empowerment and sociocultural wellbeing of the benefiting communities. • Improved accessibility to communities, markets, farms and agro-processing centres. • Increased agricultural production by facilitating easy access to inputs, extension services, primary and secondary (urban) markets. • Improved communication and socioeconomic integration amongst adjoining communities. • Better economic opportunities for migrants • Improved confidence in the government of the day

ATTENDANCE AT STAKEHOLDERS ENGAGEMENT MEETING

ABIA STATE INTEGRATED INFRASTRUCTURE DEVELOPMENT PROJECT (ABSIIDP)

ENVIPLAN INTERNATIONAL LIMITED (ENGINEERING+PLANNING+DEVELOPMENT+MANAGEMENT)

EVENT: STAKEHOLDERS SCOPING WORKSHOP ON SOCIAL MANAGEMENT AND RESETTLEMENT ACTION PLAN FOR THE PROPOSED ROAD CONTRUCTION, EROSION CONTROL AND WASTE MANAGEMENT PROJECTS IN ABA AND UMUAHIA, ABIA STATE

VENUE: DAMGRETE HOTEL UMUAHIA | DATE: THURSDAY 28TH OCTOBER 2021

ORGANIZER:

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9	Chukwunta Eunice U	Umuda Ofeme	Woman Leader	08063885005		[signature]
10	Augustine Ikegwu	Umuda Ofeme	community leader	09094141389		[signature]
11	Elder A.I.A. Oluaoha	Nkata Ibeku	Community chairman	0806498 1269		[signature]
12	Elder A.C.B. Nwosu (JP)	Umuakwu	Village Head	08065715177		[signature]
13	Deaconess NGOZI Egbe	Umuakwu		08162009647		[signature]
14	Elder Kingsly Adindu	Umuakwu		08132404896		[signature]
15	HON. NWABUEZE Onuigbo	Umuda Ofeme	Councilor	08039673016		[signature]

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ORGANIZER:

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	IFEYINWA Chima	Umuahia South	youth	09066673592		[signature]
	Chief Charles Ogbonna	Umuyumo Nsulu Anti Comm. Isialangwa North	Palace Sec.	07036279741		[signature]
	chief sir Ogbonna Okechukwu	Umunwala Nsulu Anti Comm. Isialangwa North	Palace chieftain	09011606859	Elderogbonnacs@gmail.com	[signature]
	Bar Chinedu Adekson	Umunwala Nsulu Anti Comm. Isialangwa North	Nsulu GA.	08064664134	—	C.A.
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	Lady Onyinyechi Nduka	Ameke Ibeku	Chairperson	08062471741	Feeling	[signature]
	Ngbeke Akachi B	L & B Const. Comp	Supervisor	07039093964	Akachibethel@gmail	[signature]
	Chukwuma Abraham	Umuagu-Aba	President General	08055455581	Chuksabraham3@gmail.com	[signature]
	Lucky Ben Nwosu	A.D.U Community Union	Community Leader	09078111869	Luckyben[illegible]	[signature]
	Nwoke Henry Ikechi	Inte-nde Ofeme	Community Leader	08023831931	[illegible]@yahoo	[signature]
	Barr. Onyemata David C.	Ofeme Progressive Union - Federated	PG (President General)	08038829211	onyematadavid@gmail.com	[signature]

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VENUE:	DAMGRETE HOTEL UMUAHIA		
ORGANIZER:		DATE:	THURSDAY 28TH OCTOBER 2021

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3	Kanu Chidiebere	Ndume Ibeku	Stakeholder	0703069[illegible]	[illegible]	[illegible]
4	[illegible] E [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Ugochukwu Onosike	Akanu Amano [illegible]	Stakeholder	07051680[illegible]		[illegible]
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8	Uluocha Nelson C.	Ohuhu	Stake holder	[illegible]	[illegible] @gmail.com	[illegible]
9	Nwachukwu O Eze	Afara	Stakeholder	[illegible]	[illegible]	[illegible]
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12	SIR PATRICK AGOHA	UMUDA OFEME	STAKEHOLDER	09121546274	[illegible]	[illegible]

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ORGANIZER:		DATE:	THURSDAY 28TH OCTOBER 2021

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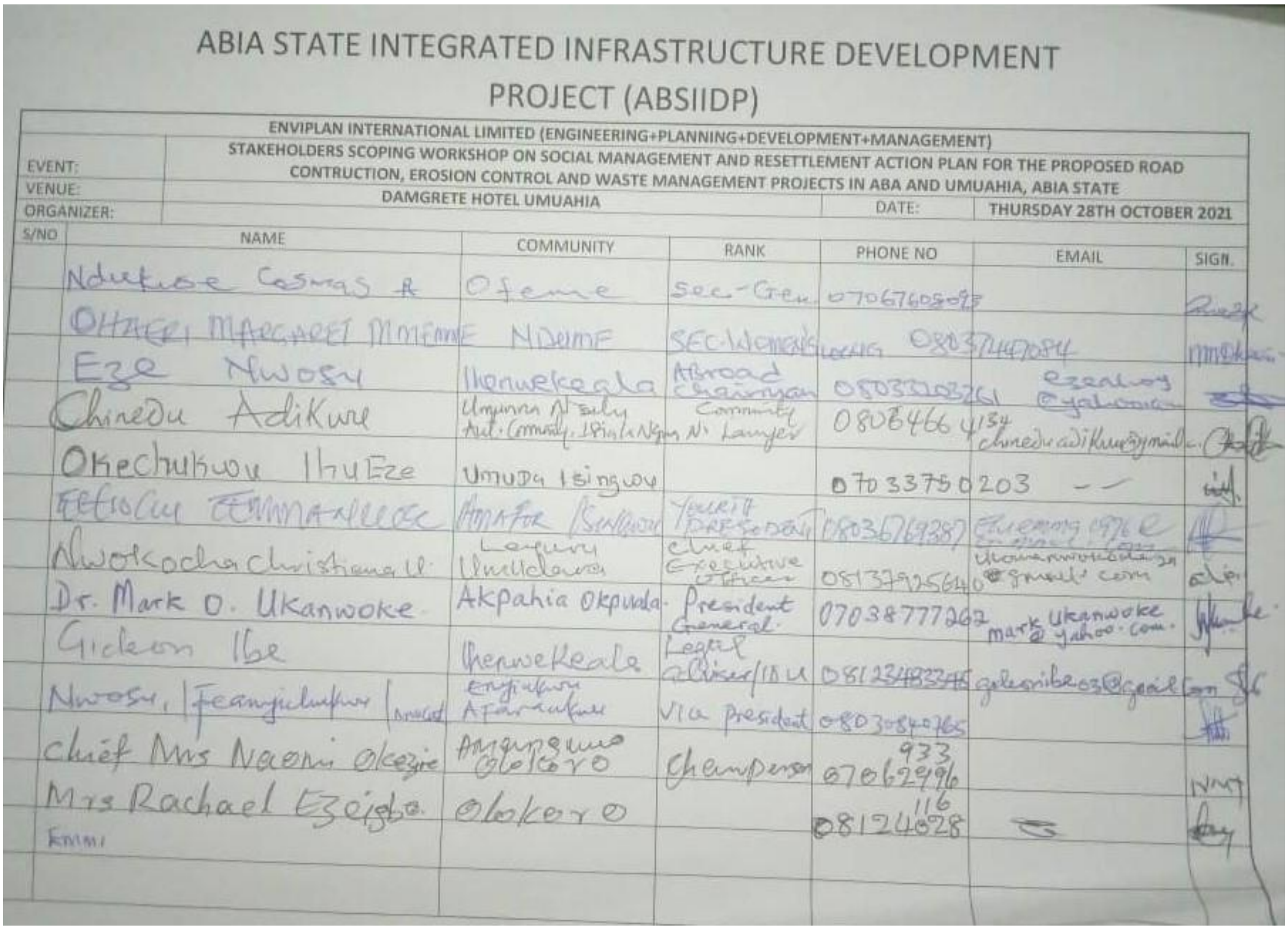

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VENUE:	DAMGRETE HOTEL UMUAHIA					
ORGANIZER:				DATE:	THURSDAY 28TH OCTOBER 2021	

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	Chief Mrs Naomi Okezie	Amaumuanwu Olokoro	Chairperson	07062996933		[illegible]
	Mrs Rachael Ezeigbo.	Olokoro		08124028116		[illegible]
	Emmi					

Reactions were thrown open for the stakeholders to respond to the presentation and their responses are tabulated below

Date	Stakeholders	Objectives	Consultative Activities	Outcome
March 2021	Stage 1			
	✧ Community members ✧ Traditional Rulers (Eze), Chiefs ✧ Women Groups ✧ Youth Groups ✧ Federal & State Government Officials ✧ CSOs ✧ Local Council Officials	✧ Present the project and the ESIA process to the communities and relevant agencies and help them understand the project; ✧ Identify key issues, concerns and expectations of the communities and agencies related to the project and study area; ✧ Identify current practices and requirements of each agency related to the project; ✧ Complete the stakeholders' list and validate the general approach for consultations; ✧ Identify relevant information sources and collect available	✧ Meeting between our team members and the Project Managers at the ABSIIDP Abia State. ✧ Meetings at State level with relevant State Ministries, Agencies and affected LGAs in Abia State. ✧ Meetings at community level, held in each community within the project area in Abia State. ✧ Conduct of meetings	✧ The communities understood the objectives and requirements of the project and pledged support and cooperation; ✧ The relevant agencies are aware of the project and the ESIA/RAP process (team, objectives and schedules); ✧ The requirements of Abia State Laws and Regulations relevant to the project were highlighted by the agencies and understood by ABSIIDP and its consultants; ✧ The main stakeholders' concerns and expectations were documented and have been considered for inclusion in the scope of the studies; and ✧ A preliminary list of stakeholders was completed and the orientation of the Stakeholders' Engagement Plan was enhanced.

		data and reports. ✧ Obtain Assurance of the stakeholders' Cooperation		
	✧ second phase			
Sept.2021	✧ Abia State Ministries of Lands, Works, Transport, Abia State Environmental Protection Agency. ✧ Project Affected Persons in each community affected by the gully erosion.	✧ Identify relevant information sources and collect available data and reports ✧ Present preliminary findings ✧ Define the methodology & approach ✧ Obtain feedback ✧ Refine methodology & approach of the ESIA ✧ Address concerns expressed ✧ Inform stakeholders on the proposed infrastructures and activities and seek their informed opinion about the socio-environmental risks and opportunities potentially associated with the project as	✧ Field trip to project sites and impacted communities. ✧ Field trips to collect data ✧ Tender A project background information document, in a poster form was produced and distributed to the authorities and representatives prior to meetings for public advertising.	✧ Obtained stakeholders' acceptance ✧ Increased understanding of government intentions. ✧ Obtained relevant data from the project environment and the affected persons. ✧ Help to consolidate, through the ESIA and RAP process, the efforts made by the ABSIIDP in order to establish lasting relationships with affected communities and other stakeholders

		well as take the measures and actions in order to manage the anticipated impacts;		
	The third phase			
	✧ Abia State Integrated Infrastructure Development Project (ABSIIDP). ✧ Community members ✧ Traditional Rulers (Eze), Chiefs ✧ Women Groups ✧ Youth Groups ✧ Federal & State Government Officials ✧ CSOs ✧ Local Council Officials	✧ Disclosure of the Final site survey, ESIA, ESMP and RAP preliminary results . ✧ Obtain feedback from stakeholders on issues of concern and expectations in order to optimize the project; ✧ Generate a social and institutional dialogue in order to assess and strengthen the project's social acceptability; ✧ establish lasting relationships with affected communities and other stakeholders ✧	✧ Invite community leaders in Conduct a structured Consultative forum for invited stakeholders. ✧ Record responses and attendance ✧ Establish a system of continuous dialogue between the project and the communities ✧ Establish a process of engagement includeing the women as well as youths in each community	

APPENDIX V – SAMPLED QUESTIONNAIRE FOR THE ESIA PROJECT

QUESTIONNAIRE FOR SOCIO-ECONOMICS IMPACT ASSESSMENT STUDIES

GENERAL HOUSEHOLD QUESTIONNAIRE

EIA OF ROAD PROJECT	**(DO NOT WRITE IN THIS PLACE)**

1. Study No.----------
2. Interview No----------
3. Interviewer's No.----------
4. Ward----------
5. Ward Code----------

This questionnaire is in connection with Abia/Umuahia projects. The goal of the study is to establish relevant socio-economic information vital for the sustainable development planning of the area. The study has nothing to do with taxation. Please answer the questions completely and accurately, as any correct answer you provide would facilitate our work. All answers you provide will be treated confidentially.

