



Draft Final Report

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)



Enugu Ngwo Gully Erosion Site, Enugu State

Enugu State Nigeria Erosion and Watershed
Management Project

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LIST OF ACRONYMS

AIRBDA	Anambra-Imo River Basin Development Authority
EN-NEWMAP	Enugu Nigeria Erosion and Watershed Management Project
ENSEPA	Enugu State Environmental Protection Agency
CSOs	Civil Society Organisations
EAs	Environmental Assessments
EIA	Environmental Impact Assessment
ESIAs	Environmental and Social impact Assessments
ESMP	Environmental and Social Management Plan
FEMA	Federal Road Maintenance Agency
FEPA	Federal Environmental Protection Agency
FMEEnv	Federal Ministry of Environment
FRSC	Federal Road Safety Corps
GDP	Gross Domestic Product
LGAs	Local Government Areas
MDAs	Ministries, Departments and Agencies
NGOs	Non-Governmental Organizations
NESREA Agency	National Environmental Standards Regulatory Enforcement Nigeria Erosion and Watershed Management Project
NEWMAP	
PAD	Project Appraisal Document
PAPs	Project Affected Persons
PMU	Project Management Unit
PDO	Project Development Objectives
PPE	Personal Protective Equipment
RCBC	Reinforced Concrete Box Culvert
SMEEnv	State Ministry of Environment
SMW	State Ministry of Works
SPMU	State Project Management Unit

EXECUTIVE SUMMARY

The Government of Nigeria is implementing the multi-sectoral Nigeria Erosion and Watershed Management Project (NEWMAP), financed by the World Bank, Global Environment Facility, the Special Climate Change Fund, and the Government of Nigeria. The Project Development Objective (PDO) of the NEWMAP is to improve erosion management and gully rehabilitation; increase incomes for rural households from improved agricultural and forest practices through the use of conservation agriculture, agroforestry, natural regeneration, etc.; and gain efficiency in public administration and public spending through improved knowledge base, analytical tools, multi-sectoral coordination and stakeholder dialogue.

Various documents have been prepared in line with NEWMAP, and they include; Environmental and Social Management Framework (ESMF), Resettlement Policy Frameworks (RPF), Project Appraisal Document (PAD) prepared for the Nigerian Erosion and Watershed Management Project. This report focuses on the Environmental and Social Management Plan (ESMP) developed for the Rehabilitation of the Enugwu-Ngwo Gully Erosion in Enugu North LGA of Enugu State Nigeria.

Objectives of the Environmental and Social Management Plan

The objective of the **ESMP** is to develop procedures and plans to ensure that the mitigation measures will be implemented throughout the phases for the **Rehabilitation of the Enugwu-Ngwo Gully Erosion site**. It has also been prepared to ensure the effective long-term protection of the area and other biotic and abiotic components of the environment.

Description of the study area

The Enugwu-Ngwo is located in the southwest parts of Enugu Metropolitan. It is located within latitude 6° 25' 6" N and longitude 7° 26' 19" E and has population of about 50,000 people.

There are four (4) gully fingers, which share a common watershed area of approximately 104 hectares (ha) and converge around Ogbete Market, Coal Camp and Police College area within the Enugu city metropolis, with GIS location coordinates of within latitude 6° 25' 55" N and 6° 27' 00" N and longitude 7° 27' 13" E and 7° 28' 00" E.

The project area is populated and residents are mainly poultry farmers and civil servants. There are also traders and artisans living within the project communities. Within the area are located schools, Primary Healthcare Centre, and market.

Project Environment

The climate of Enugwu-Ngwo is characteristically of the Equatorial type found in South-Eastern Nigeria, essentially warm and humid. This is a resultant effect of its prevailing seasonal wind, nearness to the seacoast and the relatively flat topography of the environment. A humid Tropical Maritime (mT) from across the Atlantic Ocean in the south dominates the region in the longer wet season (April to October). A drier Tropical Continental (cT) air mass blowing from the northeast direction controls the climate and meteorology of the area during the dry season (November to March).

The climate is tropical with two distinct seasons, the rainy season and the dry season. The rainy season begins around the first of May and continues into September while the dry season runs from November to April. Rainfall reaches its highest monthly maximum of 300 – 400mm during the month of June through September and drops to 0.0-1.0mm in December and January.

Social Baseline Environment

The socio-economic assessment studies were aimed at examining the socioeconomic conditions of the people living around the project site in Enugwu-Ngwo in Enugu North LGA of Enugu State.

This is to ensure that the potential impacts of the proposed rehabilitation project is captured and described while proffering solutions to possible negative impacts to human habitat, health and livelihoods.

The specific objectives of the study include:

- To elicit information about the existing socioeconomic and demographic characteristics of the inhabitants living within the community
- To document the distributional characteristics of the socioeconomic components in the project area
- To analyse the patterns of the relationships of the socioeconomic components
- To discuss and deduce the effect of the patterns on the environment of the proposed Project through the perceptions of the respondents
- To provide a baseline data for the assessment of the socioeconomic impacts of the proposed project
- Suggest mitigation measures and environmental management plan for the proposed project.

A random sampling survey was carried out within the community. Questionnaires were administered to a total of 150 respondents.

Project Description

Proposed solution to ameliorate the erosion problem is proper management of prevailing flood flow path to the gully and subsequently control the gully using adequate drainage systems such as culverts, drains, chute channels and stilling basins, rip-rap resting on geotextile, then gabion check dams placed along the gully bed to slow down the flow velocity, etc.

Policy, Legal, Regulatory and Institutional Framework

The section on Policy examined the various regulation and legal documents as it concerns Nigeria and Imo State. The World Bank Safeguards and other relevant International guidelines applicable to the sub-project intervention were also examined. The various institutional frameworks relevant to the NEWMAP was also evaluated in this section.

The Rehabilitation Project is rated a Category B (equivalent to Category II in the Nigeria EIA Act) project in accordance with the Environmental Assessment Policy of the World Bank, which will focus on mitigation and Environmental planning measures. The identified World Bank safeguard policies triggered by the rehabilitation of the gully site include; Environmental Assessment (OP 4.01); Natural Habitats (OP 4.04) and Physical and Cultural Resources (OP 4.11 and Pest Management Safeguard Policy OP 4.09).

Summary of potential impacts for the Enugu-Ngwo Gully Erosion site

Beneficial Environmental and Socio-economic Impacts

The beneficial environmental and socio-economic impacts associated with the rehabilitation works will include:

Some of the beneficial impacts associated with the project include:

- Rehabilitation of the erosion menace in the community;
- Repair of the watershed gullies;
- Connection and restoration of access to houses and villages already cut off by the erosion;

- Provision of employment opportunities for both skilled and unskilled workers;
- Improved agricultural productivity within the community and Enugu state at large;
- Community development programs;
- Reintegration of community and diversification of sources of livelihood;
- Reduction of mortality rate;
- Promotion of afforestation programs (with all its benefits);
- Minimization of flooding and control of coastal overflow.
- Reduced fear perception of loss of property, inhabitation and ancestral origins of the communities;
- Control and Reduction of water body sedimentation rates due to erosion;
- Reduction in mortality/morbidity from landslides;
- Initiation/ kick-off of rapid production systems and agricultural practices;
- Increase in social interactions;
- Improved livelihood enhancing activities;
- Gender Issues: Construction activities will encourage economic activities, especially for women. Since there would be a large workforce, petty traders and food-spots owners will benefit immensely from the demand on site;
- Promotion of goodwill and community appreciation of the NEWMAP intervention in Enugu State and Nigeria at large.

Adverse Environmental and Socio-economic Impacts

Some adverse impacts that may be associated with the rehabilitation of the gully as highlighted in this report may include the following:

- Construction machinery moving around the area can create soil compaction, which may harm the soil's future potential as farmland, impair drainage and increase the risk of flooding;
- Waste Generation: Construction crews may generate solid and liquid wastes (sewages). Uncontrolled and untreated, these wastes are major sources of pollution, disrupting the ecosystem and contributing to local (and sometimes much broader) health problems;
- Restricted Access to Business owners: During the rehabilitation works there are bound to be restriction in movement, which will affect transport of goods and services;
- Pressure on the Available Water for Domestic purpose and other Uses;
- Noise and Vibration Nuisance: The project area is a built-up area with residential houses, schools (especially Colliery Secondary School), and market. The civil works will generate noise and vibrations on site and surrounding environment. Most civil work projects starting from the pre-construction phase to the decommissioning phase would generate relatively high levels of noise and would be mainly from heavy equipment. The noise levels generated by construction equipment would vary significantly, depending on such factors as type, model, size, and condition of the equipment, operation schedule, and condition of the area being worked. Accordingly, potential impacts of site monitoring and testing activities on ambient noise level would be expected to be temporary and intermittent in nature;
- Emission of Green House Gases, Dust and Particulates: Emissions from exhaust fumes will originate from mobile sources including vehicles, trucks and heavy equipment during mobilization;

- Attack by Poisonous Insects, Reptiles and other Dangerous Wild Animals: Field workers engaged in site clearing, geotechnical investigations and construction could be exposed to attack by animals. These attacks could result in injuries, poisoning or even death;
- Interference with Land Transport: The equipment and personnel will be transported by road. Additional traffic during transport of equipment and personnel for the proposed project will likely create a traffic jam on the road. There is high likelihood that when moving these equipment and personnel along these roads, the transport activities of the community could be disrupted and this could have impact on the socio-economic activities of the community;
- Alteration of Habitat and Biodiversity: Disturbance on the natural habitat due to human activity can result to likelihood that some amount of flora and fauna would be destroyed. Site clearing will lead to loss of species diversity and abundance, including soil organisms, fungi, invertebrates, and bacteria. It will also lead to loss of food sources, fauna habitat, breeding grounds and nesting sites;
- Work Site Accidents: The frequency and incidence of occupational hazards rise with increasing activities. Site clearing is typically done using both heavy and light equipment such as graders, and bulldozers. In the process of clearing there could be injuries and possibly fatalities among the workforce;
- Loss of Jobs: At the end of the project lifetime the project workforce will be demobilized. This will bring about loss of jobs for the project workers. This will translate to loss in income and business opportunities. Most of the small scale businesses that provided goods and services to the road crew members will either windup or experience significant reduction in the volume of business with the demobilization of the project and this too will translate to loss of income.

This ESMP therefore will ensure that the adverse/negative impacts are reduced to the barest minimum while the beneficial impacts are enhanced.

Project Alternatives

Various alternatives to the planned rehabilitation of the Enugu-Ngwo Gully Erosion Site were evaluated. These include:

- Do nothing approach;
- Rock lined chute;
- Wood drop structure;
- Vegetated overall structure.

Also several technological and design options were analyzed for the project. This includes:

- Rock lined chute;
- Wood drop structures.

The preferred alternative would be to implement the current project proposal; however with a combination of suitable alternatives to enable the project achieves its objectives. This is mainly based on cost benefit analysis as well as sustainability.

Environmental and Social Management Plan and Monitoring Plan Budget

The ESMP included the various impacts discussed according to the respective phases during project implementation. The impacts have been described, as they will impact on the different

environmental and social sensitivities. The mitigation measures, mitigation costs and institutional responsibilities were also highlighted in the ESMP matrix table.

The total cost for Implementing the ESMP and Monitoring Plan for the Enugwu-Ngwo Gully Erosion Site Rehabilitation Works is estimated at Seventeen Million One Hundred and Twenty-Seven Thousand Three Hundred and Ninety Six Naira Only (₦17,127,396); [Eighty-Six Thousand Five Hundred and Two US Dollars \$86,502.00].

Institutional Arrangement for ESMP and Monitoring Plan

It is envisaged that the environmental and social impacts and their designed enhancement and mitigation measures shall be monitored during implementation of the construction/rehabilitation works and operation phases. The roles and responsibilities for monitoring the environmental and social impacts and the implementation of the ESMP are as follows.

Overall sub-project coordination will be housed in Project Management Unit (PMU), of Enugu State NEWMAP Office. They will oversee the day-day project management and ensure that environmental and socio-economic concerns and management as elucidated in the ESMP are integrated into all aspects of project implementation. The Enugu State Ministry of Environment; herein referred to as State Ministry of Environment (SMEEnv); National Environmental Standards Regulatory Enforcement Agency (NESREA), and Enugu State Environmental Protection Agency (ENSEPA) will monitor, evaluate and audit the implementation of the ESMP to ensure that the rehabilitation works and project operations meet “best environmental practices”.

Awareness creation exercises on HIV/AIDS, environmental protection and personal hygiene and sanitation shall also be undertaken for contactors personnel and all stakeholders involved in project implementation.

Stakeholder Consultation

The public consultation strategy for the ESMP activities evolved around the provision of a full opportunity for involvement for all stakeholders, especially the PAPs. Concerns raised by the stakeholders are documented and incorporated in this report and used to develop mitigation and/or enhancement measures.

The stakeholders were informed of the visits through the existing communication line between the SPMU and the communities. The Community leaders through the use of town criers, church announcements and phone calls, informed the rest of the community of the proposed meetings.

Consultation Method: A combination of various consultation methods were used to assess knowledge, perception and attitude of the groups consulted concerning the project, and its potential environmental and social impacts. An Advocacy Visit, Focal group meetings, Town hall meeting and Indebt Interviews were conducted.

The advocacy visit meeting was held on 25th May 2016 at the Community Hall. This visit involved the Town Association Executives, Youth executives and women group executives, some project affected Persons and Traditional Chiefs.

The advocacy visit was held to introduce the ESMP sub-projects to the stakeholders and seek their consent and opinion on the exercise. The visit was also scheduled to gain a better understanding of the project environment, social structure and existing livelihood activities of the area. This meeting was also scheduled to allow the authorities select a suitable date for a larger stakeholder’s consultation including venue and time for the town hall meeting. This will give the community well enough time to disseminate the information to all relevant stakeholders.

This meeting was held on the 28th May, 2016 at the Village Town hall. The essence was to enable interested and affected parties to air their concerns (views and opinions on the proposed development) which might have been overlooked during the advocacy visit. It also gave room for

more enlightenment on the need for the people's collective effort in protecting the environment. The stakeholders were given a rundown of the NEWMAP Interventions as well as the need for the ESMP.

- a) The process is taking so long and the Erosion problem is escalating. People that own land have relocated but those without are stuck in the erosion area with no place to go.
- b) Will it be necessary for the people that didn't fill the questionnaire that was distributed in the community to do so later?
- c) Will the bank also provide portable water and Electricity and access road as it was noticed that questions on these were included in the questionnaire.
- d) Will other erosion sites within the area be included in the intervention?

These were adequately treated by the consultant and the SPMU.

The outcome of the several consultations showed that the communities have a good understanding of the project and are delighted that the project is going to see the light of day. They thanked the consultants for the thoroughness in execution of their assignment and promised to be of assistance to ensure the success of the projec

1 CHAPTER ONE: INTRODUCTION

1.1 Background

The ecological menace of erosion is a major disaster that continues to threaten landmass in Nigeria. Some of these erosions have resulted due to natural and human causes. Over 6,000km² of land are affected by erosion and about 3,400km² are highly exposed. In some areas of southern Nigeria, farmland degradation has caused yield reductions of between 30% and 90%, and as much as a 5% drag on agricultural GDP. Erosion has a devastating effect on many peoples' lives and destroys infrastructure essential for economic development and poverty alleviation.

Gully erosion contributes to environmental problems and damage estimated at over \$100 million annually (mostly in South-Eastern Nigeria). It creates channels of various sizes through concentrated runoff on definite routes, which result in systematic removal of soil particles, including plant nutrients, from one location to another, and even in worse cases destruction of lives and properties. In view of this, the Government of Nigeria is implementing the multi-sectoral Nigeria Erosion and Watershed Management Project (NEWMAP), financed by the World Bank, Global Environment Facility, the Special Climate Change Fund, and the Government of Nigeria. The NEWMAP is aimed at reducing vulnerability to soil erosion in targeted sub-catchments. The project is currently being implemented in 14 states, namely Cross River, Abia, Ebonyi, Imo, Abia, Enugu, Anambra, Edo, Gombe, Kogi, Kano, Delta, Oyo and Sokoto states. NEWMAP finances activities implemented by States and activities implemented by the Federal government.

The Project Development Objective (PDO) of the NEWMAP is to improve erosion management and gully rehabilitation; increase incomes for rural households from improved agricultural and forest practices through the use of conservation agriculture, agro-forestry, natural regeneration, etc.; and gain efficiency in public administration and public spending through improved knowledge base, analytical tools, multi-sectoral coordination and stakeholder dialogue.

NEWMAP Components are divided into 4 viz;

Component 1: Erosion and Catchment Management investment

Sub-component 1A Gully Rapid Action and Slope Stabilization

Sub-component 1B Integrated Catchment Management

Sub-component 1C Adaptive Livelihoods

Component 2: Erosion and Catchment Management Institutions and Information Services

Sub-component 2A Federal MDA Effectiveness and Services

Sub-component 2B State MDA Effectiveness and Services

Sub-component 2C Local Government Capacity

Sub-component 2D Private Sector Capacity

Component 3: Climate Change Agenda Support

Sub-component 3A Policy and Institutional Framework

Sub-component 3B Low Carbon Development

Component 4: Project Management

This program is financed through an 8-year Strategic Investment Loan (SIL) of \$508.59M, consisting of a \$500M IDA concessional loan blended with GEF and SCCF grants totalling \$8.59M. The Government of Nigeria's contribution will amount to approximately \$150M. This contribution only reflects the costs currently directly attributable to Project activities but will also include the cost of liaison officers from each MDA which is yet to be reflected. The calculated amount comprises (i) a federal contribution both cash and in-kind of \$83.34 for duties, taxes, staff and office costs and (ii) a cash and in-kind contribution by each state of approximately \$6M (for each of 11 states totalling approximately \$67M) for resettlement, staff and office costs and pre-feasibility designs of intervention sites. State contributions to project financing are an agreed criterion for project participation (PAD, 2012).

Various documents have been prepared in line with the NEWMAP, and they include; Environmental and Social Management Framework (ESMF), Resettlement Policy Frameworks (RPF), Project Appraisal Document (PAD) prepared for the Nigerian Erosion and Watershed Management Project.

This report focuses on the Environmental and Social Management Plan (ESMP) prepared for the Rehabilitation of the Enugu-Ngwo Gully Erosion, in Udi LGA Enugu State, Nigeria.

There are four (4) gully fingers, which share a common watershed area of approximately 104 hectares (ha) and converge around Ogbete Market, Coal Camp and Police College area within the Enugu city metropolis, with GIS location coordinates of within latitude 6° 25' 55" N and 6° 27' 00" N and longitude 7° 27' 13" E and 7° 28' 00" E. The Gully fingers are named Colliery, Amuzam, Ezata and St Theresa Erosion Gully Sites.

The NEWMAP intends to rehabilitate the gully erosion site and reduce longer-term erosion vulnerability in the targeted areas. This activity will be employed through some civil works such as construction of infrastructure and stabilization of the gully. An engineering design report has already been prepared for the Enugwu-Ngwo erosion gully intervention, which highlights on the detailed civil works that will be carried out. This ESMP study will therefore, aim to identify potential and significant adverse environmental and social impacts that will be associated with the rehabilitation and to propose means of minimizing and/or mitigating them to acceptable levels.

1.1 Purpose of the ESMP

The is an instrument that details the measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental and social impacts or to reduce Environmental and Social Management Plan (ESMP) to acceptable levels; and the actions needed to implement these measures. The ESMP is an integral part of Category "A" Environmental Assessments (EAs) (irrespective of other instruments used). EAs for Category "B" projects may also result in an ESMP. However, the impacts of the Enugwu-Ngwo Gully erosion rehabilitation project are considered to be mainly site specific. The project will concentrate mainly on the rehabilitation which will include the construction of a set of side drains, filling and compaction of fill to reclaim part of the gully head and its finger gully, construction of step-wise drop structure to dissipate a large part of the energy of flow, use of flat gabion mattress lying on geotextile material, use of Reno/gabion mattresses where necessary to protect the base from scouring and re-vegetation of the gully site with local grass and trees within the distance of the gully and its finger. More on the project design is explained in Chapter 3 of this report.

The civil works will be concentrated at the areas closest to the erosion site and will ensure negligible adverse impacts on livelihood. The adverse impacts will be largely reversible, indirect and short term. Considering the aforementioned, the project falls suitably into the World Bank's

category B; hence the most suitable safeguard instrument to address beneficial and adverse impacts is an Environmental and Social Management Plan (ESMP).

The ESMP provides a set of procedures through which NEWMAP will develop and implement environmental, social, health, and safety management systems, programs, processes and procedures that will establish a foundation for sound mitigation of adverse impacts, enhancement of positive impacts, institutional responsibilities, indicative costs for mitigation and eventual monitoring of the ESMP.

The ESMP outlines Enugu State NEWMAP Project Management Unit's corporate commitment to managing the project in a responsible, safe and sustainable manner whereby the protection of the environment, safety of people and social concerns take priority above all other business concerns.

The ESMP will also ensure compliance with applicable environmental standards all through the life span of the project. The Bank will disclose the ESMP document publicly, in Nigeria and at the World Bank Info-shop before project appraisal.

1.3 Objectives of the Environmental and Social Management Plan

Objective and Scope of the Consultancy

The objective of the consulting services is to prepare an Environmental and Social Management Plan (ESMP) for the Enugu-Ngwo Gully Erosion sub-project sites in Enugu State intervention sites. Other objectives for this work shall include Well-documented set of mitigation, monitoring and institutional actions to be taken before and during implementation to eliminate adverse environmental and social impacts, offset them or reduce them to acceptable levels. It should also include the measures needed to implement these actions, addressing the adequacy of the monitoring and institutional arrangements for the upper and lower watersheds in the intervention site.

1.2 Specific Tasks for the ESMP

The specific tasks for the ESMP will include to:

- a) Describe the biophysical and social environment including the existing status of the sub watershed and gullies;
- b) Identify the potential environmental and social issues/risks associated with the intervention;
- c) Drawing on the feasibility and engineering report and site design, appropriate baseline indicators (for example, m³/sec of runoff collected in the sub-watershed during a heavy long-hour rainfall);
- d) Develop a plan for mitigating environmental and social risks associated with construction and operation in the gully intervention in consultation with the relevant public and government agencies;
- e) Identify feasible and cost-effective measures that may reduce potential significant adverse environmental and social impacts to acceptable levels;
- f) Develop a time-bound plan for mitigating environmental and social risks associated with the specific intervention in the designated sub-watershed management in consultation with the relevant public and government agencies;
- g) Identify feasible and cost-effective measures that may reduce potentially significant adverse environmental and social impacts to acceptable levels;
- h) Identify monitoring objectives and specifies the type of monitoring, with linkages to the impacts assessed and the mitigation measures described above (in point a – e);

- i) Provide a specific description of institutional arrangements: the agencies responsible for carrying out the mitigation and monitoring measures e.g. for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training) and the contractual arrangements for assuring the performance of each implementing agency;
- j) Define technical assistance programs that could strengthen environmental management capability in the agencies responsible for implementation;
- k) Provide an implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans;
- l) Provide the expected capital and recurrent cost estimates and sources of funds for implementing the ESMP and inform accordingly the design consultants so that these costs are duly taken into consideration in the designs;
- m) Assist the SPMU to: (i) Register the ESMP with the environmental assessment (EA) Department at Federal and State Ministry of Environment; and (ii) disclose the finalised ESMP at National, State, LGA and Community levels.

1.4 Technical Approach and Methodology to the ESMP

The Consultant carried out a reconnaissance exercise first to get a visual understanding of the project area. Subsequently, a more detailed assessment was carried out which has been integrated in this report. The environmental and social sensitivities of the project area and its surrounding environs were ascertained. Advocacy Visits, Stakeholder/Public Consultations were also carried out. The Advocacy visit was done with the major identified Focal Group Leaders in the communities, which included (the traditional ruler of Enugwu Ngwo, Members of the Executive Council, Women and Youth Group leader of the Communities etc). A more detailed Consultation with a greater number of people from the communities was carried out subsequently as well as a feedback meeting. Information garnered from the exercise including their concerns regarding the intervention is documented in Chapter 8 and Annex 2 of this report.

The methodology used in the conduct of the Environmental and Social Management Plan is based on guidelines as proposed by the following:

- Federal Government of Nigeria EIA Law and subsequent Federal Ministry of Environment standard procedure for conducting EIA/ESIA in Nigeria;
- Guidelines documented under the World Bank Environmental Assessment Operational Policies OP 4.01.

The rehabilitation works will trigger some of the World Bank Safeguard Policies including Environmental Assessment OP 4.01; Natural Habitats OP 4.04; Physical and Cultural Resources OP 4.11 and Pest Management Safeguard Policy OP 4.09. These guidelines collectively advise that Environmental and Social Management Plan studies are essential to examine the potential environmental and social threats and benefits (impacts) associated with rehabilitation works for the Enugwu-Ngwo Gully Erosion site.

2 CHAPTER TWO: POLICY LEGAL AND REGULATORY FRAMEWORK

2.1 Introduction

A number of national and international environmental guidelines are applicable to the operation of the NEWMAP. The policy and regulatory frameworks discussed in this section guided the preparation of this ESMP.

2.2 The Environmental and Social Management Framework (ESMF) for the NEWMAP

The ESMF was prepared as a guide to set out the general terms to achieve health, safety, and environmental regulatory compliance objectives to comply with the WorldBank Operational Policy (OP4.01–Environmental Assessment). This will focus on specific steps to be taken, policy, competence building, communication with the public, and monitoring.

It shall identify the entity or entities responsible for carrying out the mitigating measures, any legal agreements required and a full budget for the capital and recurrent costs of mitigation. The ESMP shall also contain a monitoring plan indicating the responsible parties and the frequency of monitoring, key indicators.

The preparation of this ESMP is consistent with the guidelines and recommendations of the ESMF of NEWMAP, which is also found to be in agreement with the guidelines of the World Bank OP 4.01.

2.3 Relevant Nigeria Acts and Legislations

2.3.1 National Policy on Environment

Environmental consciousness and awareness regarding the adverse effects of development projects, including agricultural projects, resulted in the articulation of a national framework for environmental protection and national resources conservation. Decree No. 58 of 1988, as amended by Decree No. 59 of 1992, established the Federal Environmental Protection Agency (FEPA) as the main government structure for environmental matters in the country. The FEPA put in place the 1989 National Policy on the Environment, revised in 1995, with sustainable development as its goal. International agencies such as the World Bank, and other development partners usually set environmental criteria for projects they are involved in. The stated goal of the National Policy on the Environment is to achieve sustainable development in Nigeria, and in particular to:

- Secure a quality of environment adequate for good health and well-being;
- Conserve and use the environment and natural resources for the benefit of present and future generations;
- Restore, maintain and enhance the ecosystem and ecological processes essential for the functioning of the biosphere to preserve biological diversity, and the principle of optimum sustainable yield in the use of living natural resources and ecosystems;
- Raise public awareness and public understanding between the environment and development and encourage individual and community participation in environmental improvement efforts; and

- Cooperate in good faith with other countries, international organizations and agencies to achieve optimum use of trans-boundary natural resources and the prevention or abatement of trans-boundary environmental degradation.