6. Date of Interview: ……..
7. Local Gov't Area: ……
8. State:……
9. Settlement/Community:…….
10. Settlement Status: ……..

SECTION A: PERSONAL CHARACTERISTICS

PLEASE PROVIDE US SOME INFORMATION ABOUT YOURSELF AND HOUSEHOLD

A.1 Sex of the Respondent. 1. Male ☐ 2. Female ☐

A.2 Age of the respondent: ……Years.

A.3 What is your marital status:……

A.4 State of Origin: ……..; Ethnic Group:……..

A.5 Please tell us the number of persons in your household (including yourself)…….

A.6 Please state the number of persons in your household (including yourself) who fall into the following age categories.

S/No.	Age Categories.	Gender		Total
		Male	Female	
1.	≤ 4			
2.	5 - 9			
3.	10-14			
4.	15-19			
5.	20-24			

6.	25-29			
7.	30-34			
8.	35-39			
9.	40-44			
10.	45-49			
11.	50-54			
12.	55-59			
13.	60-64			
14.	≥65			

A.7 What is the highest level of education that you have attained?……

A.8 How many numbers of your household including yourself fall into the following educational categories?

S/No	Education Attained	Gender		Total
		Male	Female	
1.	No Formal Education			
2.	Pre-Primary			
3.	Primary (Uncompleted)			
4.	Primary (Completed)			
5.	Secondary (Uncompleted)			
6.	Secondary (Completed)			
7	Tertiary (Uncompleted)			
8	Tertiary (Completed)			

A.9 Are you employed (including self-employed), unemployed, retired or a housewife?……..……

A 9 (a). If employed, please what is the title of your job and name of

establishment?……..

A.9 (b): Please give a brief description of your job responsibility in your place of work:
……
……
……
A.9 (c). Do your engage in any secondary occupation:…….

A.9 (d). If "YES", please state the nature of your occupation……

…….....

……

A.10 How many number of your household (including yourself) fall into the following employment categories?

S/No	Employment Status	**Gender**		Total
		Male	**Female**	
1.	Employed			
2.	Unemployed			
3.	Retired			
4.	Housewife			

A.11 Please estimate your annual income from primary and secondary sources:

1. Primary N……..

2. Secondary N……..

A.11 (a) To which of the following monthly income categories do your household belong?

1.	☐	Less than 3,000	☐	3,000-5, 000
2.	☐	6,000- 9,000	☐	10,000- 19,000
3.	☐	20,000-39,000	☐	40,000-49,000
4.	☐	50,000-59,000	☐	60,000-69,000
5.	☐	70,000-79,000	☐	80,000-89,000
6.	☐	90,000 and 100, 000	☐	100, 000 and above.

SECTION B: ENVIRONMENTAL CONDITIONS AND NEIGHBOURHOOD QUALITY

B.1 Do you experience erosion in this community? (a) Yes [ ] (b) No [ ]

B.1a If yes to B1, indicate the environmental problems which your settlement/community experience that can cause or be linked to the erosion problems in this community (a) Soil infertility (b) Poor drainage system (c) Bad road (d) Low visibility (e) Bad lands (f) Flooding (g) environmental degradation (h) Degraded land (i) Destruction of infrastructures (j) Others (specify) ……

B.1b If yes to B1, indicate the environmental problems which your settlement/community would likely experience that can cause or be linked to the proposed erosion intervention project during construction? (a) Soil infertility (b) Poor drainage system (c) Bad road (d) Low visibility (e) Erosion Problems (f) Flooding (g) environmental degradation (g) Destruction of infrastructures (h) encroachment of land properties (i) Pollution (air, surface water, ground water, noise), (j) Others (specify) …….....

B.1c if yes to B1, indicate the environmental problems which your settlement/community would likely experience that can cause or be linked to the proposed gully erosion intervention project during operation? (a) Soil infertility (b) Poor drainage system (c) Bad road (d) Low visibility (e) Erosion Problems (f) Flooding (g) environmental degradation (h) Destruction of infrastructures (i) encroachment of land properties (j) Pollution (air, surface water, ground water, noise) (k) Others (specify) …….....

B.2 Do you think the erosion intervention activities will affect any valued resource/cultural/archaeological property in your area? (a) Yes (b) No

B.2a If yes mention the name(s) of the valued resource/cultural/archaeological property…….

B.3 How do you dispose of your household refuse? ……..……

B.4 What type of toilet system do you use?……..……..

B.5 What is the source(s) of energy used in cooking for your household?…….……

B.6 (a): How do you source for this energy requirement? ……..…….

……..……

……..……..

B.6 (b): What are the problems encountered in meeting the energy demand of the household?
……..

……..……
……..

B.7 Do you have River/Stream/Lake/Pond in your locality?……..……

B.7 (a): If "YES", please state what uses you make of these water resources?.....

……..……..

……..……..

B.8 Do you have public water supply in your neighbourhood?…….……

B.8 (a) If 'YES', how regular or otherwise is this?

1. ☐ Very regular
2. ☐ Somewhat irregular
3. ☐ Somewhat regular
4. ☐ Very regular

B.9 (b) Please give reasons for your answer
……
……
……
……

B.9 (c) How do you rate pipe-borne water supply in your area?

1. ☐ Potable
2. Somewhat potable
3. ☐
4. Not potable ☐

B.9 (d) Is the water directly connected to your house or within the neighbourhood i.e. 200metres from your house)?

1. ☐ Within the neighbourhood
2. ☐ Directly connected

B.10. If 'No', What is the source of water for your household?……..

……

B.10 (a) Would you say this water is potable (i.e. good for drinking)?

1. ☐ Yes 2. ☐ No

B.10 (b) If 'No', Please explain……...

……
……
……

B.11 Please tell us the estimated distance to source of water supply…….meter.

B.12 Do you pay water rates? 1. No ☐ 2. Yes ☐

B.12 (a) If 'Yes', How much do you pay per annum? N----------

B.12 (b) When last did you pay your water rate (State month/Year)……..

B.12 (c) If 'No', Why not?…….....

……
……
……

B.13 On the whole, how much of your household income is expended on water supply monthly? N……

B.13 (a) What percentage of your household monthly income is spent on water acquisition?……

B.14 What is the daily average water consumption by your household? (i.e. how many 20 litres jerry cans used daily/drums)……litres.

B.15 In your opinion, what are the problems of water supply in your neighbourhood?……..……
……
……

B.16 Please make general suggestions on ways you think the water supply can be improved……
……
……
……

B.17 I shall now use some statements to describe your residential neighbourhood/Settlement. Please tell us your satisfaction or dissatisfaction with development/social service provisions in the area.

S/No	Aspects	1.Very Dissatisfied	2.Rather Dissatisfied	3. About Okay	4. Rather Satisfied	5. Very Satisfied
1.	Overall level of living					
2.	Health Delivery					
3.	Housing					
4.	Employment					

S/No	Aspects	1.Very Dissatisfied	2.Rather Dissatisfied	3. About Okay	4. Rather Satisfied	5. Very Satisfied
	opportunities					
5.	Income position					
6.	Availability of potable water					
7.	Electricity provision					
8.	Public transport facilities					
9.	Educational facilities/ services					
10.	Security of life and property					
11.	General sanitation					
12.	Population of the area					
13	Environmental conditions					

B.18 All things considered, would you say that your neighbourhood/settlement is a good place to live in? 1. No. ☐ 2. Yes ☐

B.19 (a) If 'No', please explain……

……
……
……

SECTION C: DIRECT OBSERVATION AND MEASUREMENT

FOR THE INTERVIEWER

C.1 House Type:

1 ☐ Rooming house (courtyard)

2 ☐ Rooming house (wagon type)

3 ☐ Single-family

4 ☐ Block of flats (multi-family)

5 ☐ Semi-detached

6 ☐ Storied building (single family)

C.2 Building Materials:

C.2 (a) Walling:

1 ☐ Corrugated iron sheets

2 ☐ Wood

3 ☐ Mud

4 ☐ Blocks

5 ☐ Burnt bricks

6 ☐ Cardboard/plywood sheets

C.2 (b) Roofing:

1 ☐ Corrugated iron sheets

2 ☐ Wood

3 ☐ Slate

4 ☐ Thatch

5 ☐ Decking

6 ☐ Cardboard/plywood sheets

7 ☐ Any other, specify: _____

C.3 Foundation:

1 ☐ Strip

2 ☐ Raft

3 ☐ Pile

4 ☐ None

C.4 House Condition:

1 ☐ Good (needs no repair)

2 ☐ Fairly Good (needs minor repair)

3 ☐ Bad (needs major repair)

4 ☐ Very bad (beyond repair)

C.5 Household Parking:

1 ☐ Private garage

2 ☐ Street side

3 ☐ Cartilage (premises)

4 ☐ Communal

C.6 Open Spaces:

1 ☐ Available within compound

_____

2 ☐ Not available

C.7 Distance to nearest dwelling house from respondent:

1 ☐ Less than 5 metres

2 ☐ 5 – 9

3 ☐ 10 – 14

4 ☐ 15 or more

C.8 Distance from Respondent's Dwelling to Basic Facilities:

S/no	Facility	1.more than 2 km	2.beween 1 and 2 km	3.less than 1 km
(i)	Elementary School			
(ii)	Police Station			
(iii)	Hospital/Clinic/Maternity			
(iv)	Shopping area/local market			
(v)	Recreational Playground			
(vi)	Church			
(vii)	Mosque			
(viii)	Secondary School			

Thank you for your cooperation

APPENDIX Vb - QUESTIONNAIRE FOR PAPs

QUESTIONNAIRE FOR PROJECT AFFECTED POPULATION FOR THE ABIA STATE INTEGRATED INFRASTRUCTURAL DEVELOPMENT PROJECT

Dear Respondent,

The Abia State Integrated Infrastructural Development Project is collecting data of the persons whose livelihood are directly and indirectly affected by the proposed Projects in the State. This will aid mitigation measures in reducing the negative impacts that might be envisaged. Please fill in your responses appropriately.

Thank you.

HH number: ……..

1. Name of Community: ……LGA: ……
2. Political ward: ……GPS coordinates: ……
3. Name of Enumerator: ……..Phone number: ……

A. Socio-demographic Characteristics

4. Name of affected Person(s): ……..Phone number: ……..
5. Marital Status: ……Sex: ……Age: ……..
6. Status of respondent: Traditional ruler/head [ ], Church leader [ ], Family head [ ], Union leader [ ], Visitor [ ] Others specify ……
7. How many children do you have? ……Boys: ……Girls: ……Dependents: ……..
8. Occupation: ……Monthly income: ……
9. Religion: Christian [ ], Muslim [ ], African Tradition Region [ ], None mentioned [ ]
10. Level of Education: ……Any Disability: Yes [ ]; No [ ]
11. If yes, please specify: ……

12. Are you an indigene of this community? Yes [ ], No [ ]
13. How long have you lived in this community? ……..
14. Are you a landlord or tenant? ……if you are a tenant, how much do you pay monthly? ……..

B. Knowledge and Awareness of developmental Project in Abia

15. Are you aware of the proposed projects in Abia State? Yes [ ], No [ ]
16. If yes, which of the projects are you aware of? Road Construction [ ], Erosion Control [ ], Waste Management project [ ], All of the above [ ], None of the above [ ]
17. What is your opinion about the proposed projects? It is very welcomed [ ], It is welcomed [ ], It is not welcomed [ ], please specify …….
18. Would you be willing to give your support to this project? Yes [ ], No [ ]
19. If yes, please specify ways you would support the project? Accept compensation [ ], Accept resettlement [ ], Make myself available if needed [ ], others specify ……
20. If No, what is your suggestion? Stop the project [ ], continue the project without my support [ ], please specify …… …… ....

C. Impact of the proposed Developmental Projects in Abia

21. Do you think the proposed projects will develop your community? Yes [ ], No [ ]
22. Do you perceive any positive and/or negative impact(s) from the proposed projects? Yes [ ], No [ ]
23. Please specify the positive impacts: Employment opportunity [ ], Economic boom [ ], Infrastructural development [ ], Scholarship [ ], Cheap mode of transport [ ], Social Benefits [ ], others specify …… ……
24. Please specify the negative impacts: Increased crime [ ], high incidence of diseases [ ], Inter-communal disputes [ ], others specify ……
25. Which gender will the project have negative impacts the most? Female [ ], Male [ ], None [ ]
26. Which gender will the project have positive impacts the most? Female [ ], Male [ ], None [ ]
27. Are you directly or indirectly affected by the proposed projects? Yes [ ], No [ ]
28. If yes, how? Affected livelihood options [ ], Affected residents [ ], Affected farmland [ ], Affected Health [ ], specif…….

D. Health Data

29. Can you recall the number of deaths in the last 12 months? Yes [ ], No [ ]

30. What are the major cases of the recorded deaths in this community? Maternal mortality [ ], road accident [ ], aging [ ], AIDs [ ], others specify ……
31. List the common diseases in your community? Malaria [ ], Diarrhea [ ], Physical Disabilities [ ], Hypertension [ ], others specify ……
32. Do you have access to health facilities? Yes [ ], No [ ]
33. If yes, which of them? Primary health care [ ], General hospital [ ], Traditional Herbal Homes [ ], others specify …… …….
34. Which is the fastest to consult during illness? Primary health care [ ], General hospital [ ], Traditional Herbal Homes [ ], others specify ……

E. Land Accessibility and Ownership

35. How do you acquire land in this community? Tenant/Lease [ ], Communal [ ], Inheritance [ ], Outright purchase [ ], Family [ ], others specify ……
36. Are farmlands acquired the same way for residential buildings? Yes [ ], No [ ]
37. If No, what is the difference? Payment are different [ ], Locations are different [ ], Family Eligibility [ ], others specify …… ……..
38. Which gender are permitted to own land in this community? Men [ ], Women [ ]
    Give specifics:
    ……
39. Are specific economic tree/farm produce that a specific gender cannot own? Yes [ ], No [ ]
40. If yes, please specify…… ……..

F. Economic and Housing Data

41. What type of house is affected by this project? Thatched [ ], Thatched/wooden [ ], Thatched/mud [ ], Zinc roof/wooden [ ], Zinc roof/mud [ ], Zinc root/blocks [ ], Others specify ……..
42. How long was the affected house built? ……..Do you own the affected property? Yes [ ], No [ ]
43. What is the total size of your land in hectares/acres? ……
44. For the affected land do you intend to: support the project [ ], not support the project [ ], demand compensation [ ], No idea
45. For the affected properties, would you prefer to be resettled or compensated? ……
46. If you want to be compensated for your affected property, how much would it be? ……

47. If you want to be resettled? Where would it be? ……
48. What economic trees do you have in your affected property? Guava tree [ ], Mango tree [ ], Paw paw [ ], others specify ……
……..
49. What method of cropping system do you use in this community? Mono-cropping [ ], mixed cropping [ ], inter-cropping [ ], others specify ……
50. Is there any company/organization in this community? Yes [ ], No [ ]
IF Yes, state the benefits you derive from the company: Job opportunity [ ], Access to loan facilities [ ], Electricity supply [ ], others specify
……

Thank you, do you have any question?

APPENDIX VI: ENVIRONMENTAL HAZARD MANAGEMENT –

SUGGESTED CODE OF CONDUCT AND CLAUSES FOR CONTRACTORS

General

SPECIFIC OBLIGATIONS OF CONTRACTORS

The Environmental and Social Management Plan (ESMP)

- Inform himself and those who work with him about this ESMP.
- Prepare his work strategy and plan to fully take into account relevant provisions of the ESMP.
- If the Contractor fails to implement the approved ESMP after written instruction by the Supervising Engineer (SE) to fulfil his obligation within the requested time, the PMU reserves the right to arrange through the SE for execution of the missing action by a third party on account of the Contractor.
- Where it is established that there are persist flouting of the guidelines and other relevant provisions sanction shall be made on the contractor
- Sustainability Issues
- The Contractor shall ensure in its performance of the construction service to ensure that it uses working methods, equipment and materials that will improve the sustainability of delivering the contract requirements, with particular emphasis on the following sustainability objectives:
  - Increased recycled content;
  - Reduced transport distances;
  - Whole life cost considerations;
  - Reduced energy use and CO2 emissions;
  - Waste reduction; and
  - Reducing impact on the community i.e. noise and disruption of traffic).
- The Contractor shall encourage their supply chain to help them meet the sustainability objectives of this contract.
- The Contractor shall produce a materials sourcing plan for the items covered under the Schedule of Rates
- Transport of products and tools to the site
- Delivery of products to the site in concentrated form and then dilution on site Use of reusable containers to transport products to the site
- Delivery of products in bulk and outside peak traffic times
- Disposal of used products or packaging from products
- Products or packaging taken away for reuse, recycling or appropriate disposal by the contractor Training of contractor staff

The contractor needs to indicate members of its Staff who are trained on the environmental impact of their work and the environmental policy of the authority on whose project they will be working.

Health and Safety

- Precautions for maintenance of Contractor's personnel H&S
- Appointment of an accident prevention officer at the site and reporting on H&S conditions HIV-AIDS prevention
- Prohibitions
- Prohibitions on child labour
- Prohibitions on forced labour.
- Prevent pollution of water bodies and neighbouring environ from wastes arising from construction sites.

APPENDIX VI: ENVIRONMENTAL HAZARD MANAGEMENT –

SUGGESTED CODE OF CONDUCT AND CLAUSES FOR CONTRACTORS

As part of Environmental Hazard Management, the Contractor shall be made to comply with the principles for good practices through the implementation of all measures necessary to avoid undesirable adverse environmental and social impacts, wherever possible as well as restore work sites to acceptable standards, and abide by any environmental performance requirements by law or specified in this ESIA report. 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 sites, asphalt mixing sites, dispersing coal ashes, vibrating equipment, temporary access infrastructure such as roads, etc. to ensure safety, health and the protection of workers and communities living in the vicinity dust producing activities.
b. Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g., excavation, blasting) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.
c. Ensure that existing water flow regimes in rivers, streams and other natural or irrigation channels is maintained and/or re-established where they are disrupted due to works being carried out.
d. Prevent bitumen, 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 in uncovered burrow pits is treated in the best way to avoid creating possible breeding grounds for mosquitoes.
e. Prevent and minimize the impacts of quarrying, earth burrowing, piling and building of temporary construction camps and access infrastructure such as roads on the biophysical environment including protected areas and arable lands; local communities and their settlements. As much as possible, restore/rehabilitate all sites to acceptable standards.
f. 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 SE so that the appropriate authorities may be expeditiously contacted for fulfilment of the measures aimed at protecting such historical or archaeological resources.
g. Discourage construction workers from engaging in the exploitation of natural resources such as hunting, fishing, collection of forest products or any other activity that might have a negative impact on the social and economic welfare of the local communities.
h. Implement soil erosion control measures in order to avoid surface run off and prevents siltation, etc.
i. Ensure that garbage, sanitation and drinking water facilities are provided in construction workers camps.
j. Ensure that as much as possible, local materials are used to avoid importation of foreign material and long-distance transportation.
k. Ensure public safety, and meet traffic safety requirements for the operation of work to avoid accidents.

2. 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.

3. 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.

4. Besides the regular inspection of the sites by the relevant government authority and other supervising agencies for adherence to the contract conditions and specifications, the contractor will 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. In all cases, 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/Campsite Waste Management

APPENDIX VI: ENVIRONMENTAL HAZARD MANAGEMENT –

SUGGESTED CODE OF CONDUCT AND CLAUSES FOR CONTRACTORS

a) All vessels (drums, containers, bags, etc.) containing oil/fuel/surfacing materials and other hazardous chemicals shall be bunded in order to contain spillage. All waste containers, litter and any other waste generated during the construction shall be collected and disposed off at designated disposal sites in line with applicable government waste management regulations.
b) All drainage and effluent from storage areas, workshops and camp sites shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations.
c) Used oil from maintenance shall be collected and disposed off appropriately at designated sites or be re-used or sold for re-use locally.
d) Entry of runoff to the site shall be restricted by constructing diversion channels or holding structures such as banks, drains, dams, etc. to reduce the potential of soil erosion and water pollution.
e) Construction waste shall not be left in stockpiles along the infrastructure such as road, but removed and reused or disposed of on a daily basis.
f) 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.

Material Excavation and Deposit

a) The Contractor shall obtain appropriate licenses/permits from relevant authorities to operate quarries or burrow areas.
b) The location of quarries and burrow areas shall be subject to approval by relevant local and national authorities, including traditional authorities if the land on which the quarry or burrow areas falls within traditional land.

New extraction sites:

a) Shall not be located in the vicinity of settlement areas, cultural sites, wetlands or any other valued ecosystem component, or on high or steep ground or in areas of high scenic value, and shall not be located less than 1km from such areas.
b) Shall not be located adjacent to stream channels wherever possible to avoid siltation of river channels. Where they are located near water sources, burrow pits and perimeter drains shall surround quarry sites.
c) Shall not be located in archaeological areas. Excavations in the vicinity of such areas shall proceed with great care and shall be done in the presence of government authorities having a mandate for their protection.
d) Shall not be located in forest reserves. However, where there are no alternatives, permission shall be obtained from the appropriate authorities and an environmental impact study shall be conducted.
e) Shall be easily rehabilitated. Areas with minimal vegetation cover such as flat and bare ground, or areas covered with grass only or covered with shrubs less than 1.5m in height, are preferred.
f) Shall have clearly demarcated and marked boundaries to minimize vegetation clearing.
g) Vegetation clearing shall be restricted to the area required for safe operation of construction work. Vegetation clearing shall not be done more than two months in advance of operations.
h) Stockpile areas shall be located in areas where trees can act as buffers to prevent dust pollution. Perimeter drains shall be built around stockpile areas. Sediment and other pollutant traps shall be located at drainage exits from workings.
i) The Contractor shall deposit any excess material in accordance with the principles of the general conditions, and any applicable EMP, in areas approved by local authorities and/or the SE.
j) Areas for depositing hazardous materials such as contaminated liquid and solid materials shall be approved by the SE and appropriate local and/or national authorities before the commencement of work. Use of existing, approved sites shall be preferred over the establishment of new sites.