2.3.2 The Federal Ministry of Environment

The act establishing the Ministry places on it the responsibility of ensuring that all development and industry activity, operations and emissions are within the limits prescribed in the National Guidelines and Standards, and comply with relevant regulations for environmental pollution management in Nigeria as may be released by the Ministry. To fulfil this mandate a number of regulations/instruments are available (See section on National Legal Instruments on Environment), however the main instruments in ensuring that environmental and social issues are mainstreamed into development projects is the Environmental Impact Assessment (EIA) Act No. 86 of 1992 See Annex 1. With this Act, the FMENV prohibits public and private sectors from embarking on major prospects or activities without due consideration, at early stages, of environmental and social impacts. The act makes an EIA mandatory for any development project, and prescribes the procedures for conducting and reporting EIA studies.

As part of the effective utilization of the EIA tool, the Ministry has produced Sectoral guidelines detailing the necessary requirements of the EIA process from each Sector. One of these Sectoral Guidelines that apply to the proposed project is the ‘Sectoral Guidelines on Infrastructure Development.’

Procedurally, in Nigeria, it is worthy to note that before commencement of an EIA, the FMENV issues a letter of intent on notification by the proponent, approve the terms of reference, ensure public participation, review and mediate.

The possible technical activities expected for a proposed project include screening, full or partial EIA Study, Review, Decision-making, Monitoring Auditing and Decommissioning/Remediation post-closure.

National Legal Instruments on the Environment

Environmental Impact Assessment Act No. 86, 1992 (FMEnv)

This Act provides the guidelines for activities of development projects for which EIA is mandatory in Nigeria. The Act also stipulates the minimum content of an EIA and is intended to inform and assist proponents in conducting EIA studies as well as a schedule of projects, which require mandatory EIAs.

According to these guidelines:

- **Category I** projects will require a full Environmental Impact Assessment (EIA).
- **Category II** projects may require only a partial EIA, which will focus on mitigation and Environmental planning measures, unless the project is located near an environmentally sensitive area—in which case a full EIA is required.
- **Category III** projects are considered to have “essentially beneficial impacts” on the environment, for which the Federal Ministry of the Environment will prepare an Environmental Impact Statement.

Other National Legal Instruments on Environment

- Federal Environmental Protection Agency (Amendment) Act No 59 of 1992
- The National Guidelines and Standards for Environmental Pollution Control in Nigeria
- The National Effluents Limitations. Regulation 1991
- The National Environmental Policy (Pollution Abatement in Industries and Facilities Generating Waste) Regulations 1991
- The Management of Solid and Hazardous Wastes. Regulations 1991
- National Guidelines on Environmental Management Systems (1999)
- National Guidelines for Environmental Audit
- National Policy on Flood and Erosion Control 2006 (FMEnv)
- National Air Quality Standard Decree No. 59 of 1991
- National Environmental Standards and Regulations Enforcement Agency Act 2007 (NESREA Act)
- The constitution of the Federal Republic of Nigeria 1999

2.3.3 Land Use Act of 1978

The Land Use Act, Cap202, 1990 Laws of the Federation of Nigeria is the applicable law regarding ownership, transfer, acquisition and all such dealings on Land. The provisions of the Act vest every Parcel of Land in every State of the Federation in the Executive Governor of the State. He holds such parcel of land in trust for the people and government of the State. The Act categorized the land in a state to urban and non-urban or local areas. The administration of the urban land is vested in the Governor, while the latter is vested in the Local Government Councils. At any rate, all lands irrespective of the category belongs to the State while individuals only enjoy a right of occupancy as contained in the certificate of occupancy, or where the grants are “deemed”.

Thus the Land Use Act is the key legislation that has direct relevance to resettlement and compensation in Nigeria. Relevant Sections of these laws with respect to land ownership and property rights, resettlement and compensation are summarized in this section.

The Governor administers the land for the common good and benefits of all Nigerians. The law makes it lawful for the Governor to grant statutory rights of occupancy for all purposes; grant easements appurtenant to statutory rights of occupancy and to demand rent. The Statutory rights of Occupancy are for a definite time (the limit is 99years) and maybe granted subject to the terms of any contract made between the state Governor and the Holder.

Local governments may grant customary rights of occupancy to land in any non-urban area to any person or organization for agricultural, residential, and other purposes, including grazing and other customary purposes ancillary to agricultural use. But the limit of such grant is 500 hectares for agricultural purpose and 5,000 for grazing except with the consent of the Governor. The local Government, under the Act is allowed to enter, use and occupy for public purposes any land within its jurisdiction that does not fall within an area compulsorily acquired by the Government of the Federation or of relevant State; or subject to any laws relating to minerals or mineral oils.

2.3.4 Forestry Act

This Act of 1958 provides for the preservation of forests and the setting up of forest reserves. It is an offence, punishable with up to 6 months imprisonment, to cut down trees over 2ft in girth or to set fire to the forest except under special circumstances. Nigeria is at present a wood deficit nation. In order to ameliorate the situation, the policy on forest resources management and sustainable use is aimed at achieving self-sufficiency in all aspects of forest production through

the use of sound forest management techniques as well as the mobilization of human and material resources. The overall objectives of forest policy are to prevent further deforestation and to recreate forest cover, either for productive or for protective purposes, on already deforested fragile land.

Specifically, the National Agricultural Policy of 1988 in which the Forestry Policy is subsumed, provides for:

- Consolidation and expansion of the forest estate in Nigeria and its management for sustained yield;
- Regeneration of the forests at rates higher than exploitation;
- Conservation and protection of the environment viz: forest, soil, water, flora, fauna and the protection of the forest resources from fires, cattle grazers and illegal encroachment;
- Development of Forestry industry through the harvesting and utilization of timber, its derivatives and the reduction of wastes;
- Wildlife conservation, management and development through the creation and effective management of national parks, game reserves, tourist and recreational facilities, etc.

2.4 State Legislations

Some of the functions of the State Ministries of Environment include:

- Liaising with the Federal Ministry of Environment, FMENV to achieve a healthy or better management of the environment via development of National Policy on Environment
- Co-operating with FMENV and other National Directorates/Agencies in the performance of environmental functions including environmental education/awareness to the citizenry
- Responsibility for monitoring waste management standards,
- Responsibility for general environmental matters in the State, and
- Monitoring the implementation of ESIA studies and other environmental studies for all development projects in the State.

Some laws in the state include:

Enugu State Policy on Environment (2010)

This policy emphasizes state government efforts to sustainable management of the Enugu environment with regards to Erosion control. The state government commits to:

- Seek the intervention of the Federal Government of Nigeria and relevant partner agencies in the control of Erosion, to compliment the effort of the state.
- Sensitize communities on erosion control efforts.
- Procure necessary refuse disposal equipment like trucks, pay loaders, giant bins e.t.c
- Involve households, communities, local governments and states in the joint clearance of drainages.
- Sensitization of households on waste disposal practices and management.
- Sponsor relevant environmental bills to the state assembly for enactment.

- Involve LGAs, communities, and civil society organizations (CSOs) in the enforcement of environmental laws.
- Embark on aggressive afforestation programmes involving LGAs, communities and civil society organizations (CSOs) in the state.

Enugu Riverine Area Management Policy (2010)

This policy is to minimize riverine erosion and other forms of riverine degradation such as riverbank failures, landslides and alluvial deposits.

Enugu State Watershed Management Policy (2010)

This policy enables the commencement of co-ordinated/holistic/integrated management of natural resources: Land, water, vegetation, etc. on a watershed basis to ensure resource conservation through the minimization of land and soil degradation and maintenance of water quality and yield for environmental sustainability.

Enugu State Flood and Erosion Control Management Support System (2010)

This policy aims at supporting a reliable up-to-date database and integrated management system as tools to support all erosion and control programs.

Enugu State Environmental Protection Agency Law

This law focuses on the protection of the rural and urban environment in the Enugu State. It was made to support the observation of a sanitation day being the last Saturday of the every month.

Anambra-Imo River Basin Development Authority

Anambra-Imo River Basin Development Authority is a Federal Government Parastatal under the Ministry of Water resources. It is one of the 12 River Basin Development Authorities established in 1976 by Decree Number 25 and amended by Decree No 35 of 1987. The function of the AIRBDA is towards the development of water resources potentials of the states and to effectively and efficiently manage water resources by harnessing and conserving surface and underground water.

2.5 World Bank Environmental and Social Safeguards

The World Bank has in place a number of operational and safeguards policies, which aim to prevent and mitigate undue harm to people and their environment in any development initiative involving the Bank. The Nigerian EIA Act and the World Bank safeguard policies are similar; designed to help ensure that projects proposed for Bank financing are environmentally and socially sustainable, and thus improve decision-making. The Bank has twelve safeguards policies; however, this section focuses on the World Bank Environmental and Social Safeguard Policies as applicable for to the Project.

Environmental Assessment (EA) (OP/BP 4.01)

Environmental Assessment is used in the World Bank to identify, avoid, and mitigate the potential negative environmental and social impacts associated with Bank's lending operations early on in the project cycle. In World Bank operations, the purpose of Environmental Assessment is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted and their concerns addressed. This policy is triggered if a project is likely to have potential adverse environmental and social risks and impacts in its area of influence. The EA has various tools that can be used, including amongst others Environmental & Social Impact Assessment (ESIA) or Environmental and Social Management Plan (ESMP).

Natural Habitats (OP/BP 4.04)

Any project or sub-project with the potential to cause significant conversion (loss) or degradation of natural habitats, whether directly (through construction) or indirectly (through human activities induced by the project).

Forests (OP 4.36)

This operational policy aims to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty, and encourage economic development. The policy recognizes the role forests play in poverty alleviation, economic development, and for providing local as well as global environmental services. Success in establishing sustainable forest conservation and management practices depends not only on changing the behaviour of all critical stakeholders, but also on a wide range of partnerships to accomplish what no country, government agency, donor, or interest group can do alone.

This policy applies to the following types of Bank financed investment projects:

- a. Projects that have or may have impacts on the health and quality of forests;
- b. Projects that affect the rights and welfare of people and their level of dependence upon or interaction with forests;
- c. Projects that aim to bring about changes in the management, protection, or utilization of natural forests or plantations, whether they are publicly, privately, or communally owned.

Involuntary Resettlement (OP/BP 4.12)

This policy can be triggered if the project will involve involuntary taking of land and involuntary restrictions of access to property, protected areas, etc. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts. It promotes participation of displaced people in resettlement planning and implementation. The main objective of this policy is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement. The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects.

Physical Cultural Heritage OP 4.11

This policy is to assist countries to avoid or mitigate adverse impacts of development projects on physical cultural resources. For purposes of this policy, “physical cultural resources” are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. The cultural interest may be at the local, provincial or national level, or within the international community.

Pest Management OP 4.09

This policy is to (i) promote the use of biological or environmental control and reduce reliance on synthetic chemical pesticides; and (ii) strengthen the capacity of the country’s regulatory framework and institutions to promote and support safe, effective and environmentally sound pest management. It is envisaged that the Project activities on one side may affect the habitats of native fauna (most likely pests such as wild rodents etc) and on the other, lead to movement of displaced pests to local farm lands and homes (as farmland is the next abundant mass of land in the project states besides forests). In the event of this, the policy aims to (a) Ascertain that pest management activities in Bank-financed operations are based on integrated approaches and seek to reduce reliance on synthetic chemical pesticides (Integrated Pest Management (IPM) in agricultural projects and Integrated Vector Management (IVM) in public health projects. (b) Ensure that health and environmental hazards associated with pest management, especially the use of pesticides are minimized and can be properly managed by the user. (c) As necessary, support policy reform and institutional capacity development to (i) enhance implementation of IPM-based pest management and (ii) regulate and monitor the distribution and use of pesticides.

2.6 International Guidelines

International Development Partners/Agencies such as WorldBank and other financial organizations interested in development projects recognize this highly especially in development that result in involuntary resettlement. It is against this background that policies and guidelines have been set form an aging such issues.

Nigeria is signatory to some international agreements and Protocols concerning the environment, notably:

- International Union for Conservation of Nature and Natural Resources (IUCN) Guidelines;
- Convention of Biological Diversity;
- Convention Concerning the Protection of the World Cultural and National Heritage Sites (World Heritage Convention);
- United Nations Framework Convention on Climate Change (1992).

The World Bank’s policies on Environmental Assessment and involuntary resettlement will be applied in any sub-project of the NEWMAP that displaces people from land or productive resources due to land take. Where there is conflict between national legislation and WorldBank Operational Policies, the latter policies shall prevail.

2.7 Nigeria EIA Guidelines and World Bank EA Guidelines

The Environmental Impact Assessment Act No. 86 (Decree No. 86) of 1992 requires that developmental projects be screened for their potential impact. Guidelines issued in 1995 by the former Federal Environmental Protection Agency (FEPA) direct the screening process.

According to these guidelines:

Category I projects will require a full Environmental Impact Assessment (EIA).

Category II projects may require only a partial EIA, which will focus on mitigation and Environmental planning measures, unless the project is located near an environmentally sensitive area--in which case a full EIA is required.

Category III projects are considered to have “essentially beneficial impacts” on the environment, for which the Federal Ministry of the Environment will prepare an Environmental Impact Statement.

With regard to environmental assessment, the Bank has also categorized projects based on the type of EA required, namely:

Category A - projects are those whose impacts are sensitive, diverse, unprecedented, felt beyond the immediate project environment and are potentially irreversible over the long term. Such projects require full EA.

Category B - projects involve site specific and immediate project environment interactions, do not significantly affect human populations, do not significantly alter natural systems and resources, do not consume much natural resources (e.g., ground water) and have adverse impacts that are not sensitive, diverse, unprecedented and are mostly reversible. Category B projects will require partial EA, and Environmental and Social Management Plans.

Category C - Projects are mostly benign and are likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project, although some may require environmental and social action plans.

Category FI - A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

This World Bank categorization (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, the World Bank safeguard policy shall take precedence over Nigeria EA laws, guidelines and or standards.

Thus for this ESMP, the Nigeria’s EIA requirements and World Bank operational procedures were harmonized as far as possible, hence it is made responsive to the objectives of good practice. It is especially made responsive with regard to the followings:

- Early consideration of environmental and social issues;
- Identification and early consultation with stakeholders;
- Prevention of adverse impacts through the consideration of feasible alternatives; and
- Incorporation of mitigation measures into planning and (engineering) design.

The World Bank provides a number of operational and safeguard policies, which aim to prevent and mitigate undue harm to people and their environment in any development initiative involving the Bank. The Nigerian EIA Act and the World Bank safeguard policies are similar. OP.4.01 and Nigerian EIA Act are also similar. World Bank EA Screening Category A is similar to Nigerian EIA

Act category I, World Bank EA Category B is equivalent to Nigeria EIA Act Category II, World Bank EA Category C is equivalent Nigeria EIA Act Category III. However in the event of divergence between World Bank safeguard policies and the Existing Environmental laws in Nigeria the more stringent requirement will take precedence.

3 CHAPTER THREE: DESCRIPTION OF THE PROJECT ENVIRONMENT AND BASELINE STUDIES

3.1 Enugu State

Enugu State is an inland state that made up one of the South Eastern geopolitical region of Nigeria, located between latitude 04 30'N and 07 30'N and longitude 06 45'E and 08 45'E. The State is regarded as the oldest urban area in the South East Geopolitical Zone.

Enugu State shares boundaries with Anambra State on the West, Abia and Imo states on the South, Ebonyi state on the East, Benue state to the Northeast, and Kogi on the Northwest. The state is made up of seventeen (17) Local Government Areas (LGAs) and they include; Aninri, Awgu, Enugu East, Enugu North, Enugu South, Ezeagu, Igbo Etiti, Igbo Eze North, Igbo Eze South, Isi Uzo, Nkanu East, Nkanu West, Nsukka, Oji River, Udeni, Udi, UzoUwani. Enugu and Nsukka are its major towns.

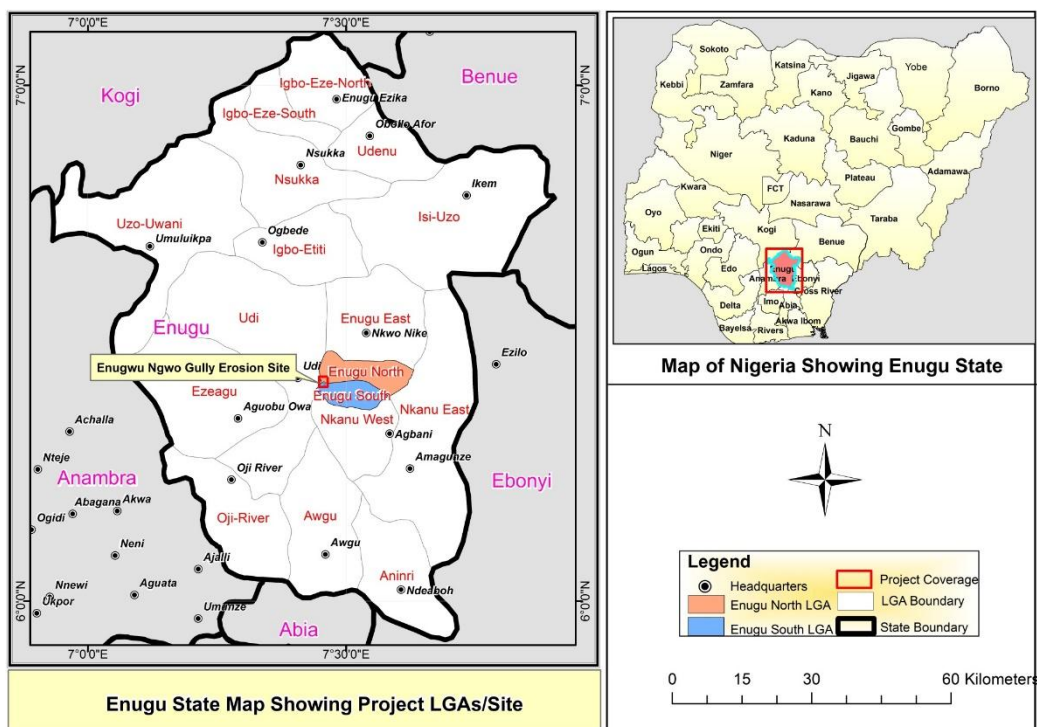


Figure 1 Map of Enugu State showing the LGAs highlighting the project area

3.2 Biophysical settlements of Enugu State

3.2.1 Climate and Meteorology

Enugu State has a tropical savannah climate, and experiences two seasons; the Rainy and Dry Seasons. The rainy season usually falls between April/May and October and is accompanied by heavy humidity and strong rainfalls. The average annual rainfall in Enugu ranges between 152 to 203 cm, with the heaviest rainfall occurring between June and July. Enugu's climate is humid and this humidity is at its highest between March and November.

The dry season typically occurs between November and March/April and is usually hotter than the rainy period. The lowest rainfall of about 16 mm is normal in February. This period is also characterized by the dry and dusty harmattan winds in January and February.

The mean daily temperature is about 27 °C. The hottest month is February with a mean temperature of about 33°C while the lowest temperatures occur in the month of November, reaching 15.86°C.

3.2.2 Geology, Relief and Drainage

Enugu sits at 223 metres (732 ft) above sea level, with the Udi, Awgu and Nsukka highlands. Enugu State occupies much of the highlands of Awgu, Udi and Nsukka. The hills are flanked by the rolling lowlands of Oji River, Adada and Anambra Basins to the west, and the Ebonyi (Aboine) River Basin to the east.

Enugu's hills at the extreme may reach an elevation of 1,000 meters (3,300 ft.). Highlands surrounding Enugu for the most part are underlain by sandstone, while lowlands are underlain by shale.

Much of the escarpment stretching from Enugu to Orlu has been ravaged by soil and gully erosion. Other geological features in Enugu include the Nike Lake near which the Nike Lake Hotel. The Ekulu, Asata, Ogbete, Aria, Idaw and Nyaba rivers are the six largest rivers located in the city. The Ekulu River is the largest body of water in Enugu urban and its reservoir contributes to part of the city's domestic water supply.

3.2.3 Vegetation

The vegetation on the highlands is of semi-tropical rainforest type. It is characteristically green and is complemented by typical grassy vegetation. Fresh water swamp forests occur in the Niger-Anambra Basin.

3.3 Socio Economic Setting of Enugu State

The state, which homogeneously consists of the Igbo ethnic group, has an estimated population of 3,257,298 (2006 census). With an area of 7,618 sq. km, this gives a population density of approximately 622.7 persons/km².

Enugu state is predominantly known for her agriculture and presence of coal.

Economically, Enugu state is predominantly rural and agricultural, with a substantial proportion of its working population engaged in farming such as Poultry, Yam tubers, palm produce and rice are some of the state's main produce. Trading is the dominant occupation in the urban areas, followed by civil and public service.

3.3.1 Education

Nigeria's First Indigenous University, University of Nigeria, Nsukka (UNN), is located in Enugu State. The state also hosts the Enugu State University of Science & Technology (ESUT), Institute of Management and Technology (IMT), Enugu State College of Education Technical, Enugu, Caritas University, Amorji-Nike, Renaissance University, Ugbawka; Federal Government College

Enugu, Federal School of Dental Technology & Therapy College of Immaculate Conception, Enugu; Queen's School Enugu a Preeminent high school for girls in the Eastern region; etc

Every community in Enugu State has at least one Primary/Elementary school and one Secondary school, funded and run by State Government. There are also large numbers of private nursery, primary and secondary schools in Enugu State.

3.4 Administration

At the helm of affairs in the state is the executive Governor, assisted by the Deputy Governor. Other components of the State Executive Council are Commissioners and the Secretary to the state government. The Governor is also assisted by a number of Special Advisers and Special Assistants. The state legislature, the law-making body, is headed by the Speaker.

He is assisted by the Clerk of the House in the general administration of the Assembly. The seventeen local government areas are each headed by an Executive Chairman, assisted by a Deputy Chairman and several supervisory councillors.

Each Local government has a quasi-legislative arm composed of councillors who represent the various wards. Some communities are governed by a system of gerontocracy in which a council of elders forms the government. One of the members, usually the oldest, is designated the Community Head, or Chief, or Traditional Ruler.

He works with a cabinet of executive and ordinary members who represent their respective villages. Other communities select their chiefs or traditional rulers in accordance with their written constitution. In all cases, each community has a town union (also known as Community Development Association) headed by a President.

The President works with a team of assisting executive members chosen through a popular election. Town Unions spearhead development activities and ensure that the state government's new programmes are implemented. At the head of the traditional political system is the first son ("Okpala").

He holds the symbol of political and religious authority called "Ofo." In some parts of the state, however, the age-grade system of government is used, and in many others, traditional government is by titled societies (Nze na Ozo). Generally, these forms of government make use of masquerade societies to execute decisions.

3.5 Overview of Enugu Ngwo

The Enugu Ngwo is located in the southwest parts of Enugu Metropolitan. It is located within latitude 6° 25'6" N and longitude 7 °26'19" E and has population of about 50,000 people.

It is a semi urban environment and is rapidly getting fully urbanized and located within the humid tropical rainforest belt of Nigeria. Two main seasons exist in the Enugu Ngwo area, the dry season which spans from November to March and the rainy season which begins in April and ends in October with a short period of reduced rains in August commonly referred to as "August break". Temperature in the dry season ranges from 20°C to 38°C and results in high evapotranspiration, while during the rainy season temperature ranges from 16°C to 28°C, with generally lower evapotranspiration.

The average monthly rainfall ranges from 31mm in January to 270 mm in July, with the dry season experiencing much reduced volume of rainfall unlike the rainy season, which has high volume of rainfall. Most of the streams and rivers in this area overflow their banks (Aghamelu et al., 2011a).

3.5.1 Biological Environment

Flora

Vegetation in this area is of the guinea savannah type which dominates most of the eastern Nigeria. A major characteristic of this vegetation is the presence of luxuriant trees and grasses.

The vegetation types encountered within the Study Area are as follows:

- Areas of fallow bush of varying ages;
- Fields used for rotational subsistence farming;
- Degraded secondary rainforest as well as statutory and communal forests;

All flora habitats surveyed were found to comprise shrubs, grasses, sedges and a mixture of mature trees and re-growing juvenile trees.

Table 1 Some common plants found in the project area

S/NO	COMMON NAME	BOTANICAL NAME
1.	Maize /corn	<u><i>Zeamays</i></u>
2.	Cassava	<u><i>Manihotesculenta</i></u>
3.	Banana	<u><i>Musasapientum</i></u>
4.	Water leaf	<u><i>Talinumtriangulare</i></u>
5.	Okro	<u><i>Abelmoschusesculentus</i></u>
6.	Pineapple	<u><i>Ananascomosus</i></u>
7.	Guava	<u><i>Psidiumguajava</i></u>
8.	Cocoyam	<u><i>Colocasiaesculenta</i></u>
9.	Pumpkin	<u><i>Cocurbitapepo</i></u>
10.	Melon	<u><i>Citrullusvulgaris</i></u>
11.	Pepper (small)	<u><i>Capsicumannuum</i></u>
12.	Mango	<u><i>Mangiferaindica</i></u>
13.	Pawpaw	<u><i>Caricapapaya</i></u>
14.	Bitter leaf	<u><i>Vernoniaamygdalina</i></u>
15.	Oil Palm	<u><i>Elaeisguineensis</i></u>
16.	Mango	<u><i>Mangiferaindica</i></u>
17.	Avocado Pear	<u><i>Perseaamericana</i></u>
18.	Plantain	<u><i>Musaparadisiaca</i></u>

19	Coconut	<i>Cocosnucifera</i>
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Fauna

Some wildlife found in the project area includes grass cutters, monitor lizard, etc. Furthermore, goat, sheep among others were some of the livestock sited within the project area.

This section will be presented in full detail in the draft and final reports as field work is still ongoing.

3.6 Overview of the Project Area

Enugu-Ngwo is also characterized by environmental degradation which is one of the environmental problems ravaging almost all the parts of Nigeria. Gully erosion is one of the catastrophes devastating the environment.

There are four (4) gully fingers, which share a common watershed area of approximately 104 hectares (ha) and converge around Ogbete Market, Coal Camp and Police College area within the Enugu city metropolis, with GIS location coordinates of within latitude 6° 25' 55" N and 6° 27' 00" N and longitude 7° 27' 13" E and 7° 28' 00" E.