Rehabilitation and Soil Erosion Prevention

APPENDIX VI: ENVIRONMENTAL HAZARD MANAGEMENT –

SUGGESTED CODE OF CONDUCT AND CLAUSES FOR CONTRACTORS

a) To the extent practicable, the Contractor shall rehabilitate the site progressively so that the rate of rehabilitation is similar to the rate of construction.
b) 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.
c) Topsoil shall not be stored in large heaps. Low mounds of no more than 1 to 2m high are recommended.
d) Re-vegetate stockpiles to protect the soil from erosion, discourage weeds and maintain an active population of beneficial soil microbes.
e) Locate stockpiles where they will not be disturbed by future construction activities.
f) To the extent practicable, reinstate natural drainage patterns where they have been altered or impaired.
g) 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.
h) Identify potentially toxic overburden and screen with suitable material to prevent mobilization of toxins.
i) 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.
j) Minimize the long-term visual impact by creating landforms that are compatible with the adjacent landscape.
k) Minimize erosion by wind and water both during and after the process of reinstatement.
l) Compacted surfaces shall be deep ripped to relieve compaction unless subsurface conditions dictate otherwise.
m) 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

a) The Contractor shall at all costs avoid conflicting with the water demands of local communities.
b) 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.
c) Abstraction of water from wetlands shall be avoided. Where necessary, authority must be obtained from relevant authorities.
d) Temporary damming of streams and rivers shall be done in such a way as to avoid disrupting water supplies to communities downstream, and to maintains the ecological balance of the river system.
e) No construction water containing spoils or site effluent, especially cement and oil, shall be allowed to flow into natural water drainage courses.
f) Wash water from washing out of equipment shall not be discharged into water courses or infrastructure such as road drains.
g) 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

a) Location of access infrastructure such as roads/detours shall be done in consultation with the local community especially in important or sensitive environments. Access infrastructure such as roads shall not traverse wetland areas.
b) Upon the completion of civil works, all access infrastructures such as roads shall be ripped and rehabilitated.
c) Access infrastructure such as roads shall be sprinkled with water at least five times a day in settled areas, and three times in unsettled areas, to suppress dust emissions.

Blasting

APPENDIX VI: ENVIRONMENTAL HAZARD MANAGEMENT –

SUGGESTED CODE OF CONDUCT AND CLAUSES FOR CONTRACTORS

a) Blasting activities shall not take place less than 2km from settlement areas, cultural sites, or wetlands without the permission of the SE.
b) Blasting activities shall be done during working hours, and local communities shall be consulted on the proposed blasting times.
c) Noise levels reaching the communities from blasting activities shall not exceed 90 decibels.

Disposal of Unusable Elements

a) 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 must 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.
b) As much 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.
c) AC-pipes as well as broken parts thereof must be treated as hazardous material and disposed of as specified above.
d) Unsuitable and demolished elements shall be dismantled to a size fitting on ordinary trucks for transport.

Health and Safety

a) In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of AIDS.
b) Adequate infrastructure such as road signs to warn pedestrians and motorists of construction activities, diversions, etc. shall be provided at appropriate points.
c) Construction vehicles shall not exceed maximum speed limit of 40km per hour.

Repair of Private Property

a) 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.
b) 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)

APPENDIX VI: ENVIRONMENTAL HAZARD MANAGEMENT –

SUGGESTED CODE OF CONDUCT AND CLAUSES FOR CONTRACTORS

a) 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 EMP for the works. The Contractor's EHS-MP will serve two main purposes:
b) For the Contractor, for internal purposes, to ensure that all measures are put in place for adequate EHS management, and as an operational manual for his staff.
c) 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 the monitoring of the Contractor's EHS performance.
d) 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;
- a description of all planned monitoring activities (e.g. sediment discharges from burrow areas) and the reporting thereof; and the internal organizational, management and reporting mechanisms put in place for such.
- The Contractor's EHS-MP will be reviewed and approved by the Client before start of the works. This review should demonstrate that the Contractor's EHS-MP has covered all of the identified impacts, and has defined appropriate measures to counteract any potential impacts.

EHS Reporting

a) The Contractor shall prepare bi-weekly progress reports to the SE in 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 in Annex 6. It is expected that the Contractor's reports will include information on:
b) EHS management actions/measures taken, including approvals sought from local or national authorities;
c) Problems encountered in relation to EHS aspects (incidents, including delays, cost consequences, etc. as a result thereof);
d) Lack of compliance with contract requirements on the part of the Contractor;
e) Changes of assumptions, conditions, measures, designs and actual works in relation to EHS aspects; and
f) Observations, concerns raised and/or decisions taken with regard to EHS management during site meetings.
g) It is advisable that reporting of significant EHS incidents be done "as soon as practicable". Such incident reporting should 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 that the include such records, as well as copies of incident reports, as Annexes 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

a) 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 EMP, 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:
b) EHS in general (working procedures);
c) emergency procedures; and
d) social and cultural aspects (awareness raising on social issues).

APPENDIX VI: ENVIRONMENTAL HAZARD MANAGEMENT –

SUGGESTED CODE OF CONDUCT AND CLAUSES FOR CONTRACTORS

Cost of Compliance

a) 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
b) 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

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

EHS Incident Notification

a) Provide within 24 hrs to the Supervising Engineer
b) Originators Reference No: .....
c) Date of Incident: .....
d) Time: .....
e) Location of incident: .....
f) Name of Person(s) involved: .....
g) Employing Company: .....
h) Type of Incident: .....
i) Description of Incident:
j) Where, when, what, how, who, operation in progress at the time (only factual)
k) Immediate Action:
l) Immediate remedial action and actions taken to prevent reoccurrence or escalation
m) Signature (Name, Title, Date): .....
n) Contractor Representative

APPENDIX 7.2 – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - QUALITY ANALYTICAL LABORATORY SERVICES LTD, IPAN REG

APPENDIX 7.3 – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - QUALITY ANALYTICAL LABORATORY SERVICES LTD), DPR

APPENDIX 7.4 – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - QUALITY ANALYTICAL LABORATORY SERVICES LTD, DPR PERMIT

APPENDIX 7.5A – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - QUALITY ANALYTICAL LABORATORY SERVICES LTD, CLIBRATION CERTIFICATES FOR EQUIPMENT

APPENDIX 7.5B – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - QUALITY ANALYTICAL LABORATORY SERVICES LTD, CLIBRATION CERTIFICATES FOR EQUIPMENT

APPENDIX 7.5C – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - QUALITY ANALYTICAL LABORATORY SERVICES LTD, CLIBRATION CERTIFICATES FOR EQUIPMENT

APPENDIX 7.6 – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - TOBEJAY TECHNOLOGIES LIMITED

APPENDIX 7.7A – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - LABORATORY RESULTS – MET, AIR QUALITY, NOISE

APPENDIX 7.7B – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - LABORATORY RESULTS – SURFACEIN-SITU MEASUREMENTS

APPENDIX 7.7C – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - LABORATORY RESULTS – SURFACE WATER MEASUREMENTS

APPENDIX 7.7C – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - LABORATORY RESULTS – SURFACE WATER MEASUREMENTS

APPENDIX 7.7D – ACCREDITED LABORATORIES USED FOR SAMPLE ANALYSIS - LABORATORY RESULTS – SEDIMENT MEASUREMENTS

WINELIGHT RC 2209.847
ANALYTICAL SYSTEMS NIGERIA LIMITED
...trusted for quality laboratory equipment and back-up

ThermoOrion
ThermoNicolet
ThermoProjects
ThermoFinnigan
ThermoElemental
ThermoSpectronic
ThermoONIX Process Analysis

CERTIFICATE OF CALIBRATION

Customer: Quality Analytical Laboratory Services Ltd.

Instrument Type: Atomic Absorption Spectrophotometer (AA500)

Serial Number: 20-0930-21-0025

Accessories: Burner head, Atomizer, Aspirating probe etc.

METHOD OF CALIBRATION

The burner head was washed and allow to dry and then replaced. The atomizer was checked and tested ok.

The aspirating probe was replaced. Copper (Cu) standard was then prepared and used to calibrate the equipment and tested ok.

CALIBRATED BY:

Name: Oladele Afolabi

Tittle: Service Eng.

Signature: AFL

Date: 26/07/21

Winelight is the Agent/Representative of
Unicam Ltd, Cambridge U.K
Unicam is an ISO certified co Reg. No
BSEN 1809001 cert. No FM 09032

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ANALYTICAL SYSTEMS NIGERIA LIMITED
...trusted for quality laboratory equipment and back-up

ThermoOrion
ThermoNicolet
ThermoProjects
ThermoFinnigan
ThermoElemental
ThermoSpectronic
ThermoONIX Process Analysis

CERTIFICATE OF CALIBRATION

Customer: Quality Analytical Laboratory Services Ltd.

Instrument Type: Gas Chromatography (Hp 6890 Series)

Serial Number: US00024007

Accessories: Oven, Column, Syringes and Injector etc

METHOD OF CALIBRATION

Oven and temperature control was regulated and tested OK.

The injector was serviced and the needle was replaced.

The instrument was checked and calibrated with 10 ppm TPH standard and tested OK

CALIBRATED BY:

Name: Oladele Afolabi

Tittle: Service Eng.

Signature: AFL

Date: 26/07/2021

Winelight is the Agent/Representative of
Unicam Ltd, Cambridge U.K
Unicam is an ISO certified co Reg. No
BSEN 1809001 cert. No FM 09032

• LABORATORY INSTRUMENTS • SPECTROMETERS • CHROMATOGRAPHS • ELECTROCHEMISTRY • PETROLEUM TESTING
Head Office: 2, Bola Crescent, Anthony Village, Lagos P.O.Box 8487, Ikeja, Lagos Nigeria Tel.: 234-1-493270, 4974810, 4937251, 080-22901866

WINELIGHT RC 2209.847
ANALYTICAL SYSTEMS NIGERIA LIMITED
...trusted for quality laboratory equipment and back-up

ThermoOrion
ThermoNicolet
ThermoProjects
ThermoFinnigan
ThermoElemental
ThermoSpectronic
ThermoONIX Process Analysis

CERTIFICATE OF CALIBRATION

Customer: Quality Analytical Lab. Serv. Ltd.

Instrument type: 7219 Visible Spectrophotometer

Serial Number: 07111502021501097

WAVELENGHT CALIBRATION

The instrument has been calibrated against Holmium dioxide and Didymium filters at the following wavelengths.

NOS	PEAK WAVELENGHT	MEASURED PEAK	TOLERANCE	REMARKS
1	HOLMIUM PEAK FILTER	361.0	361+/- 1nm	pass
2	DIDYMIUM PEAK FILTER	807.1	807 +/- 2nm	pass

ABSORBANCE ACCURACY

The instrument has been checked for absorbance accuracy as at below using Absorbance filters whose calibration can be traced to the N.P.L. (national physical laboratories).

NOS	WAVE LENGTH (nm)	APPROXIMATE FILTER & TOLERANCE VALUE		REMARKS
		050 +/-0.05A	1.0+/-0.1A	pass
1	250	250.01	250.00	—
2	300	300.01	300.01	—
3	350	350.00	350.00	—
4	450	450.02	450.01	—
5	540	540.01	540.01	—
6	650	650.02	650.02	—

CALIBRATED BY:

Name: Oladele Afolabi

Title: Service Eng.