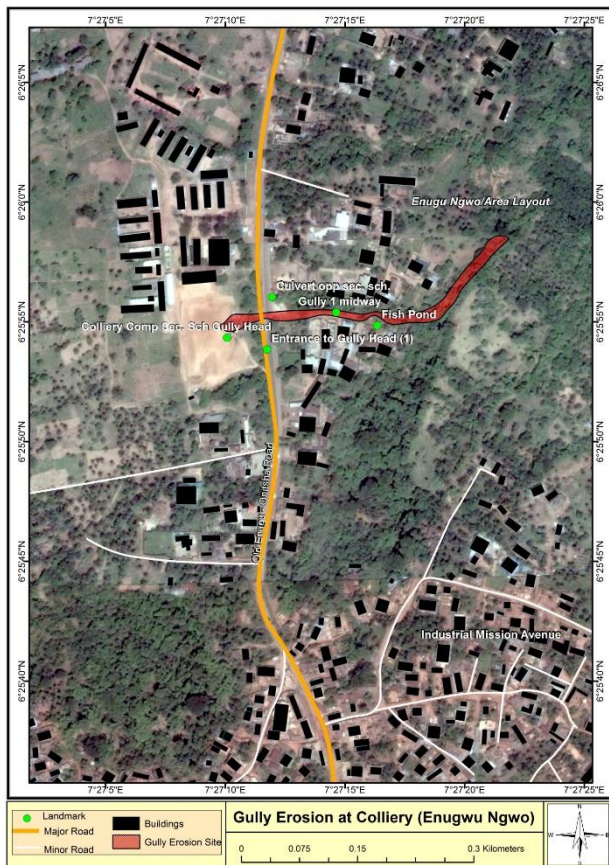


Figure 2 Satellite imagery of Colliery Gully area Colliery Gully Erosion Site

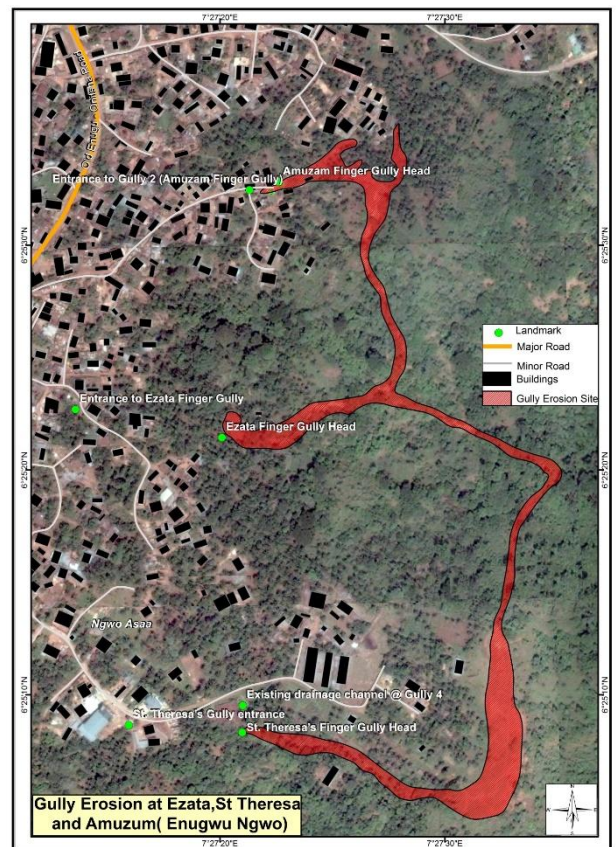


Figure 3 Satellite Imagery of St Theresa, Ezata and Amuzam Gully areas

The Colliery gully erosion site is one of the four (4) gully fingers within the Enugu-Ngwo erosion sites. It has the following physical characteristics:

- Gully Head Depth = 10 metres;
- Length before Gully Head = 40 metres;

- Length of Active Gully = 240 metres;
- Width at Gully Head = 15 metres;
- Width at middle of active Gully = 20 metres;
- Width at end of active Gully = 30 metres;
- Length from last Check Dam To outfall Bench Mark = 50 metres.



Figure 4 Yielded beam for stone pitch constructed by FERMA



Figure 5 Colliery Secondary School Football field



Figure 6 Broken drainage on Ngwo-9th Mile Road



Figure 7 Fish pond within the gully

This finger originates from colliery Secondary School and extends cutting through Ngwo-9th mile Road. The FERMA have earlier tried to intervene with the erosion by building a culvert and stone pitching of some sections to prevent the progress. However, as at present the beam holding the stone pitching has yielded and the gully is still progressing. Residents along the corridor have tried using palliative measures to help control the progression of the erosion. These include use of sand bags, sand filling of some sections as well as construction of drains to direct the surface runoff. Some residents have also constructed fishpond within the gully.

Amuzam Gully Erosion Site

The Amuzam gully erosion site is one of the four (4) gully fingers within the Enugu-Ngwo erosion sites. It has the following physical characteristics:

- Gully head depth = 12 metres;
- Length before gully head = 50 metres;
- Length of active gully = 340 metres;
- Width at gully head = 15 metres;
- Width at middle of active gully = 45 metres;
- Width at end of active gully = 30 metres;
- Length from last check dam to outfall bench mark = 100 metres.



Figure 8 Section of the Amuzam gully finger



Figure 9 sand bags used by residents to check the gully

This gully finger is very progressive and has already taken a poultry house on its path. It is presently threatening the home of Engr. Anthony Orji which is about 10metres from the gully head. Some palliative methods have also been employed by the community to check the progress of the gully. A catch pit was dug to capture surface runoff which slowly releases the accumulated water. However, this was washing off some other section of the road whenever the catch pit is full. The community further resorted to the use of pipes and pumping machine to slowly release the water as well as proper channeling into the gully.



Figure 10 Part of a poultry house damaged by the gully



Figure 11 Catch pit constructed by residents



Figure 12 Building threatened by the gully

Ezeta Gully Erosion Site

The Ezeta gully erosion site is one of the four (4) gully fingers within the Enugu-Ngwo erosion sites. It has the following physical characteristics:

- Gully head depth = 11 metres;
- Length before gully head = 180 metres;
- Length of active gully = 225 metres;
- Width at gully head = 15 metres;
- Width at middle of active gully = 35 metres;
- Width at end of active gully = 30 metres;
- Length from last check dam to outfall bench mark = 39 metres.

This gully is located near Umueza lane and progresses downstream joining the Amuzam gully finger. Both continue till the Ezeta stream. The gully has prevented most of the land owners from farming as it has taken over vast area of farm lands. This finger is situated near the Ezeta shrine which is threatened by the gully.



Figure 13 A section of the Ezata gully finger

St. Theresa Gully Erosion Site

The St. Theresa gully erosion site is one of the four (4) gully fingers within the Enugu-Ngwo erosion sites). It has the following physical characteristics:

- Gully head depth = 12 metres;
- Length before gully head = 50 metres;
- Length of active gully = 340 metres;
- Width at gully head = 20 metres;
- Width at middle of active gully = 30 metres;
- Width at end of active gully = 30 metres;
- Length from last check dam to outfall bench mark = 100 metres.

This finger is named after St Theresa Catholic Church situated at the entrance to Unity lane. The community has tried to checkmate the erosion by construction of drains to channel the runoff. However, field visit showed that poor termination of this drainage has led to the quick progression of the erosion.



Figure 14 Drainage constructed to channel runoff at St. Theresa gully finger

4 CHAPTER FOUR: SOCIO-ECONOMIC BASELINE CONDITIONS

4.1 Introduction

The socio-economic assessment studies were aimed at examining the socioeconomic conditions of the people living around the project site in Enugwu-Ngwo in Enugu North LGA of Enugu State. This is to ensure that the potential impacts of the proposed rehabilitation of the Enugwu-Ngwo Gully Erosion site project is captured and described while proffering solutions to possible negative impacts to human habitat, health and livelihoods.

The specific objectives of the study include:

- To elicit information about the existing socioeconomic and demographic characteristics of the inhabitants living within the community;
- To document the distributional characteristics of the socioeconomic components in the project area;
- To analyse the patterns of the relationships of the socioeconomic components;
- To discuss and deduce the effect of the patterns on the environment of the proposed Project through the perceptions of the respondents;
- To provide a baseline data for the assessment of the socioeconomic impacts of the proposed project;
- Suggest mitigation measures and environmental management plan for the proposed project.

4.2 Methodology

The general methodology used for the socio-economic impact assessment employed the collection of primary and secondary source data. The primary sources data gathering comprised of questionnaire administration, group interviews Ground trotting/Reconnaissance survey for identification and Disclosure (awareness creation), discussions and direct observations. Secondary data was obtained from the National Population Commission and desktop literature review. Structured questionnaires were administered to people living around the project area. Data collected was analysed using Microsoft Excel 2010.

4.3 Primary Data

A random sampling survey was carried out within the communities in the project area (Colliery (Hill-Top), Amuzam, Ezata and St Theresa). Questionnaires were administered to a total of 150 respondents.

4.3.1 Gender Distribution of Respondents

It was gathered from the field survey that majority of the Respondents (about 52%) are males while females are 48%. Secondary data of population within the local government shows a similar picture may be attributed to the willingness of the respondents to fill the questionnaires.

Gender

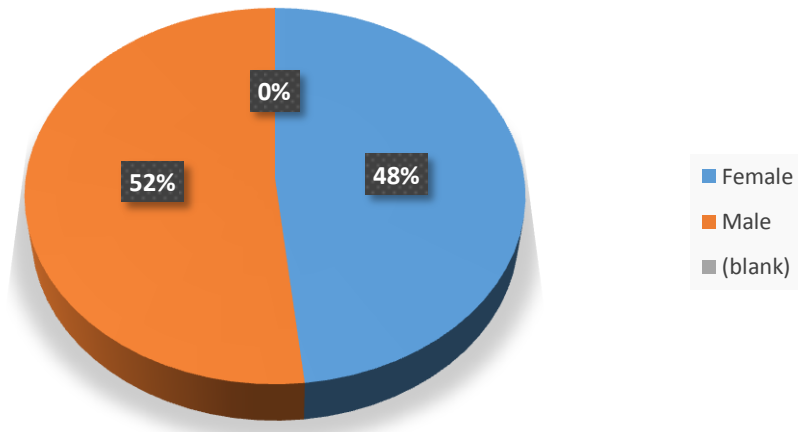


Figure 15 Gender Distribution of Respondents within the project area

4.3.2 Age Distribution of Respondents

As shown in figure below, Respondents range from 21 to above 61 years. This goes to show that more matured people were more eager to respond than the younger ones as they seem to have more patience. The graph shows that the age groups are almost evenly distributed within the project area. The least age group among Respondents belongs to those from 21-30 (11%). The highest population of Respondents (29%) were within 31-40.

Age Distribution

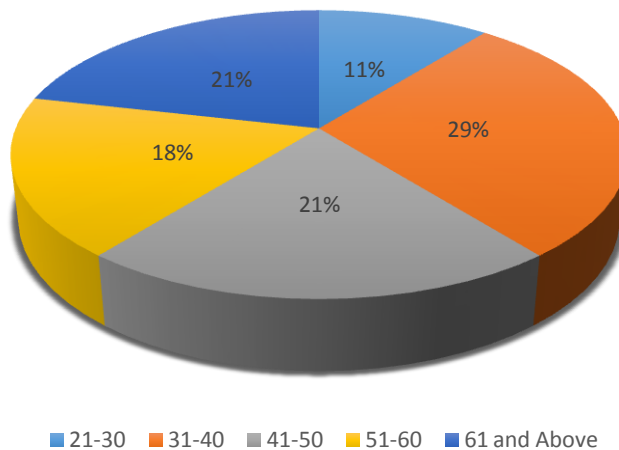


Figure 16 Age Distribution of Respondents within the project area

4.3.3 Marital status of Respondents

Respondents are predominantly married people (about 62%). Singles and widows/widowers are the other marital status that featured among the Respondents. The significance of this result is that Respondents are majorly men and women who are the breadwinners and help mates in their respective households. Widows and widowers constitute 24% of the Respondents while 4% are divorced.

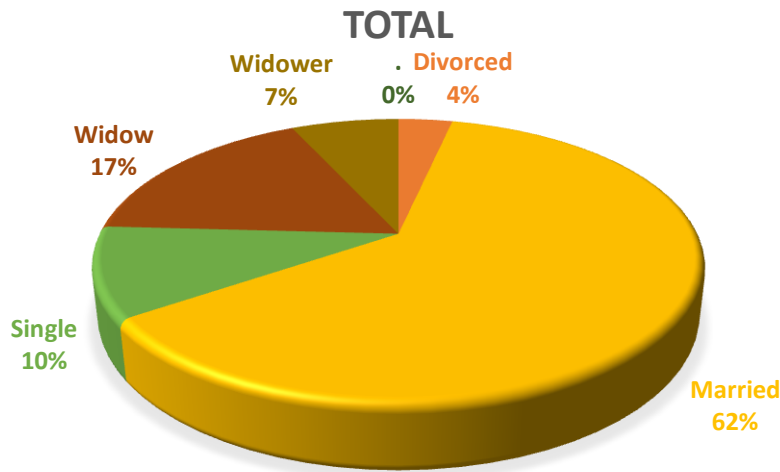


Figure 17 Marital Status of Respondents within the project area

4.3.4 Religious practice of Respondents

All the respondents are Christians and are mostly Roman Catholics. No Muslim was among the Respondents. None of the respondents practiced African Traditional Religion. It goes to show that the area is a highly religious (Christian) community.

4.3.5 Literacy Level

Most people or respondents have some form of education (97%). The highest number of respondents (24%) indicated that their highest level of academic qualification is HND/BSc. There was no record of Respondents without a form of formal education. This shows that majority of Respondents have the minimum level of education that might help them in making informed decision, or participate meaningfully during discussions as it affects the project implementation.

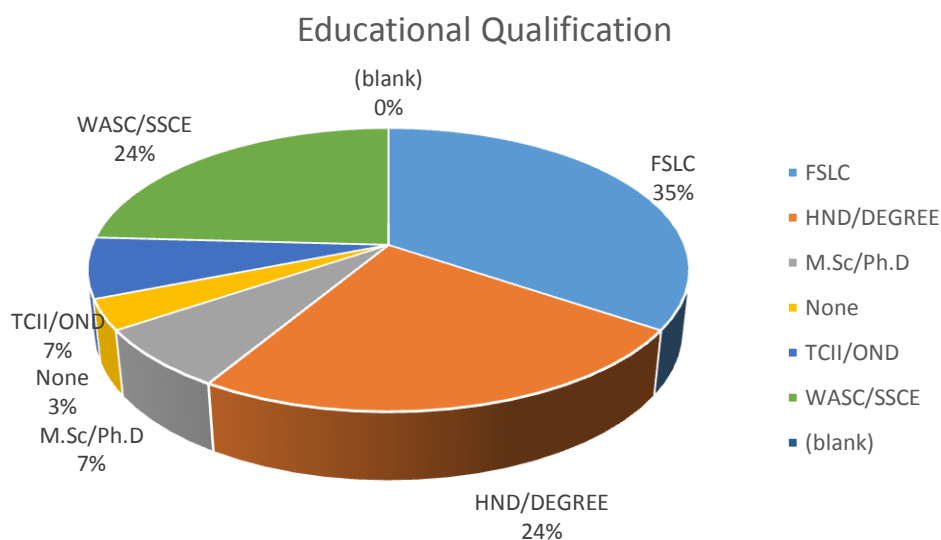


Figure 18 Educational Qualification of Respondents within the project area

4.3.6 Sources of Water for Domestic Use

76% of respondents get domestic water from water vendors while 7% make use of water from commercial boreholes and another 7% make use of water from river. 3% use water from both river (in few occasions) and commercial borehole while about 7% of respondents use water from their private boreholes. A small amount of the respondents still use rainwater harvesting at some point in the year.

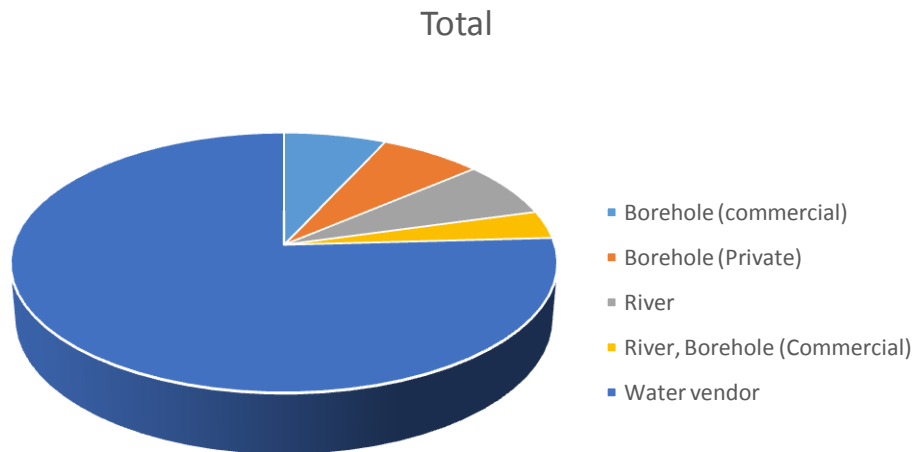


Figure 19 Source of Water for Domestic Use

4.3.7 Household Waste Disposal, Cooking Fuel and Electricity

About 52% of the people in the area dispose their household waste in the gully. 33% burn their refuse and another 3% dispose in public open dump sites. About 41% of the respondents make use of firewood for cooking while 31% use Gas and the rest use kerosene. The survey also showed that electricity is obtained from the national grid within the project communities. However, their services are epileptic. As an alternative source of electricity, the people mostly use hurricane lamps (62%) and Generators (31%). The rest combine both sources as secondary source of power.

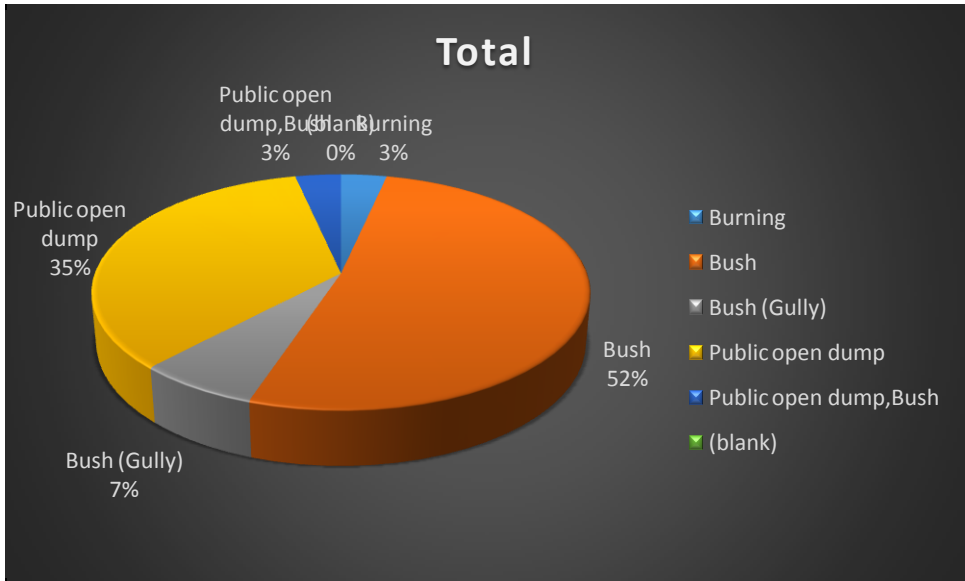


Figure 20 Waste Disposal Methods

4.3.8 Average household size of Respondents

The survey shows that most of the respondents (57%) run large households (Above 7). 20% of the respondents have medium sized households while 27% have families of 2-4 members. This goes to show that the level of dependent on the Head of Household will be much and also the burden on available social amenities will be high.

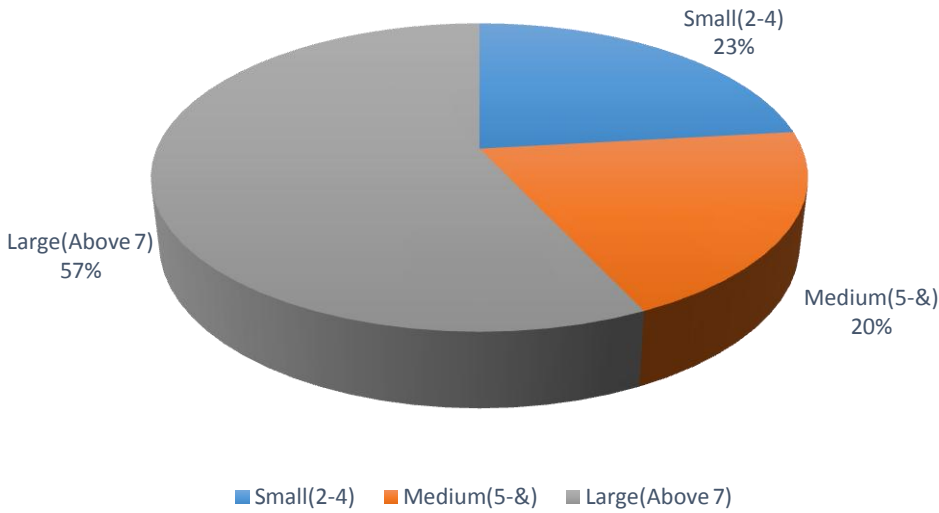


Figure 21 Average Family Size of Respondents within the project area

4.3.9 Occupation

Figure below shows that majority (83%) of the Respondents in this community are self-employed with 77% engaged in trading, while 7% of the respondents are farmers. 11% of the Respondents are public servant, then the remaining (10%) are artisans and engage in such businesses as welding, mason, etc.

4.3.10 Average Income status of Respondents

Field survey shows that dominant income groups amongst Respondents lie between ~~N6,000-~~ ~~N20,000~~ and ~~N21,000 -N80,000~~ and ~~N81,000-N120,000~~ per Month respectively. The trend shows that about 80% of Respondents each belong to one of these three groups. The survey also shows that about 10% fall within the income of ~~N101,000- N500,000~~ per month while about 42% of Respondents earn ~~N500,000~~ or above more per month.

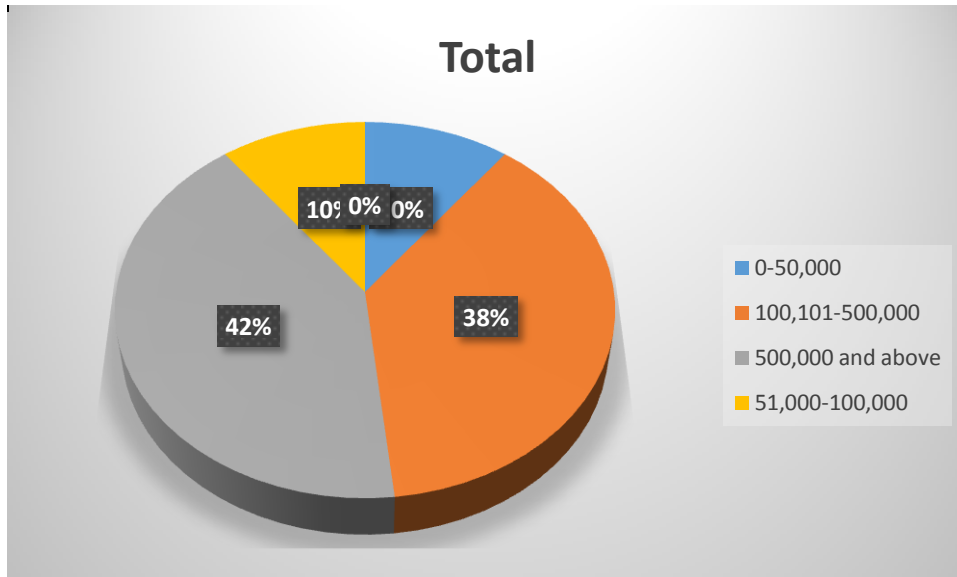


Figure 22 Average Monthly Income of Respondents within the project area

Average income of Respondents in the project area were measured at two levels; the overall average which indicates an aggregation of middle and low level income earning Respondents and the low income groups with lowest limit of N500 per day. The outcome is that on the overall aggregation, Respondents mean income is ~~N4500~~ or \$22.7 per day (for middle and low income combined) and ~~N1200~~ or \$6 per day for lower income group.

Although these results imply that Respondents can maintain reasonably, good standard of living, it is however, not inconceivable that impacts on their sources of livelihood may have adverse impacts on their income sustenance and standard of living, especially with the dependence on trading, farming as well as low rate of saving culture in the less developed countries.

4.3.11 Infrastructural Development

The Major road leading to Enugwu-Ngwo communities are tarred through state and LGA efforts. However, some sections of the road within the communities have been damaged by rain leaving many potholes along the way. There is GSM telecommunication facilities of various networks available in the area and have considerably good connection. The respondents were of the opinion that the access roads within the community.

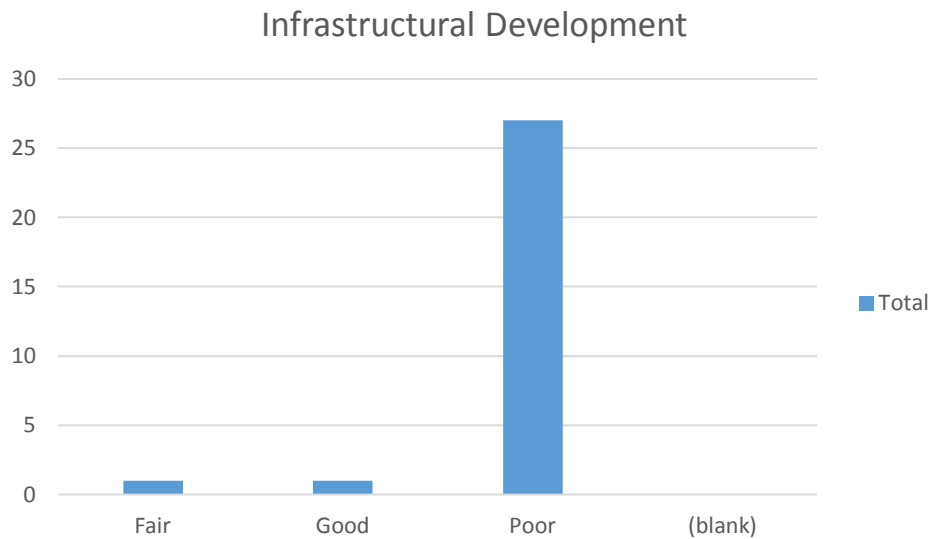


Figure 23 Infrastructural development perception

4.3.12 Desirability of the Project

All of the respondents showed high level of acceptance of the project stating that the gully erosion site poses high risk for the members of the community. They also indicated that the gully has denied them peaceful sleep over the years. They stated that if the menace is allowed to linger there is the fear of heavy property lost.

4.3.13 Health Status Survey

Field survey revealed Malaria is the prevalent disease in the project area. Also respiratory problems and cough were some of the major symptoms described by respondents as common. This may be attributed to the location of the community on the hill and its resultant cold weather. Some of the older people indicated arthritis as a major disease. The respondents were of the opinion that the health facilities are good however more can be done by the government. The PHCs are functioning and there are also private owned clinics in the area.

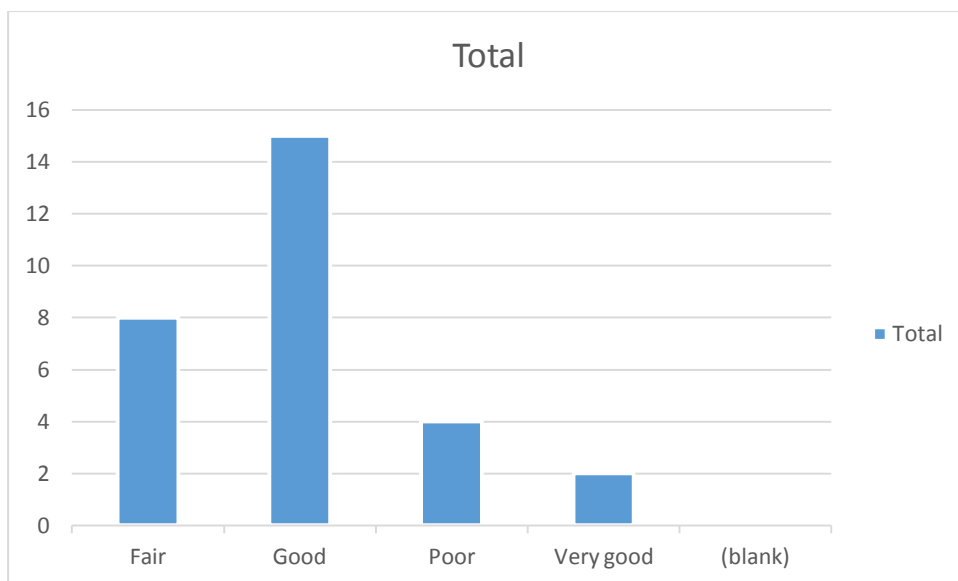


Figure 24 Health Care facilities

4.4 Secondary Data Collection

Tables below show Secondary data obtained from the National Population Commission. The distribution of households by types of housing unit is indicated in table 2.

Table 2 Distribution of Households by type of housing unit

CATEGORIES	Enugu North LGA	Enugu
House on a separate stand/Yard	21676	464971
Traditional/hut structure made of Traditional Material	320	28237
Flat in Block of Flats	9568	69593
Semi Detached House	2862	42423
Rooms/Let in House	17569	83262
Informal/Impoverished Building	421	4878
Other	5199	32403
TOTAL	57615	725767

Source: National Population Commission (2006)

In Comparison to secondary data provided above majority of the households as seen during field observation revealed that the respondents either live in Flats or Room/Let in Houses.

None of the respondents in the project area have access to pipe-borne water. This is because a functional water supply network does not exist and most people make use of mainly boreholes.

The distribution of households by sources of Water supply for domestic usage is indicated in table 3.

Table 3 Distribution of Households by Source of water Supply for Domestic Use

CATEGORIES	Enugu North LGA	Enugu State
Pipe borne inside dwelling	12372	31123
Pipe borne outside dwelling	9348	53773
Tanker supply water vendor	12796	92970
Well	9335	107163
Borehole	2889	42439
Rain Water	2832	90745
River/Stream	4498	202834
Dugout/Pond/Lake/Dam	313	22765
Other	2232	81955
TOTAL	57615	725767

Source: National Population Commission (2006)

When compared to primary data, information on the use of water closet, pit latrine and Bush corresponded to that provided from Secondary data. However, there is no public toilet within the community. See table 4 for the distribution of toilet facilities.

Table 4 Distribution of Regular Households by type of Toilet Facilities

CATEGORIES	Enugu North LGA	Enugu State
Water Closet	36401	135394
Pit Latrine	9146	223159
Bucket/Pan	1437	15612
Toilet Facility in another (different) dwelling	811	23213
Public Toilet	5942	107550
Nearby Bush//beach/field	3670	218371
Other	208	2468
TOTAL	57615	725767

Source: National Population Commission (2006)

Distribution of Regular Household Method Solid Waste Disposal

Information provided from secondary data on solid waste disposal (see table 5) shows that Enugwu-Ngwo contribute to the data for unapproved dumpsites as most of them dispose into the gully.

Table 5 Distribution of Regular Household Method for solid Waste Disposal

CATEGORIES	Enugu North LGA	Enugu State
Organized Collection	13396	124113
Buried by Household	3522	78701
Public Approved Dump site	18377	104560
Unapproved Dump site	13390	231276
Burnt by Household	7606	155471
Other	1324	31646
TOTAL	57615	725767

Source: National Population Commission (2006)

4.5 Hydrology

4.5.1 Hydrology of Amuzam Gully Finger

The total contributory catchment area to the gully head is estimated to be 4.2 hectares. Similarly, the total contributory catchment area to the active gully bed/corridor is estimated to be 2.953 hectares. Furthermore, the total contributory catchment area to the inactive stretch of drainage corridor is 1.9 hectares. This gave total sub-watershed catchment of 9.03 hectares. (Divine Flora and Fauna 2014).

Overland flow length AB is estimated to be 100 meters and channel flow length BC of 400 meters. Urbanization and other infrastructural development have however introduced artificial surfaces in the catchment. Based on close observations and measurements carried out on site and environs, the retardance coefficient was estimated to be 0.235.

Based on these studies, a 100 year average recurrence interval (ARI) and a time of concentration of 20.62 minutes is adopted as reference base for design. Using these data and Rational Method, the design rain is 280mm/hr. The flow rate (discharge) for the sub catchment is estimated at 2.12m³/s for gully head, and 1.5m³/s for gully bed (Divine Flora and Fauna 2014).

4.5.2 Hydrology of Colliery

The total contributory catchment area to the gully head is estimated to be 2.48 hectares. Similarly, the total contributory catchment area to the active gully bed/corridor is estimated to be 5.44 hectares. Overland flow length AB is estimated to be 100 meters and channel flow length BC of 180 meters. Urbanization and other infrastructural development have however introduced artificial surfaces in the catchment. Based on close observations and measurements carried out on site and environs, the retardance coefficient was estimated to be 0.253 (Divine Flora and Fauna 2014).

Based on these studies, a 100 year average recurrence interval (ARI) and a time of concentration of 18.54 minutes is adopted as reference base for design. Using these data and Rational Method, the design rainfall intensity is 250mm/hr. The peak discharge for the sub-catchment is estimated at 1m³/s for gully head, and 2m³/s for gully bed (Divine Flora and Fauna 2014).

4.5.3 Hydrology of Ezata Gully Finger

The total contributory catchment area to the gully head is estimated to be 4.97 hectares. Similarly, the total contributory catchment area to the active gully bed/corridor is estimated to be 8.5 hectares. This gave total sub-watershed catchment of 13.47 hectares. Overland flow length is estimated to be 250 meters and the channel flow length to be 400 meters. (Divine Flora and Fauna 2014).

Based on close observations and measurements carried out on site and environs, the retardance coefficient was estimated to be 0.253. Urbanization and other infrastructural development have introduced artificial surfaces in the catchment area. Based on these studies, a 100 year average recurrence interval (ARI) and a time of concentration of 27.51 minutes are adopted as reference basis for design. Using these data and Rational Method, the design rainfall intensity is 230mm/hr. The peak discharge for the sub-catchment is estimated at 1.72m³/s for gully head, and 2.99m³/s for gully bed. This yielded 4.71 m³/s for the gully outlet (Divine Flora and Fauna 2014).

4.5.4 Hydrology of St Theresa Gully Finger

The total contributory catchment area to the gully head is estimated to be 35.3 hectares with overland flow length of 350 meters and channel flow of 500 meters. Similarly, the total contributory catchment area to the active gully bed/corridor is estimated to be 29.5 hectares. Based on close observations and measurements carried out on site and environs, the retardance coefficient was estimated to be 0.253. Urbanization and other infrastructural development have introduced artificial surfaces in the catchment area.(Divine Flora and Fauna 2014).

Based on these studies, a 100 year average recurrence interval (ARI) and a time of concentration of 29.8 minutes are adopted as reference basis for design. Using these data and Rational Method, the design rainfall intensity is 225mm/hr. The peak discharge for the sub catchment is estimated at 11.3m³/s for gully head, and 9.6m³/s for gully bed. This yielded 21 m³/s for the gully outlet.(Divine Flora and Fauna 2014).

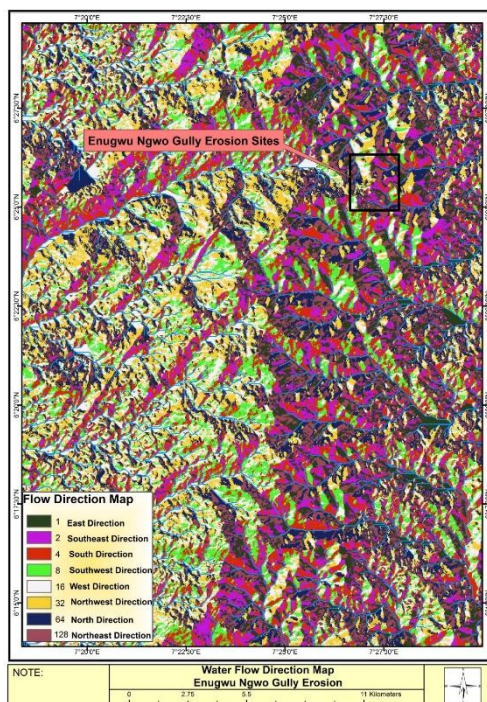


Figure 25 Flow direction Map of EnugwuNgwo Catchment Area

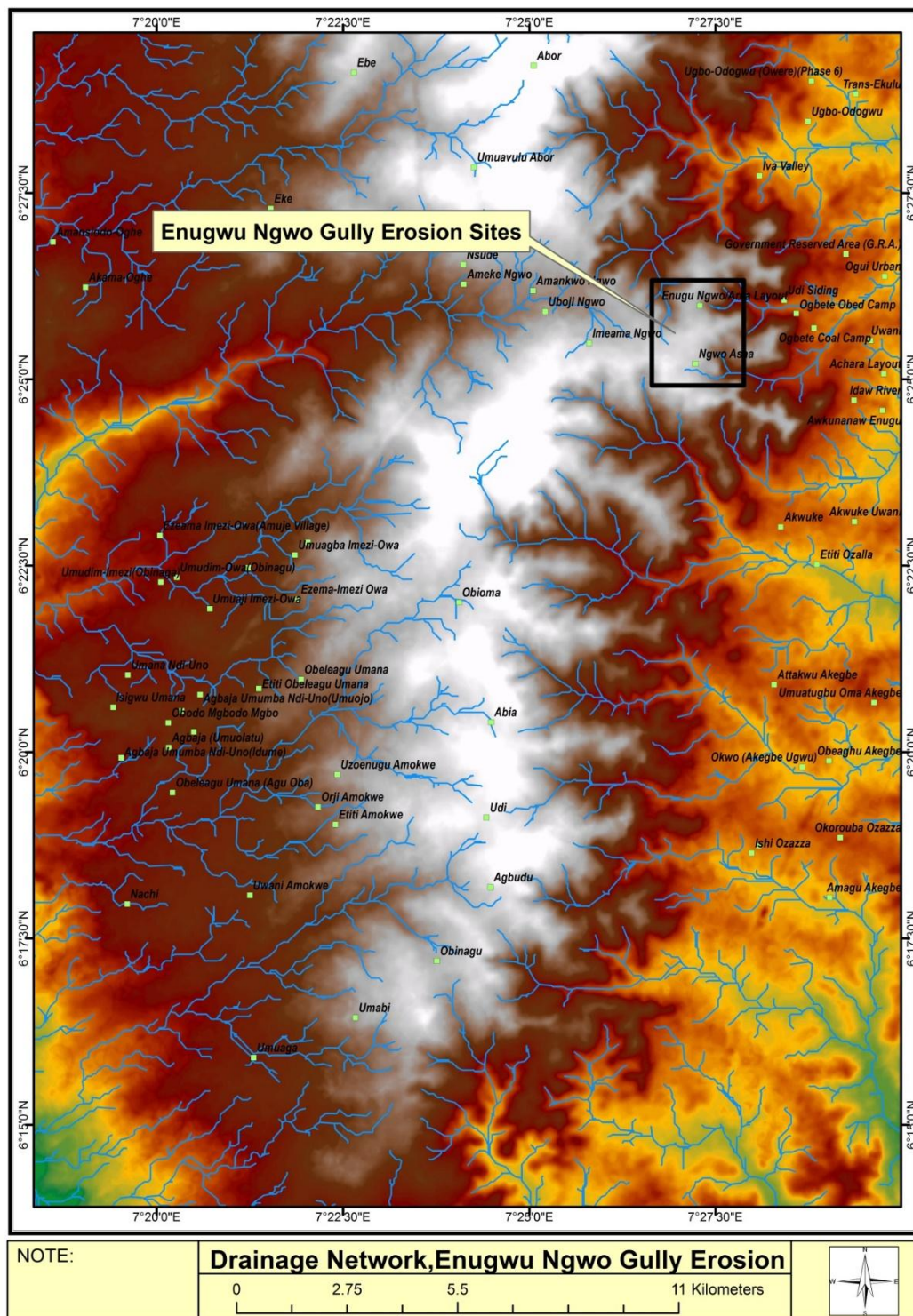


Figure 26 Drainage Network of Enugwu-Ngwo Catchment

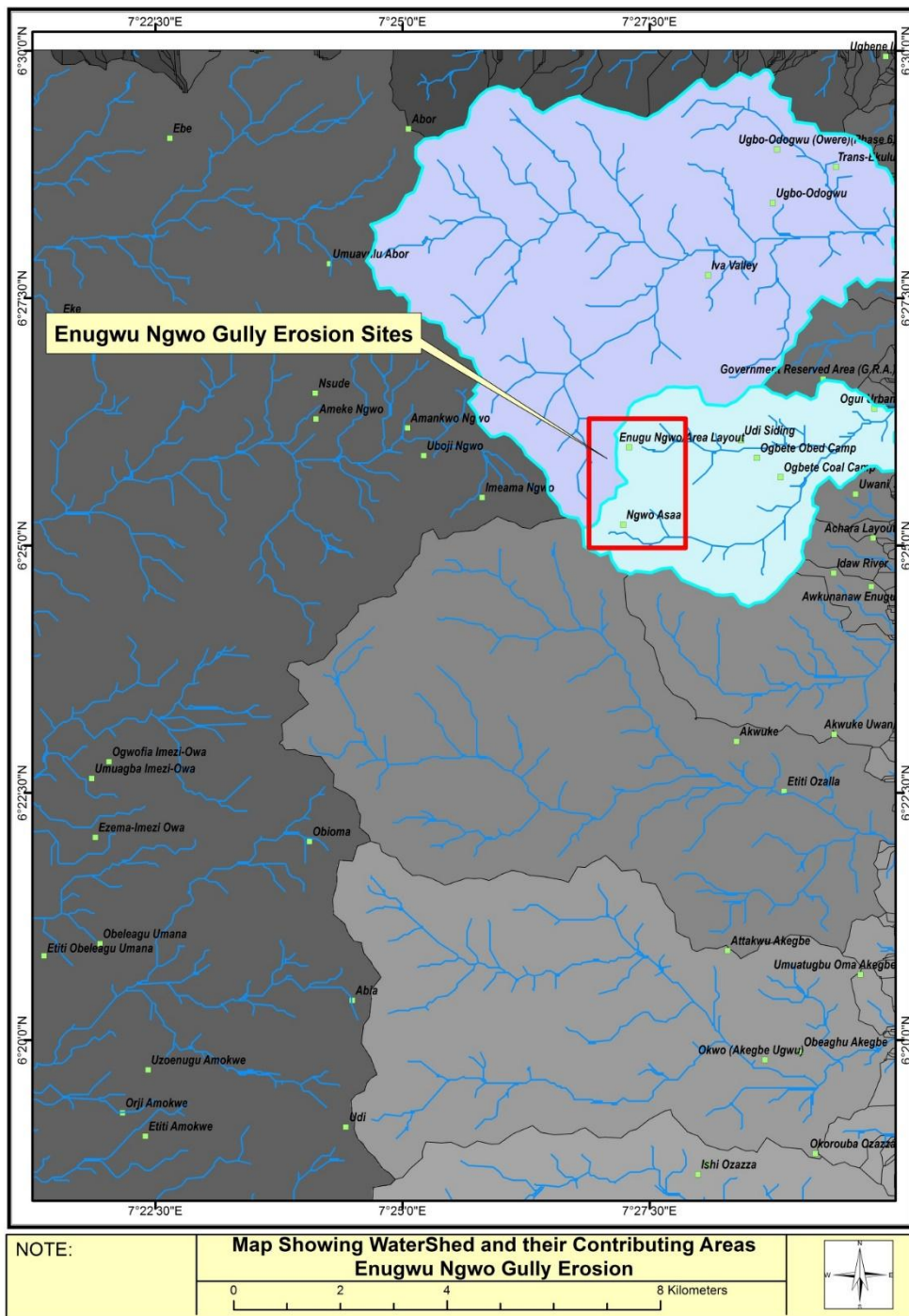


Figure 27 Map showing Enugwu-Ngwo Catchment

4.6 Technical Approach and Methodology to the Reconnaissance Exercise

The methodology used in the conduct of the reconnaissance exercise for the sub-project is based on guidelines as proposed by the following:

- Federal Government of Nigeria EIA Law and subsequent Federal Ministry of Environment standard procedure for conducting EIA/ESIA in Nigeria;
- Guidelines documented under the World Bank **Environmental Assessment** Operational Policies OP 4.01.

4.6.1 Preliminary Site Visit/Scoping and Reconnaissance Exercise

A preliminary site visit/scoping will enable an understanding of the project area and its environs and identification of potential impacts. This visit created an opportunity for the consultants to have a first-hand view of the erosion site.

The methodology used in the conduct of the Reconnaissance exercise for the sub-project is based on guidelines documented under the World Bank Operational Policies OP 4.01.

The reconnaissance exercise for this project has been approached as a communication, consultation and disclosure process, in which the project proponents and other relevant stakeholders exchange information with the aim of mutual understanding which is a critical key to the actualization of the NEWMAP.

During the reconnaissance visit, some baseline conditions of the project area were assessed and documented in this report. The major components, which were considered for physical, ecological and social environmental surveys, are discussed in the subsequent chapters of this report.

Effort was also made in highlighting envisaged impacts associated with the sub-project. For this purpose maps, engineering drawings, satellite imagery were used as well as ground trotting with the SPMU staff.

The details of these will be incorporated in the Draft ESMP reports as more consultations and field studies are still ongoing.

4.7 Impact Identification

The proposed Rehabilitation of the Enugu Ngwo Gully Erosion will lead to several changes in the environment and socio-economic aspect of the project area. A good number of these changes will be beneficial, especially the impacts of rehabilitating degraded land and reducing longer-term erosion vulnerability within the affected communities.

4.7.1 Impact Identification and Assessment Tool

For the identification of these potential impacts, the most useful tools in identifying, assessing, and managing the impacts will be fully engaged so that critical social and environmental issues associated with the rehabilitation project will be fully identified, and ensure that all positive impacts are optimized and negative impacts mitigated.

During the reconnaissance visit to the Enugu-Ngwo gully site, a number of potential and associated impacts were revealed and carefully noted by the use of a Checklist as enumerated in Annex 1. The use of checklist adopted for the evaluation of the potential impacts posed by the

project was based on its comprehensiveness, selectivity, mutual exclusivity, objectivity, confidence limit and ability to deduce and predict interactions.

4.7.2 Beneficial Impacts Associated with the Rehabilitation of Enugu-Ngwo gully erosion site

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.

Some of the beneficial impacts associated with the project include:

- Rehabilitation of the erosion menace in the community;
- Repair of the watershed gullies;
- Connection and restoration of access to houses and villages already cut off by the erosion;
- Provision of employment opportunities for both skilled and unskilled workers;
- Improved agricultural productivity within the community and Enugu state at large;
- Community development programs;
- Reintegration of community and diversification of sources of livelihood;
- Reduction of mortality rate;
- Promotion of afforestation programs (with all its benefits);
- Minimization of flooding and control of coastal overflow;
- Reduced fear perception of loss of property, inhabitation and ancestral origins of the communities;
- Control and Reduction of water body sedimentation rates due to erosion;
- Reduction in mortality/morbidity from landslides;
- Initiation/ kick-off of rapid production systems and agricultural practices;
- Increase in social interactions;
- Improved livelihood enhancing activities;
- Gender Issues: Construction activities will encourage economic activities, especially for women. Since there would be a large workforce, petty traders and food-spots owners will benefit immensely from the demand on site;
- Promotion of goodwill and community appreciation of the NEWMAP intervention in Enugu State and Nigeria at large.

4.7.3 Adverse Impacts associated with the Rehabilitation of the Enugu-Ngwo gully erosion site

Some adverse impacts that may be associated with the rehabilitation of the gully site are highlighted in this subsection. Notwithstanding, the ESMP will be prepared to ensure that these impacts are reduced to the barest minimum.

- Construction machinery moving around the area can create soil compaction, which may harm the soil's future potential as farmland, impair drainage and increase the risk of flooding;
- Waste Generation: Construction crews may generate solid and liquid wastes (sewages). Uncontrolled and untreated, these wastes are major sources of pollution, disrupting the ecosystem and contributing to local (and sometimes much broader) health problems;

- Restricted Access to Business owners: During the rehabilitation works there are bound to be restriction in movement, which will affect transport of goods and services;
- Pressure on the Available Water for Domestic purpose and other Uses;
- Noise and Vibration Nuisance: The project area is a built-up area with residential houses schools (especially Colliery Secondary School), and market. The civil works will generate noise and vibrations on site and surrounding environment. Most civil work projects starting from the pre-construction phase to the decommissioning phase would generate relatively high levels of noise and would be mainly from heavy equipment. The noise levels generated by construction equipment would vary significantly, depending on such factors as type, model, size, and condition of the equipment, operation schedule, and condition of the area being worked. Accordingly, potential impacts of site monitoring and testing activities on ambient noise level would be expected to be temporary and intermittent in nature;
- Emission of Green House Gases, Dust and Particulates: Emissions from exhaust fumes will originate from mobile sources including vehicles, trucks and heavy equipment during mobilization;
- Attack by Poisonous Insects, Reptiles and other Dangerous Wild Animals: Field workers engaged in site clearing, geotechnical investigations and construction could be exposed to attack by animals. These attacks could result in injuries, poisoning or even death;
- Interference with Land Transport: The equipment and personnel will be transported by road. Additional traffic during transport of equipment and personnel for the proposed project will likely create a traffic jam on the road. There is high likelihood that when moving these equipment and personnel along these roads, the transport activities of the community could be disrupted and this could have impact on the socio-economic activities of the community;
- Alteration of Habitat and Biodiversity: Disturbance on the natural habitat due to human activity can result to likelihood that some amount of flora and fauna would be destroyed. Site clearing will lead to loss of species diversity and abundance, including soil organisms, fungi, invertebrates, and bacteria. It will also lead to loss of food sources, fauna habitat, breeding grounds and nesting sites;
- Work Site Accidents: The frequency and incidence of occupational hazards rise with increasing activities. Site clearing is typically done using both heavy and light equipment such as graders, and bulldozers. In the process of clearing there could be injuries and possibly fatalities among the workforce;
- Loss of Jobs: At the end of the project lifetime the project workforce will be demobilized. This will bring about loss of jobs for the project workers. This will translate to loss in income and business opportunities. Most of the small scale businesses that provided goods and services to the road crew members will either windup or experience significant reduction in the volume of business with the demobilization of the project and this too will translate to loss of income.

Further beneficial and adverse impacts will be identified in the course of the ongoing field work and enhancement/mitigation measures will be developed and presented in the Draft Report.

5 CHAPTER FIVE: PROJECT DESCRIPTION

Owing to the different Gully sites in Enugwu-Ngwo, various activities shall be carried out to ameliorate, mitigate and reclaim already eroded lands. The various works to be carried out in each Gully site are described below.

5.1 Colliery Gully Erosion Site Control Design

Construction of Retaining wall and Inlet Collector Chamber

The retaining wall will be provided to retain the recovered part of the eroded school field. This will have following section dimensions:-

- Height = 3 meters;
- Heel Length = 2 meters;
- Toe Length = 1.45 meters;
- Total Length of wall = 50 meters.

The collector chamber is an integral part of the retaining wall by design for rigidity and robustness. This collector chamber will be located at eastern end of the retaining wall. The collector chamber measures 1.5m width by 1.5m length by 1.5m depth with 1 meter inlet concrete collar band at 0.02 inlet slope. Before the inlet collar, there will be 1 meter gravel/rip-rap band.

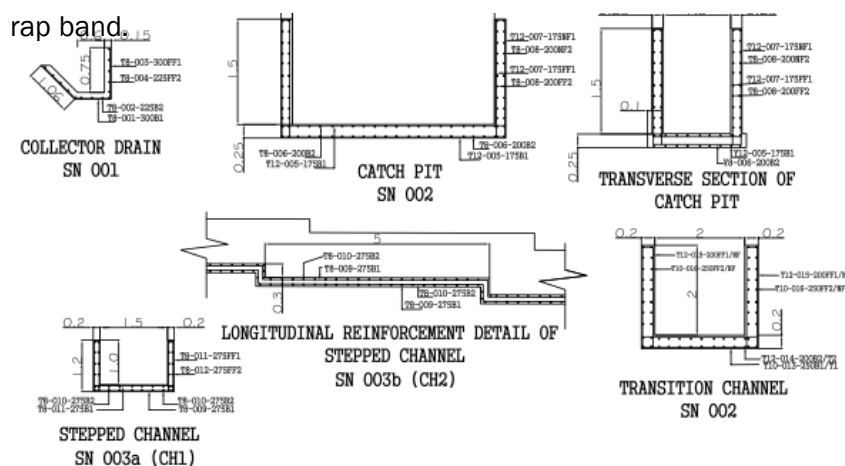


Figure 28 Longitudinal details of stepped channels
Collector Channel

All the discharges from the inlet collector chamber will be transmitted to the upstream side catch pit of the culvert. The collector channel measuring 1 meter width by 0.75 meter depth will be constructed in two numbers 1.5 meter drop height step, giving the required elevation difference of 3 meters between the inlet chamber and the culvert. The collector channel also has double bend equal to 90 to join the culvert catch pit. The 3 meters height reinforced retaining wall formed part of the channel up to 45 degrees double bend, from where the channel becomes symmetrical with 0.75 meter in height.

Construction of Culvert and associated upstream and downstream catch pits

This culvert replaces the old one which has to be abandoned because it was not hydraulically adequate. The new culvert will be made of one rectangular concrete box, 1 m width by 1 m height and 12 m long. It will be constructed across the Enugu – 9th Mile old road with 1.5m width x 1.5m length x 1.5m depth catch pits , on both sides. Both catch pits are offset at least 2 meters away from edges of the road. The culvert is for discharge of 1m³/s corresponding to maximum probable discharge from the contributory catchment funnel. The culverts and the gully head approach ancillary structures have been designed for 100-year return period.

Construction of total drop height rectangular Concrete Channel

The horizontal length of the chute and drainage channel will be 38 m with total elevation drop height of 10 m. The reinforced concrete chute channel will be at slope of 1V to 3H. Its objective is to stabilize the gully head and transmit the discharges down to the stilling/energy dissipation basin.

The Reinforced Concrete Chute Channel (R.C.C. Channel) has to be constructed from the gully head, all the way down to the stilling/ energy dissipater basin 30 m away downstream. The reinforced concrete rectangular channel has width of 1 m and depth of 1.4 m. The channel and the stilling basin which are important hydraulic structure have been designed for a discharge of 100-year return period.

The R.C.C. Channel having an invert slope of 0.333 (1V to 3H) is followed by a type 3 stilling basin of 7 m length, 1 m width and 3.7 m in depth inclusive of freeboard.

At the downstream of the stilling basin, a protection of adequate rip-rap is provided as indicated on the engineering drawings. The rip-rap has been designed to resist the flow velocity at the outlet of the basin.

The stilling basin has been deepened by 1.1 m to allow the formation of hydraulic jump on it (hydraulic jump height of 2.06 m). The amount of deepening was dictated by the depth of tail water at the outlet of the basin, estimated at 0.92 m from critical depth and speed of flow analyses.

Piers and pad footings works

The RCC Chute will be supported on 4 numbers pier and pad footing and 1 number bearing platforms as follows; -

Type 1; (pier & pad) unit has the following dimensions;-

- Height of pier from firm ground measures 5 meters;
- Isolated Pad footing measures 3,15m width x 3.15m length x 1.1m depth (tapering from 3.15m to 0.6m over 0.8m from finished ground level);
- Cross-section of pier measures 0.6m by 0.6m;
- Tie beams for tying the piers measure 0.2 meter depth by 0.6 meter width.

Type 2;

- (bearing platform). Unit 1 which supports the chute at chute inlet has the following dimensions;-

- At top of chute;-

Length = 1.8 meters, width = 3 meters, thickness = 1.3 meter with recess key of 0.8 meter.

- At base of chute :-

Length = 3.15 meters, width = 3.15 meters, thickness = 0.3m to 1.1 meters over height of 0.8 meters.