Signature: AFL

Date: 26/07/21

• LABORATORY INSTRUMENTS • SPECTROMETERS • CHROMATOGRAPHS • ELECTROCHEMISTRY • PETROLEUM TESTING
Head Office: 2, Bola Crescent, Anthony Village, Lagos P.O.Box 8487, Ikeja, Lagos Nigeria Tel: +234-1-4932?0, 4974810, 4937251, 080-22901866
Direct Fax: +234-1-4931738/4937005 E-mail Address: info@winelightng.com Internet Address:http://www.winelightng.com

FEDERAL REPUBLIC OF NIGERIA

PERMIT TO OPERATE AS AN OIL INDUSTRY SERVICE COMPANY

MAJOR CATEGORY

PERMIT NO: DPR/OGISP/21/5268268/R230536

This Permit is hereby granted to

TOBEJAY TECHNOLOGIES LIMITED

of 14 OMOZUWA STREET, OFF UWASOTA ROAD, (NOW 235 UGBOWO LAGOS ROAD, BENIN CITY) BENIN CITY, EDO, NIGERIA

to render the service to the Oil Industry in the Category listed hereunder:

ONSHORE ENVIRONMENTAL/ WASTE MANAGEMENT
- Environmental Assessment/Studies (EIA, EER, EAR, PIA)

This Permit expires on the Friday, April 29, 2022

Fee Paid: ₦ 25,000.00

Dated 29th day of April 20 21

Director of Petroleum Resources

This permit does not cover "Supply of Expatriate Manpower" in any guise

Quality Analytical Laboratory Services Ltd.
KM 8, Benin/Lagos Express Road
Opp. Konkon Petrol Station, Evbumore Quarters Benin City
Branch Laboratory: 7 NNPC Housing Complex Road, Opp. Forever Living Products, Ekpan – Warri Delta State
Phone: 08036454541, 08054000553 & 08127212731

AIR QUALITY MEASUREMENT FOR UMUAHIA ROAD PROJECT ENV. INVESTIGATION.

Sampler: Mr. Adhazor O. Christian **Date: 9/10/2021, Time: 11:18AM**

		ABA		UMUAHIA - EME		AMAOGWUGWU		FMEnv. Limit
PARAMETERS	UNITS	AQ 1	AQ 2	AQ 3	AQ 4	AQ 5	AQ 6	8-hour
Temp.	^{0}C	35.2	34.2	37.0	35.9	36.2	36.2	35
Noise	dB	53.7	50.9	46.8	48.4	54.8	51.7	90
NO_2	µg/m3	0.004	0.004	0.005	0.006	0.005	0.004	0.1
SO_2	µg/m3	0.006	0.005	0.004	0.004	0.004	0.006	0.06
O_2	%	20.9	21	21	20.9	21	20.9	21
H_2S	µg/m3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
CO	µg/m3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10
SPM	µg/m3	4.0	4.2	3.5	3.6	4.0	3.8	250
VOC	µg/m3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	20
O_3	µg/m3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
Radiation	uSv/H	0.015	0.013	0.017	0.011	0.025	0.019	6310
NH_3	µg/m3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
Humidity	g/cm3	62.3	65.3	59.5	52.3	48.5	52.1	NA
Wind speed	m/s	0.88	0.87	1.56	2.03	1.87	1.92	
Wind Direction		SW	SW	SE	SW	SW	SE	
LATITUDE		N05°06.982′	N05°07.975′	N05°37.743′	N05°37.515′	N05°35.662′	N05°35.624′	
LONGITUDE		E007°22.845′	E007°22.509′	E007°26.265′	E007°26.229′	E007°26.980′	E007°26.952′	

ABA RIVER: Stations 1&2, EME RIVER: Stations 3&4, Amaogwugwu: Stations 5&6

Pius Okoruwa
Managing Director
For: Quality Analytical Laboratory Services Limit

Quality Analytical Laboratory Services Ltd.
KM 8, Benin/Lagos Express Road
Opp. Konkon Petrol Station, Evbumore Quarters Benin City
Branch Laboratory: 7 NNPC Housing Complex Road, Opp. Forever Living Products, Ekpan – Warri Delta State
Phone: 08036454541, 08054000553 & 08127212731

INSITU PARAMETERS FOR WATER SAMPLES FROM UMUAHIA ROAD PROJECT ENV. INVESTIGATION.

Sampler: Mr. Adhazor O. Christian **Date: 9/10/2021, Time: 11:18AM**

		ABA RIVER		EME RIVER		AMAOGWUGWU RIVER	
PARAMETERS	UNITS	STN 1	STN2	STN3	STN4	STN5	STN6
TEMPERATURE	° C	29.3	31.0	28.7	28.3	32.6	32.4
pH		5.5	5.4	6.1	6.2	6.0	5.9
EC	µS/cm	46	38	22	18	48	44
TDS	mg/l	23	19	11	9	24	22
LATITUDE		N05°06.982′	N05°07.975′	N05°37.743′	N05°37.515′	N05°35.662′	N05°35.624′
LONGITUDE		E007°22.845′	E007°22.509′	E007°26.265′	E007°26.229′	E007°26.980′	E007°26.952′

Note:

ABA RIVER: Station 1&2

EME RIVER: Station 3&4

Amaogwugwu: Station 5&6

Quality Analytical Laboratory Services Ltd.
KM 8, Benin/Lagos Express Road
Opp. Konkon Petrol Station, Evbumore Quarters Benin City
Branch Laboratory: 7 NNPC Housing Complex Road, Opp. Forever Living Products, Ekpan – Warri Delta State
Phone: 08036454541, 08054000553 & 08127212731

AIR QUALITY MEASUREMENT FOR UMUAHIA ROAD PROJECT ENV. INVESTIGATION.

Sampler: Mr. Adhazor O. Christian **Date: 9/10/2021, Time: 11:18AM**

Parameters	Units	Methods	Aba R	Aba R	Eme R	Eme R	Amaogwugwu R	Amaogwugwu R
Matrix		SURFACE WATER	SW1	SW2	SW3	SW4	SW5	SW6
			N05°06.982'	N05°07.975'	N05°37.743'	N05°37.515'	N05°35.662'	N05°35.624'
			E007°22.845'	E007°22.509'	E007°26.265'	E007°26.229'	E007°26.980'	E007°26.952'
Physiochemical Parameters								
pH		ASTM D1293-18	5.5	5.4	6	6.2	5.6	5.9
Temp	$_0$C	EPA 1979, 170.1	29.3	31	28.5	28.3	32.6	32.4
TDS	mg/l	ASTM D1668	23	19	10	9	23	22
EC	uS/cm	ASTM D1125-95	46	38	20	18	48	44
Turbidity	NTU	APHA 2130B	1.72	1.95	7	7.1	27.12	27.52
TSS	mg/l	APHA 2540C	0.08	0.09	0.95	0.96	1.82	1.87
TS	mg/l	ASTM D1868	23.08	19.09	10.95	9.96	23.86	23.87
DO	mg/l	ASTM D888-92(1996)	5.6	5.8	7.3	7.4	6.1	6.2
BOD	mg/l	APHA 507	2.6	2.2	2.5	2.6	2.53	2.74
COD	mg/l	ASTM D1252-95	14.56	22.81	12.54	14.14	15.51	16.22
Chloride	mg/l	API-RP-45	13.8	11.4	5.3	5.4	13.1	13.2
Bicarbonate	mg/l	ASTM D1067-92	24.4	18.3	17.4	18.3	18.1	18.3
Carbonate	mg/l	ASTM D1067-92	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate	mg/l	APHA 427C	0.152	0.101	5.831	5.765	11.214	10.974
Phosphate	mg/l	ASTM D515-88	0.004	0.024	0.054	0.079	0.135	0.165
Nitrate	mg/l	ASTM D3869-90	1.014	2.789	1.059	1.859	2.521	2.535

Parameters	Units	Methods	Aba R	Aba R	Eme R	Eme R	Amaogwugwu R	Amaogwugwu R
Matrix		SURFACE WATER	SW1	SW2	SW3	SW4	SW5	SW6
Sulphide	mg/l	APHA, 1985	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ammonium-nitrogen	mg/l	ASTM D1426-93	0.12	0.12	0.141	0.146	0.152	0.158
Sodium	mg/l	ASTM D2791-93	3.74	2.05	0.77	0.67	1.79	1.72
Potassium	mg/l	ASTM D2791-93	1.42	0.78	1.42	0.99	2.8	2.3
Calcium	mg/l	ASTM D1126-96B	5.77	3.85	3.12	2.57	4.77	4.49
Magnessium	mg/l	ASTM D1126-96B	2.72	3.11	2.54	3.89	5.16	5.46
Total Hardness	mg/l	ASTM D1126-96B	11.21	12.81	15.21	16.01	25.32	25.62
METALS								
Iron	mg/l	APHA 3111B	0.07	0.03	1.021	0.992	1.86	1.62
Lead	mg/l	APHA 3111B	0.042	0.018	0.065	0.058	0.066	0.062
Copper	mg/l	APHA 3111B	0.062	0.036	0.07	0.056	0.077	0.074
Cadmium	mg/l	APHA 3111B	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	mg/l	APHA 3111B	0.045	0.049	0.051	0.056	0.062	0.064
Colbat	mg/l	APHA 3111B	0.024	0.021	0.046	0.049	0.051	0.056
Nickel	mg/l	APHA 3111B	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Manganese	mg/l	APHA 3111B	0.047	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	mg/l	APHA 3111B	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic	mg/l	APHA 3111B	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury	mg/l	APHA 3111D	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ORGANICs								
Oil & Grease/THC	mg/l	ASTM D3941	<1.0	<1.0	0.46	0.56	0.59	0.64
PAH	mg/l	USEPA 8270	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BTEX	mg/l	USEPA 8260	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
MICRO ORGANISMS								
HUB	cfu/g (103)	Vaour Phase Transfer	1.18	1.16	1.52	1.54	1.43	1.46
HUF	cfu/g (103)	Vapour Phase Transfer	0.68	0.64	0.7	0.72	0.74	0.78
THB	cfu/g (10^5)	Pour Plate	3.02	2.76	2.98	2.67	2.89	2.98
THF	cfu/g (10^3)	Pour Plate	1.23	1.56	1.44	1.64	2.02	2.26