Gabions works

Series of 9 numbers Gabions Check dams of 2m heights at the center will be used as intermediate control structures at various chainages along the gully.

The gabions check dams are designed for 100-year return period.

There will be 3 different average consistent gradients along the gully. For the first gradient (0.077), the distance between the check dams has been calculated to be 25 m in order to have a very small slope after filling. For the second average consistent gradient (0.197), the distant between adjacent check dams is 10.2 m to have a very small fill slope after filling. Similarly for the last average consistent slope (0.0012), the distant between adjacent check dams is 166 m.

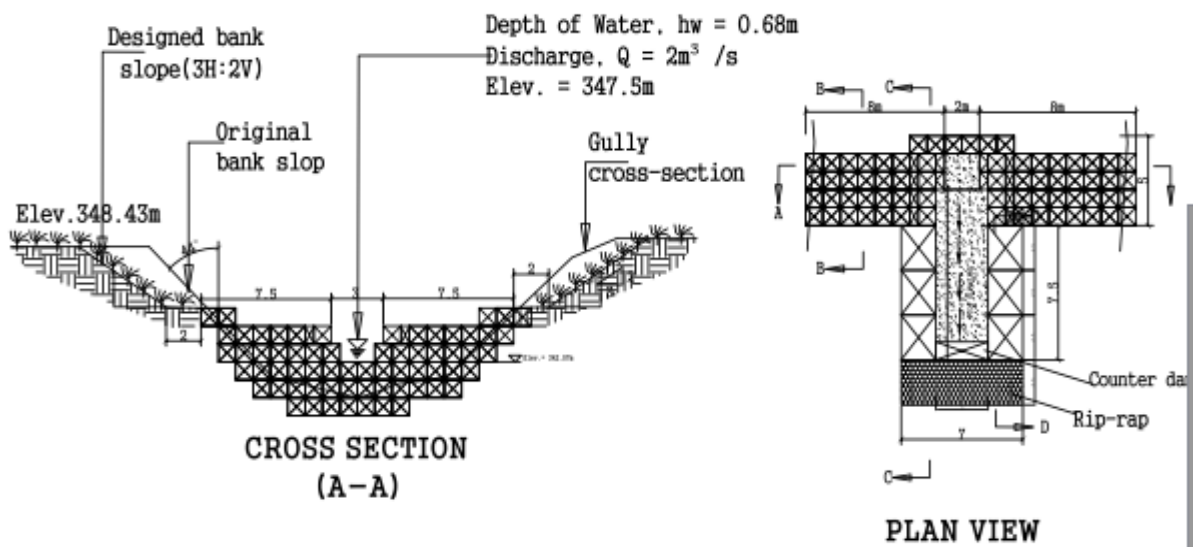


Figure 29 Cross sectional area of Check Dams placed along the Gully

The check dams will have 3m flow width, gabion apron length of 6 m, designed for maximum discharge of 3 m³/s. 2.5 m length of Rip-rap protection will be provided at end of the apron, to prevent regressive erosion, and stability structure length of 3 m.

Within the zone of 0.197 slope, where the distance between check dams (10.2m) is less than the length of check dam and rip rap (11.5m), the gap between check dams will be completely lined with apron material.

The stability has been checked for the below parameters

- ✓ Gabion density – 1,700 kg/m³
- ✓ Soil density- 1,800 kg/m³
- ✓ Soil friction angle – 22.5^o
- ✓ Soil cohesion- 18 kN/m²
- ✓ Coefficient of earth pressure = 0.45 Overall safety factor is approximately 3.6.

Earth works for Gully head reclamation

The gully head is to be reclaimed at designed slope of 1 vertical to 3 horizontal (1V to 3H) longitudinally. The maximum depth of fill is 10 meters, and the minimum depth is 0.5 meter. Average width of fill is 9 meters. Compaction will be done with hand operated vibratory compactor, which is adequate for Bio-engineering works.

Local road rehabilitation works

Laterite/Stones with stabling and containment cross beams is to be constructed along the local access road.

The dimensions of the road is as follows;-

- Width of road = 5 meters.

Earth filling and compaction is to be done in layers not exceeding 150mm thick and cambered at 0.025 slope towards the side drainage channel.

The higher camber side is topped with concrete gravity curbing measuring;-

- Base width = 0.5 meters;
- Top width = 0.25 meters;
- Height = 0.5 meters.

Culverts with associated catch pits across the concrete paved road:

3 numbers Culverts are to be constructed across the rehabilitated access road to direct storm water into the gully bed at designed intervals.

The culvert will have the following dimensions;-

- Diameter of culvert = 0.75 meters;
- Thickness of wall = 0.15 meters.

The associated catch pit measures;-

- width = 1 meter;
- length = 1 meter;
- Depth = 1.5 meter.

Off shoots into the Gully bed:

3 numbers off shoots are constructed to accept and transmit the storm water from the culverts across the rehabilitated local road into the gully bed.

The offshoot consists of rectangular channel measuring approximately 15 m sloping length by 0.75m width by 0.75m depth inclusive of freeboard. At the end of the offshoot, gabion apron measuring 4.5 meters length by 10 meters width by 0.5 meter thick. This gabion configuration acts as impact basin for the dissipation of the energy of the storm water. The gabion aprons are place at upstream side of corresponding check dam.

Structured Vegetation and Bio-engineering works:

Plants and shrubs and grasses are to be planted in formation to form structured vegetation and bioengineering components.

The vegetation will be planted as follows:

For gully head;

- Ogillisi in rows at 5 meters centers;
- Bamboo in clusters in between the Ogillisi rows.

For gully beds and embankments:

- Ogillisi in rows at 5 meters centers;
- Plantain/banana in clusters at 2.5 meters grid points in between rows of Ogillisi;
- Bitterleaf in between the plantain/banana;
- Local carpet grasses planted in-between the bitterleaf plants.

Table 6 Summary of Hydraulics Calculations Colliery Erosion Site

PARAMETER	DESCRIPTION	HYDRAULIC CONTROL STRUCTURE	
		10 METER DROP	RECOMMENDED

		HEIGHT GULLY HEAD	VALUE
Q	discharge (m ³ /s)	1.5	1.5
h ₁	height before hydraulic jump (m)	0.103	0.103
u ₁	speed before hydraulic jump (m/s)	14.55	14.55
h _a	depth of flow (m) before chute channel	0.89	0.89
u _a	speed of flow (m/s) before chute channel	1.68	1.68
b	designed width of flow along the channel (m)	1.00	1
h _c	critical depth value at expanded section (m)	0.61	0.61
u _c	critical speed value at expanded section(m/s)	2.45	2.45
h _t	depth of hydraulic jump (m)	2.06	2.06
h _b	depth of stilling basin (m)	1.09	1.1
h _g	depth of inlet control channel (m)	1.60	1.6
h _s	depth of chute channel (m)	1.40	1.4
h _e	depth of stilling basin (m)	3.70	3.7
l ₁	length to baffle block from start of stilling basin (m)	1.65	1.65
l	length of stilling basin (m)	5.67	7

Q = 3m³/s is used for the check dams designs.

5.2 Amuzam Gully Erosion site Control Design

Inlet Control channel:

This control channel measuring 1.5m width by 1.65m depth by 10 meters length by 0.3m thick will be located upstream of the reinforced concrete chute channel. Its primary function is to control the inflow parameters into the RCCC to determinate.

The Culvert Construction and associated upstream and downstream catch pits:

The 7.2 meters length culvert measures 1.5 m width by 1.5m depth by 0.3m thick. It will be constructed with 1.5m width x 1.5m length x 1.5m depth catch pits , one either side. The culvert is for discharge of 1m³/s corresponding to maximum probable discharge from the contributory catchment funnel. The culverts and the gully head approach ancillary structures have been designed for 100-year return period.

Rectangular Concrete Chute Channel with Stilling Basin:

The Construction of Catch Pit and Flow Alignment Structures (CPFAS) and 12 m Total Drop Height CPFAS is L-shaped on plan, and about 13 meters length by 3 meters width by 2.1 meters depth by 0.2 meters thick, with embedment depth of 0.5 meters.

The horizontal length of the chute channel is 38 m with total elevation drop height of 12 m. The reinforced concrete chute channel is at slope of 1V to 3H. Its objective is to stabilize the gully head and transmit the discharges down to the stilling/energy dissipation basin. The hydraulic control structure will be referred as Reinforced Concrete Chute Channel (R.C.C. Channel which has to be constructed at the gully head, all the way down to the stilling/energy dissipator basin

about 38m away downstream with total elevation drop of 12 m. The reinforced concrete rectangular chute channel has width of 1.5 m and depth of 1.4 m. The channel and the stilling basin which are important hydraulic structure have been designed for a discharge of 100-year return period.

The R.C.C. Channel having an invert slope of 0.333 (1V to 3H) is followed by a type 3 stilling basin of 7 m length, 1.5 m width and 4 m in depth inclusive of freeboard.

At the downstream of the stilling basin, a protection of adequate rip-rap will be provided as indicated on the engineering drawings. The rip-rap has been designed to resist the flow velocity at the outlet of the basin.

The stilling basin has been deepened by 1.25 m to allow the formation of hydraulic jump on it (hydraulic jump height of 2.26 m). The amount of deepening was dictated by the depth of tail water at the outlet of the basin, estimated at 0.99 m from critical depth and speed of flow analyses.

Gabions works:

Series of 13 numbers Gabions Check dams of 2m heights at the center will be used as intermediate control structures at various chainages along the gully. This gabion check dams are designed for 100-year return period.

There are 3 different average consistent gradients along the gully. For the first gradient, the distance between the check dams has been calculated to be 40 m in order to have a very small slope after filling. For the second average consistent gradient, the distant between adjacent check dams is 24 m to have a very small fill slope after filling. Similarly for the last average consistent slope, the distant between adjacent check dams is 360 m.

The check dams have 4 m flow width, gabion apron length of 7 m, designed for maximum discharge of 5 m³/s. 2.5 m length of Rip-rap protection is provided at end of the apron, to prevent regressive erosion, and stability structure length of 3 m.

The stability has been checked for the below parameters:

- ✓ Gabion density - 1,700 kg/m³
- ✓ Soil density- 1,800 kg/m³
- ✓ Soil friction angle - 22.5⁰
- ✓ Soil cohesion- 18 kN/m²
- ✓ Coefficient of earth pressure, $k_a = 0.45$; Factor of safety is estimated to be approximately 3.4

Stepped channel between culvert and stilling basin chute channel

The channel measures 1.5 meters width by 1.65 meters depth, and has a series of 3 numbers step-downs of 1 meter vertical drop height each. For each step down, horizontal length of step is 8 meters, and sloping length of 8 meters.

Gully head catch pit/flow direction re-alignment structure:

This structure will direct inflows into the chute channel. The L-shaped catch pit/flow direction realignment structure measures approximately 12 meters total length. The outlet direction is in the same alignment with the gully head flow direction. Alignment is at 133 degrees.

It will be deepened into ground by 0.5 meter, and has 2.5 meters effective outlet flow height. With the outlet width of 1.5 meters, the outlet speed of flow is regulated to critical speed. This condition makes the chute channel inflow hydraulics determinate. The thickness of the catch pit wall is 0.3 meter.

Earth works for Gully reclamation:

The gully is to be reclaimed at designed 60% stage level. The maximum depth of fill will be 6 meters, and the minimum length of 150m. Average width of fill will be 12 meters bringing the total Volume of fill to 3240 m³. Compaction will be done with hand operated vibratory compactor, which is adequate for Bio-Engineering works.

Local road rehabilitation works:

Stones stabilized berms access road is to be constructed along the local access road. The dimensions of the road is as follows:-

- Width of road = 5 meters;
- Thickness of stones berms = 0.15 meters.

Construction is to be done in panels not exceeding 2.5 meters span and cambered at 0.025 slopes towards the side drainage channel.

The higher camber side will be topped with concrete gravity curbing measuring:-

- Base width = 0.5 meters;
- Top width = 0.25 meters;
- Height = 0.5 meters.

Off shoot into the gully bed:

1 number off shoot will be constructed to accept and transmit the storm water from the flow path into the gully bed. The offshoot consists of rectangular channel measuring approximately 15 m sloping length by 0.75m width by 0.75m depth inclusive of freeboard. At the end of the offshoot, gabion apron measuring 4.5 meters length by 5 meters width by 0.5 meters thick. This gabion configuration acts as impact basin for the dissipation of the energy of the storm water. Being located just upstream of check dam, the dispersing discharge will be controlled.

Structured Vegetation and Bio-engineering works:

Plants and shrubs and grasses will be planted in formation to form structured vegetation and bioengineering components. The vegetation plants to be used will be same as in Colliery Gully Erosion site.

Table 7 Summary of Hydraulics Calculations Amuzam Erosion Site

PARAMETER	DESCRIPTION	HYDRAULIC CONTROL STRUCTURE	
		10 METER DROP HEIGHT GULLY HEAD	RECOMMENDED VALUE
Q	Discharge (m ³ /s)	2.5	2.5
h ₁	Height before hydraulic jump (m)	0.105	0.105
u ₁	Speed before hydraulic jump (m/s)	15.83	15.83
h _a	Depth of flow (m) before chute channel	0.96	0.96
u _a	Speed of flow (m/s) before chute channel	1.74	1.74
b	Designed width of flow along the channel (m)	1.50	1.5
h _c	Critical depth value at expanded section (m)	0.66	0.66
u _c	Critical speed value at expanded section(m/s)	2.54	2.54
h _t	Depth of hydraulic jump (m)	2.26	2.26
h _b	Depth of stilling basin (m)	1.23	1.25
h _g	Depth of inlet control channel (m)	1.65	1.65
h _s	Depth of chute channel (m)	1.40	1.4
h _e	Depth of stilling basin (m)	4.00	4
l ₁	Length to baffle block from start of stilling basin (m)	1.81	1.8
l	Length of stilling basin (m)	6.23	7

Q = 4m³/s is used for the check dams designs

The same design approach used at Colliery and Amuzam Gully sites will be employed in the Ezata and St. Theresa Gully Erosion with specific dimensions for each of the sites as stipulated in the engineering design. The primary activities to be carried out in the mentioned sites are as follows:

5.3 Ezata Gully Erosion:

- Construction of rectangular concrete channel with series of steps between pointA2 and A4 upstream of gully head;
- Construction of Inlet control channel before the CPFAS(Catch Pit and Flow Alignment Structure);
- Construction of CPFAS;
- Construction of one number reinforced concrete chute channel of elevation drop height of 11 meters together with associated stilling basin and rip-rap;
- Earth works for gully head reclamation and stabilization;
- Construction of six numbers check dams of 2 meters elevation nominal elevation drop height and associated rip-rap;
- Construction of sixteen numbers mini check dams of 0.5 meter elevation nominal elevation drop height and associated rip-rap;
- Rehabilitation of local access road together with single rectangular side drain, gravity curbing;
- Construction of concrete apron as upstream side of mini check dam;

- Construction of Structured Vegetation and Bio-Engineering components.

5.4 St. Theresa Gully Erosion:

- Construction of 3 meters width by 2.5 meters depth by 10 meters length culvert across the local access road;
- Construction of upstream and downstream culvert catch pits. The upstream catch pit measures – 3 meters width by 3 meters length by 3 meters depth. The downstream catch pit measures 4 meters width by 5 meters length by 3 meters depth;
- Construction of 4 meters width varying from 2.5 meters to 6 meters depth by 13.5 meters length rectangular drainage baffled chute channel from downstream side of culvert catch pit to the gully head CPFAS (catch pit/flow alignment structure);
- Construction of L-shaped catch pit/flow direction re-alignment structure (CPFAS) measuring 10 meters long-side by 5 meters short-side by 6 meters width by 1 meter depth. The outlet is in the same alignment with the gully head chute channel flow direction;
- Construction of 3 meters width by 6 meters depth reinforced concrete chute channel of elevation drop height of 12 meters together with associated stilling basin and rip-rap. The chute channel is designed at slope of 1 vertical to 3 horizontal;
- Construction of 135 meters length of ridge walling to redirect runoff towards gully head;
- Earth works and terracing for gully head reclamation and stabilization;
- Construction of three numbers check dams of 2 meters elevation nominal elevation drop height and associated rip-rap along the gully corridor;
- Rehabilitation of local access road together with single rectangular side drain, gravity curbing;
- Construction of Structured Vegetation and Bio-Engineering components at gully head and along gully corridor.

The design approach is well detailed in the engineering design report for this project.

6 CHAPTER SIX: PROJECT OPTIONS AND ALTERNATIVES

6.1 Introduction

In the context of this ESMP, 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 of this ESMP and/or other safeguard instrument considered appropriate.

For intervention work of this nature, there are usually a number of viable options that can be considered. These alternatives include: the no project option; delayed project; alternative site/location and project execution options. For this project, analysis of the various alternatives is presented as follows:

6.2 No Project Option

The no project option implies that the intervention work shall not be executed; hence there is no need to carry out this study. This implies the site will remain in its current state and perhaps widen due to natural forces without even any interference from man. Nevertheless, this situation will worsen and put the activities of man and the environment into further jeopardy since the area is already exposed to the forces of erosion. The intervention work is designed to stop these forces and mitigate any negative impacts that may arise.

Therefore, choosing the no project option will mean a loss of efforts made by all parties to ensure the erosive forces do not continue to pose risk to lives and the environment and even loss of job opportunity to Nigerians. The 'no project option' is therefore not considered a viable option.

6.3 Delayed Project Option

This option implies that the planned intervention 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 delayed 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.

6.3.1 Do project Option

This option means going ahead to implement the intervention work. This also entails incorporating professional advice on the most practicable option such as are spelt out in this ESMP and other relevant safeguard instruments and/or best practices relating to the execution of the intervention. This will definitely reassure the public of their safety and the environment. It will also aid employment creation. The environmental threats from the gully erosion will be reduced drastically, if not totally solved in that area. The devastation by erosion that has rendered the existing road impassable will be addressed and solved.

This 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.

6.3.2 Gully Treatment Options

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:

- 1 The do nothing
 - 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.
- 2 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.
- 3 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.
- 4 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.
- 5 Stabilization of gully without partial backfilling of the beds or battering of the banks
 - This option can result in a long drawn-out process, requiring planting and replanting;
 - Significant sediment loss can occur before the gully bank reaches a stable form.

6.4 Alternative Technologies/Designs

The stabilization of an active gully requires an understanding of the various erosion processes that can occur within a gully, plus the ability to recognize the cause of the erosion and identify appropriate treatment measures. Management options for the Enugwu-Ngwo gully erosion may include the following:

6.4.1 Option One: Rock Lined Chute

The rock-lined chute is used to lower surface water into the open channel where a gully has developed. The chute is sized according to drainage area and site factors. Proper sizing of the rock to withstand the expected velocity of water in the chute is the key factor. For the installation of this structure a good source of rock must be available in the area.

Rock chutes are an essential item in the stabilization of gullies.



Wherever practical erosion problems should be stabilized synthetic material should only be used in circumstances where natural based solutions fail to achieve the required stability.

Most rock chute fail as a result of poor construction practices and from water passing around the chute or the use of inadequately sized rock (as a result of either a design or construction problems).

The critical components of the rock chute design are:

- Control of flow entry into the chute;
- Determination of an appropriate rock size; and
- The design of energy dissipation measures at the base of the chute to prevent undermining of the chute and damage to the gully banks.

The upper surface of the rock chute must blend with the surrounding land to allow water to freely enter the chute without being diverted along the edge of the rock lining.

The rock size must be based on the flow conditions down the chute, the slope of the chute, the shape of the rocks (i.e. round or angular), and the degree of variability in rock size. The recommended mean rock size for long, straight chutes may be determined.

Constraints

- The non-availability of rocks in the area could be step back in the use of this alternative

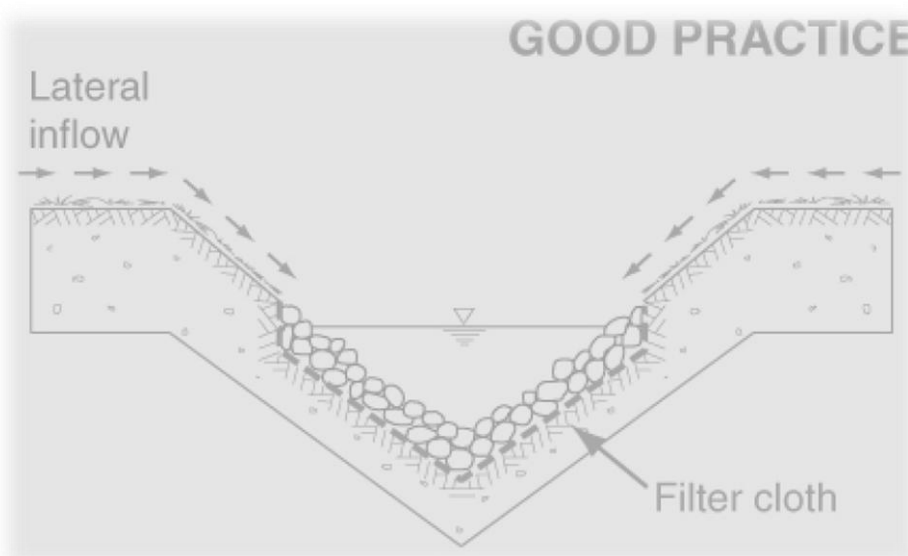


Figure 31 Schematic diagram of a rock lined chute

6.4.2 Option Two: Wood Drop Structure

Wood has been used in various ways to control soil erosion. Over the past few years, the wood drop structure has been used with much success.

The wood must be adequately treated to withstand contact with the soil in a wet condition and adequate drainage around this structure required.

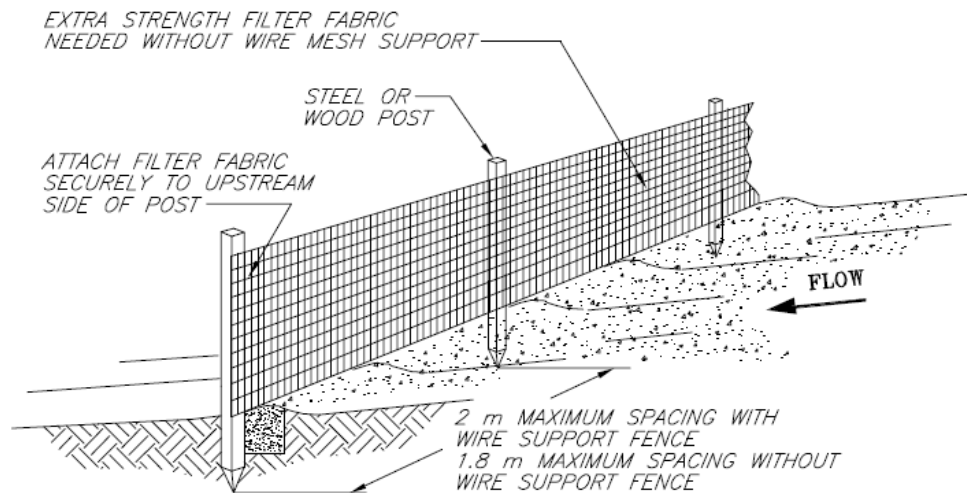


Figure 32 Schematic diagram of a wood Drop structure

Constraints

- As the gully is deep and very wide its encroachment would be continuous with the use of this alternative. Since trapping of sand would be a dependent factor.

6.4.3 Option Three: Do Nothing Option

The “do-nothing” option would involve maintaining the status quo. This would mean that no further rehabilitation of the erosion site will be done. This would actually lead to degradation of un-eroded areas thereby causing more harm than good to the immediate environment.

6.4.4 The Preferred Alternative

The preferred alternative would be to implement the current project proposal, however with a combination of suitable alternatives to enable the project achieves its objectives.

7 CHAPTER SEVEN: SUMMARY OF IMPACTS

7.1 Introduction

The proposed Rehabilitation of the Enugwu Ngwo Gully Erosion will lead to several changes in the environment and socio-economic aspect of the project area. A good number of these changes will be beneficial, especially the impacts of rehabilitating degraded land and reducing longer-term erosion vulnerability in the project community.

There are a number of approaches for the prediction and evaluation of impacts. The ISO 14001 method is simple to apply and provides a high level of details and also relies on limited data, unlike the other methods that require the availability of large historical data. The ISO 14001 method, therefore, is selected for the identification and evaluation of impacts for the proposed road rehabilitation project.

7.2 Impact Identification and Evaluation

In line with general guidelines for an Environmental Impact Assessment (EIA) process, the following were the basic steps adopted for identification and evaluation of impacts:

- Impact identification;
- Impact qualification;
- Impact rating;
- Impact description.

7.2.1 Impact Identification

The aim of impact identification is to account for the entire potential and associated bio-physical, social and health impacts making sure that both significant and insignificant impacts are accounted for. The anticipated impacts were determined based on the interaction between project activities and environmental sensitivities. The identified potential impacts during the different phases of the proposed project are listed in tables 21-23.

7.2.2 5.2.2 Impact Qualification

The identified impacts of the project were qualified based on the following four criteria:

- Positive or negative;
- Short-term or long-term;
- Reversible or irreversible;
- Direct or indirect.

Negative impacts are those that adversely affect the biophysical, health, and social environments, while positive impacts are those, which enhance the quality of the environment. For this study, short-term means a period of time less than three months while any period greater than three months is considered long-term. By reversible/irreversible, is meant whether the environment can either revert to previous conditions or remain permanent when the activity causing the impact is terminated.

7.2.3 Impact Rating

This stage involves evaluation of the impact to determine whether or not it is significant. The quantification scale of 0, 1, 3 and 5 was used. The system of rating employed was adapted from

The International Organization for Standardization ISO 14001– Environmental Management System Approach. The criteria and weighting scale used in evaluating significance are as follows:

- Legal/regulatory requirements (L);
- Risk factor (R);
- Frequency of occurrence of impact (F);
- Importance of impact on an affected environmental components (I);
- Public perception/interest (P);

Legal /Regulatory Requirements (L)

This asks the question ‘is there a legal/regulatory requirement or a permit required?’ The scoring is as follows:

0= There is no legal/regulatory requirement;

3= There is legal/regulatory requirement;

5= There is a legal/regulatory requirement and permit required.

The legal/regulatory requirements were identified based on national laws/guidelines/standards (FMEnv) relating to the project activity.

Risk (R)

This uses a matrix based on the interaction of the probability of occurrence of the impact (Table 6) against consequences (Table 7). The matrix (Table 8) is referred to as the Risk Assessment Matrix (RAM). Five probability categories are interacted against four groups of consequences. The resultant outcomes are given scores with colour-coding. High-risk categories are red; intermediate risks, yellow and low risks, green as follows:

1=Low risk (green);

3=Intermediate risk (yellow);

5=High risk (red).

Table 8 Probability of Occurrence

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

Table 9 Consequences of Impact

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

Table 10 Risk Assessment Matrix

	A	B	C	D	E
I					
II					
III					
IV					

Frequency of Impact (F)

Frequency of impact refers to the number of occurrence of impact. The frequency of impact was determined using historical records of occurrence of impacts, and consultation with experts and local communities. The criteria for rating the frequency of impacts are outlined in Table 14.

Table 11 Frequency rating Criteria

Frequency	Rating	Criteria
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Low	1	Rare, not likely to happen within project lifespan
Medium	3	Likely to happen \geq 5 years
High	5	Very likely to happen throughout the project lifespan

Importance of Affected Environmental Component and Impact (I)

The importance of the affected environmental components was determined through consultation and consensus of opinions. This was also further facilitated by information on experiences on the impacts of already existing facilities in the proposed project area. The rating of the importance of impacts is shown in Table 10.