SEDIMENT

Sample Id	UNITS	METHODS	Aba R	Aba R	Eme R	Eme R	Amaogwugwu R	Amaogwugwu R
Matrix	SEDIMENT		SED 1	SED 2	SED 3	SED 4	SED 5	SED 6
			N05°06.982'	N05°07.975'	N05°37.743'	N05°37.515'	N05°35.662'	N05°35.624'
			E007°22.845'	E007°22.509'	E007°26.265'	E007°26.229'	E007°26.980'	E007°26.952'
Physiochemical Parameters								
pH(H2O)		ASTM D4972	6.6	7.1	5.1	5.1	5.2	5.3
EC (uS/cm)		USEPA9050A	67	28	220	228	101	103
Cl^-	mg/kg	ASTM D512-89	32.16	13.44	120.11	109.44	48.99	49.44
PO_4	mg/kg	ASTM D515	22.368	6.341	9.216	8.832	7.55	7.84
NH4-N	mg/kg	ASTM D1426-93	1.234	1.134	2.23	2.26	2.433	2.534
NO_3	mg/kg	ASTM D3869-90	6.625	3.313	24.243	21.296	28.981	28.868
NO_2	mg/kg	APHA 4500-NO2	0.126	0.045	0.189	0.165	0.196	0.189
SO_4	mg/kg	ASTM D516	0.445	0	0.313	0.223	20.786	20.471
TOC	%	Walkley-Black	0.13	0.13	0.73	0.74	1.3	1.25
N	%	ASTM D3590	0.04	0.03	0.07	0.08	0.11	0.14
METALS								
Na	mg/kg	USEPA 7000B	23.36	19.08	26.07	26.02	23.34	23.21
K	mg/kg	USEPA 7000B	34.54	35.99	48.21	48.36	60.24	60.56
Ca	mg/kg	USEPA 7000B	12.83	38.48	576.04	545.09	265.72	275.75
Mg	mg/kg	USEPA 7000B	11.67	3.89	143.21	132.26	67.22	66.13
Zn	mg/kg	USEPA 7000B	81.4	8.4	16.7	15.9	43.4	41.2
Cu	mg/kg	USEPA 7000B	12.34	8.45	14.13	13.56	19.02	18.78
Cd	mg/kg	USEPA 7000B	<0.05	<0.05	<0.05	<0.05	1.05	1.24
Pb	mg/kg	USEPA 7000B	5.62	5.26	6.76	6.34	8.78	8.76
Fe	mg/kg	USEPA 7000B	2805.4	1433.3	4453.2	4154.3	4579.4	4580.6
Mn	mg/kg	USEPA 7000B	11	4.7	43.25	42.55	8.1	7.9
Co	mg/kg	USEPA 7000B	5.62	2.19	4.33	4.21	6.57	6.86
Ni	mg/kg	USEPA 7000B	6.31	4.34	12.3	12.28	8.23	8.23
Cr	mg/kg	USEPA 7000B	1.12	0.56	1.64	1.38	1.17	1.06
As	mg/kg	USEPA 7000B	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hg	mg/kg	USEPA 7473	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ORGANICs								
THC	mg/kg	ASTM D3941	<1.0	<1.0	1.06	1.06	1.08	1.34
PAH	mg/kg	USEPA 8270	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BTEX	mg/kg	USEPA 8260	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
MICRO ORGANISMS								
HUB	cfu/g (103)	Vapour Phase Transfer	1.12	1.14	1.25	1.54	1.39	1.48
HUF	cfu/g (103)	Vapour Phase Transfer	0.56	0.66	0.67	0.69	0.73	0.74
THB	cfu/g (10^3)	Pour Plate	2.54	2.74	3.12	3.14	2.72	2.68
THF	cfu/g (10^3)	Pour Plate	1.58	2.12	1.82	1.72	2.52	2.48

ABA RIVER: Stations 1&2, EME RIVER: Stations 3&4, Amaogwugwu: Stations 5&6

Pius Okoruwa
Managing Director
For: Quality Analytical Laboratory Services Limit

RESULTS OF GROUNDWATER ANALYSIS
MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE
P.M.B 7267, UMUAHIA ABIA STATE, NIGERIA
DEPARTMENT OF CIVIL ENGINEERING
SOIL AND WATER ENGINEERING LABORATORY

REPORT FORM FOR PHYSICAL, CHEMICAL AND BIOLOGICAL ANALYSIS

CLIENT:
PROJECT: OHIA WATER SAMPLE, UMUAHIA SOUTH L.G.A
CONTRACTOR:
NATURE OF SOURCE: WATER BOREHOLE

	VALUES	REMARKS
A. PHYSICAL PARAMETER		Recommendation
APPEARANCE	Clear & Colourless	Clear
COLOUR	None	0HTU
TASTE	Nil	-
ODOUR	Nil	-
TEMPERATURE	29^0C	-
TURBIDITY	3.2 NTU	< 5 NTU
CONDUCTIVITY	122 µS/L	< 250 µS/L
TDS	78 Mg/l	
% TRANSMITTANCE		
B. CHEMICAL ANALYSIS		
PH	6.6	(6.5-8.5)
ALKALINTY		
ACIDITY		
SALITY		
TOTAL HARDNESS	107 Mg/l	
CACO3	86mg/l	
FE total	ND	0
Mn	ND	
Cu	ND	0
K	37.6 Mg/l	
Ca	142 Mg/l	< 250 Mg/l
Mg	28 Mg/l	< 250 Mg/l
Hg		
Cd	ND	
Pb	ND	0
Cr		
S^2		
$S0_4$		< 250 Mg/l
H.C03	0.2Mg/l	
Na	38 Mg/l	
CN		0
Fe	ND	
Ct		
Ammonia		
$Cl_{2\ total}$	72.4 Mg/l	500 Mg/l
$Cl_{2\ free}$		
Dissolved O_2		> 5 Mg/l
Phosphate		
Silica		

C. BACTERIOLOGICAL ANALYSIS
NAME OF SAMPLER:
SOURCE /NATURE OF SAMPLE:
TIME/DATE OF ANALYSIS STARTED:
TIME/ DATE ANALYSIS COMPLETED:
PH OF SAMPLE AT TIME OF COLLECTION:

ISOLATED ORGANISM FROM WATER		**NO OF ORGANISMS PER**
TOTAL COLIFORM	No BacteriaIgrowth after 48hrs of incubation	
E. COLI	No BacteriaI growth after 48hrs of incubation	

FACAL COLIFORM		

REMARKS/ SPECIAL NOTES: All the values of chemical parameters are within the WHO standard for drinking water. There are no traces of metallic ions and the water is not contaminated. The water is portable and fit for drinking.

13/07/2021

MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE
P.M.B 7267, UMUAHIA ABIA STATE, NIGERIA
DEPARTMENT OF CIVIL ENGINEERING
SOIL AND WATER ENGINEERING LABORATORY

HYSICAL, CHEMICAL AND BIOLOGICAL ANALYSIS

PROJECT: APUMIRI WATER SAMPLE, UMUAHIA SOUTH L.G.A
CONTRACTOR:
NATURE OF SOURCE: WATER BOREHOLE

	VALUES	REMARKS
A. PHYSICAL PARAMETER		Recommendation
APPEARANCE	Clear & Colorless	Clear
COLOUR	None	0HTU
TASTE	Nil	-
ODOUR	Nil	-
TEMPERATURE	29^0C	-
TURBIDITY	2.7 NTU	< 5 NTU
CONDUCTIVITY	132 µS/L	< 250 µS/L
TDS	98 Mg/l	
% TRANSMITTANCE		
B. CHEMICAL ANALYSIS		
PH	6.7	(6.5-8.5)
ALKALINTY		
ACIDITY		
SALITY		
TOTAL HARDNESS	156 Mg/l	
CACO3	132mg/l	
FE total		0
Mn	ND	
Cu	ND	0
K	16.2 Mg/l	
Ca	128 Mg/l	< 250 Mg/l
Mg	32 Mg/l	< 250 Mg/l
Hg		
Cd	ND	
Pb	ND	0
Cr		
S^2		
$S0_4$		< 250 Mg/l
H.C03	0.8Mg/l	
Na	62.5 Mg/l	
CN		0
Fe	ND	
Ct		
Ammonia		
$Cl_{2\ total}$	67.4 Mg/l	500 Mg/l
$Cl_{2\ free}$		
Dissolved O_2		> 5 Mg/l
Phosphate		
Silica		

C. BACTERIOLOGICAL ANALYSIS
NAME OF SAMPLER:
SOURCE /NATURE OF SAMPLE:
TIME/DATE OF ANALYSIS STARTED:
TIME/ DATE ANALYSIS COMPLETED:
PH OF SAMPLE AT TIME OF COLLECTION:

ISOLATED ORGANISM FROM WATER		**NO OF ORGANISMS PER**
TOTAL COLIFORM	No BacteriaIgrowth after 48hrs of incubation	

E. COLI	No BacteriaI growth after 48hrs of incubation	
FACAL COLIFORM		

REMARKS/ SPECIAL NOTES: The water sample is portable and fit for drinking. Most of the parameters are within the acceptable limits and there is no trace of element.

_____ 13/07/2021

Lab Scientist/Analyst Date

MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE
P.M.B 7267, UMUAHIA ABIA STATE, NIGERIA
DEPARTMENT OF CIVIL ENGINEERING
SOIL AND WATER ENGINEERING LABORATORY

HYSICAL, CHEMICAL AND BIOLOGICAL ANALYSIS

PROJECT: APUMIRI WATER SAMPLE, UMUAHIA SOUTH L.G.A
CONTRACTOR:
NATURE OF SOURCE: WATER BOREHOLE

	VALUES	REMARKS
A. PHYSICAL PARAMETER		Recommendation
APPEARANCE	Clear & Colorless	Clear
COLOUR	None	0HTU
TASTE	Nil	-
ODOUR	Nil	-
TEMPERATURE	29^0C	-
TURBIDITY	2.7 NTU	< 5 NTU
CONDUCTIVITY	132 µS/L	< 250 µS/L
TDS	98 Mg/l	
% TRANSMITTANCE		
B. CHEMICAL ANALYSIS		
PH	6.7	(6.5-8.5)
ALKALINTY		
ACIDITY		
SALITY		
TOTAL HARDNESS	156 Mg/l	
CACO3	132mg/l	
FE total		0
Mn	ND	
Cu	ND	0
K	16.2 Mg/l	
Ca	128 Mg/l	< 250 Mg/l
Mg	32 Mg/l	< 250 Mg/l
Hg		
Cd	ND	
Pb	ND	0
Cr		
S^2		
$S0_4$		< 250 Mg/l
H.C03	0.8Mg/l	
Na	62.5 Mg/l	
CN		0
Fe	ND	
Ct		
Ammonia		
$Cl_{2\ total}$	67.4 Mg/l	500 Mg/l
$Cl_{2\ free}$		
Dissolved O_2		> 5 Mg/l
Phosphate		
Silica		

C. BACTERIOLOGICAL ANALYSIS
NAME OF SAMPLER:
SOURCE /NATURE OF SAMPLE:
TIME/DATE OF ANALYSIS STARTED:
TIME/ DATE ANALYSIS COMPLETED:
PH OF SAMPLE AT TIME OF COLLECTION:

ISOLATED ORGANISM FROM WATER		**NO OF ORGANISMS PER**
TOTAL COLIFORM	No BacteriaIgrowth after 48hrs of	

	incubation	
E. COLI	No BacteriaI growth after 48hrs of incubation	
FACAL COLIFORM		

REMARKS/ SPECIAL NOTES: The water sample is portable and fit for drinking. Most of the parameters are within the acceptable limits and there is no trace of element.

_____ 13/07/2021

Lab Scientist/Analyst Date

MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE
P.M.B 7267, UMUAHIA ABIA STATE, NIGERIA
DEPARTMENT OF CIVIL ENGINEERING
SOIL AND WATER ENGINEERING LABORATORY

HYSICAL, CHEMICAL AND BIOLOGICAL ANALYSIS

PROJECT: OSISIOMA-UMUOBO WATER SAMPLE, OSISIOMA L.G.A
CONTRACTOR:
NATURE OF SOURCE: WATER BOREHOLE

	VALUES	REMARKS
A. PHYSICAL PARAMETER		Recommendation
APPEARANCE	Clear & Colorless	Clear
COLOUR	None	0HTU
TASTE	Nil	-
ODOUR	Nil	-
TEMPERATURE	29.5^0C	-
TURBIDITY	3.0 NTU	< 5 NTU
CONDUCTIVITY	138 µS/L	< 250 µS/L
TDS	102 Mg/l	
% TRANSMITTANCE		
B. CHEMICAL ANALYSIS		
PH	6.8	(6.5-8.5)
ALKALINTY		
ACIDITY		
SALITY		
TOTAL HARDNESS	122 Mg/l	
CACO3	108mg/l	
FE total		0
Mn	ND	
Cu	ND	0
K	13.8 Mg/l	
Ca	138 Mg/l	< 250 Mg/l
Mg	46 Mg/l	< 250 Mg/l
Hg		
Cd	ND	
Pb	ND	0
Cr		
S^2		
$S0_4$		< 250 Mg/l
H.C03	0.6Mg/l	
Na	28 Mg/l	
CN		0
Fe	ND	
Ct		
Ammonia		
$Cl_{2\ total}$	58.6 Mg/l	500 Mg/l
$Cl_{2\ free}$		
Dissolved O_2		> 5 Mg/l
Phosphate		
Silica		

C. BACTERIOLOGICAL ANALYSIS
NAME OF SAMPLER:
SOURCE /NATURE OF SAMPLE:
TIME/DATE OF ANALYSIS STARTED:
TIME/ DATE ANALYSIS COMPLETED:
PH OF SAMPLE AT TIME OF COLLECTION:

ISOLATED ORGANISM FROM WATER		**NO OF ORGANISMS PER**
TOTAL COLIFORM	No BacteriaIgrowth after 48hrs of incubation	

E. COLI	No BacteriaI growth after 48hrs of incubation	
FACAL COLIFORM		

REMARKS/ SPECIAL NOTES: The water sample is portable and fit for drinking. The parameters tested are within the permissible limits for drinking water.

_____ 13/07/2021

Lab Scientist/Analyst Date

MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE
P.M.B 7267, UMUAHIA ABIA STATE, NIGERIA
DEPARTMENT OF CIVIL ENGINEERING
SOIL AND WATER ENGINEERING LABORATORY

HYSICAL, CHEMICAL AND BIOLOGICAL ANALYSIS

PROJECT: UMUEVO UMUIKEA WATER SAMPLE, ISIALA NGWA SOUTH L.G.A
CONTRACTOR:
NATURE OF SOURCE: WATER BOREHOLE

	VALUES	REMARKS
A. PHYSICAL PARAMETER		Recommendation
APPEARANCE	Clear & Colorless	Clear
COLOUR	None	0HTU
TASTE	Nil	-
ODOUR	Nil	-
TEMPERATURE	29^0C	-
TURBIDITY	3.4 NTU	< 5 NTU
CONDUCTIVITY	124 µS/L	< 250 µS/L
TDS	142 Mg/l	
% TRANSMITTANCE		
B. CHEMICAL ANALYSIS		
PH	6.6	(6.5-8.5)
ALKALINTY		
ACIDITY		
SALITY		
TOTAL HARDNESS	132 Mg/l	
CACO3	126mg/l	
FE total		0
Mn	ND	
Cu	ND	0
K	21.2 Mg/l	
Ca	133.6 Mg/l	< 250 Mg/l
Mg	36 Mg/l	< 250 Mg/l
Hg		
Cd	ND	
Pb	ND	0
Cr		
S^2		
$S0_4$	30.8Mg/l	< 250 Mg/l
H.C03	0.8Mg/l	
Na	32.2 Mg/l	
CN		0
Fe	ND	
Ct		
Ammonia		
$Cl_{2\ total}$	62.6 Mg/l	500 Mg/l
$Cl_{2\ free}$		
Dissolved O_2		> 5 Mg/l
Phosphate		
Silica		

C. BACTERIOLOGICAL ANALYSIS
NAME OF SAMPLER:
SOURCE /NATURE OF SAMPLE:
TIME/DATE OF ANALYSIS STARTED:
TIME/ DATE ANALYSIS COMPLETED:
PH OF SAMPLE AT TIME OF COLLECTION:

ISOLATED ORGANISM FROM WATER		**NO OF ORGANISMS PER**

TOTAL COLIFORM	No BacteriaIgrowth after 48hrs of incubation	
E. COLI	No BacteriaI growth after 48hrs of incubation	
FACAL COLIFORM		

REMARKS/ SPECIAL NOTES: The water sample is free from contamination and thus fit for drinking. The parameters tested are within the WHO acceptable limits for drinking water.

_____ 13/07/2021

Lab Scientist/Analyst Date

GROUNDWATER MEASUREMENTS

MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE
P.M.B 7267, UMUAHIA ABIA STATE, NIGERIA
DEPARTMENT OF CIVIL ENGINEERING
SOIL AND WATER ENGINEERING LABORATORY

HYSICAL, CHEMICAL AND BIOLOGICAL ANALYSIS

PROJECT: ARUMUIKA II WATER SAMPLE, ISIALA NGWA SOUTH L.G.A
CONTRACTOR:
NATURE OF SOURCE: WATER BOREHOLE

	VALUES	REMARKS
A. PHYSICAL PARAMETER		Recommendation
APPEARANCE	Clear & Colorless	Clear
COLOUR	None	0HTU
TASTE	Nil	-
ODOUR	Nil	-
TEMPERATURE	29^0C	-
TURBIDITY	4.0 NTU	< 5 NTU
CONDUCTIVITY	118 µS/L	< 250 µS/L
TDS	92 Mg/l	
% TRANSMITTANCE		
B. CHEMICAL ANALYSIS		
PH	6.7	(6.5-8.5)
ALKALINTY		
ACIDITY		
SALITY		
TOTAL HARDNESS	118 Mg/l	
CACO3	101mg/l	
FE total		0
Mn	ND	
Cu	ND	0
K	28.2 Mg/l	
Ca	128 Mg/l	< 250 Mg/l
Mg	24.0Mg/l	< 250 Mg/l
Hg		
Cd	ND	
Pb	ND	0
Cr		
S^2		
$S0_4$	26.7	< 250 Mg/l
H.C03	0.2Mg/l	
Na	46 Mg/l	
CN		0
Fe	ND	
Ct		
Ammonia		
$Cl_{2\ total}$	62.8 Mg/l	500 Mg/l
$Cl_{2\ free}$		
Dissolved O_2		> 5 Mg/l
Phosphate		
Silica		

C. BACTERIOLOGICAL ANALYSIS
NAME OF SAMPLER:
SOURCE /NATURE OF SAMPLE:
TIME/DATE OF ANALYSIS STARTED:
TIME/ DATE ANALYSIS COMPLETED:
PH OF SAMPLE AT TIME OF COLLECTION:

ISOLATED ORGANISM FROM WATER		NO OF ORGANISMS PER
TOTAL COLIFORM	No BacteriaIgrowth after 48hrs of incubation	

E. COLI	No BacteriaI growth after 48hrs of incubation	
FACAL COLIFORM		

REMARKS/ SPECIAL NOTES: The water sample is good for drinking. There is no trace element found. All parameter tested are within the acceptable standard.

_____ 13/07/2021

Lab Scientist/Analyst Date

MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE
P.M.B 7267, UMUAHIA ABIA STATE, NIGERIA
DEPARTMENT OF CIVIL ENGINEERING
SOIL AND WATER ENGINEERING LABORATORY

HYSICAL, CHEMICAL AND BIOLOGICAL ANALYSIS

PROJECT: AMAISE WATER SAMPLE, ISIALA NGWA SOUTH L.G.A
CONTRACTOR:
NATURE OF SOURCE: WATER BOREHOLE

	VALUES	REMARKS
A. PHYSICAL PARAMETER		Recommendation
APPEARANCE	Clear & Colorless	Clear
COLOUR	None	0HTU
TASTE	Nil	-
ODOUR	Nil	-
TEMPERATURE	28.5^0C	-
TURBIDITY	2.8 NTU	< 5 NTU
CONDUCTIVITY	136 µS/L	< 250 µS/L
TDS	112 Mg/l	
% TRANSMITTANCE		
B. CHEMICAL ANALYSIS		
PH	6.8	(6.5-8.5)
ALKALINTY		
ACIDITY		
SALITY		
TOTAL HARDNESS	126 Mg/l	
CACO3	106mg/l	
FE total		0
Mn	ND	
Cu	ND	0
K	32.8 Mg/l	
Ca	86 Mg/l	< 250 Mg/l
Mg	30Mg/l	< 250 Mg/l
Hg		
Cd	ND	
Pb	ND	0
Cr		
S^2		
$S0_4$	42.8	< 250 Mg/l
H.C03	0.06Mg/l	
Na	23 Mg/l	
CN		0
Fe	ND	
Ct		
Ammonia		
$Cl_{2\ total}$	86 Mg/l	500 Mg/l
$Cl_{2\ free}$		
Dissolved O_2		> 5 Mg/l
Phosphate		
Silica		

C. BACTERIOLOGICAL ANALYSIS
NAME OF SAMPLER:
SOURCE /NATURE OF SAMPLE:
TIME/DATE OF ANALYSIS STARTED:
TIME/ DATE ANALYSIS COMPLETED:
PH OF SAMPLE AT TIME OF COLLECTION:

ISOLATED ORGANISM FROM WATER		NO OF ORGANISMS PER
TOTAL COLIFORM	No BacteriaIgrowth after 48hrs of incubation	

E. COLI	No BacteriaI growth after 48hrs of incubation	
FACAL COLIFORM		

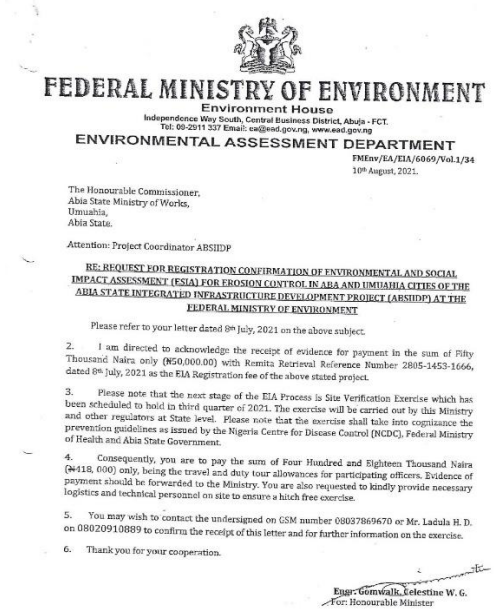
REMARKS/ SPECIAL NOTES: The water sample is potable and fit for drinking, the parameter tested are within the acceptable limits for drinking meter. No trace element found

_____ 13/07/2021

Lab Scientist/Analyst Date

Appendix x: Communication with Federal Ministry of Environment and Authority to disclose the ESIA

1. Project Registration



FEDERAL MINISTRY OF ENVIRONMENT
Environment House
Independence Way South, Central Business District, Abuja - FCT.
Tel: 09-2911 337 Email: ea@ead.gov.ng, www.ead.gov.ng
ENVIRONMENTAL ASSESSMENT DEPARTMENT

FMEnv/EA/EIA/6069/Vol.1/34
10th August, 2021.

The Honourable Commissioner,
Abia State Ministry of Works,
Umuahia,
Abia State.

Attention: Project Coordinator ABSIIDP

RE: REQUEST FOR REGISTRATION CONFIRMATION OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR EROSION CONTROL IN ABA AND UMUAHIA CITIES OF THE ABIA STATE INTEGRATED INFRASTRUCTURE DEVELOPMENT PROJECT (ABSIIDP) AT THE FEDERAL MINISTRY OF ENVIRONMENT

Please refer to your letter dated 8th July, 2021 on the above subject.

2. I am directed to acknowledge the receipt of evidence for payment in the sum of Fifty Thousand Naira only (₦50,000.00) with Remita Retrieval Reference Number 2805-1453-1666, dated 8th July, 2021 as the EIA Registration fee of the above stated project.