Table 12 Importance Criteria

Importance	Rating	Criteria
Low	1	<ul style="list-style-type: none"> • Imperceptible outcome • Insignificant alteration in value, function or service of impacted resource • Within compliance, no controls required
Medium	3	<ul style="list-style-type: none"> • Negative outcome • Measurable reduction or disruption in value, function or service of impacted resource • Potential for non-compliance
High	5	<ul style="list-style-type: none"> • Highly undesirable outcome (e.g., impairment of endangered species and protected habitat) • Detrimental, extended animal behavioural change (breeding, spawning, moulting) • Major reduction or disruption in value, function or service of impacted valued ecosystem resource • Impact during environmentally sensitive period • Continuous non-compliance with existing statutes

Public Perception (P)

The consensus of opinions among the project stakeholders were used to determine the public perception on the potential impacts and the following criteria were applied (Table 11):

The combination of the five impact rating weights forms the basis for judging the level of significance of each impact. A matrix displaying the combination based on the ISO 14001 tool is shown in Table 12.

The final ratings of the identified impacts are presented in Tables 13-15. In this report, medium and high significant negative impacts were judged to require mitigation, and all positive impacts required enhancement.

Table 13 Perception Criteria

Public Perception	Rating	Criteria
Low	1	<ul style="list-style-type: none"> • No risk to human health, acute and/or chronic • No possibility of life endangerment for residents, associated communities • Minor reduction in social, cultural, economic values • Unlikely adverse perception among population
Medium	3	<ul style="list-style-type: none"> • Limited incremental risk to human health, acute and/or chronic • Unlikely life endangerment for residents, abutting communities • Some reduction in social, cultural, economic value • Possibility of adverse perception among population • Potential for non-compliance
High	5	<ul style="list-style-type: none"> • Elevated incremental risk to human health, acute and/or chronic • Possibility of life endangerment for residents, abutting communities • Major reduction in social, cultural, economic value • Continuous non-compliance with statute • Any major public concern among population in study area

Table 14 Impact Value and Rating Colour Code

Impact Value	Cut off Values	Impact Rating
L+R+F+I+P	<8	Low
L+R+F+I+P	≥8 but <15	Medium
L+R+F+I+P	≥15	High
F + I	>6	
P	= 5	
Positive		Positive

7.2.4 Summary of Associated and Potential Impacts Determination

The results of the evaluation of the interactions between the proposed activities and their impacts on environmental and social sensitivities are shown in subsequent pages of this chapter. The identified negative impacts were rated as **minor, moderate and major**. Beneficial impacts arising from the project were rated as positive. Hence, no further classifications were made on the beneficial impacts.

7.3 Identified Potential Impacts (by Project Phases)

Pre-Construction Phase

A. Environmental Impacts

Positive

- Prior to the commencement of rehabilitation works, a feasibility study and environmental assessment are required to describe the proposed project needs, aid project design, and ensure environmental and socio-economic sustainability of the project and the project community.
- The project will undertake a stakeholders/public consultation exercise to sensitize the stakeholders in the project command area and beyond on the environmental safeguards components of the project. The public consultation process is seen to be a positive impact, as it will form a basis for project design and implementation decisions-making.

Negative

a. Air Quality

- The pre-construction phase will give rise to fugitive dusts and frequent exhaust emissions into the atmosphere as equipment is delivered to the Enugwu Ngwo Gully Erosion Site and along access roads within the proposed rehabilitation site.

b. Soil

- Leakages may occur from stacked equipment containing oil such as engine oil. This could result in the seeping-through of oil into the soil, thereby leading to possible contamination of soil, surface water and ground water.
- Soil compaction and soil structure changes may occur due to influx and stationary positioning of heavy duty equipment and vehicles

c. Noise and Vibration

- During the pre-construction activities the WHO/FMEnv permissible noise level (90dB) may be exceeded due to mobilization of heavy machinery to the rehabilitation site.

B. Social Impacts

Positive

- The project will undertake a stakeholders/public consultation exercise to sensitize stakeholders in the project command area and beyond on the social safeguards to ensure project sustainability. The public consultation process is seen to be a positive impact, as it will form a basis for project concept decision-making and implementation.

Negative

a. Land Acquisition

- Possible unresolved issues during land acquisition process from members of the community which may result in conflict between contractors and land owners;

- Hostile and unfriendly community attitudes during land acquisition process;
- Decrease in accruable income from land.

b. Noise

- Noise from heavy-duty project vehicles and equipment may exceed the WHO/FMEnv acceptable noise level limits, resulting in nuisance.

c. Others

- Possible disruptions of movement of residents within the project area to places of work, and businesses, as a result of movement of equipment and materials along access roads, resulting in loss of man-hours and negative perception of the project amongst road users and residents;
- Properties particularly farmlands may be accidentally damaged or destroyed during the movement of heavy duty vehicles and equipment;
- Accidents involving vehicles or pedestrians may occur during vehicle and equipment movement to site.

C. Occupational Health and Safety

Positive

- During the pre-construction phase, Occupational Health and Safety (OHS) awareness programs will be conducted. Awareness programs and interactive sessions will benefit primarily the contractors' personnel, schools, residents and businesses. Guidelines on safe practices and safe behaviours will be made available to these groups in order to minimize the occurrence of occupational incidents or accidents in the course of implementing project activities

Negative

- During the pre-construction phase air pollution from exhaust fumes of vehicles and release of fugitive dust as a result of equipment moving to the work area may occur. This will pose an occupational health risk (*respiratory infections and diseases*), especially for people residing in and carrying out activities around the project rehabilitation area and also, contractor personnel, and personnel conveying equipment;
- Exposure to noise pollution, injuries and accidents during movement of equipment to the work areas.

Construction Phase

A. Environmental Impacts

Positive

- Channelization of flood waters: Drainage channels will be constructed, to channel storm water to collector drains at the gully head;
- Construction of suitable sized and aligned collector drains at the gully head to collect and lead the storm water/runoff from the roads into drop structures;
- A chute will be constructed to channel water into the stilling basin. This will enable the controlled flow of water from the collector drain to the stilling basin;
- The phase will allow for recovery works for land located within the gully, so as to safeguard residential properties at risk of erosion;
- Re-vegetation activities will be carried out, to provide cover for the eased out slopes, channels, chute and the stilling basin. The structured vegetation to be applied include sand bags, erosion resistance trees, plants and grasses in other to make the area environmental friendly and to improve the aesthetic of the project area;
- Stabilization (even out/ uniformity) of the slopes, where feasible to prevent further collapse of the slopes.

Negative

a. Climate Change

- Climate change impacts need to be assessed from two perspectives. Firstly the impact of the project on climate change and secondly the impact of climatic change on the project scheme and its infrastructure;
- Green House Gas (GHG) emissions from vehicular and construction equipment would be generated during the pre-construction, construction and subsequently, operational phases of the project. These emissions would be the primary impact of the project on climate change. GHG emissions are considered based on three “scopes” – Scope 1 (direct emissions), Scope 2 (indirect emissions) from the consumption of purchased energy [Purified Motor Spirit {PMS}, diesel] and Scope 3 (other indirect emissions).

b. Air Quality

- Emission of Green House Gases, Dust and Particulates: Emissions from exhaust fumes will originate from mobile sources including vehicles, trucks and heavy equipment during construction works;
- Excavation, and other civil works will lead to the increase in fugitive dust;
- Civil works will cause changes in the air and atmospheric conditions of the project area and surrounding environment. Fugitive dusts, machinery exhaust fumes [nitrogen oxides (NOX), carbon monoxide (CO), sulphur oxides (SOx), hydrocarbons and suspended particulates], and dusts from rehabilitation/construction activities will impact negatively on air quality. Air pollution from machineries will be short term, moderate and localized.

c. Soil

- Construction machinery stationed and moving around the area can create soil compaction, which may harm the soil's future potential as farmland, impair drainage and increase the risk of flooding;
- Excavation and compaction activities through construction works will alter the soil properties including loss of valuable top soils;
- Accidental spillage of chemicals and fuels from the operation and maintenance of construction vehicles and equipment will pose negative impacts to surface and future groundwater quality.

d. Water Quality and Hydrology

- Increased pressure on water resources during construction works;
- During construction works, seepage of fuel from machineries and effluent discharge into the watershed may occur, thus impacting on the water quality;
- During the rehabilitation works, there may be potential for sediment/contaminant laden water runoff to impact on water quality. The contaminants in water runoff may have the potential to enter existing drainage channels and into local watercourses, affecting downstream users and aquatic life;
- Flood draining activities may introduce chemicals into water bodies leading to possible changes in water colour and pH levels, pollution and eutrophication in surface water.

e. Noise and Vibration

- The project area is a built-up area with residential houses, schools, market and a hotel. The civil works will generate noise and vibrations on site and surrounding environment. Most activities associated with road project starting from the pre-construction phase to the construction phase would generate relatively high levels of noise and would be mainly from heavy equipment. The noise levels generated by construction equipment would vary significantly, depending on such factors as type, model, size, and condition of the equipment, operation schedule, and condition of the area being worked. Accordingly, potential impacts of site monitoring and testing activities on ambient noise level would be expected to be temporary and intermittent in nature;
- Vibrations resulting from construction equipment may cause further soil destabilization and consequent erosion.

f. Waste

- Construction activities will lead to the production of solid wastes - soil excavated debris, metal scraps, plastics, wood, waste concrete, papers and cartons, etc;

- Increased generation of liquid waste – concrete washings, canal watering, etc;
- Construction crews may generate solid and liquid wastes (sewages). Uncontrolled and untreated, these wastes are major sources of pollution, disrupting the ecosystem and contributing to local (and sometimes much broader) health problems.

g. Flora and Fauna

- Alteration of habitat and biodiversity may occur, due to human activities and disturbance on the natural habitat. Site clearing will lead to loss of species diversity and abundance, including soil organisms, fungi, invertebrates, and bacteria. It will also lead to loss of food sources, fauna habitat, breeding grounds and nesting sites;
- Reduction in the number of native wildlife;
- During mobilization of equipment, construction activities such as grading, dredging, filling, excavation etc., Weed invasion/proliferation of opportunist species (weeds & pests) may occur.

h. Topography

- Scarification of natural landscape of the project site.

B. Social Impacts

Positive

a. Employment

- Employment of skilled and unskilled labour will be promoted. Artisans and professionals from the project area will be provided contractual employment during this phase. This will help promote community goodwill.

b. Economic Benefits

- This phase will encourage economic activities within and around work areas. Petty traders, food vendors and other small businesses will benefit from the demands at the work site.

c. Waste Management

- The construction phase will see to the implementation of a viable waste management plan for project activities.

d. Occupational, Health and Safety

- Occupational health and safety efforts will be intensified during the construction phase as signage, warning and hazard signs will be put up to inform residents and others, about the on-going rehabilitation works in sensitive areas;
- The phase will encourage the conduct of Occupational Health Risk Assessment (OHRA), Job Hazard Analysis (JHA), Hazard Communication Program (HAZCOM), OHS trainings and other proactive safety strategies (fulfilling the social and fiscal

imperatives) which will help reduce the occurrence of on-site incidents/accidents and the resultant burden of direct or indirect compensation costs.

Negative

a. Impact on Livelihood/Community Activities/Social Stress

- During the rehabilitation works there are bound to be restriction in movement, which will affect residents and business owners in the project area;
- Road rehabilitation activities may disrupt use of access roads by other users including travellers. There may be occurrences of traffic congestion on access roads as a result of intermittent movement of equipment and materials into and from the rehabilitation work area. There is high likelihood that when moving these equipment and personnel along these roads, the transport activities of the community could be disrupted and this could have impact on the socio-economic activities of the community;
- Flooding in other areas may occur during construction activities (construction of drainage), which can lead to destruction of lands, and properties;
- Human Displacement: Civil, re-vegetative, and watershed management may require the relocation of surrounding residents and their sources of livelihood.

b. Social Vices

- The project will attract a significant workforce. Associations between workers and local residents may lead to casual sexual relationships, thereby increasing the risks of sexually transmitted infections (*STIs*) and *HIV*;
- Vices such as theft, drug use, casual sex (*with minors, prostitutes, etc.*), small scale gambling, rape, etc., may arise due to the influx of project workforce into the area.

c. Health and Safety

- Incidences of respiratory conditions and respiratory diseases (silicosis, asthma, bronchitis, upper respiratory infections may occur due to air contamination by exhaust fumes and dust resulting from civil works;
- Possible spread of water borne diseases (e.g. Cholera, Dysentery, Amoebiasis, Salmonellosis etc) may occur;
- Possible outbreak of HIV/AIDS and other STDs;
- During construction activity through creation of pools of stagnant water there may be an increase in malaria cases;
- Exposure of workforce to attack by poisonous insects, reptiles and other dangerous wild animals. These attacks could result in injuries, poisoning or even death;
- The frequency and incidence of occupational hazards may rise with during construction activities;

- Accidents may occur during the construction phase as a result of increased vehicular movements.

d. Noise and Vibrations

- This phase will cause noise and vibration nuisance.

e. Waste

- The construction phase will give rise to increased generation of waste from construction activities.

f. Archaeological and Cultural Loss

- Construction works may impact on sensitive sites such as Shrines etc.

g. Conflict

- Conflict may arise between community members and contractor. This may hinder or slow down project implementation activities.

h. Traffic

- Existing travel patterns will be negatively impacted during the construction phase of the project.

C. Occupational Health and Safety

Negative

- In the course of rehabilitation works, there would be a moderate to severe likelihood of the occurrence of workplace hazards. Activities using heavy and light equipment such as graders and bulldozers could predispose personnel to hazards. “Unsafe behaviours” and “unsafe conditions” will pose serious occupational health and safety risks;
- Contact with natural hazards such as animals, insects, poisonous plants.

Operational Phase

A. Environmental Impacts

Positive

- Repair of watershed gullies and rehabilitation of erosion menace. Proper erosion and watershed management as flood waters and run-off will be efficiently controlled;
- Improved access road for between villages in the communities. This will immensely benefit community residents and other road users;

- Stabilization of the Enugwu-Ngwo gully erosion site, this preventing further erosion from occurring;
- Aesthetic modifications will promote good ambience within the Enugwu-Ngwo gully erosion site;
- Availability of water (in the stilling basin) for agricultural use;
- Control and reduction of water body sedimentation rates due to erosion;
- Promotion of afforestation programs

Negative

a. Water Quality

- Roadway runoff, wastes (municipal solid wastes, agricultural wastes, effluent, and hazardous wastes etc.) may cause turbidity, changes in water colour and in pH levels.

b. Odour

- Release of foul smell from the collector drains, chute and stilling basin as a result of runoff/storm water containing decaying matter.

c. Blocked Drains

- There may be sediment laden run-off/storm water which may block the collector drains whereby affecting water flow.

B. Social Impacts

Positive

a. Livelihood

- Proper erosion and watershed management as flood waters and run-off will be controlled;
- With the rehabilitation of the Enugwu-Ngwo gully erosion site, the risk of land and properties being carried away will be significantly reduced. Reduced fear perception of loss of property, inhabitation and ancestral origins of the communities;
- Increase in project area development and business opportunities;
- Improved access between villages and communities thus increasing social interactions. Reintegration of community and diversification of sources of livelihood;
- Improved agricultural productivity within the community and Enugu state at large;
- Initiation/ kick-off of rapid production systems and agricultural practices;
- Reduction in mortality/morbidity from landslides;

b. Education

- The rehabilitation in the Enugwu-Ngwo gully site area will lead to educational and social tourism to the project (for example university students studying various the fields of

erosion and watershed management and engineering), and Industrial Training and those requiring hands-on experience;

- Increase in community development programs.

c. Traffic

- Increase in traffic within the roads and access roads of the project.

d. Control

- Control and monitoring of human activity e.g. farming, building etc. within the recovered areas and eased out side slopes.

Negative

a. Loss of Employment

- At the end of the project lifetime the project workforce will be demobilized. This will bring about loss of jobs for the project workers. This will translate to loss in income and business opportunities. Most of the small scale businesses that provided goods and services to the road crew members will either windup or experience significant reduction in the volume of business with the demobilization of the project and this too will translate to loss of income.

b. Air Quality

- Increase vehicular emissions from road users.

c. Waste

- Indiscriminate dumping of waste may lead to blocking of drainage channels and sanitation issues.

d. Conflict

- There may be land use conflict in managing the erosion site e.g. ecological, grazing and farming.

e. Health and Safety

- The stilling basin could become a breeding site for disease vectors e.g. flies and mosquitoes. Possible spread of water borne diseases (e.g. Cholera, Dysentery, Amoebiasis, Salmonellosis etc.) may occur;
- Increase in respiratory problems amongst local residents as a result of increase in road users;
- Increase in vehicular accidents along constructed/rehabilitated access roads.

C. Occupational Health and Safety

Positive

- Implementation of site-specific occupational health and safety management plans (OHSMPs);
- Monitoring for occupational health and safety risk assessment (OHSRA) report data;
- Continuous job hazard analysis and process hazard analysis (JHA and PHA);
- Implementation of a hazard communication program (HazCom);
- Reduced direct and indirect costs as a result of pro-active safety strategies;
- OHS Training;
- PPE availability.

Negative

- There may be flood risk associated with the stilling basin. This is likely to occur when the impoundment level of the stilling basin exceeds the safety level;
- Injury of workers and the public during the operation and maintenance activities.

Table 15 Identified Potential Impacts and Rating - Pre Construction Phase

Project Phase	Component	Sub-component	Potential Impact	Description	Likelihood	Consequence	Rating
Pre-construction Phase	Environment	Air	Fugitive dust and exhaust fumes from vehicles	Direct Negative Short-term/long-term Local/widespread Reversible	Medium	Considerable	Moderate
		Soil	Soil compaction and soil structure changes due to influx and stationary positioning of heavy duty equipment and vehicles	Direct Negative Short-term Local Reversible	Medium Low	Considerable	Moderate
			Leakages from stacked equipment and subsequent seeping through of contaminated oils and chemicals	Direct Negative Short-term Local Reversible	Medium	Considerable	Moderate
		Noise	Increase above permissible noise level, (90dB) due to movement of vehicles, equipment and machines to the gully erosion site	Direct Negative Short-term Local/widespread Reversible	Medium	Considerable	Moderate
		Vegetation	De-vegetation - Loss of flora and fauna	Direct Negative Short-term Local/widespread Reversible/Irreversible	Medium	Little	Minor
Project Phase	Component	Sub-component	Potential Impact	Description	Likelihood	Consequence	Rating
Pre-construction Phase	Social	Land Acquisition	Conflict between contractor and land owners, due to unresolved issues during land acquisition process	Direct Negative Short-term Local Reversible	Medium	Considerable	Moderate
			Decrease in accruable income due to sale of land	Direct Negative Short-term/Long-term Local Reversible	Medium	Considerable	Moderate
		Traffic	Traffic congestion/travel delay	Direct Negative Short-term Local/widespread Reversible	Medium	Considerable	Moderate
		Noise	Nuisance to surrounding residents/communities	Direct Negative Short-term Local Reversible	Medium	Considerable	Moderate
		Others	Accidental destruction of property such as farmlands	Direct Negative Short-term Local Reversible	Medium low	Little	Minor
			Grievances	Direct/Indirect Negative Short-term Local Reversible	Low	Little	Minor
			Accidents	Direct/Indirect	Medium	Considerable	Minor

			involving vehicles or pedestrians	Negative Short-term Local Reversible	Low		
Project Phase	Component	Sub-component	Potential Impact	Description	Likelihood	Consequence	Rating
Pre-construction Phase	Social	Others	Blocked access route to places of work, residence and business	Direct/Indirect Negative Short-term Local Reversible	Medium Low	Considerable	Minor
Pre-Construction	Occupational Health and Safety	Air	Exposure to respiratory disease risks from dusts, exhaust fumes of equipment and vehicles	Direct Negative Short-term /long-term Local/wide spread Reversible	Medium	Considerable	Moderate
		Health and Safety	Exposure to injuries and accidents during movement of equipment	Direct Negative Short-term /long-term Local/wide spread Reversible	Medium	Great	Major

Table 16 Identified Potential Impacts and Rating - Construction Phase

Project Phase	Component	Sub-component	Potential Impact	Description	Likelihood	Consequence	Rating		
Construction Phase	Environment	Climate Change	GHG Emissions	Direct /indirect Negative short-term/Long-term Local/widespread Irreversible	Medium low	Considerable	Minor		
		Air	Cement dust, fugitive dust, welding fumes, exhaust fumes, hazardous gases (NO _x , CO, SO _x , PM _{2.5} , PM ₁₀)	Direct Negative short-term/Long-term Local/widespread Irreversible	Moderate	Considerable	Moderate		
		Soil	Destabilization of soil structure/ Increase of erosion site	Direct Negative short-term Local Reversible	Medium	Considerable	Moderate		
			Compaction of top soil due to movement of heavy vehicles and equipment	Direct Negative short-term Local Reversible	Medium-high	Considerable	Moderate		
			Contamination of soil by oil spills, fuel, etc.	Direct Negative short-term Local Reversible	Medium-low	Considerable	Minor		
		Water quality/hydrology	Discharge of sediment laden run-off into water bodies	Direct/Indirect Negative Short-term/Long-term Local/Widespread Reversible	Medium	Considerable	Moderate		
			Contamination from (oils, fuel, chemical substances etc)	Direct/indirect Negative short-term/long-term Local/widespread Reversible	Medium	Considerable	Moderate		
		Construction Phase	Environment	Water quality/hydrology	Contamination by human faecal wastes	Direct/indirect Negative short-term/long-term Local/widespread Reversible	Medium	Considerable	Moderate
				Noise and Vibration	Noise pollution and vibration nuisance as a result of on-going rehabilitation works.	Direct Negative short-term Local Reversible	Medium-high	Considerable	Moderate
Soil destabilization due to vibrations from construction equipment use	Direct Negative short-term Local Reversible				Medium low	Considerable	Minor		

		Waste	Increased generation of solid and liquid wastes	Direct Negative short-term Local Reversible	Medium	Considerable	Moderate
		Biodiversity	Loss of flora and fauna	Direct Negative short-term /Long term Local Reversible/irreversible	Medium High	Considerable	Moderate

Project Phase	Component	Sub-component	Potential Impact	Description	Likelihood	Consequence	Rating
Construction Phase	Social	Socio-economic activities	Disruptions to resident activities within the project area	Direct Negative short-term Local Reversible	Medium	Considerable	Moderate
			Blocked access route/Restricted access	Direct Negative short-term Local Reversible	Medium	Considerable	Moderate
Construction Phase	Social	Public	Negative perception among residents and commercial establishments etc about the project.	Direct Negative short-term Local Reversible	Medium	Little	Minor
			Possible human displacement	Indirect Negative short-term Local Reversible	Medium	Great	Moderate
		Traffic	Delay in travel time	Direct Negative short-term Local Reversible	Medium low	Little	Minor
		Education	Noise disturbances to the serene learning environments. (name of school)	Direct Negative short-term Local Reversible	Medium	Considerable	Moderate
		Health and Safety	Increase in sexual activities leading to possible spread of STIs	Indirect Negative short-term Local/widespread Reversible	Medium high	Great	Major
			Incidence of respiratory diseases due to air contamination by fugitive dusts and exhaust	Direct Negative short-term Local Reversible	Medium	Considerable	Moderate

			fumes				
			Residents and workforce exposed to accidents and injuries	Direct Negative short-term Local Reversible	Medium	Great	Moderate
			Incidence of water borne diseases (e.g.dysentery, cholera)	Direct Negative short-term Local Reversible	Medium	Considerable	Moderate
Construction Phase	Social	Behaviour	Occurrence of social vices (e.g. theft, drug use etc)	Indirect Negative short-term Local Reversible	Medium	Considerable	Moderate
		Noise	Nuisance due to increase in noise levels	Direct Negative short-term Local Reversible	Medium	Little	Minor
		Project Performance	Conflict between community members and contractor	Direct Negative short-term Local Reversible	Medium	Considerable	Moderate
			Grievance and resistance from communities	Direct/Indirect Negative Short-term/long-term Local Reversible	Medium	Considerable	Moderate
Construction Phase	Occupational Health and Safety	Personnel safety	Injuries, falls, accidents, explosions, fires, leakages, accidents etc.	Direct/Indirect Negative Short-term/Long-term Local/widespread Reversible	Medium high	Considerable	Moderate

Table 17 Identified Potential Impacts and their Ratings - Operational Phase

Project Phase	Component	Sub-component	Potential Impact	Description	Likelihood	Consequence	Rating
Operational Phase	Environment	Air	Exhaust fumes from road users	Indirect Negative Short-term/long-term Local/widespread Irreversible	Medium	Considerable	Moderate
		Noise	Nuisance due to increase in noise levels	Indirect Negative Short-term/long-term Local Reversible	Medium	Considerable	Moderate
		Water quality and hydrology	Contaminated (with human waste) water run-off into surface water etc.	Indirect Negative Short-term/long-term Local/widespread Reversible	Medium	Considerable	Moderate
		Water flow	Blocked drains (with sediment) impeding water flow	Indirect Negative Short-term Local Reversible	Medium	Considerable	Moderate
	Social	Employment	Loss of employment (engaged contract staff on the project)	Indirect Negative short-term Local Reversible	High	Little	Moderate
		Health and Safety	Increase in water borne diseases (malaria, typhoid, cholera)	Indirect Negative short-term Local Reversible	Medium	Considerable	Moderate
			Increase in vehicular related accidents	Indirect Negative short-term Local Reversible	Medium	Considerable	Moderate
			Increase in respiratory problems amongst local residents due to increase of road users	Indirect Negative short-term Local Reversible	Medium	Considerable	Moderate
		Occupational Health and Safety	Personnel safety	Injury of workers during operation and maintenance activities	Direct Negative short-term/Long-term Local/widespread Reversible	Low	Considerable

8 CHAPTER EIGHT: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Overview

The range of environmental, social and occupational health and safety issues associated with the rehabilitation works for the Enugwu-Ngwo Gully Erosion Site Project will be described in a *matrix table format* for the environmental and social management plan (ESMP). The table also includes a column for **Monitoring Indicators** and **Monitoring Frequencies**.

It outlines the corresponding mitigation measures for potential environmental and social impacts; and occupational health and safety risks that are envisaged to occur during activities. Since the project consists of civil rehabilitation works basically, majority of the environmental and social impacts and occupational hazards will be expected to arise during the construction phase of the project. The ESMP also covers potential impacts as perceived during the pre-construction and operation phases.

8.2 Institutional Arrangement for ESMP and Monitoring Plan

It is envisaged that the environmental and social impacts and their designed enhancement and mitigation measures shall be monitored during implementation of the construction/rehabilitation works and operation phases. The roles and responsibilities for monitoring the environmental and social impacts and the implementation of the ESMP are as follows.

Overall sub-project coordination will be housed in Project Management Unit (PMU), of Enugu State NEWMAP Office. They will oversee the day-to-day project management and ensure that environmental and socio-economic concerns and management as elucidated in the ESMP are integrated into all aspects of project implementation. The Enugu State Ministry of Environment; herein referred to as State Ministry of Environment (SME_{Env}); National Environmental Standards Regulatory Enforcement Agency (NESREA), and Enugu State Environmental Protection Agency (ENSEPA) will monitor, evaluate and audit the implementation of the ESMP to ensure that the rehabilitation works and project operations meet “best environmental practices”.

Awareness creation exercises on HIV/AIDS, environmental protection and personal hygiene and sanitation shall also be undertaken for contactors personnel and all stakeholders involved in project implementation.

8.2.1 ESMP and Monitoring Plan Budget

The total cost for Implementing the ESMP and Monitoring Plan for the Enugwu-Ngwo Gully Erosion Site Rehabilitation Works is estimated at **Seventeen Million One Hundred and Twenty-Seven Thousand Three Hundred and Ninety Six Naira Only (N17,127,396); [Eighty-Six Thousand Five Hundred and Two US Dollars \$86,502.00]**. The ESMP matrix for the implementation of the Rehabilitation works for the Enugwu Ngwo Gully Erosion Site is highlighted from Table 16-18.

Table 18ESMP - Pre-Construction Phase

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Environment	Air	Mobilization of workers, equipment and other materials into Enugwu-Ngwo Gully Erosion Site	Increase in amounts of fugitive dusts and exhaust fumes from movement of heavy-duty vehicles and equipment into work areas.	Sprinkling of water via spraying devices to limit dusts.	Air quality parameters are within permissible Limits	Twice monthly	Mitigation: Contractor	4,680
				Ensure that vehicles are serviced; undergo vehicle emission testing (VET) and vehicle exhaust screening (VES) as laid down in the NESREA guidelines.	Ensure that vehicles are serviced; undergo vehicle emission testing (VET) and vehicle exhaust screening (VES) as laid down in the NESREA guidelines.	Every two months	Monitoring: NESREA (state), SMENV, PMU, Contractor	
	Soil	Mobilization of workers, equipment and other materials into Enugwu-Ngwo Gully Erosion Site	Loss of top soil and soil compaction due to movement of vehicles to site and stacking of heavy-duty equipment	Limit zone of vehicle and equipment weight impacts (designate an area for parking and stacking equipment)	Visible demarcation of vehicles and equipment limit zone Warning signs, flags will be utilized to alert users, so as to reduce risks associated with the rehabilitation of the project	Weekly	Mitigation: PMU and Contractors	8,580
Leakages from stacked equipment and subsequent intrusion of oil and chemical substances into soil.				Ensure fastening of loose parts (bolts, nuts); Install impermeable surface at the limit zone to contain potential leakages	Installation of impermeable platform at limit zone.	Weekly	Monitoring: SMENV, ENSEPA, PMU	
Environment	Noise	Mobilization of workers, equipment and	Increase above permissible noise level, (90dB) during	The effective control of noise from vehicles and equipment during this	Options for noise impact mitigation are being	Weekly	Mitigation: PMU, Contractor	780

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
		other materials into Enugwu-Ngwo Gully Erosion Site	movement of vehicles, equipment and machines (site-specific and widespread). A Logarithmic scale in decibels (ie Decibel Sound Pressure Level) was used.	<p>phase may be achieved by considering the following techniques:</p> <ul style="list-style-type: none"> • Alternative design options; • Mitigation at the source; • Mitigation along the path; and • Mitigation at the receiver <p>For minimal disturbance it will be advised that equipment is transported when it will cause least disturbance</p>	implemented		Monitoring: S MEnv, ENSEPA	
	Vegetation	Vegetation clearing	Displacement of soil fauna and damage to flora.	Contractors should limit vegetation clearing to minimum areas required particularly areas with indigenous vegetation	Vegetation clearing is limited to precise areas	Monthly	Mitigation: Contractors Monitoring: PMU	1,870
			Predisposing of soils to erosion	Cleared areas should be re-vegetated with beneficial local species known to mitigate against erosion	Re-vegetation is ongoing where appropriate.	Monthly		
SUB-TOTAL :								15,912

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Social	Traffic	Mobilization of workers, equipment and other materials into Enugwu-Ngwo Gully Erosion Site	Traffic congestion/travel delay along some major roads	Apply lane configuration changes to affected roads and streets.	Lane configuration changes are being made where applicable.	Daily	Mitigation: Contractors, FRSC (Federal Road Safety Corps) Monitoring: FRSC;	1716
	Noise	Mobilization of workers, equipment and other materials into Enugwu-Ngwo Gully Erosion Site	Nuisance to nearby residential areas	Retrofit with suitable cost effective vehicle sound proofing materials/ technologies.	Retrofitting with vehicle sound proof materials is being performed	Daily	Mitigation: Contractors Monitoring: SMENV, ENSEPA	1872
Social	Air	Mobilization of workers, equipment and other materials into Enugwu-Ngwo Gully Erosion Site	Exposure to health risks from fugitive dusts and exhausts fumes.	Provision of facemasks to residents and project personnel.	Provision of face masks and appropriate PPEs are being provided.	Weekly	Mitigation: SMENV, PMU, Public Health depts. Enugu North LGA Monitoring: ENSEPA	1638
				Restrict access of non-project personnel to work areas where dusts and emissions exist/persist from project works.	Restriction barrier are being installed.			
	Land	Land Acquisition	Conflict owing to unresolved land acquisition and involuntary displacement during the construction	The PMU will carry out an extensive enlightenment program to inform farmers and communities on the aim, scope and nature of the work	Documented evidence of enlightenment carried out showing method, coverage and dates of programs	Monthly for 6months before and during construction/rehabilitation phase	PMU	1560
	Construction camping	Transportation and movement of heavy equipment	Public Safety and Traffic congestion	Transportation of heavy equipment will be carried out during off pick hours when it will not disturb public movement Where movement	Evidence of warning signal Log record of time of lorry arrival/discharge of equipment	Weekly during pre-construction phase	Contractor PMU	-

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
				cannot be avoided during work hour, the contractor must attach a warning signal				
	Others	Mobilization of workers, equipment and other materials into Enugwu-Ngwogully Erosion Site	Disruption of vehicle and pedestrian access to where rehabilitation works will be conducted	Adequate and timely sensitization of identified Respondents; Lane configuration	Adequate and timely sensitization program is being conducted Lane configuration change have been made	Monthly	Mitigation: PMU	780
			Grievances and negative community perception about the project.	Adequate and timely sensitization of identified Respondents	Sensitization exercise are conducted		Monitoring: PMU, Independent Consultant, Contractors	2340
SUB TOTAL – 9,906								

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Occupational Health and Safety	Air	Mobilization of workers, equipment and other materials into gully erosion site	Respiratory disease risks from exposure to exhaust fumes of equipment and vehicles	Institute workers respiratory protection program (WRPP)	Institution of WRPP	Weekly	Mitigation: Independent Consultant, Contractors Monitoring: ENSEPA, PMU	4290
	Noise	Mobilization of workers, equipment and other materials into gully erosion site	Noise pollution	Institute noise control plan	Institution of noise control plan	Weekly	Mitigation: Independent Consultant, Contractor Monitoring: ENSEPA, PMU	1170

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
	Accidents	Mobilization of workers, equipment and other materials into gully erosion site	Accidents involving pedestrians	Education and training of Respondents about the project and accident occurrence	Education and training has been conducted	One-off	PMU, Contractor, Independent Consultant	780
Contractor(s) education and training on pedestrian safety				Training has been conducted	One-off	PMU	234	
Install safety signage				Safety signage have been installed	Weekly	PMU, Contractor	780	
Collapse of heavy equipment etc. being conveyed to rehabilitation work area			Conduct haulage safety training	Training has been conducted	One-off	Contractor	390	
			Enhanced fastening of equipment to carriage section of vehicles.	Contractor(s) Compliance	Weekly	Contractor	780	
Personnel Safety	Attack from dangerous animals during de-vegetation activities	Conduct safety and first aid training	Training has been conducted	One-off	Contractor	468		
SUB-TOTAL - 8,893								
PRE-CONSTRUCTION PHASE TOTAL - 34,7100								

Table 19ESMP - Construction Phase

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Environment	Climate Change	Operation of equipment used during the construction phase	GHG Emissions	<p>Fuel switching- Fuel switching from high- to low-carbon content fuels (where available) can be a relatively cost effective means to mitigate GHG emissions during this phase. Transition to renewable energy sources i.e. solar energy (where applicable)</p> <p>Energy efficiency- Machines e.g. generator plants could be turned off when not in use, in order to reduce carbon emissions.</p> <p>Multiple trips reduction: In order to reduce vehicular movement and subsequent increased carbon emissions. Hire vehicles, plants and equipment that are in good condition (current models) generally less than 3 yrs. old.</p>	Compliance to proffered mitigation measures.	Weekly	<p>Mitigation: PMU, Contractors</p> <p>Monitoring: ENSEPA, PMU</p>	1560
	Air	Operation of equipment used during the construction phase	Fugitive and cement dusts	Routine watering of the rehabilitation site	Contractors Compliance	Daily	Mitigation: Contractors	-
		Rehabilitation works – including filling and compaction activities, construction of side drains, culverts and other hydraulic structures				Daily	Mitigation: Contractors	1560

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Environment	Air	Heavy equipment operations during construction	Exhaust fumes, hazardous gases (NOx, CO, SOx, SPM,), Oxides from welding activities.	Wet Right-of-Way to reduce dust production	QC and QA are in practice	Monthly	Mitigation: PMU, Contractors	624
				Test Procedures - Routine measuring of HC and CO concentrations during rehabilitation works should be employed for PMS powered vehicles. Diesel (AGO) vehicles should be tested for exhaust opacity during unloaded engine free acceleration periods.	Contractors Compliance	Monthly	Monitoring: PMU, Contractors	1950
				Quality Control -Routine equipment efficiency audits Quality Assurance -Continuous training of contractor(s) personnel on air quality management	Contractors Compliance	Monthly	Mitigation: Contractors Monitoring: PMU	0
	Water quality/Hydrology	All rehabilitation works	Contamination of surface water (discharge of sediment laden run-off into drainages, waterways etc)	Attempts to dispose of sediment-laden run-off into surface water should be discouraged and prevented. Implement site-specific waste management plans	Contractors Compliance	Daily	Mitigation: Contractors	0
		Defecation near gully erosion site	Generation of sewage overtime (from use of temporary mobile toilets by personnel involved in civil works)	Liaise with the municipal sewage collection authorities for collection and treatment of waste with ENSEPA	PMU Compliance	Monthly	Mitigation: PMU Monitoring: SMENV, ENSEPA	780

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Environment	Soil/geology	Movement of heavy vehicles/Stationary vehicles and equipment	Surface soil compaction	Creation of limit zones Minimize compaction during stockpiling by working the soil in the dry state. Rip compacted areas to reduce runoff and re-vegetate where necessary All topsoil and other soil profiles must be managed strictly	PMU, and Contractor's Compliance	Monthly	PMU, Contractors	312
		Contamination by oil spills, lubricants and other chemicals	Pollution of soil and groundwater	All oil and lubricants should be sited on an impervious base and should have drip pans The storage area should be far from water course All containers should be clearly labelled	Contractor Compliance	Periodically	Mitigation: Contractor Monitoring: SMENV, ENSEPA	936
		Filling and Compaction activities for gully head and finger gullies reclamation	Loss of top soil ; possible minor to moderate soil instability	Ensure excavation is limited to desired areas Filling and compaction in layers must range between 150-200mm thicknesses as recommended.	Contractor Compliance	Monthly	Contractor	1872
		Erosion management	Erosion management	The contractor must implement appropriate erosion control measures to avoid further erosion in this watershed. Construct soil conservation measures at appropriate locations Execution of major works that would impact on soil structure should be carried out during the dry season. If done during the wet season, temporal drain should precede the permanent drain so that run-off from rain can be managed properly.	Contractor Compliance	Weekly	Contractor	3120

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Environment	Noise	Construction of all hydraulic structures	Extensive noise site-specific pollution as a result of on-going construction works.	Mitigation at source (for all activities) A noise barrier or acoustic shield will reduce noise by interrupting the propagation of sound waves.	Contractors Compliance	Weekly	Mitigation: PMU, Contractors Monitoring: SMENV, ENSEPA	3198
		Rehabilitation/construction works						
	Waste	All rehabilitation/construction works	Increase in waste generated	Implement site-specific waste management plan Liaise with ENSEPA for effective waste management	Contractors Compliance	Weekly	Mitigation: Contractor Monitoring: SMENV, ENSEPA,	936
	Sanitary Concerns	Increased human faecal waste	Increased human faecal waste	Provision of on-site sanitary facilities	Contractors Compliance	One-off	Mitigation: Contractor Monitoring: SMENV, ENSEPA,	624
	Design	All Rehabilitation Works	Interference with the physical setting	The design shall in no way propose to implement developments that will hinder drainage, change the topography or introduce physical changes that are not in harmony with the physical setting of the Project area. The structures to be developed should be aesthetically acceptable to blend in with the surrounding. These structures should not form or end up being used by the resident population as access or bridges. No residential facilities shall be erected on site and the proponent shall as much as possible complete the works in such a way that natural aesthetics	Contractors Compliance	During Design	Monitoring: Contractor	No additional costs to BOQ

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
				shall be retained at the locations. Restoration shall be undertaken to ensure that the original setting is as much as possible retained.				
								SUB-TOTAL - 17,472

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Social	Livelihood Impacts	Rehabilitation/ Construction of Road and drainage network	Disruptions to residents activities - (e.g. blocked access to residents)	Conduct survey to identify best alternatives to prevent disruptions to livelihood within on & off-site work areas before commencement of rehabilitation works.	Independent Consultants Compliance	One-off	Mitigation: PMU, Independent Consultant Monitoring: SMENV, PMU	1950
	Traffic	Mobilization of equipment and other materials	Loss of travel time due to heavy concentration of construction/project vehicles on and off the project site	Lane configuration changes	Contractors Compliance	Weekly	Mitigation: FRSC Monitoring: PMU,	468
			Grievances and negative perception among residents and commercial establishments about the project	Involve Respondents at certain levels of decision making and implementation of activities	PMU Compliance	Monthly	PMU	
	Education	Extensive civil work/rehabilitation activities	Noise disturbances to the serene environments for the residence	Mitigation at source Inform residents prior to commencement of works	Compliance	Monthly	Mitigation: PMU, Contractors Monitoring: Enugu North LGA	1560
Social	Health	Continuous civil work activities and steady influx of workforce	Increase in sexual activities leading to possible spread of STIs	Awareness campaign on sexual diseases, and distribution of male and female condoms.	Conduct of awareness campaigns	Quarterly	Mitigation: MWR, Public Health dept. of the Enugu North LGA. Monitoring: SMH	858

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Social	Health	Continuous civil work activities and steady influx of workforce	Incidence of respiratory diseases due to air contamination by fugitive dusts and exhaust fumes	Distribute facemasks to residents as a means to reduce allergic reactions and respiratory disease occurrence. Regular sprinkling of water in during construction works.	Facemasks are being distributed	Monthly	Mitigation: PMU, Contractors Monitoring: SMH, Public Health dept. of the Enugu North LGA,	1638
		Blocked drainage channel	Possible spread of water borne diseases	Creation of temporary channels to collect flood water	Compliance		Monitoring: SMENV	-
	Environmental hygiene and aesthetics	Waste management	Increase in waste generated from construction works	Ensure that all construction wastes are gathered on-site and disposed off according through the available waste disposal operation in the project area.	Contractors Compliance	Weekly	Contractors Monitoring: SMENV, ENSEPA	-
	Behaviour	Implementation of civil works and Rest periods	Occurrence of on-site/off-site social vices (Fights, rape, harassments, theft, vandalization, drug use etc.	Enforce and ensure proper orientation on acceptable behaviours for construction personnel on/off-site.	Compliance	Monthly	Contractors Monitoring: SMENV, ENSEPA	-
	Project performance	Implementation of all construction phase activities	Conflicts between contractors, communities etc. may disrupt completion of tasks.	Good work enforcement program	Compliance	Monthly	Contractors Monitoring: SMENV, ENSEPA	1092
Conflict resolution				4680				
Regular stakeholders meetings				1560				
Social	Noise	Massive use of heavy machinery for land clearing, levelling and excavation of soil	Hearing impairment for machinery operators	Operators of heavy duty machines must wear ear muffs They must not exceed 8 working hours per day	Evidence of procurement of ear muffs Evidence of use of the PPE Record of signing out time	Daily	Contractor	156
			Noise nuisance for Residents.	Mitigation at source Inform residents prior to	Compliance	Monthly	Mitigation: PMU, Contractors	1014

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
				commencement of works			Monitoring: Enugu North LGA	
	Loss of occupation	Land Acquisition	Disincentive to land owners	The pastoralist must be carried along all through	Minutes of meetings with land owners	monthly	Mitigation: Contractor Monitoring: PMU	-
SUB-TOTAL - 14,976								

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Occupational Health and Safety	Personnel safety	All construction activities	Fugitive dust and fumes from grinding, welding, cutting, or brazing surfaces coated with lead-based paint; Silica dust from cutting concrete; solvent vapours from adhesives, paints, strippers, cleaning solvents, and spray coatings; and isocyanate vapours from spray foam insulation and certain spray paints or coatings.	Develop and implement on-site occupational health and safety management plan; Routine OHS training and education; Conduct routine JHA/PHA; Use of PPE; Establish electrical safety program; Establish fall protection program; Establish fleet safety management program; Establish and implement HazCom; Conduct hazard identification, control and analysis; Establish fire prevention program; Use material safety data sheets (MSDS); Employ hierarchy of controls procedure; Conduct OHSRA, Cost Benefit Analysis(CBA), Return on Investment(ROI)/pay-back period analysis	Independent Consultants/Contractors Compliance	Monthly	Independent Consultant, Contractors Monitoring: PMU	3120
				Monthly		Contractors Monitoring: PMU		
SUB-TOTAL - 3,120								
CONSTRUCTION PHASE TOTAL - 49,920								

Table 20ESMP - Operational Phase

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Environment	Soil	Change of topography	Change in soil profile	Training on Sustainable Land Management (SLM) practices	Trainings conducted	Monthly	Mitigation: PMU, SMENV Monitoring: SMENV, NESREA (state), ENSEPA	3120
			Increase in soil salinity					
			Change in land use					
	Noise	Increase of road users	Noise nuisance to local residents	Air sampling and monitoring	-	One-off	Monitoring: SMENV, NESREA (state), ENSEPA	780
Water Quality	Roadway runoff	Potential surface water pollution	Water sampling and monitoring	Compliance	Bi-Annual	Monitoring: SMENV, NESREA (state), ENSEPA	1560	
Waste	Waste generation	Social and health concerns arising due to poor waste management practices	Dispose waste streams through the municipal waste management system in the project area.	Proper waste management	Monthly	Monitoring: SMENV, ENSEPA,	1092	
		Blocked drainage due to poor waste disposal	Flooding on roads					
Environment	Others	Negligence of rehabilitated Enugwu Ngwo gully erosion site	Negligence of rehabilitated Enugwu Ngwo gully erosion site	Regular maintenance and dredging of sediments in drainage channels and chute	PMU Compliance	Monthly Weekly Monthly	PMU	1092
SUB-TOTAL - 7,644								

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Social	Employment	Closure of civil works	Loss of employment	Inform personnel that employment is short-term prior to their engagement.	Proper engagement of service documentation	One-off	Contractors Monitoring: PMU	312
	Health	Operation of rehabilitated gully site	Blocked drainage structure Breeding site for disease vectors Possible increase of malaria cases due to stagnant water in drainage structures	Regular maintenance of drainage structures	Compliance		Independent consultant, PMU	-
		Increase in number of vehicles using roads	Increase in respiratory problems amongst local residents	Regular sampling and monitoring	Regular monitoring		Monitoring: NESREA, SMH	-
	Land use conflicts	Land use conflicts	Land use conflict	Control land use conflicts through Land use planning that should be participatory to designate areas for ecological, grazing and farming	Inspections are conducted		Contractors Monitoring: PMU	468
	Safety	Increase in number of road users	Increase in vehicular accidents	Use of road safety signage	Compliance	One-off	Monitoring: FRSC	0
		Operation of rehabilitated gully site	Seepage or flow back action Collapse of rehabilitated gully head or finger gullies	Re-vegetation activities using approved plant/tree species to establish green belt along the gully as a stabilization measure	Compliance	One-off	Monitoring: PMU	4680
SUB-TOTAL – 13,104								

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (USD)
Occupational Health and Safety	Personnel safety	Tasks implementation	Injuries, accidents, deaths	Implement on-site occupational health and safety management plan; Routine OHS training and education; Conduct routine JHA/PHA; Use of PPE; Establish electrical safety program; Implement fall protection program; fleet safety management program; Implement HazCom; Conduct hazard identification, control and analysis; Implement fire prevention program; Use material safety data sheets (MSDS); Implement hierarchy of controls procedure; Conduct OHSRA, Cost Benefit Analysis(CBA), Return on Investment (ROI)/pay-back period analysis	Independent Consultants, Contractors Compliance.	Monthly	SMENV, PMU	5200
SUB-TOTAL – 6,240								
OPERATIONAL PHASE TOTAL – 19,344								

8.3 Mitigation Measures for Enugwu-Ngwo Gullies

Just like most south-Eastern part of the country, Enugwu-Ngwo, is a torrent catchment that comprises several gully systems that are destroying forest and rangelands, hillside farming areas, and urban areas. Therefore, in order to mitigate the torrent and avoid upstream floods, it is essential to stabilize all the gullies throughout the entire catchment area.

Gully control is one of the most important restoration methods used in watershed management, and timing is an essential element. The field work in all structural and vegetative control measures selected should be completed during the dry and early rainy season. Otherwise, the incomplete structural work can easily be destroyed during the first rainy season. In addition, vegetative measures such as the planting of tree seedlings and shrub and grass cuttings cannot begin until structural work is complete. Each continuous gully in the gully system should be regarded as a basic treatment unit, and all the control measures in that unit should be finished before the rainy season. This is important because any continuous gully head that is left behind is capable of affecting the watershed again.

8.3.1 Selection of Mitigation Measures

The main criteria for selecting structural control measures should be based on:

- a) The size of the gully catchment area;
- b) The gradient and the length of the gully channel.

The various portions of the main gully channel and branch gullies should be stabilized either by brush fills; earth plugs and brushwood, log, and loose-stone check dams. The lower parts are treated with loose-stone or boulder check dams. At a stable point in the lowest section of the main gully channel, for example, on a rock outcrop, a gabion check dam or cement masonry check dam should be constructed. If there is no stable point, a counter-dam (gabion or cement masonry) must be constructed in front of the first check dam. The points where the other check dams will be constructed are determined according to the compensation gradient of the gully channel and the effective height of the check dams. General standards for selecting control measures for each portion of a continuous gully are given in table 19 below.

Table 21 Criteria for Selection of Control Measures for a Continuous Gully

Length of main gully channel portions (m)	Gradient of main gully channel portions (%)	Catchment area of gully portions (ha)	Required structural measures for each portion of main gully channel
-	-	2 or less	Above gully heads: Diversion ditches or channels
100 or less (from gully head)	Various	2 or less	Maximum 100m from gully head: Brush fills, earth plugs, woven-wire, brushwood, log and loose stone check dams. These measures can also be constructed in branch gullies.
900	70 or less	2 - 20	Between 100m - 1000m: Boulder check dams, retaining walls between check dams if necessary, one gabion or cement-masonry check dam is usually constructed as a first check dam instead

			of a boulder one.
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Note: All structural measures must be accompanied with vegetative measures (planting of tree seedlings, shrub and grass cuttings, and sowing of tree, shrub and grass seeds).

8.4 Estimation of Catchment Runoff

In order to design appropriate conservation structures such as check-dams; diversion ditches or waterways, it is important to be able to make an estimate of runoff. Runoff expressed in terms of depth is not convenient to determine the capacity of disposal structures. When planning to design a channel or a spillway to discharge a given amount of runoff, it will be proper to know how much of the runoff could be accommodated by that channel. Therefore, the knowledge of the quantity of water to be conveyed and at what rate is necessary. That is the reason why it is compulsory to determine the peak runoff rate in this catchment.

In natural catchments, any rainfall is either intercepted by vegetation, infiltrates into the soil, starts moving over the surface as runoff or is lost through evaporation. For a rainfall of a given duration and intensity, the proportion which becomes runoff depends mainly on the cover of vegetation or crop residues, the soil infiltration rate, water content and storage capacity, and the slope of the land.

The reason why the peak runoff rate is used to determine the capacity of channels is to avoid risk of designing low or high capacity channels, rupture and overtopping of dams, overflow of bunds, channels and rainfall multiplier systems. For instance, low capacity channel would not be required since it allows overtopping and high capacity channel is not required either, because it entails unnecessary costs.

There are two simple methods used for estimating runoff rate: known as the **Rational formula** ($Q = CIA/360$) and **Cook's method** ($Q = TRF$)

They are both useful and as they will not give exactly the same result they can both be used and the results compared to check on the reliability of the estimate.

A. Rational formula for estimating runoff rate

The rational formula is expressed as follows:

$$Q = CIA/360$$

Where:

Q = runoff rate (m³/s)

C = Runoff coefficient (between 0 and 1)

I = Rainfall intensity (mm/hr) = **Rainfall amount over time taken.**

A = Area of the catchment (ha)

While using the above formula, the following points should be noted:

- **Runoff coefficient** is the proportion of total rainfall that is expected to become runoff during the design storm. **Runoff = Rainfall – Infiltration.** It can be determined easily as shown in table 20.

Table 22 Runoff coefficient values for use with the rational formula

Land use and topography	Soil type		
	Sandy loam	Clay and silt loam	Tight clay
Cultivated land <ul style="list-style-type: none"> ▪ Flat land (0-5 %) ▪ Rolling land (5 – 10 %) ▪ Hilly land (10 -30 %) 	0.30 0.40 0.52	0.50 0.60 0.72	0.60 0.70 0.82
Pasture land <ul style="list-style-type: none"> ▪ Flat ▪ Rolling ▪ Hilly 	0.10 0.16 0.22	0.30 0.36 0.42	0.40 0.55 0.60
Forest land <ul style="list-style-type: none"> ▪ Flat ▪ Rolling ▪ Hilly 	0.1 0.25 0.30	0.30 0.35 0.50	0.40 0.50 0.60
Developed areas (villages) <ul style="list-style-type: none"> ▪ Flat ▪ Rolling 	0.40 0.50	0.55 0.65	0.65 0.80

Source: Hudson, N. 1995.

- **Rainfall intensity** value in millimetre per hour for use in rational formula is the highest that can be expected in a 10 year return period for a time equal to the time of concentration of runoff at the outlet of the catchment. This is known as the design storm. The time of concentration is an important concept and assumed that the peak runoff will occur when the storm period lasts just as long as it takes for water from the furthest part of the catchment to reach the outlet. In this way all parts of the catchment are contributing to the runoff at the outlet simultaneously. Time of concentration can be calculated using the following formula:
 $T_c = 0.0195 L^{0.77} S_g^{-0.385}$.

Where:

T_c = Time of concentration (min)

L = Maximum length of flow (m)

S = Average gradient (m/m)

Once the time of concentration is found, rainfall intensity can be selected from a typical rainfall intensity duration curve for a 10 years frequency (for SWC structures) possibly developed for that particular area.

Time of concentration for small catchments can also be determined using the table 21.

Table 23Time of concentration for small catchments

Area (ha)	Time of concentration (minutes)
0.4	1.4
2.0	3.5
4.0	4.0
40	17
200	41
400	75

(Source: Thomas, 1997)

- **Area** of a catchment under question which is often called **runoff area** can be measured either from a map or surveyed directly on the field, or usually estimated.