3. Please note that the next stage of the EIA Process is Site Verification Exercise which has been scheduled to hold in third quarter of 2021. The exercise will be carried out by this Ministry and other regulators at State level. Please note that the exercise shall take into cognizance the prevention guidelines as issued by the Nigeria Centre for Disease Control (NCDC), Federal Ministry of Health and Abia State Government.

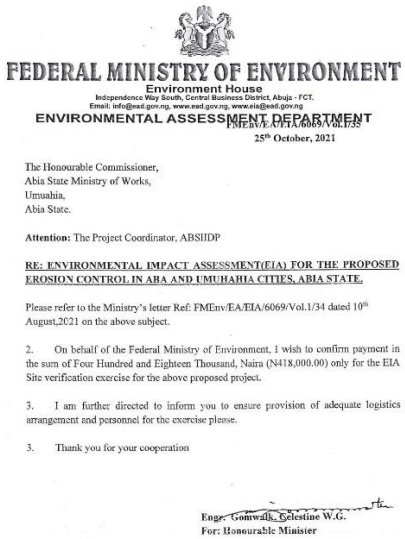
4. Consequently, you are to pay the sum of Four Hundred and Eighteen Thousand Naira (₦418, 600) only, being the travel and duty tour allowances for participating officers. Evidence of payment should be forwarded to the Ministry. You are also requested to kindly provide necessary logistics and technical personnel on site to ensure a hitch free exercise.

5. You may wish to contact the undersigned on GSM number 08037869670 or Mr. Ladula H. D. on 08020910889 to confirm the receipt of this letter and for further information on the exercise.

6. Thank you for your cooperation.

Engr. Gomwalk, Celestine W. G.
For: Honourable Minister

2. Project Site Verification



FEDERAL MINISTRY OF ENVIRONMENT
Environment House
Independence Way South, Central Business District, Abuja - FCT.
Email: info@ead.gov.ng, www.ead.gov.ng, www.eia@ead.gov.ng
ENVIRONMENTAL ASSESSMENT DEPARTMENT
FMEnv/EA/EIA/6069/Vol.1/35
25th October, 2021

The Honourable Commissioner,
Abia State Ministry of Works,
Umuahia,
Abia State.

Attention: The Project Coordinator, ABSIIDP

RE: ENVIRONMENTAL IMPACT ASSESSMENT(EIA) FOR THE PROPOSED EROSION CONTROL IN ABA AND UMUHAHIA CITIES, ABIA STATE.

Please refer to the Ministry's letter Ref: FMEnv/EA/EIA/6069/Vol.1/34 dated 10th August,2021 on the above subject.

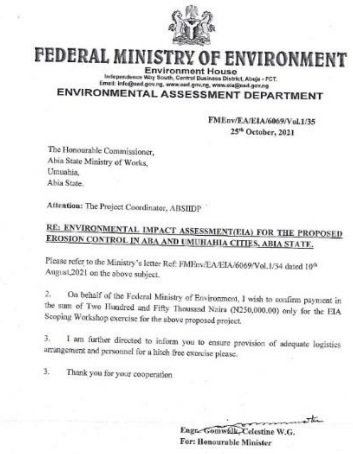
2. On behalf of the Federal Ministry of Environment, I wish to confirm payment in the sum of Four Hundred and Eighteen Thousand, Naira (N418,000.00) only for the EIA Site verification exercise for the above proposed project.

3. I am further directed to inform you to ensure provision of adequate logistics arrangement and personnel for the exercise please.

3. Thank you for your cooperation

Engr. Gomwalk, Celestine W.G.
For: Honourable Minister

3. Project Scoping Workshop



FEDERAL MINISTRY OF ENVIRONMENT
Environment House
ENVIRONMENTAL ASSESSMENT DEPARTMENT

FMEnv/EA/EIA/6069/Vol.1/35
25th October, 2021

The Honourable Commissioner,
Abia State Ministry of Works,
Umuahia,
Abia State.

Attention: The Project Coordinator, ABSIIDP

RE: ENVIRONMENTAL IMPACT ASSESSMENT(EIA) FOR THE PROPOSED EROSION CONTROL IN ABA AND UMUHAHIA CITIES, ABIA STATE.

Please refer to the Ministry's letter Ref: FMEnv/EA/EIA/6069/Vol.1/34 dated 10th August,2021 on the above subject.

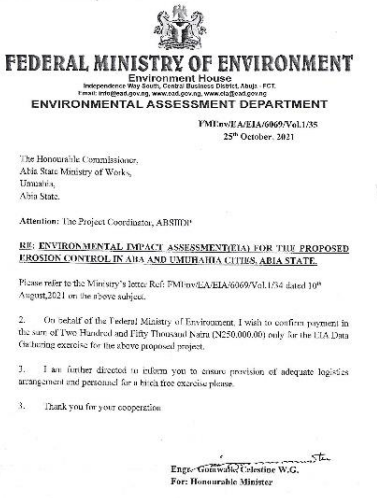
2. On behalf of the Federal Ministry of Environment, I wish to confirm payment in the sum of Two Hundred and Fifty Thousand Naira (N250,000.00) only for the EIA Scoping Workshop exercise for the above proposed project.

3. I am further directed to inform you to ensure provision of adequate logistics arrangement and personnel for a hitch free exercise please.

3. Thank you for your cooperation

Engr. Gomwalk, Celestine W.G.
For: Honourable Minister

4. Project Field Data Gathering



FEDERAL MINISTRY OF ENVIRONMENT
Environment House
Independence Way South, Central Business District, Abuja - FCT.
Email: info@ead.gov.ng, www.ead.gov.ng, www.eia@ead.gov.ng
ENVIRONMENTAL ASSESSMENT DEPARTMENT

FMEnv/EA/EIA/6069/Vol.1/35
25th October, 2021

The Honourable Commissioner,
Abia State Ministry of Works,
Umuahia,
Abia State.

Attention: The Project Coordinator, ABSIIDP

RE: ENVIRONMENTAL IMPACT ASSESSMENT(EIA) FOR THE PROPOSED EROSION CONTROL IN ABA AND UMUHAHIA CITIES, ABIA STATE.

Please refer to the Ministry's letter Ref: FMEnv/EA/EIA/6069/Vol.1/34 dated 10th August,2021 on the above subject.

2. On behalf of the Federal Ministry of Environment, I wish to confirm payment in the sum of Two Hundred and Fifty Thousand Naira (N250,000.00) only for the EIA Data Gathering exercise for the above proposed project.

3. I am further directed to inform you to ensure provision of adequate logistics arrangement and personnel for a hitch free exercise please.

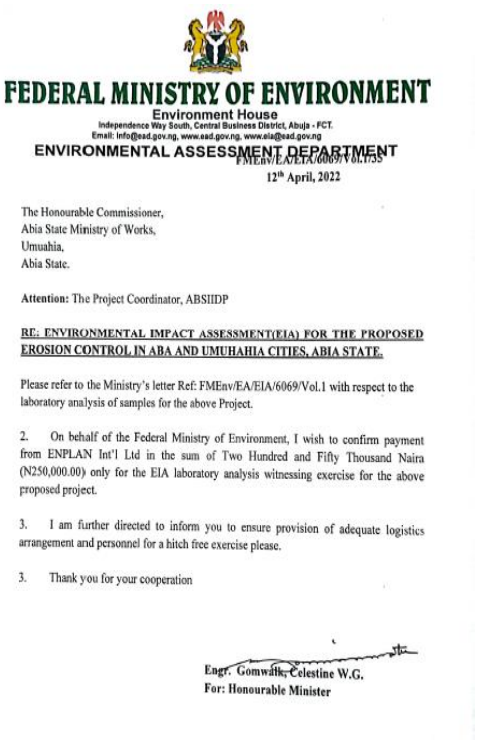
3. Thank you for your cooperation

Engr. Gomwalk, Celestine W.G.
For: Honourable Minister

5. Project Laboratory Analysis Participation

6. Project Authority to disclose the ESIA

Appendix x: Communication with Federal Ministry of Environment and Authority to disclose the ESIA



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ENVIRONMENTAL ASSESSMENT DEPARTMENT

FMEnv/EA/EIA/6069/Vol.1/35
12th April, 2022

The Honourable Commissioner,
Abia State Ministry of Works,
Umuahia,
Abia State.

Attention: The Project Coordinator, ABSIIDP

RE: ENVIRONMENTAL IMPACT ASSESSMENT(EIA) FOR THE PROPOSED EROSION CONTROL IN ABA AND UMUHAHIA CITIES, ABIA STATE.

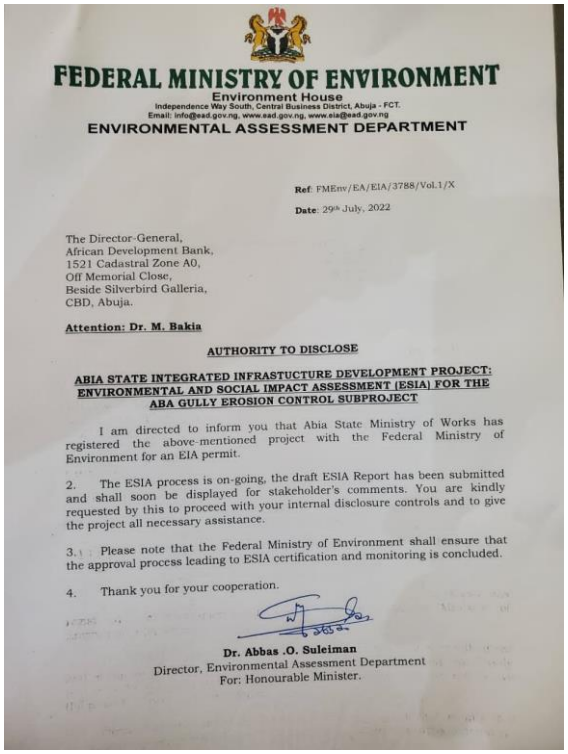
Please refer to the Ministry's letter Ref: FMEnv/EA/EIA/6069/Vol.1 with respect to the laboratory analysis of samples for the above Project.

2. On behalf of the Federal Ministry of Environment, I wish to confirm payment from ENPLAN Int'l Ltd in the sum of Two Hundred and Fifty Thousand Naira (N250,000.00) only for the EIA laboratory analysis witnessing exercise for the above proposed project.

3. I am further directed to inform you to ensure provision of adequate logistics arrangement and personnel for a hitch free exercise please.

3. Thank you for your cooperation

Engr. Gomwalk, Celestine W.G.
For: Honourable Minister



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ENVIRONMENTAL ASSESSMENT DEPARTMENT

Ref: FMEnv/EA/EIA/3788/Vol.1/X

Date: 29th July, 2022

The Director-General,
African Development Bank,
1521 Cadastral Zone A0,
Off Memorial Close,
Beside Silverbird Galleria,
CBD, Abuja.

Attention: Dr. M. Bakia

AUTHORITY TO DISCLOSE

ABIA STATE INTEGRATED INFRASTUCTURE DEVELOPMENT PROJECT: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE ABA GULLY EROSION CONTROL SUBPROJECT

I am directed to inform you that Abia State Ministry of Works has registered the above-mentioned project with the Federal Ministry of Environment for an EIA permit.

2. The ESIA process is on-going, the draft ESIA Report has been submitted and shall soon be displayed for stakeholder's comments. You are kindly requested by this to proceed with your internal disclosure controls and to give the project all necessary assistance.

3. Please note that the Federal Ministry of Environment shall ensure that the approval process leading to ESIA certification and monitoring is concluded.

4. Thank you for your cooperation.

Dr. Abbas .O. Suleiman
Director, Environmental Assessment Department
For: Honourable Minister.