8.5 Reasons for Failure in Gully Rehabilitation

Gully control can be tedious where executed measures do not seem to work. Failure in control brings losses of material, time, money and sometimes makes the gully erosion even worse. Actually, failure can be avoided if appropriate measures are taken and proper techniques are applied. From experience, the following problems can be taken as the major reasons for the failure of most of the gully rehabilitation schemes which must be avoided in this project.

- Poor consideration for upper catchment treatment;
- Poor installation of check-dams which is related to lack of keying the check-dam to the floor and sidewalls of the gully;
- Lack of apron. If there is no apron, water falling from the check-dam spillway erodes the area below and undermines the structure. If the apron is not keyed or secured into the gully, it will be washed away;
- Lack of spillway. The check-dam tends to impede the flow of water. This leads to the water exerting pressure on the dam which can weaken it. A spillway will discharge the runoff thus protecting the check-dam;
- Poor maintenance. The life and effectiveness of control measures is extended by regular maintenance. Any 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;
- Improper spacing of check-dams. Proper spacing is crucial if the check-dams are to serve their purpose. Inappropriate and irregular spacing of the check-dams may lead to their being washed away;
- Failure to complete the work. In some instances the gully rehabilitation schemes may not be completed because of various reasons. Half measures do not offer the required protection and are a waste of time and resources;
- Structures are sometimes made too high and the water which ponds causes instability of the soil and piping underneath or around the structure;

- Poor integration between physical and biological measures.

8.6 Maintenance and Utilization of a Rehabilitated Gully

Maintenance of gully control structures is a very important point worth to be emphasized. 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.

The use of gully will depend on whether it has been established for a protected waterway or the water has been diverted and the gully stabilized for other uses. Under the condition when the water is discharged through the gully after the necessary stabilization activities have been undertaken, the side of the gully can be used for growing of grass or fodder. But in conditions when the gully is not used as a waterway, it can be used for growing horticultural crops or plants such as banana or other fruit trees. Wide gullies can have tree planted on the side slopes provided they are not too steep.

The other important issue for sustainable gully rehabilitation scheme is the identification of users and development of a use concept or management plan. In most cases, gullies are crossing different land uses owned by many land users. Therefore, 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 and its produces should be elaborated and agreed upon.

Experiences have shown that most of the gully rehabilitation efforts are made accidentally without having clear purposes. As a result, it is common to see gullies with a huge biomass, mostly of one species (*Sesbaniasesban* or *Elephant grass*) but not harvested and after all owners are not known. This has forced the community members into conflict and hence destruction of the whole endeavour.

In view of this fact, the identification of land owners along gully areas and demarcation of their boundary, development of a management plan and formulating user's agreement (on maintenance and proper utilization of the gully) should come before any treatment effort. It is always crucial to remember that before deciding to undertake gully control measures one has to plan first for what purpose the gully is intended to be used after treatment and then try to take measures relevant to the future strategy.

9 CHAPTER NINE: STAKEHOLDERS'/FOCUS GROUP CONSULATATION

9.1 Introduction

Public consultation and participation are essential because they afford PAPs the opportunity to contribute to both the design and implementation of the project activities and reduce the likelihood for conflicts.

The consultation process will ensure that all those identified as stakeholders are consulted. Information about the project was shared with the stakeholders, to enable meaningful contribution, and enhance the success of the project

The public consultation strategy for the ESMP activities evolved around the provision of a full opportunity for involvement for all stakeholders, especially the PAPs. Concerns raised by the stakeholders are documented and incorporated in this report and used to develop mitigation and/or enhancement measures for the GRM.

The consultation was conducted to ensure the effective participation and awareness of the Project community and to document comments, suggestions and concerns raised with regards to the project and its sub-activities. The following were taken into full account:

1. The project will have foreseeable environmental and social impacts, especially on the environment, the people and structures around the gully;
2. The project aims at impacting more positively to the environment and social conditions, and will devise suitable, practicable mitigation measures through an ESMP to reduce or eliminate negative impacts;
3. That positive impact of sub-project activities will be enhanced;
4. The priority concerns raised by Project Affected Persons (PAPs) and other relevant stakeholders will be put into account and incorporated in project planning.

Objectives of the Public Consultation

- To create general public awareness and understanding of the project, and ensure its acceptance;
- To develop and maintain avenues of communication between the project proponent, stakeholders and PAPs in order to ensure that their views and concerns are incorporated into project design and implementation with the objectives of reducing, mitigating or offsetting negative impacts and enhancing benefits from the project;
- To inform and discuss about the nature and scale of adverse impacts and to identify and prioritize the mitigation measures for the impacts in a more transparent and direct manner;
- To document the concerns raised by stakeholders and PAPs so that their views and proposals are mainstreamed to formulate mitigation and benefit enhancement measures; and
- To sensitize other stakeholders about the project and solicit their views and discuss their share of responsibility for the smooth functioning of the overall project operations.

The stakeholders were informed of the visits through the existing communication line between the SPMU and the communities. The Community leaders through the use of town criers, church announcements and phone calls, informed the rest of the community of the proposed meetings.

The identified groups include:

- Enugu State NEWMAP SPMU;
- Traditional Leaders;
- Title holders (Chiefs, Nze and Ozos) Elders;
- Chairman of Enuwu-Ngwo Township Association;
- Youth group Executives;
- Women group Executives;
- Town Union Executives of the communities;
- Project Affected Persons;
- People living or owning assets along the corridors of the gullies.

9.2 Advocacy Visit

The advocacy visit meeting was held on 25th May 2016 at the Community Hall. This visit involved the Town Association Executives, Youth executives and women group executives, some project affected Persons and Traditional Chiefs.

The advocacy visit was held to introduce the ESMP sub-projects to the stakeholders and seek their consent and opinion on the exercise. The visit was also scheduled to gain a better understanding of the project environment, social structure and existing livelihood activities of the area. This meeting was also scheduled to allow the authorities select a suitable date for a larger stakeholder's consultation including venue and time for the town hall meeting. This will give the community well enough time to disseminate the information to all relevant stakeholders.

The Traditional Ruler, HRH *Igwe*Ayalogu represented by Ozo Stanley Orji, expressed happiness over the visit and assured the consultant and the SPMU that the community will give them the needed support to ensure a successful study. He further buttressed the need for the project to be commenced on time so as to arrest the erosion menace.



Figure 34 Dr Obi addressing the stakeholders during the Advocacy visit



Figure 33 One of the stakeholders during the advocacy visit

He further explained that it has been a thing of concern to the community and are happy that the menace will be tackled. He explained that the workers should not be afraid as there is no taboo in the community that will affect the project or the workers. He went ahead that there will be adequate security for the equipment and workers when the civil work commence as there is an existing vigilante group as well as other security forces. He finally expressed that that the community will give all the necessary cooperation to the team and pray that they round up the study on time to give room for the civil works.

Table 24 Summary of Advocay Visit and concerns raised are highlighted in the table below;

Date	25th May 2016
Name of Stakeholder	Site Committee, Youth Leathers, Women Leaders, Traditional Leaders,
Language of Communication	English and Igbo
Introduction	A brief introduction on the project was made, stating the project objectives and its area of coverage. Stakeholders were provided information on the efforts and plan by the government and World Bank in solving the erosion problems within the state.
Response of Stakeholders about the project	The stakeholders express that there is already an existing Community project management Committee that will work with the PMU in the implementation of the project. They also stated that point of entry for equipment is being discussed and will be reported back to the PMU. They further explained that it has been a thing of concern to the community and are happy that the menace will be tackled. They stated that the workers should not be afraid as there is no taboo in the community that will affect the project or the workers and that there will be adequate security for the equipment and workers when the civil work commence as there is an existing vigilante group as well as other security forces. He finally expressed that that the community will give all the necessary cooperation to the team and pray that they round up the study on time to give room for the civil works.
Concerns/ Complaints	The stakeholders stated that the Government should ensure that the project is realized and not just end in paper work and hear say. They were also interested to know the fate of those that the erosion has damaged their property as well as the qualification required for community members to participate during the civil works. They also wanted to know how to organise the work force so as to receive grants from the project. They requested to know the aid that the community can bring to ensure the success of the project.
Feedback to the Stakeholders	The stakeholders were assured that their concerns and recommendations will be imputed in the ESMP and in project planning. They were also enlightened o the Livelihood restoration components of the project as well as requirements.
Remarks/Recommendation	Generally stakeholders appreciate the development. The NEWMAP PCU will need to implement continuous social awareness programs prior to, during and after project implementation. The consultant requested the community to come out enmasse

	during the public consultation so as to express their concerns and ideas.
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9.3 Town Hall Meetings

This was a general meeting where all the stakeholders and community members were given a general overview of the project, the component and information regarding the ESMP and ARAP especially the census/inventory and other relevant information in the RPF and TOR. The meeting also provided feedbacks, clarifications and responses from the advocacy visit.

During the visits, the consultant and NEWMAP representatives further explained to the stakeholders that the proposed development would involve construction which may impact on the livelihood of people living along the project areas. However, plan has been set up to ameliorate the envisaged environmental and social risks. The consultant explained that the World Bank OP 4.12 is a safeguard instruments or document that will address the envisaged impact and also provide guidelines for the compensation and grievance redress. They further specified the need for the community to have a buy-in of the project as it will be their duty to sustain the intervention.

9.3.1 The General Town Hall Meeting

This meeting was held on the 28th May, 2016 at the Village Town hall. The essence was to enable interested and affected parties to air their concerns (views and opinions on the proposed development) which might have been overlooked during the advocacy visit. It also gave room for more enlightenment on the need for the people's collective effort in protecting the environment. The stakeholders were given a rundown of the NEWMAP Interventions as well as the need for the ESMP.

The meeting commenced at 12:30am and the community association chairman presented the kola-nut welcoming the team of Consultant and SPMU. He on behalf of the community expressed joy that the World Bank and the Government have remembered the plight of the people due to the erosion problem and exude confidence on the community's readiness to comply with consultants engaged to execute the different components of the project.



Figure 36 Stakeholders during Townhall meeting



Figure 35 Women Group during Town hall meeting

SPMU Communications Officer explained the synergy between the World Bank and Federal Government of Nigeria and rationale for the NEWMAP establishment. He stated that the NEWMAP is saddled with responsibility of providing mitigation measures to areas vulnerable to erosion and watershed challenges. He stated that the consultant is employed by NEWMAP to satisfy World Bank safeguard requirement, which will enable it to implement the project without hitches.

He stated that the Enugwu-Ngwo Gully sites comprising Colliery, Amuzam, Ezata and St Theresa gully fingers, have gotten approval from the World Bank but explained that the ESMP is a vital instrument before project implementation. He stressed that agreement among the stakeholder is a critical measure for a successful project implementation. He also said that the main aim is for the consultant to carry out the study so as to ensure that the impacts of the project on the community are provided with mitigation measures. He therefore urged the stakeholders to work in harmony with the consultant so as to avoid crisis during/after project implementation.

The Consultant in his statement explained the World Bank safeguard policies, emphasising on OP 4.01. He stressed the importance of stakeholder engagement while challenging the stakeholders to take ownership of the project. He also said that the stakeholders will help in project security and monitoring.

He further explained the importance of project design and the setback identified by the Engineering consultant. He concluded by stating the importance of protecting the environment by avoiding things that will predispose the environment to erosion and other environmental disasters.

Concerns Raised by stakeholders

- e) The process is taking so long and the Erosion problem is escalating. People that own land have relocated but those without are stuck in the erosion area with no place to go.

Response: As soon as the ESMP and ARAP documents are concluded, the next stage will be to advertise for the contractor that will perform the civil works after which work will start. However, the community should keep up with the palliative measures that they have been employing pending when the main work will commence.

- f) Will it be necessary for the people that didn't fill the questionnaire that was distributed in the community to do so later?

Response: There is a difference between the ARAP Census form and the questionnaire for ESMP. That the one for ESMP was distributed at random for socio-economic studies and it wasn't necessary for those that missed out to worry about filling it later.

- g) Will the bank also provide portable water and Electricity and access road as it was noticed that questions on these were included in the questionnaire.

Response: The information was to understand the social status of the community as well as the available utilities. The information remains the property of the bank and they may decide to intervene in any aspect as they deem necessary.

- h) Will other erosion sites within the area be included in the intervention?

Response: The sites have been selected and approved by the Bank and if there is need to work on other sites, this process will have to be followed and coordinated through the NEWMAP PMU.

Closing Remarks: The Communications Officer implored the stakeholders to give all the necessary assistance to the consultant so as to achieve the desired objectives. He also stated that as soon as the ESMP study is concluded and the document approved that next stage will be to advertise for the

contractor that will perform the civil works after which work will start. However, the community should keep up with the palliative measures that they have been employing pending when the main work will commence. The town hall meeting was brought to an end at about 3:15pm after a closing prayer.

9.3.2 In-depth Interviews Meeting

These meetings were held with members of the existing erosion site committee, people living within the neighbourhood of the gully fingers, Colliery Secondary School. Also part of those interviewed were the project affected persons, community youths, hunters and representative of the community union. The purpose for this was to get for the consultant to get a deeper understanding of the history surrounding the erosion. Also the consultant sought to find out the measures the community have been engaged in to help prevent or reduce the progress of the erosion. As part of the information sought, the consultant was given a history of the community, cultural heritage as well as leadership hierarchy.

The outcome of the several consultations showed that the communities have a good understanding of the project and are delighted that the project is going to see the light of day. They thanked the consultants for the thoroughness in execution of their assignment and promised to be of assistance to ensure the success of the project.



Figure 38 One of the community members during the question and answer session



Figure 37 One of the women representatives during the Stakeholders meeting



Figure 39 during one of the Indebt interviews with a stakeholder

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ANNEX 1 SAMPLE SOCIO-ECONOMIC DATA COLLECTION FORM

QUESTIONNAIRE

SOCIO-ECONOMIC DATA GATHERING SHEET FOR THE ESMP FOR ENUGU NGWO GULLY EROSION SITE IN ENUGU STATE UNDER THE Nigeria Erosion and Watershed Management Project (NEWMAP)

IDENTIFICATION

- Serial Number.....
- Questionnaire administration from point of entry (a) Left side..... (b) Right side.....
- Landmark(s) at point of entry
- Location of Interview:
- Name and Signature of Interviewer:
- Date:
- Time Interview Started: Time Ended:

SOCIOECONOMIC ATTRIBUTES

Households

- Are you aware of the Gully rehabilitation Project? Yes..... No.....
- If Yes, where did you get your information from.....
- Name of Household Head (HH)
- Name of Respondent
- Relationship of Respondent to Household Head **(Please Tick One)**
 (a)Wife of HH (b) Son of HH (c) Daughter of HH (d) Father of HH (e) Mother of HH (f) Brother of HH (g) Sister of HH (h) Others Specify.....
- House Address
- Sex **(M)**..... **(F)**.....
- Age
- Religion (Christian)..... (Islam)..... (Traditional)..... (Others)..... **(Please Tick One)**
- Marital Status (Single).... (Married).... (Divorced).... (Widow/Widower).... **(Please Tick One)**
- Number of wives
- How long have you lived in this community
- How many persons live in your Household (i.e. Eat from the same pot).....
- How many persons in your house hold fall into the following age categories?

CARTEGORIES	MALE	FEMALE	TOTAL
-------------	------	--------	-------

CARTEGORIES	MALE	FEMALE	TOTAL
0-4yrs			
5-9yrs			
10-14yrs			
15-19yrs			
20-24yrs			
25-29yrs			
30-34yrs			
35-39yrs			
40-44yrs			
50-54yrs			
45-49yrs			
50-54yrs			
55-59yrs			
60-64yrs			
65-above			
TOTAL			

- What is your highest educational qualification?
 - (i)FSLC ... (ii)WASC/SSCE ... (iii)TCII/OND (iv)HND/Degree ... (v)MSc/PhD ... (vii) Islamic studies..... (vii)None..... **(Please Tick One)**

- How many members of your household/Business fall under the following educational categories?

CARTEGORIES	MALE	FEMALE	TOTAL
Primary School (attempted/still attending)			
Primary School-Completed (Living Certificate)			
Secondary School (attempted/still attending)			
Secondary School-Completed (O'Levels)			
Tertiary Institution (attempted/still attending)			
Tertiary Institution (Completed)			
Islamic Studies			
TOTAL			

- What is your Occupation (*indicate the category you belong to and the level/profession*):

Categories	Public Employee	Sector	Private Employee	Sector	Self Employed	Student
Senior Mgt Staff						
Middle level Staff						
Junior Staff						
Professional						

Artisan				
Businessman				
Part time				
Others				

- How many employed members of your household/Business/School are engaged in occupation listed below?

CATEGORIES	MALE	FEMALE	TOTAL
Farming			
Fishing			
Mining			
Hunting			
Crafting			
Trading			
Civil Service			
Company Employment			
Self-Employment			
House Wife			
Others(Specify)			
TOTAL			

- What is your Annual Income? (i)N0 -50,000..... (ii)N51, 000- 100,000..... (iii)N100,101-500,000..... (iv)N500,000 and above..... **If Not Known**, what is your Monthly income.....**OR** Daily income.....

- Estimate the monthly/annual income of other members of your Household/Business/School
 (i) ₦0 – 50,000..... (ii)₦51, 000- 100,000..... (iii)₦100,101- 500,000... (iv)₦500,000 and above.....

AVAILABILITY OF AMENITIES

- How would you describe the condition of the following amenities in town you live/community?

Amenities	Excellent	Very Good	Good	Fair	Poor
Roads to the community					
Roads within the community					
Schools in the community					
Public Health Institutions					
Potable Water					
Public Electricity					
Communication facilities (Postal Service, Telephone)					
Public recreation facilities					

- What is the major source of water available to your household? **(Please Tick One)**(i)River..... (ii)Borehole (commercial)..... (iii)Borehole (private)..... (iv)Public pipe-borne water (v)Pond (vi)Water Vendor..... (vii)Well water.....
- If a public pipe borne water, how regular does the tap flow in a week? **(Please Tick One)**
 (i)Regularly ----- (ii) Occasionally (iii) Rarely
- How long does it take you in minutes/hours to get to your water source

- What is the primary source of electricity/ light to your community? **(Please Tick One)**
 (i)Hurricane Lamp (ii) Private Generators..... (iii)Community Generators.....
 (iv)State Government Utilities Board..... (v)Company Operating in your community..... (vi)
 PHCN (National Grid).....
- What is the secondary source of electricity? **(Please Tick One)**
 (i)Hurricane Lamp (ii) Private Generators.... (iii)Community Generators..... (iv)Company
 Operating in your community.....
- What is the main fuel you use for cooking? **(Please Tick One)**
 (i)Firewood (ii)Charcoal..... (iii)Kerosene/ Oil (iv)Gas..... (v)Electricity (vi)Crop
 residue/ Saw dust..... (vii) Animal Wastes ... (viii) Others.....
- What type of toilet facility do you use? **(Please Tick One)**
 (i)Pit..... (ii) Bush..... (iii)Prier Head.....iv) Bucket..... (v) Water Closet.....
 (vi)Others (Specify).....
- How do you dispose of your household refuse? **(Please Tick one)**
 (i)Private Open Dump..... (ii) Public Open Dump..... (iii) Organized Collection.....
 (iv)Burning..... (v) Bush..... (vi)Burying.....

HEALTH

- Which of the following diseases/condition is most common in your area **(Please Tick one)**
 (i)Malaria..... (ii)Typhoid..... (iii)Diarrhoea.....
 (iv)Cough..... (v) Respiratory Disturbance.....(vi)Others.....

ANNEX 2 STAKEHOLDERS CONSULTATION ATTENDANCE REGISTER

ATTENDANCE FOR STAKEHOLDERS CONSULTATION FORUM

Location: Funston Ngato (Coal City Hall, Team)

Date: 28-05-2016

Time:

S/N	NAME	SEX	DESIGNATION	PHONE NUMBER	SIGNATURE
1	GAMUW AUBAIRE Ahi	M	MEMBER	0167024945	
2	ATI SHARUETI C AND	F	MEMBER	08037988504	
3	ATI SHARUETI C AND	F	MEMBER	08037988504	
4	ATI SHARUETI C AND	F	MEMBER	08037988504	
5	ATI SHARUETI C AND	F	MEMBER	08037988504	
6	ATI SHARUETI C AND	F	MEMBER	08037988504	
7	ATI SHARUETI C AND	F	MEMBER	08037988504	
8	ATI SHARUETI C AND	F	MEMBER	08037988504	
9	ATI SHARUETI C AND	F	MEMBER	08037988504	
10	ATI SHARUETI C AND	F	MEMBER	08037988504	
11	ATI SHARUETI C AND	F	MEMBER	08037988504	
12	ATI SHARUETI C AND	F	MEMBER	08037988504	
13	ATI SHARUETI C AND	F	MEMBER	08037988504	
14	ATI SHARUETI C AND	F	MEMBER	08037988504	
15	ATI SHARUETI C AND	F	MEMBER	08037988504	
16	ATI SHARUETI C AND	F	MEMBER	08037988504	
17	ATI SHARUETI C AND	F	MEMBER	08037988504	
18	ATI SHARUETI C AND	F	MEMBER	08037988504	

ATTENDANCE FOR STAKEHOLDERS CONSULTATION FORUM

Location: Good of Ekeqain Enuyon Apno

Date: 28/05/2016

Time:

S/N	NAME	SEX	DESIGNATION	PHONE NUMBER	SIGNATURE
1	SUR SIKAS CHRIS-EIKE AEM	M	CHAIRMAN	08051528798	
2	DR DONALD E. ASU	M	VICE-CHAIRMAN	08031373038	
3	DRONE DANFONG EZE	F	TR	08033215076	
4	DEOAGYI KEZIANH	F	MEMBER	08076763435	
5	FRANCIS DUSO AGU	M	EXECUTIVE	08065923661	
6	LEHE ANURFUS CHIME	M	MEMBER	08033448516	
7	DR OMEKA L.	M	MEMBER	08034478525	
8	Mrs. CEKERE E. OJI	M	PT TO HRA MEMBER	08054030518	
9	DR. KEVIN	M	MEMBER	08072021178	
10	Sipheny Nkperfor Nwamen	M	Member Chairman		
11	NDE MOSES OJI	M	MEMBER	08068006018	
12	EZE SAM OJI	M	MEMBER	08035061961	
13	UDEH FRANCIS CHUKUDUNYA	M	MEMBER	08077906095	
14	AMEKE PATRICIA	F	MEMBER	070335598140	
15	AGU VERNICA	F	MEMBER	01035251567	
16	ENGR. N. H. ANI	M	MEMBER	08074242878	
17	DR. E. NDIKE EZE	M	MEMBER	08078343503	
18	OSODO CHIDI	M	MEMBER	08010784108	
19	PROF. N. OJI	M	MEMBER	08015030677	
20	KEZIANH OJI	F	MEMBER	080533115122	
21	BEATNICE AGU	F	MEMBER	07055171527	
22	DR. IZUEZING	F	MEMBER	08062508050	
23	UDAOM JOSEPHINE	F	MEMBER		
24	KEZIA NDI	F	MEMBER		
25	BEANSY AGU	F	MEMBER		
26	DIWADEKA OSA	M	MEMBER	080555188	
27	DR. E. OJI	M	MEMBER	08054079575	
28	GWEL STELLA	F	MEMBER	07030818820	

ATTENDANCE FOR STAKEHOLDERS CONSULTATION FORUM
 Location: Coal City Hall, Freetown, Freetown Region
 Date: 28/05/2016
 Time:

S/N	NAME	SEX	DESIGNATION	PHONE NUMBER	SIGNATURE
1	CHING FRANCIS	M	P.R.O	08052003040	
2	Chief Sam. Krumang	M	Executive	0806660512	
3	NPZ PAPA DA AAI	M			
4	DDAGU KEITH AAI	F	Executive	08076763435	
5	YATIE MARLINE CHINE	M	SECRETARY	08033448016	
6	UDOL EMMAWELIK	M		08092826800	
7	CHINA OVIDSON AGU	M		08066579665	
8	YIEB DUBH	M		08067662111	
9	YIEB DUBH	M		081060016767	
10	YIEB DUBH	M		07058781499	
11	HUGUSTINE O. AGU	M		08036773871	
12	YIEB DUBH	M		081079125217	
13	AM CHUKWENOKA	M		08030645357	
14	JOSEPH O. EZE	M		08106714486	
15	MIMI KENETH	M		081026186490	
16	ENGR. THOMAS OSITA ANI ZORR	M	APPLICANT	08129916580	
17	NWU AMUO OBIWANG	M		07051092404	
18	NGI CHINOSI DUMENEKE	M		08137521337	
19	CHUYH WENNY	M		08052895787	
20	MKAMEGA KELVIN	M		08063999541	
21	ANI CHIDIKERE	M		0805412703	
22	DZIKOR DICKINSON	M	EXECUTIVE	08061371800	
23	SAM OZUMBA	M	EXECUTIVE	08032240348	
24	YIEB DUBH	M		08065463539	
25	YIEB DUBH	M		08033100101	
26	YIEB DUBH	M		081067022715	
27	YIEB DUBH	M		08130186802	
28	ENGR. ADENWA GILBERT	M		08064697834	

ATTENDANCE FOR STAKEHOLDERS CONSULTATION FORUM

Location: Fusion, Agona

Date: 05-05-2016

Time: 12:00 P.M.

S/N	NAME	SEX	DESIGNATION	PHONE NUMBER	SIGNATURE
1	PRINCE CHIBO AGU	M	EXECUTIVE	08065523661	[Signature]
2	EZEM ORJI ANTHONY	M	MEMBER	08080373368	[Signature]
3	AGU SAMUEL C	M	EX-MEMBER	08037986504	[Signature]
4	SAM-OKWUANI. A.	M	MEMBER	08066606512	[Signature]
5	NZE MOSES OSI.	M	MEMBER	08068005818	[Signature]
6	CHIME ANASTINE D.	M	SECRETARY	08033488016	[Signature]
7	CHIME OYFORD EZE	F	HS SEC	08032215076	[Signature]
8	ANIBE PATRICK	F	STATE HOLDER	07033559848	[Signature]
9	OZO DONALD F. AGU	M	DIRECTOR	08031373026	[Signature]
10	SRS. CHRIS. EIKE AKAS	M	MEMBER	08051525198	[Signature]
11	UGOELI AZUBIKE. A.	M	MEMBER	08036455194	[Signature]
12	OZEMOR OKECHUKWU. S.	M	EXECUTIVE	08061371806	[Signature]
13	UDEH OKECHUKWU. U.	M	MEMBER	081681897806	[Signature]
14	S/O FESTUS NOLLE EZE	M	STATE HOLDER	08076242878	[Signature]
15	PNETE SUNDAY OS	M	MEMBER	0803743807	[Signature]
16	DIVINE A. EZEH	F	EXECUTIVE	08066748988	[Signature]
17	BLESSING OGYI	F	MEMBER	08055171527	[Signature]
18	OSIG OGYI	M	MEMBER	08052811642	[Signature]
19	OZO SRS OBI	M	RAPIFORMER	08062442981	[Signature]
20	Okonjua -C. Donald	M	Research Analyst Hospital		[Signature]
21	Ochikpecku. Fave	M	CONSULTANT LIMITED	08039127013	[Signature]
22	Ogbonna Semegwena	M	"	08062691671	[Signature]
23	OZAM. SOMBINGI	M	MEMBER	07038564490	[Signature]
24	OZU OYEROR	M	RAPIFORMER	080540372518	[Signature]
25	NZE EMMANUEL AYO	M	RAPIFORMER	08033114814	[Signature]
26	Mrs Chima N. Am	F	HOMELIFE	08068019634	[Signature]